Handbook of tools for informing and monitoring urban greening strategies and nature plans

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Science Service for Biodiversity

bioagora

Contents

Abstract

This handbook is the response to a policy request submitted by DG Environment to the Knowledge Centre for Biodiversity (KCBD) through the KCBD ticketing system.

Europe's cities are facing challenges to protect, maintain, restore, and improve their nature and green space. A broad and diverse set of tools has been developed to support city planners and policymakers in tackling these challenges. This handbook maps out 59 of these tools (software, methods and modelling approaches) to assist urban decision-makers in implementing EU policies such as the EU Biodiversity Strategy for 2030 and the Nature Restoration Regulation. These tools range from simple dashboards to advanced spatial models, designed to plan, monitor, and expand urban green space.

Tools were evaluated by experts for ease of use, cost, data needs, and policy relevance, and then grouped into five clusters. These clusters include tools that (1) help with benchmarking based on indicators, (2) help explore and understand challenges, (3) are developed to support specific policies or projects, (4) provide multi-purpose spatial information, and (5) have specialized focus on specific challenges (e.g., air quality, ecological connectivity).

Factsheets provide overviews for each tool based on the assessed criteria and information. Real-life case studies show how cities across Europe are already using these tools to cool streets, boost biodiversity, and improve public health. This handbook gives decision-makers the digital edge they need to green cities faster and smarter.

Foreword

In December 2024, DG Environment submitted a policy request to the Knowledge Centre for Biodiversity (KCBD; European Commission, 2025a), through the [KCBD ticketing system](#), to get a collection of planning-support tools and related case study applications for informing and monitoring urban greening strategies and nature plans. The aim of that request was to address the operational needs of cities working to implement the provisions of the EU Biodiversity Strategy for 2030 (BDS2030) and of the Nature Restoration Regulation (NRR) towards increased urban green space and tree canopy cover. The KCBD assigned this request to the [Science Service for Biodiversity](#) (SSBD), currently under development by the [BioAgora](#) project (BioAgora, 2025). The SSBD is being developed to bridge research outcomes with decision-making needs. BioAgora identified and organised the experts that developed the current study.

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1. Introduction

The accelerating decline of biodiversity and the quality of urban nature across Europe's urban landscapes poses significant risks to human well-being, climate resilience, and ecological integrity. In response, the EU Biodiversity Strategy for 2030 (BDS2030) (European Commission, 2025b) and the Nature Restoration Regulation (NRR) Article 8 (European Commission, 2025c) set ambitious targets to halt and reverse biodiversity loss, including specific provisions for increasing urban green space and tree canopy cover. Relatedly, international policy agreements have been made to improve and bolster urban nature, such as the Global Biodiversity Framework Target 12 (Convention on Biological Diversity, 2025). These European and global targets are important foundations and incentives for strong action plans of cities (Diep & McPhearson, 2025). Achieving these targets will require systematic, evidence-based approaches to planning, implementing, and monitoring nature-based solutions and green infrastructure within cities.

Urban nature, here defined as green spaces and water bodies in and around cities, plays a vital role in supporting biodiversity (Beninde et al., 2015) and enhancing the quality of life for urban residents. They ensure the complex natural systems that support everything we depend on for a good life, including ecosystem services, can continue to exist and thrive – for example, by improving air quality, mitigating the urban heat island effect, regulating stormwater-runoff, and promoting social well-being (Veerkamp et al., 2021; Jones et al., 2022; Li et al., 2025). As urbanisation intensifies across Europe, there is a growing need for effective tools that can guide the planning, development, and management of urban nature in alignment with sustainable urban development goals (Cortinovis & Geneletti, 2018; Pierce et al., 2024).

This handbook has been developed to assist urban planners, policymakers, and regional authorities in navigating the complex landscape of tools available to support urban nature planning. In this context, tools are to be understood as software, methods, and modelling approaches designed to generate and process information on biodiversity and ecosystem services in urban contexts. The handbook provides a practical and accessible synthesis of such tools to equip users with a clear overview of planning-support tools and examples of their applications. This synthesis aims to facilitate the preparation of Urban Nature Plans and the realisation of NRR urban targets across Europe's 14,000 municipalities.

The handbook addresses two key questions: 1) what tools are currently available to support European cities in developing urban greening strategies and actions, and what data inputs do they require; and 2) what good-practice examples exist that showcase these tools in action, alongside an assessment of their transferability to other European urban contexts. The handbook has a pragmatic focus, prioritising tools that are actively maintained, widely used, and capable of supporting cities at different stages of planning – from identifying suitable areas for new urban nature, to prioritising interventions, assessing impacts or the multiple benefits provided by existing and new urban nature, and monitoring progress over time.

Recognising the diversity of urban planning systems across Europe, the handbook also highlights practical case studies to illustrate how different cities have effectively applied these tools within their local governance frameworks. It offers recommendations on usability, cost, data requirements, and potential barriers to use, ensuring its relevance as a day-to-day reference for practitioners. Moreover, an interactive tool navigator was developed to accompany the handbook and guide practitioners to relevant tools.

By highlighting the operational potential and limitations of each tool, this handbook seeks to empower municipalities and stakeholders to make informed decisions about the integration of

nature-based solutions into urban planning. In doing so, it contributes to enabling Europe's cities to become more resilient, biodiverse, and liveable for future generations.

This handbook is structured to first provide an overview of the applied methodology, followed by an overview of tool clusters and brief analysis of the collected data, the highlighting of some example tools and case studies, and a brief conclusion. The work was done in the form of a rapid assessment, providing a timely overview and searchable online tool and database, but does not provide an exhaustive list of tools available for the listed goals.

2. Methods

2.1 Tool screening and selection

This handbook provides an overview of urban greening planning tools that have been contributed and assessed by an expert group of 14 professionals, providing both a researcher/developer and user perspective.

2.1.1 Compiling the tool overview

The list of tools has been compiled in a two-step process. First, existing sources and databases of tools were searched to develop an initial list of tools. The used sources are listed in Annex 5. Second, the experts contributed tools based on their knowledge and experience. For this initial list no restrictions were provided, for example regarding types of tools, access or costs, etc. The approach resulted in an initial collection of 102 entries, for which the name, a brief description of the tool and its purpose, and URLs were recorded.

2.1.2 Screening the tools

The tools were screened in a two-step process. The initial list went through a brief screening round, to assess tool compatibility with the expert group's objectives. This initial round of screening was conducted using an overview description of each tool. For this screening round, only the tool name, URL, general description and tool focus were recorded and assessed. Entries were excluded if they did not clearly contribute to urban greening processes, had no link to urban nature, or were guidance reports rather than tools. This primary screening resulted in a list of 58 tools that were further assessed in a second round, based on a more extensive list of descriptors and criteria (Table 1). In a separate round, a short call was opened to the research and user community to suggest additional tools they believed should be included. This resulted in a list of tools with partial overlap with the existing selection of the expert group. These additional tools were screened by the expert group, resulting in the inclusion of one additional tool in the final selection, and a final list of 59 tools for further assessment. The list of tools that have been excluded from further assessment can be found in Annex 4.

Table 1. Overview of key descriptive categories and criteria applied for full screening of tools

Descriptor/criterion	Description	Assessment metric or categories
Tool name	Name of the tool	Text
Tool description	Short description of the tool, its scope, and purpose	Text
Tool URLs	Main online location(s) where the tool and relevant information can be found	Text
Tool focus	Does the tool have a particular focus	Text – explanation of focus (e.g., trees or hydrology)
Designed for urban context	Whether the tool was designed specifically for urban contexts	Binary (yes/no)

Descriptor/criterion	Description	Assessment metric or categories
General purpose	Categories of topics the tool was mainly designed for	Checklist (e.g., mapping green infrastructure, assessing particular or multiple ecosystem services, monitoring implementation of plans/strategies)
Intended user	Categories of intended users	Checklist (Scientists, consultants, city decision-makers, business, NGOs, General public, other)
Purpose in BDS2030 context	Based on the Urban Nature Plan phases (Figure 1), which steps the tool can be applied for, in the context of the Biodiversity Strategy 2030.	Ten steps from UNP diagram (Figure 1).
Purpose in NRR context	Whether the tool can support implementation of Nature Restoration Regulation Article 8.	Multiple choice (Yes – directly, yes – indirectly, no)
Scale	Levels of urban scales at which the tool can be used	Checklist (Single element/patch, neighbourhood, city, metropolitan/landscape scale)
Type of tool	Types of tool	Multiple choice (Dashboard/online visualization tool, spreadsheet, online computation tool, code/package, spatial model, custom software, other)
Type of outputs	Which types of output the tool provides	Check list (raster maps, vector maps tabular/statistical output, charts/graphical output, reports/narratives)
Costs	Potential costs related to using the tool	Multiple choice (no, yes – license, yes – subscription) and additional description
Technical skills	The level of technical skills required by the user to use the tool (e.g., GIS or software expertise, programming language, data handling).	5-point Likert scale (1 – very low technical skill requirement to 5 – very high technical skill requirements) and additional description
Types of input data	The categories of input data that are required to run the tool	Check list (land use, biophysical data, biodiversity data, socio-demographic data, environmental pressures and hazards).
Input data format	Formats of input data required to run the tool	Check list (raster maps, vector maps, tabular/attribute table, non-spatial values/parameters, other)
Data requirements	The effort required to collect datasets needed for the tool	5-point Likert scale (1 – very low data requirement to 5 – very high data requirements) and additional description

Descriptor/criterion	Description	Assessment metric or categories
Maintenance	How regularly the tool is maintained and updated	Multiple choice (Yes – recently released, Yes – evidence of recent maintenance, no, unknown)
Evidence of use	Documented evidence of use of the tool in scientific literature, grey literature or evidence from local authorities	Check list (scientific literature, grey literature, evidence of actual use by local authorities) and links to evidence
Transferability	To what degree the tool can be used beyond its original application context	Multiple choice (Yes – it can be used in all cities worldwide, Yes – it can be used in cities all over Europe, No – it is designed only for a specific context) and additional description

Source: Own elaboration

2.2 Tool assessment and criteria

The 59 remaining tools were assessed based on an extensive list of descriptors and criteria, listed in Table 1. These descriptors and criteria were developed collectively by the expert group and discussed with the requester from DG ENV. They provide an overview of key characteristics that the requester was interested in, which are also relevant to users. Each tool was assessed by two experts, who extracted the required information from the main websites of each tool, and from additional sources where needed. The information was systematically compiled in a database (Annex 1) through a Tool Assessment Form developed with Google Forms.

First, two experts extracted a set of descriptive categories for each tool, providing descriptions of the tools, their scales and input data, their potential users, and their purpose, both in a general sense and with regards to the two included key EU initiatives: the BDS2030 and the NRR. Second, experts assessed the tools based on a list of criteria. These criteria were developed to assess the accessibility, ease of use, transferability, and evidence of use, among others.

The information of the two experts was consolidated based on a check by other members of the expert team. If there were differences between the two expert assessments, the two experts were requested to discuss and resolve them collaboratively. The result is a consolidated overview of 59 tools with information on all assessed criteria which were converted into separate factsheets per tool (see Chapter 4).

In addition, an online navigator tool was developed to help users identify the tools that best suit their objectives (Annex 2). This tool takes a decision tree approach to guide potential users towards relevant tools based on questions from the tool database. It begins with a question about the user's general goal and follows up with additional questions to narrow the tool options and ultimately identify the most relevant ones. Links to the tools are embedded to guide potential users to the tools.

2.3 Analysis and clustering

To provide a further overview of tools, clusters were created based on the identified criteria (Table 2). The clusters were developed primarily based on the main purposes of the tools, the scope (e.g., which and how many ecosystem services and biodiversity components were included), the target

users, and the level of technical skills and data required to run the tools. The primary purpose of the clusters is to help users navigate the tool landscape and focus on groups of tools that best fit their needs. It should be noted that while all tools have been placed within a single cluster for a clean overview, different tools could fit in other clusters depending on which sub-tool is used, or whether pre-processed or user-specific data is used. Acknowledging that users may want to assess applicability of tools to their context based on other dimensions than those used in this handbook's clusters, the online searchable tool and database facilitate personalized guidance.

Table 2. Clustering of tools, including a descriptive name and key characteristics of each cluster. For cluster 4, sub-clusters were identified.

Cluster name	Characteristics
Cluster 1: Benchmarking	
Benchmarking based on indicator sets and indices	Users: main users are city administration.
	Purpose: they provide "recipes" that cities can apply to assess indicators; main purpose is to support strategic decisions and monitoring indicators.
	Skill/data requirements: divergent.
	Scope: broad scope.
	Scale: usually referring to city level.
Cluster 2: Exploring challenges	
Exploring challenges based on pre-processed information	Users: main users are city administration and consultants/developers.
	Purpose: can be used to explore spatial-explicit challenges and characteristics of areas of interest, in the form of maps, diagrams, etc., but do not calculate/model scenarios.
	Skill/data requirements: low technical skill requirement, and limited data input.
	Scope: broad scope.
	Scale: usually operating on a spatial explicit feature (a park, street, backyard etc.).
Cluster 3: Support specific policies	
Supporting the implementation of specific policies and projects based on evaluations	Users: main users are city administration and consultants/developers.
	Purpose: support implementation of specific policies or projects.
	Skills/data: divergent but generally do not require advanced skills and require limited data collection.
	Scope: narrow scope, specific to a single policy objective.
	Scale: usually focusing on a program or project location.
Cluster 4 Analysis of specific challenges based on hands-on modelling	

Cluster name	Characteristics
4a. Focusing on Air and Climate	Users: main users are consultants and scientists.
	Purpose: the main purpose is to (spatially) assess urban air and climate components, with components of ecosystems also featuring.
	Skills/data: divergent, but typically data intensive and requiring advanced GIS and modelling skills.
	Scope: narrow and single-purpose.
	Scale: divergent.
4b. Focusing on habitats and ecosystem connectivity	Users: main users are consultants and scientists.
	Purpose: the main purpose is to (spatially) assess urban habitats and connectivity.
	Skills/data: divergent, typically data intensive and requiring advanced GIS and modelling skills.
	Scope: narrow and single-purpose.
	Scale: divergent.
4c. Focusing on water management	Users: main users are consultants and scientists.
	Purpose: the main purpose is to (spatially) assess water management and related ecosystem services.
	Skills/data: divergent, typically data intensive and requiring advanced GIS and modelling skills.
	Scope: relatively narrow with focus on the water system.
	Scale: divergent.
4d. Focusing on other topics	Users: main users are consultants and scientists.
	Purpose: the main purpose is to (spatially) assess a specific feature of ecosystems or a specific ecosystem service.
	Skills/data: divergent, typically data intensive and requiring advanced GIS and modelling skills.
	Scope: relatively narrow with focus on the water system.
	Scale: divergent.
Cluster 5: Multi-purpose spatial decision support tools	
Multi-purpose spatial decision support tools	Users: main users are city administration, consultants, scientists.
	Purpose: broad main purposes, including assessing current green/blue spaces and their benefits to biodiversity and humans, and generating and assessing planning scenarios.
	Skills/data: divergent, but more frequently advanced. Basic to advanced technical skills are required; data and processes range from pre-digested to user-defined.
	Scope: broad, including modelling multiple ecosystem service outcomes, spatial distribution of green spaces, both economic and biophysical.
	Scale: divergent.

Source: Own elaboration

For the analysis of the tool dataset, an overview was provided of which tools are useful for different planning phases related to the Urban Nature Plans (Figure 1), the BDS2030, the NRR, and different purposes.

One tool per cluster has been highlighted in the handbook, with a relevant case study. Case studies highlight how key tools have been used previously, as a source of inspiration for potential users.

Figure 1. Urban nature plans cycle used to assess in which steps tools could be applied. For each tool the steps to which it could be applied were recorded
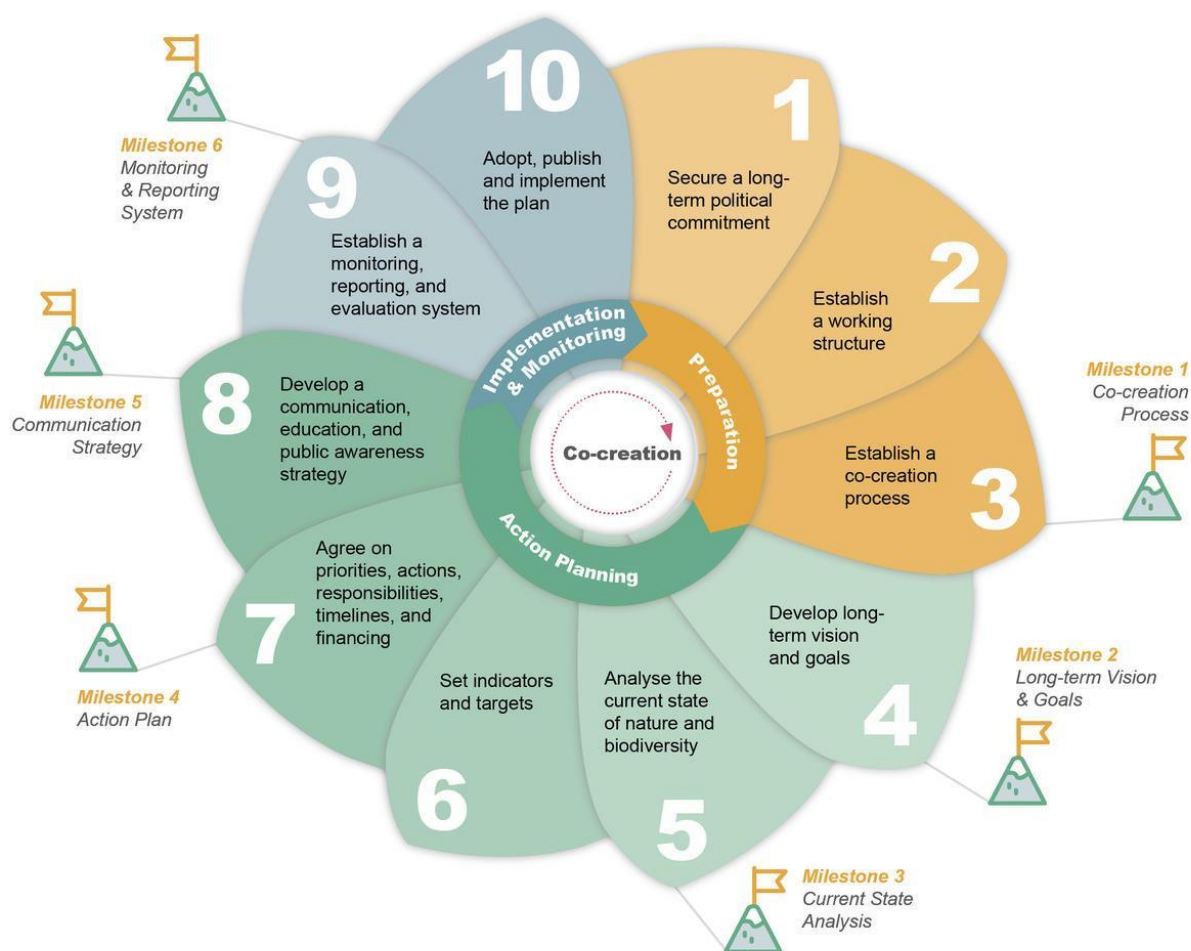
Source: https://environment.ec.europa.eu/topics/urban-environment/urban-nature-platform_en (European Commission, 2025d)

3. Tool clustering and assessment

The assessed tools were grouped into five main clusters (Table 3). Each cluster contains tools that have broadly similar characteristics regarding who the intended users are, what the main purpose is, their scope, and level of skill and data required to run the tool. The clusters are somewhat hierarchically staggered, ranging from tools that are simple to use and are more exploratory, to ultimately tools that are more complex and can address multiple benefits related to urban nature. Clusters 1 (Benchmarking) and 2 (Exploring challenges) contain tools that require relatively limited skills to run them but provide users with quick information based on indicators or maps. Cluster 3 (Support specific policies) contains tools tailored to specific policies or policy types and projects. Cluster 4 contains tools and models that have been designed for particular purposes (e.g., one particular type of ecosystem service). Four sub-clusters were identified for tools focusing on air quality and climate, habitats and connectivity, water management, and other topics. Cluster 5 contains spatial tools that require user input but also enable more flexible output relating to multiple aspects of urban nature (e.g., scenario analysis, modelling of multiple ecosystem service benefits from urban nature, etc.). While tools within each cluster share common characteristics, each cluster is heterogeneous, and specificities of tools can vary substantially.

Table 3. Tool clusters

Cluster 1: Benchmarking based on indicator sets and indices
Co-impact tool
Guide of indicators for the evaluation of urban renaturation projects
Multilayered Vulnerability Assessment Handbook - Resilience planning for urban, biodiversity and climate action
Nature-Based Solutions Opportunity Scan
Singapore Index on Cities' Biodiversity
Cluster 2: Exploring challenges based on pre-processed information
Green Infrastructure Framework
Green Scape CE Visual mapping platform
NATURVATION Atlas
SIK-Hub
Cluster 3: Supporting the implementation of a specific policies and projects based on evaluations
BeeWalk
Biodiversity Net Gain
Blue Green Factor Qgis tool
GI-Val tool
Green Area Factor Tool

i-Tree Design
NATURE Tool
Place Standard Toolbox
Scottish improvement service how to map a 20 minute neighbourhood
TESSA (Toolkit for Ecosystem Service Site-based Assessment)
Cluster 4a: Analysis of specific challenges based on hands-on modelling - air and climate
ADMS-Urban
ENVI-met
MUKLIMO
UMEP (Urban Multi-scale Environmental Predictor)
Urban Weather Generator
Cluster 4b: Analysis of specific challenges based on hands-on modelling - habitats and connectivity
Fragstats
GuidosToolbox
Cluster 4c: Analysis of specific challenges based on hands-on modelling - water management
BeST (Benefits of SuDS Tool)
BlueHealth Toolbox
GIF-Mod (Green Infrastructure Flexible Model)
Green Values (National Stormwater Management Calculator)
i-Tree Hydro
MIKE URBAN +
MUSIC (Model for Urban Stormwater Improvement Conceptualisation)
SWAT (Soil and Water Assessment Tool)
SWMM (Storm Water Management Model)
UrbanBEATS
WMOST (Watershed Management Optimization Support Tool)
Cluster 4d: Analysis of specific challenges based on hands-on modelling - other topics
EcoActuary
ESTIMAP - Pollination (urban)

ESTIMAP – Recreation (urban)
Nature discovery map for schools
ORVal (Outdoor Recreation Valuation Tool)
Cluster 5: Multi-purpose spatial decision support tools
City Explorer Toolkit
ECOPLAN QuickScan and SE
EcoServ-GIS
EcoservR
Ecosystem intelligence
EnhancES
GreenKeeper
InVEST
i-Tree ECO
i-Tree Landscape
LIFE Viva Grass Integrated Planning tool
LUCI
Nature Value Explorer
NC-Model
R-ECO
SENCE (Spatial Evidence for Natural Capital Evaluation)
SolVES (Social Values for Ecosystem Services)

Source: Own elaboration

Each (sub-)cluster contains multiple tools (Table 3), but the size of the clusters diverges. Clusters 4 and 5 contain the most tools (23 and 17 respectively) but also contain the most heterogeneous sets of tools. These clusters can help inform potential users on which tools could be relevant to them, given their goals, resources, and expertise. It should be noted that while clustering gives an overview of where each tool fits primarily, many of the listed tools could also fit in other clusters depending on the context and how they are used. For example, some tools listed in cluster 5 can also support more narrow scopes, similar to cluster 4 tools, if only a subset of ecosystem service models are run. Moreover, some tools listed in cluster 3 focus on specific topics (e.g., water-related issues) and therefore also partially overlap with cluster 4.

3.1 Required skills and data

Two main criteria were assessed for each tool: 1) the technical expertise required to use the tools and 2) efforts needed to collect the necessary data. For both criteria, the dataset contains the full range of tools – from tools that are ready to use without any specific expertise, to tools that require specific technical expertise; also, from tools that require no data input from users, to tools that require a broad range of data that needs to be collected or processed by users (Figure 2). In general, tools that require less expertise also require less data collection by users, while tools that require technical expertise also require more data collection effort. Nevertheless, particularly for mid-range scores (2, 3, 4), the spread within the database is broader, containing tools that require more user-tailored data while requiring limited technical skills and vice versa. In terms of clustering, clusters 2 and 3 require relatively limited data as well as technical skills, while the other clusters are spread across the full spectrum.

3.2 Contribution to NRR and BDS2030

A substantial amount of the assessed tools can inform the NRR Article 8, both directly through quantification of urban green space and canopy cover, and indirectly through assessing changes in ecosystem services and biodiversity related to changes in the quantity of urban green space and canopy cover.

Regarding the Urban Nature Plans (Figure 3), most tools are relevant to the Action Planning phase. Within this phase, the analysis of the current state of nature and biodiversity (Step 5, 75% of tools) and setting targets and indicators (Step 6, 80% of tools) fall within the scope of most of these tools, while several tools also facilitate Steps 7 and 8, and to a lesser extent step 4. A large portion of the tools could also facilitate establishing a monitoring, reporting and evaluation system relating to the quantity of urban nature, biodiversity, and ecosystem services (Step 9, 60% of tools). A small set of tools may also be suitable in the preparation phase, regarding the collection of initial information, or by facilitating co-creation processes.

Figure 2. Relationship between the scores for technical skills and data collection efforts required to run the tools. Names of tools and the clusters they belong to are included.
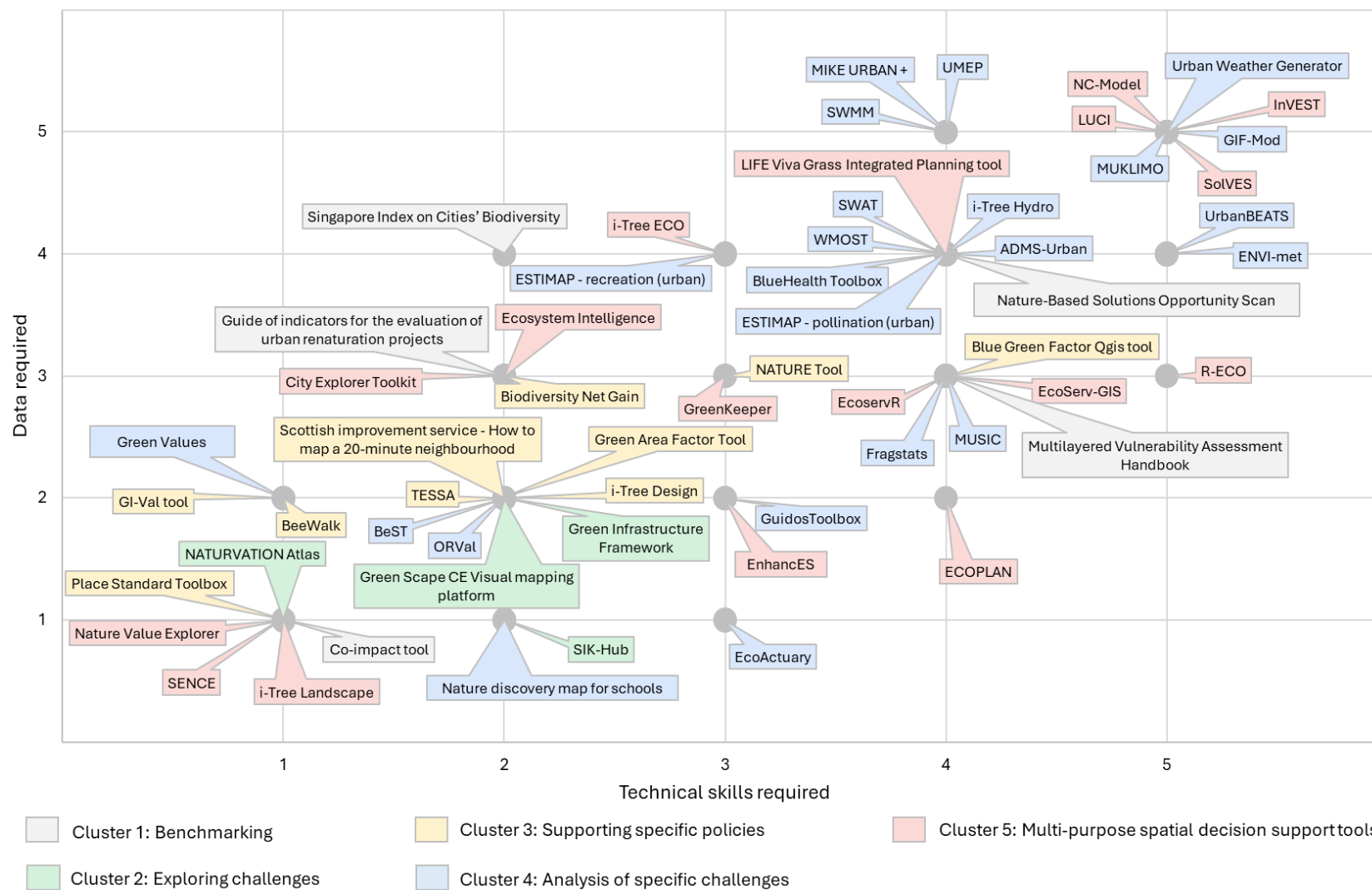
Source: Own elaboration

Figure 3. The number of tools that could be applicable for each step of the Urban Nature Plans cycle. Colours coincide with the three overarching phases of the cycle.
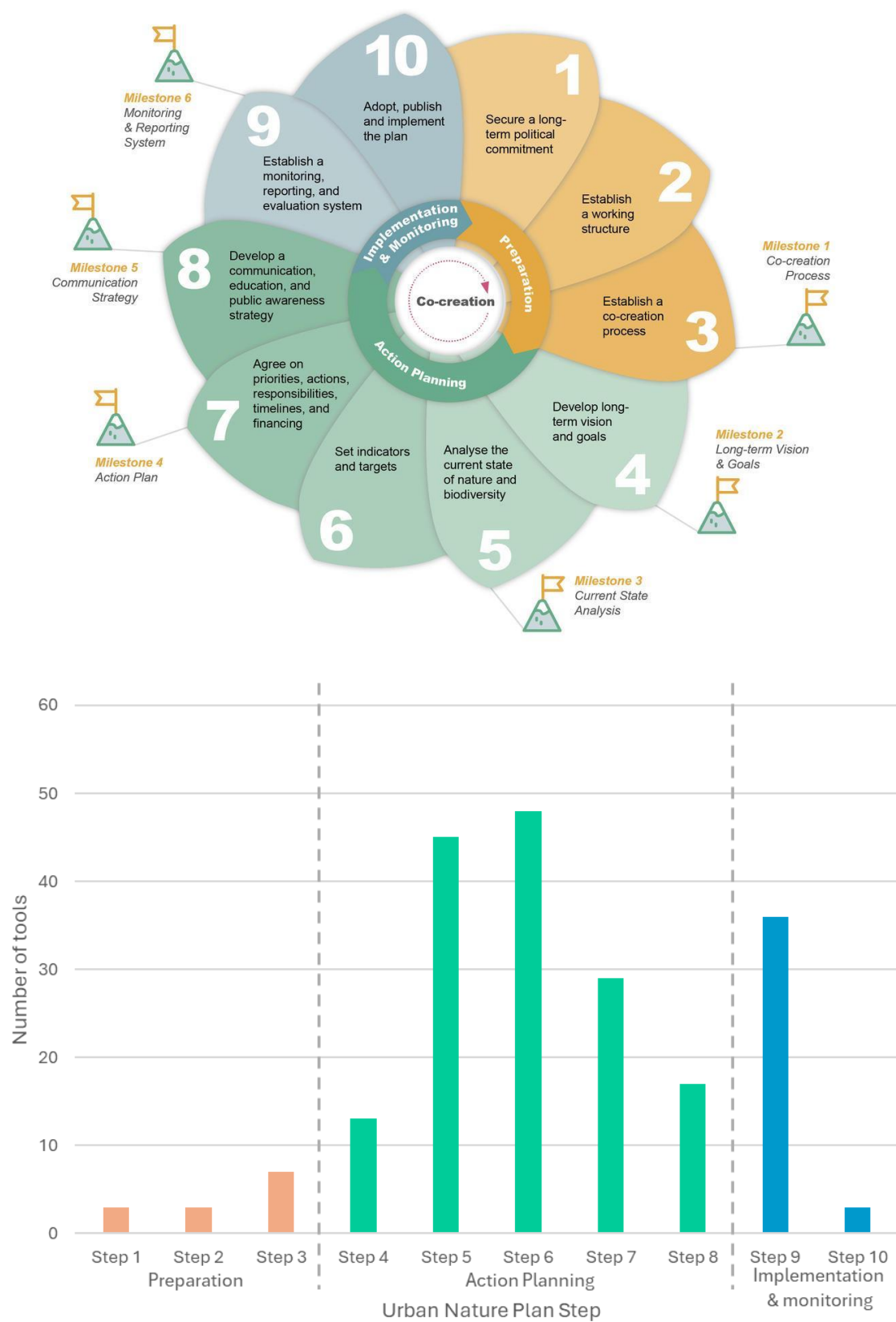
Source: Own elaboration

4. Featured tools by cluster

This section presents factsheets and case studies for a selection of the tools that were assessed, based on the clusters presented in the previous section. A representative tool from each of the main clusters feature here for illustrative purposes, with similar factsheets for all other tools provided in Annex 3.

Box 1. Singapore Index on Cities' Biodiversity factsheet

Singapore Index on Cities' Biodiversity (Cluster 1)	**[Link]**

TOOL DESCRIPTION – Assessment framework

The Singapore Index on Cities' Biodiversity (also known as the City Biodiversity Index) is a self-assessment tool designed to help cities evaluate and monitor their biodiversity conservation efforts over time. Developed by Singapore's National Parks Board in collaboration with the Secretariat of the Convention on Biological Diversity, the index offers a standardized framework for assessing biodiversity in urban areas. It consists of a city profile that provides contextual information (such as climate, geography, population, and governance), and 28 indicators, each scored on a scale from 0 to 4, organized under three pillars: native biodiversity, ecosystem services, and governance and management of biodiversity. The scoring system is flexible and intended to be used comparatively over time, enabling cities to track progress against their own baselines and to set targets for improvement. It is designed to build institutional capacity, raise awareness, and support urban planning by integrating biodiversity into decision-making. It encourages inter-agency cooperation and supports evidence-based prioritization of actions and resource allocation.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation — Mapping habitats — Mapping / assessing biodiversity — Assessing landscape structure (e.g., connectivity)	— Assessing urban heat mitigation / cooling — Assessing flood risk mitigation/ runoff management — Assessing recreation / access to green space — Assessing other ecosystem services	— Assessing the impacts of plans / strategies / actions (including nature-based solutions) — Monitoring the implementation of plans / strategies — Facilitating global-local alignment with biodiversity targets

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, 7, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: City

COST: Free	**TECHNICAL SKILLS** ♦♦♦♦♦	**MAINTENANCE STATUS**
Data collection costs depend on the city and availability of necessary data.	The tool mainly involves data collection, data entry into spreadsheets, and basic statistical understanding. The calculation of some indicators may require basic analytical or GIS skills (depends on data availability). Some familiarity with biodiversity concepts and urban ecology indicators helps for interpretation.	Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Calculating the index requires diverse data, some from existing sources, others needing surveys or expert input. Though preparation may be demanding,	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data — Socio-demographic and economic data	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT**

the index is designed to be practical and feasible, avoiding the need for exhaustive or highly specialized datasets.	— Environmental pressures and hazards — Infrastructure and built environment — Policy, governance and management	— Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box 2. Applying the Singapore Index on Cities' Biodiversity in Lisbon, Portugal

Objectives/Goals: Lisbon adopted the City Biodiversity Index (CBI), also known as the Singapore Index on Cities' Biodiversity, to assess and strengthen its urban biodiversity management. The main objectives were to systematically evaluate the state of biodiversity within city limits, identify policy and planning gaps, and inform strategies to enhance ecosystem services and climate resilience. Additionally, Lisbon aimed to align its biodiversity monitoring with international frameworks, particularly the Convention on Biological Diversity (CBD), and demonstrate its contribution to global biodiversity targets.

Approach: The CBI was developed under the CBD framework, led by Singapore in 2008-2010, as a self-assessment tool for cities to measure biodiversity status and management effectiveness. It comprises 23 indicators across three core components: native biodiversity in the city, ecosystem services provided, and governance and management of biodiversity. In Lisbon, the municipality collaborated with the University of Lisbon and the ICLEI Local Action for Biodiversity (LAB) programme to pilot the CBI. The process involved:

— Baseline Data Compilation: Gathering data on species richness (flora, birds, mammals, insects), proportion of natural areas, and connectivity across Lisbon's green spaces, including the Monsanto Forest Park, urban ecological corridors, and riverside habitats.

— Indicator Assessment: Each indicator was assessed based on existing municipal datasets, scientific studies, and field surveys. For example, Lisbon documented its native plant species and the proportion of protected natural areas within municipal boundaries.

— Stakeholder Engagement: Workshops were conducted with urban planners, ecologists, NGOs, and community gardening groups to validate data and identify priority areas for intervention, such as enhancing pollinator corridors and riverbank restoration.

— Reporting and Benchmarking: Results were compiled to produce Lisbon's CBI scorecard, which was benchmarked against other cities piloting the Index, including Singapore and Helsinki. This enabled Lisbon to identify both strengths (e.g. high proportion of urban parkland) and areas for improvement (e.g. systematic monitoring of invertebrate diversity).

Outcomes: Using the CBI, Lisbon gained a clearer understanding of its biodiversity assets and management gaps. Specific outcomes included:

— Integration into Municipal Planning: The CBI assessment informed Lisbon's Biodiversity Action Plan (Plano de Ação para a Biodiversidade), influencing policies such as creating pollinator-friendly green roofs and roadside verges, and prioritising native planting in urban parks.

— Enhanced Funding Opportunities: The structured biodiversity data strengthened Lisbon's bids for EU-funded green infrastructure projects, demonstrating alignment with international biodiversity targets.

— International Recognition: Lisbon's use of the CBI positioned it within the global community of cities committed to urban biodiversity, enhancing its profile in forums such as the ICLEI Cities Biodiversity Center and the European Green Capital award (which Lisbon won in 2020).

Lessons learnt: Key lessons from Lisbon's use of the CBI include:

— Data Availability Challenges: Comprehensive data on certain taxa (e.g. insects, fungi) was limited, highlighting the need for continuous local biodiversity monitoring and citizen science integration.

— Interdepartmental Coordination: Implementing the Index required strong collaboration across municipal departments (environment, planning, parks) to align datasets and integrate biodiversity considerations into urban development processes.

— Local Adaptation of Indicators: While the CBI provides a globally consistent framework, Lisbon adapted some indicators to better reflect Mediterranean ecosystems and urban morphology.

Overall, the CBI approach enabled Lisbon to embed biodiversity systematically into urban planning, strengthening its ecological resilience and aligning its actions with international biodiversity commitments.
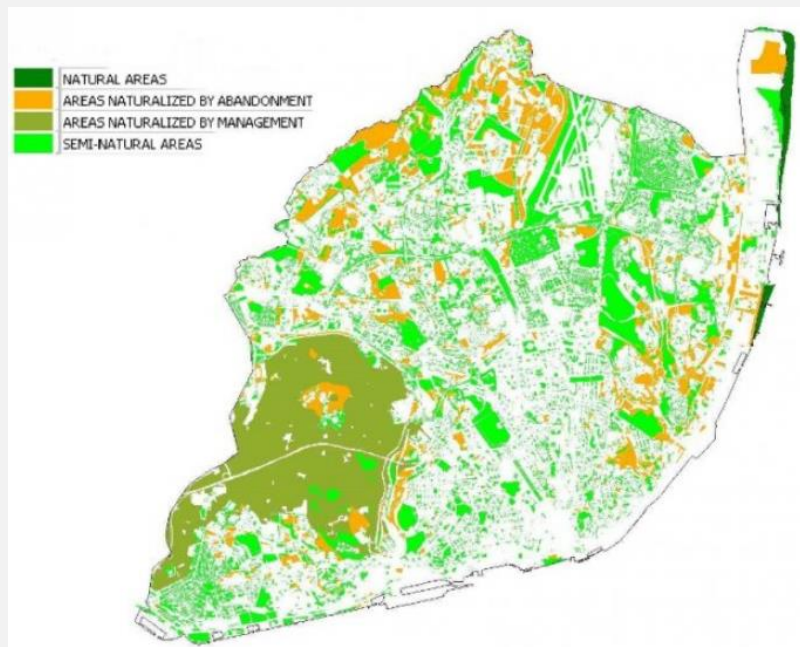
Source: Oppla, 2019

Box 3. Sik-Hub factsheet

SIK-Hub (Cluster 2)   [Link]

TOOL DESCRIPTION – Dashboard / Online visualization tool

This tool is an interactive online application for exploring, downloading, and synthesising traits of Urban-Forest Nature-Based-Solutions (UF-NBS) generated for selected case studies. It allows a quick assessment of spatial explicit indicators for walkability (recreational services) and functional connectivity (biodiversity) based on the visualisation, analysis, and story-telling of spatial data and information. The tool also hosts a dashboard as an advanced tool that allows the user to explore the data through interactive maps, graphs and tables. Other advanced functions allow the user to apply filters to the data, add their own data to the map, export the data and print the map.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation — Assessing landscape structure (e.g., connectivity)	— Assessing recreation / access to green space	— Informing decisions by providing access to pre-processed data layers

INTENDED USERS: City decision-makers **|** Scientists **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEP 6	**CONTRIBUTION TO NRR:** Yes

SCALE: Single green element/patch, and City

COST: Free There could be costs related to processing data for other cities (esp. when running on ESRI engines).	**TECHNICAL SKILLS** ♦♦♦♦♦ The tool has several features – from simple visualisations to an advanced dashboard.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Given that the tool currently covers only five cities, additional data would be required for its application to a broader set of urban contexts.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment — Policy, governance and management	**INPUT DATA FORMAT** — Geospatial data **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: No – it is designed only for a specific context. The current availability for five cities could be expanded.

Box 4. Applying the SIK-Hub in Leipzig, Germany

Objectives: The fast-growing city of Leipzig is facing the challenges of densification and the loss of green spaces, which is resulting in a decrease in accessibility to public green spaces, as well as a decrease in vegetation for biodiversity. Although the city has plenty of data on green space availability, it lacks an understanding of the network perspective of relevant ecosystem services. This relates to questions about the walkable environment from a human perspective, as well as the connectivity of the city's vegetation from a species perspective.

Process/methodology adopted: Against this background, SIK-Hub provides pre-processed layers to enable the spatial inspection of the city's green infrastructure and individual vegetation patches, as well

as the accessibility of individual buildings and estimated recreational flows along the city's streets. Regarding the benefits of a walkable environment and recreational green spaces, the tool provides a building-based index that estimates the extent to which households are exposed to physical barriers when accessing public green spaces. In addition, it displays the crowding patterns of recreational flows for each street, helping to navigate areas where large numbers of people seek to access public green infrastructure. This evidence could be supplemented with socio-demographic data (e.g. census) or environmental stress data (e.g. pollution). Regarding connectivity, the tool provides the probability of connectivity (PC) for each canopy patch in the city and illustrates functional corridors comprising relevant patch nodes and connecting edges. The tool also provides fractions of PC to help estimate the relevance of a node as a habitat or stepping stone. SIK-Hub offers a variety of features, including visualisations, explanations of data, and story maps. It also provides an advanced dashboard that enables users to explore data via interactive maps, graphs, and tables, as well as functions for filtering and uploading individual data.

Outcomes: The SIK-Hub output enables it to be used in a very practical way. For example, official cadastral information can be uploaded and intersected to prioritise brownfield sites and identify the added value of renaturing brownfield sites. This involves determining a) the strategic functional corridors formed by brownfield sites, b) the connectivity relevance and exposure of individual brownfield sites, and c) how renaturing brownfield sites would strengthen existing corridors and form alternative paths. These aspects were implemented in Leipzig's integrated urban development concept, Leipzig 2030, as brownfield sites are important for the city's sustainable development in the face of dynamic population growth and its challenges.

Lessons learnt: Several important lessons have emerged from the development and use of SIK-Hub. Addressing urban sustainability effectively requires integrating both human-centred and ecological perspectives. Tools must be comprehensive and data-rich to capture the complexity of urban systems while remaining user-friendly and practical for planners and decision-makers. The inclusion of interactive features and the ability to incorporate local datasets significantly enhances usability. Moreover, the experience in Leipzig highlights the untapped potential of brownfield sites, which, if strategically renatured, can play a vital role in strengthening ecological networks and supporting sustainable urban expansion in rapidly growing cities.
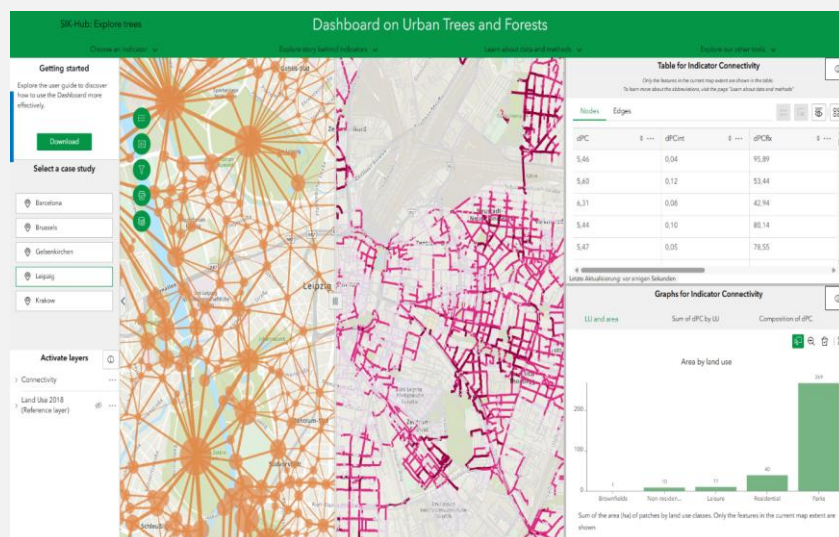
Source: SIK-Hub Arcgis - Explore trees

Box 5. Place Standard Toolbox factsheet

Place Standard Toolbox (Cluster 3) [Link]

TOOL DESCRIPTION – Assessment Framework

The Place Standard is a publicly accessible, web-based framework developed in Scotland to support structured, community-centred evaluations of urban environments. Built around 14 thematic questions, it facilitates discussion on both physical aspects (e.g., green spaces, infrastructure, transport) and social dimensions (e.g., participation, safety, wellbeing). Each theme is rated on a scale from one (indicating significant need for improvement) to seven (very good), with users recording responses on "what is good" and "what could be improved." The results are presented in a compass-style visual that aids communication and enables comparison over time.

The tool is highly inclusive, usable by individuals or groups, and features tailored versions for children, design professionals, climate resilience, and air quality. It offers downloadable guidance, case studies, and training materials to support facilitation across diverse audiences. As a conversation-based diagnostic and planning support tool, it helps surface local perceptions and priorities. It is widely used in community planning, spatial design, and regeneration to promote inclusive decision-making, climate adaptation, and wellbeing.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans/strategies
— Supporting inclusive community engagement and place-based dialogue to inform planning and regeneration strategies

INTENDED USERS: City decision-makers | Scientists | Consultants | General public | Community Facilitators

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 3, 4, and 8 | **CONTRIBUTION TO NRR:** No

SCALE: Neighbourhood

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
It is designed for easy, broad community participation without the need for GIS, programming, or advanced data handling skills.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
The tool primarily relies on community surveys and participatory workshops, which do not require complex or hard-to-obtain datasets.

TYPE OF INPUT DATA
— Socio-demographic and economic data
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Reports / narratives

EVIDENCE OF USE: Scientific literature | Grey literature | Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box 6. Applying the Place Standard Toolbox in Glasgow, UK (Improvement Service, nd, 2025)

Objectives: The Place Standard Tool was developed to tackle health inequalities by better integrating public health and spatial planning. Inspired by Glasgow's leadership in the Equally Well initiative (2008–2010) and the Healthy Sustainable Neighbourhoods Model, the Place Standard Tool aimed to provide a simple, accessible framework for structured conversations about place. The goal was to support evidence-based decision-making and inclusive planning across communities, professionals, and policymakers.

Process/Methodology adopted: Between 2012 and 2014, a national team comprising the Scottish Government, Architecture & Design Scotland, Public Health Scotland, and Glasgow City Council led a collaborative design process. This included extensive workshops and consultations with stakeholders from the public, private, and third sectors. The tool, launched in 2015, uses a visual "wheel" format to assess 14 key themes, such as housing, transport, green space, and social interaction, rated on a scale from 1 to 7. These ratings help identify local strengths and areas for improvement. The Improvement Service later joined to support its national rollout.

Outcomes: Since its launch, the Place Standard Tool has been widely adopted across Scotland's 32 local authorities, informing Locality Plans, Local Development Plans, masterplans, and community action plans. Councils such as Shetland and East Ayrshire pioneered its use for cross-service engagement. Nationally, a Place Standard Leads group and the Place Alliance were created to facilitate peer learning and implementation support. Internationally, the World Health Organization adopted the Place Standard Tool for its European Healthy Cities Network, calling it "Scotland's gift to the world." It has since been used in 16 countries and translated into 15 languages. Etive Currie has led training for thousands of professionals and communities across Europe and North America. In 2017, the Place Standard Tool won the UK & Ireland RTPI Health and Wellbeing Award.

Lessons learnt: Key lessons from the Place Standard Tool's development and implementation include the value of cross-sector collaboration, the importance of strong leadership, and the tool's effectiveness stemming from its simplicity and inclusivity. There was also a recognised need for context-specific adaptations, such as rural and youth-specific versions, which are now in development. The Place Standard Tool's integration into Scotland's National Planning Framework 4 (NPF4) and its support for concepts like 20-minute neighbourhoods and local place plans underline its lasting legacy.

Source: Place Standard website

Box 7. ENVI-Met factsheet

ENVI-Met (Cluster 4)   [Link]

TOOL DESCRIPTION – Custom Software

ENVI-met is a holistic, three-dimensional microclimate modelling software designed to simulate and analyse surface-plant-air interactions in complex urban environments. The tool is widely used in urban climate research, environmental planning, and the design of climate-adaptive cities. It allows for high-resolution, microscale simulations of atmospheric processes—such as air and surface temperature, wind flow, humidity, radiation balance, and pollutant dispersion—typically down to a spatial resolution of 0.5–5 metres and a time step of seconds to hours.

ENVI-met is particularly valued for assessing the impact of urban greening, materials, and building morphology on thermal comfort, urban heat island mitigation, and overall climate resilience. It supports scenario-based analysis, enabling planners and researchers to test interventions such as tree planting, green roofs, permeable surfaces, or changes to street design. The model integrates vegetation, soil, radiation, and fluid dynamics in a unified framework, offering a realistic representation of urban microclimates.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation	— Assessing urban heat mitigation / cooling	— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9.   **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch, and Neighbourhood

COST: Yes, you must buy a licence. Business License: €1,900–2,900/year, depending on user type (e.g., public or commercial sector). University License: €1,500/year, covering up to 50 devices per department. Student License: €300/year, valid for one year with proof of enrolment. Free Trial: Available with limitations on domain size and output features.	**TECHNICAL SKILLS** ♦♦♦♦♦ Effective use of ENVI-met requires advanced technical skills, including GIS proficiency, knowledge of urban microclimates and environmental data, and experience with data analysis and simulations. A background in environmental science, urban planning, or a related field is recommended. Programming is not essential but useful for advanced tasks.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦♦ For a typical neighbourhood-scale project, initial data collection and preparation can take from several days to a few weeks, particularly when starting from raw or fragmented datasets.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

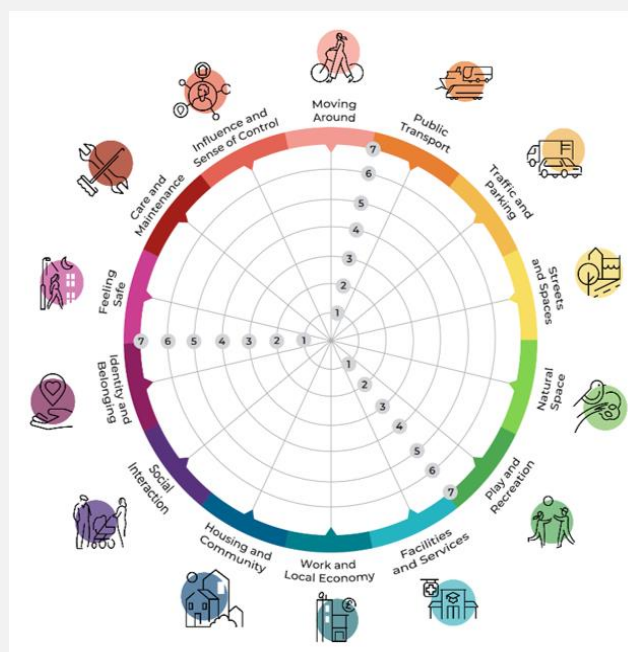**TRANSFERABILITY:** Yes - it can be used in all cities worldwide

Box 8. Applying the ENVI-Met in Granollers (Catalonia, Spain) (Langemeyer et al., 2024; Glodeanu et al., 2025)

This case study demonstrates how high-resolution ENVI-met modelling turns climate adaptation from a generic ambition into a place-specific, numbers-driven design brief — showing where, how much and why to invest in urban nature.

Objectives/Goals: Use ENVI-met microscale modelling to anticipate how future (2041-2070) climate warming will affect thermal comfort in a 990,000 m² pilot area and to test whether nature-based solutions (NBS) — especially street trees — can keep the neighbourhood liveable

Outcomes: Improved climate risk analysis. Under a +1 °C to +3 °C Potential Evapotranspiration (PET) rise expected in the mid-century scenario, 93 % of the streets would fall into thermal-stress conditions without intervention.

Quantified cooling power of trees. Simulations showed up to 9 °C lower PET beneath a continuous canopy than over adjacent asphalt, proving trees are the most cost-effective lever.

Design guidance. Scenario maps and surface-based indicators highlighted 10 priority "opportunity areas" where widening tree pits, adding pocket parks and permeable soils would yield the biggest comfort gains.

Lessons learnt: Model early, iterate often. Running ENVI-met at 1–2 m resolution before drafting the street section let planners compare alternatives and avoid costly retrofits later.

Canopy continuity matters more than species choice. A dense, contiguous crown delivered most of the 9 °C benefit; scattered trees had a much weaker effect.

Risk communication accelerates buy-in. The stark "93 % at risk" map convinced non-technical stakeholders to champion NBS as basic urban infrastructure rather than decoration.
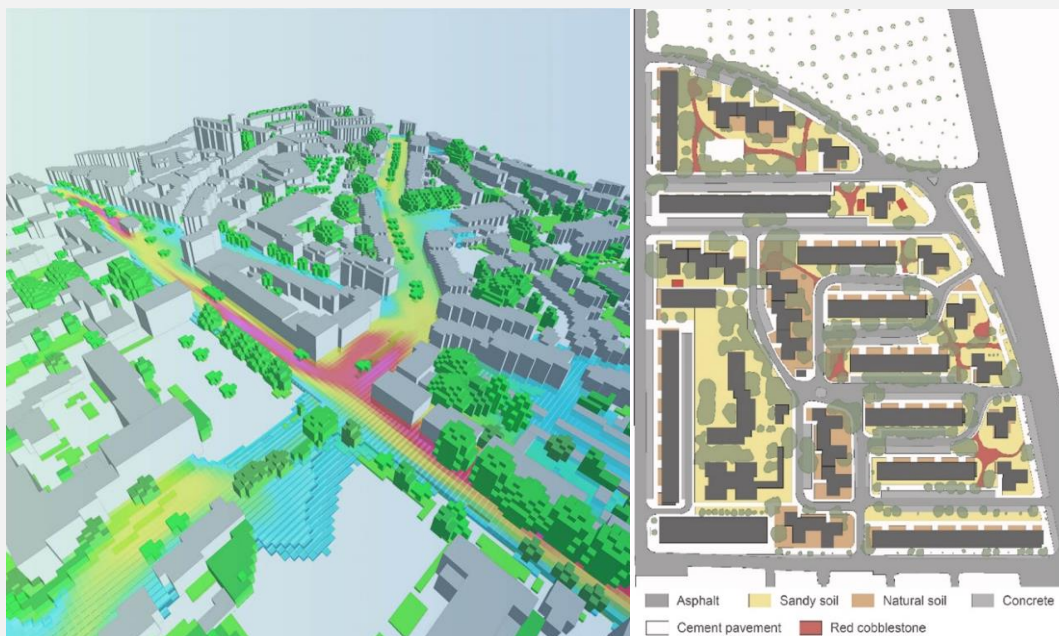
Source: ENVI-met (left); Sola-Caraballo et al. (2024) (right)

Box 9. EcoServ-GIS factsheet

EcoServ-GIS (Cluster 5) [Link]

TOOL DESCRIPTION – GIS-based Toolkit

EcoServ-GIS is a Geographic Information System (GIS) toolkit, developed by Durham Wildlife Trust and partners, for mapping ecosystem services at a city to regional scale. The toolkit generates maps illustrating the need for each service as well as the capacity for service provision, using scientifically-based standardised methods and widely available datasets to incorporate aspects of the physical landscape (e.g. habitat) and socio-economic factors (e.g. health deprivation). It provides users with the facility to overlay these maps to show how well demand and capacity coincide in space, highlighting those natural areas providing high levels of service delivery that should be conserved, as well as those that are most in need of measures aimed at improving single or multiple service delivery. The outputs can also be used to create Ecological Habitat Network maps (to show where areas are more or less connected to a wider network of sites for focal species) and Biodiversity Opportunity Area Maps (to identify areas where habitat creation or habitat buffering might be suitable). The latest version includes tools to map nine services, including ones that grade greenspace according to the opportunities they provide for enjoying nature and wildlife.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon storage and sequestration)

INTENDED USERS: City decision-makers **|** Scientists **|** NGOs **|**Planners

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9 | **CONTRIBUTION TO NRR:** Yes

SCALE: Neighbourhood, City, and Metropolitan area / Landscape

COST: Free It requires an ArcGIS licence and a license for OS MasterMap (which is a digital product of the UK mapping agency). Costs can range from £15,000 to £70,000+, depending on scale, the data used and delivery approach.	**TECHNICAL SKILLS ♦♦♦♦♦** The tool is designed for experienced GIS professionals or advanced users with good technical and analytical capabilities. New users will likely need training or support to use it confidently.	**MAINTENANCE STATUS:** No
DATA REQUIREMENTS ♦♦♦♦♦ The tool requires a large amount of data and significant effort would be required to collate it. Compared with other tools, it uses more simplified process models, reducing the need for academic or specialist input.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment — Policy, governance and management	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No - it is designed only for a specific context. It uses input data specifically produced for the UK, so applying it to cities elsewhere in Europe or globally would require: substituting local spatial data, adjusting the models to reflect local ecosystems and social conditions, and potentially recalibrating the service supply and demand functions.

Box 10. Applying the EcoServ-GIS in Birmingham, UK (Birmingham City Council, 2013)

Objectives/Goals: In 2015, Birmingham City Council sought to integrate ecosystem services thinking into local planning decisions to enhance urban resilience, wellbeing, and green infrastructure investments. The primary objective was to understand where ecosystem services were being provided across the city and where they were most needed. This included identifying opportunities to improve air quality, noise regulation, and accessible greenspace provision for deprived communities.

Process / Methodology adopted: To achieve this, the council collaborated with ecologists at Birmingham and Black Country Wildlife Trust and Natural England to pilot the EcoServ-GIS tool. EcoServ-GIS is a suite of GIS models developed by the UK's Centre for Ecology & Hydrology (CEH) for mapping and assessing ecosystem services at a local scale.

Using locally collected and national datasets, practitioners mapped:

— Provisioning layers: Where services were being generated (e.g. urban woodlands regulating air quality).

— Beneficiary layers: Where people needed those services most (e.g. high population density areas with poor air quality).

— Accessibility and demand layers: To identify service deficits or mismatches.

For Birmingham, they focused on six ecosystem services: noise regulation, air quality regulation, local climate regulation, aesthetic value, accessible nature, and pollination. Data inputs included OS MasterMap, land cover data, population density, Index of Multiple Deprivation, and health indicators.

The team worked iteratively, refining models with local knowledge through workshops with planners, health practitioners, and community groups to ensure outputs were decision relevant.

Outcomes: The EcoServ-GIS analysis revealed:

— Significant mismatches between greenspace distribution and the areas of highest health and deprivation needs, particularly in inner-city neighbourhoods.

— Critical areas where small interventions (e.g. street trees, pocket parks) could deliver disproportionate wellbeing benefits by filling service deficits.

— New spatial evidence to underpin Birmingham's emerging green infrastructure strategy and inform planning priorities.

Results directly influenced the Birmingham Green Living Spaces Plan, adopted in 2013, and subsequent work under the Birmingham Health and Wellbeing Board to integrate ecosystem services linking into health inequalities strategies.

Lessons learnt: Key lessons from this application included:

— Stakeholder co-development was vital. Early engagement ensured the tool's outputs were understandable and aligned with real planning questions, not just ecological interests.

— Data availability determined model accuracy. Where fine-scale land use data or tree canopy data were lacking, model outputs were less precise.

— Visual outputs (maps showing provision vs. need) were powerful communication tools for senior decision-makers and cross-sector partners unfamiliar with ecosystem service language.

There remains a challenge to move from mapping to implementation, requiring policy levers, funding mechanisms, and design guidance to translate ecosystem services assessments into tangible urban projects.

This case demonstrates EcoServ-GIS's value in enabling urban planning teams to prioritise green infrastructure investments where ecosystem services are most needed by people, thus supporting health, climate adaptation, and environmental justice goals.

5. Conclusions

This handbook provides an overview of 59 tools that support policy and planning around urban greening. The included tools were diverse in their purpose, target users, scales, and complexity in use, but could broadly be clustered into five groups:

1. Tools for benchmarking based on indicator sets

2. Tools to explore challenges based on pre-processed data

3. Tools developed in support of a specific policy or project

4. Specialized models developed for particular challenges related to urban greening

5. Multi-purpose spatial tools

Within each cluster, tools had shared commonalities, but also provided a variety of approaches and ranges of complexity regarding required technical skills and data collection, providing potential users with options and opportunities to target tools that relate to the scope of their project or challenge. The developed database contains tools that together span the full spectrum of the Urban Nature Plans cycle that is important for the BDS2030, with particular relevance to understanding the current state of urban nature, developing indicator sets, and monitoring progress. The online navigation tool helps guide potential users to relevant tools for their objective.

While the list of tools is not exhaustive, it provides an important overview of the types of tools that are available, summarized with key information, and exemplified through several short case studies. Given the diversity of tools, in many cases it would be advisable to test and use a combination of tools, relevant to different aspects of a project or plan. No singular tool is suited to cover all aspects of the planning cycle fully and in-depth. Ultimately, this handbook provides a valuable starting point for tools selection for urban greening projects in European cities, within capabilities.

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List of abbreviations and definitions

Abbreviations	Definitions
BDS2030	EU Biodiversity Strategy for 2030
NBS	Nature-based Solutions
CBD	Convention on Biological Diversity
CBI	City Biodiversity Index
EU	European Union
NRR	Nature Restoration Regulation
PC	Probability of Connectivity
PET	Physiological Equivalent Temperature

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Annexes

Annex 1. Excel database with all 59 assessed tools

https://data.jrc.ec.europa.eu/dataset/1219b63e-2179-4f44-b4bd-5d9e4103006d

Annex 2. Tool recommender to select the appropriate tool

https://dopa.jrc.ec.europa.eu/kcbd/urbangreening/tool/

Annex 3. Factsheets of all 59 assessed tools

Box A1. Co-impact Tool factsheet

Co-impact Tool (Cluster 1)		**[Link]**
TOOL DESCRIPTION – Online computation tool Co-impact is a planning support tool developed to assist cities and project teams in designing tailored impact assessment plans for NBS by selecting relevant indicators and methodologies. The main objective is to make the process of building a baseline and impact assessment plan straight forward and simple, with the final report providing advice around suitable methodologies. User selects the targets they intend to reach with their NBS project, and the tool provides a set of indicators adapted to these benefits. As a final result, the user will obtain a custom-made plan for their project, with a description of each of the selected indicators, the scientific evidence behind it, as well as the recommended methodology.		
GENERAL PURPOSES **Planning & Decision Support** — Assessing the impacts of plans / strategies / actions (including NBS)		
INTENDED USERS: City decision-makers **|** Business **|** Consultants **|** NGOs		
CONTRIBUTION TO URBAN NATURE PLANS: STEP 9.	**CONTRIBUTION TO NRR:** Yes, indirectly.	
SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape		
COST: Free Free for non-commercial use.	**TECHNICAL SKILLS ♦♦♦♦♦** The tool mainly involves data collection, data entry into spreadsheets, and basic statistical understanding. The calculation of some indicators may require basic analytical or GIS skills (depends on data availability). Some familiarity with biodiversity concepts and urban ecology indicators helps for interpretation.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Users are guided to select from predefined indicators, each accompanied by recommended methodologies and data sources.	**TYPE OF INPUT DATA** No input data needed.	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Reports / narratives
EVIDENCE OF USE: Grey literature **|** Local authority use		
TRANSFERABILITY: Yes – it can be used in all cities worldwide		

Box A2. Guide of indicators for the evaluation of urban renaturation projects factsheet

Guide of indicators for the evaluation of urban renaturation projects (Cluster 1)   [Link]

TOOL DESCRIPTION – Spreadsheet

The Fundación Biodiversidad's guide provides a structured framework to monitor urban renaturalisation projects, using three types of indicators: diagnostic (current conditions), model (goals and thresholds), and monitoring (implementation and outcomes). Projects fall under three action types: A (planning and diagnostics), B (implementation, e.g. green corridors, wetlands), and C (transversal actions like governance, communication, and monitoring).

All projects must include governance, participation, communication, and monitoring plans, align with municipal strategies, focus on urban, neighbourhood, or peri-urban areas, and prioritise vulnerable communities. The guide promotes green infrastructure and ecological connectivity to enhance biodiversity, climate resilience, and quality of life, in line with EU environmental goals.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Mapping habitats
— Mapping / assessing biodiversity
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs **|** Business

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
The Fundación Biodiversidad's indicator tool is designed for non-experts, particularly municipal staff and project managers. It involves completing structured spreadsheets and interpreting predefined indicators, with no need for programming or advanced GIS skills.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
The Fundación Biodiversidad's indicator tool requires a moderate level of data input but is designed to be flexible and adaptable to each city's context and capacity. Cities are not required to use specific national or European data sources and may instead use locally available data, such as municipal records, fieldwork results, or outputs from other planning tools or studies.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters
— Narrative descriptions and qualitative information

OUTPUT DATA FORMAT
— Tabular / statistical outputs

EVIDENCE OF USE: Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in cities all over Europe. It is primarily tailored for projects in Spain and currently available only in Spanish, but it can be easily adapted for use in other contexts.

Box A3. Multilayered Vulnerability Assessment Handbook-Resilience planning for urban biodiversity and climate action factsheet

Multilayered Vulnerability Assessment Handbook – Resilience planning for urban biodiversity and climate action (Cluster 1) [Link]

TOOL DESCRIPTION – Assessment Framework

The Multilayered Vulnerability Assessment Handbook provides cities with a structured framework to identify and analyse urban vulnerabilities linked to climate change, biodiversity loss, socio-economic inequalities, and infrastructure gaps. Through a step-by-step, participatory approach, it guides planners and stakeholders in mapping vulnerability hotspots across environmental, social, economic, and institutional dimensions. The handbook supports resilience planning by helping cities prioritize interventions, especially those enhancing urban biodiversity and climate adaptation, such as green infrastructure or habitat protection. It also promotes continuous monitoring and evaluation to adjust actions over time.

Flexible and comprehensive, the tool enables cities to integrate nature-based solutions and climate action into planning, strengthening resilience across diverse urban contexts.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Mapping habitats
— Mapping / assessing biodiversity
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 1, 2, 3, 4, 5, 6, 7, and 9.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
It requires users to have a good command of GIS and data handling, experience in integrating and analysing environmental and social datasets, and familiarity with planning concepts. The tool is intended for specialized experts rather than casual users.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
The handbook guides data preparation and integration without requiring specific sources. Cities can use local or global data, and the methodology supports collection, processing, and quality checks, allowing flexibility across contexts and data capacities.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide. Widely applied in the Global South but flexible and transferable worldwide.

Box A4. Nature-Based Solutions Opportunity Scan factsheet

Nature-Based Solutions Opportunity Scan (Cluster 1) [Link]

TOOL DESCRIPTION – Spatial model offered as a consultancy service

The Nature-Based Solutions Opportunity Scan combines geospatial analysis and participatory methods to map NBS investment opportunities in cities. Developed for the World Bank and partners, it identifies suitable NBS types, project sites, benefits, and synergies with grey infrastructure. The method considers socio-economic and political feasibility and promotes a multisectoral approach. Outputs—results, recommendations, and geospatial data—are typically delivered within six weeks. The tool uses 10–30 m Earth observation and geospatial data in a four-step process: (1) define problems, (2) map NBS areas, (3) model benefits, and (4) identify optimal solutions via multicriteria analysis. It highlights NBS benefits (e.g., parks, green corridors, drainage) and barriers such as limited capacity, funding, and institutional resistance. The tool supports integrating NBS into urban planning for climate adaptation and sustainable development.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
The tool requires strong GIS and spatial data skills. Users should know geospatial analysis, ecological indicators, and data management. Programming isn't required. It suits trained professionals or technical staff in urban planning or environmental assessment.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
The tool has high data requirements, using various spatial and non-spatial datasets. It offers guidance and suggests open-access sources, but users must prepare and harmonize data manually. Using local data is recommended for better accuracy. GIS and data handling skills are essential.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Reports / narratives

EVIDENCE OF USE: Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A5. Singapore Index on Cities' Biodiversity factsheet

Singapore Index on Cities' Biodiversity (Cluster 1)   [Link]

TOOL DESCRIPTION – Assessment framework

The Singapore Index on Cities' Biodiversity (also known as the City Biodiversity Index) is a self-assessment tool designed to help cities evaluate and monitor their biodiversity conservation efforts over time. Developed by Singapore's National Parks Board in collaboration with the Secretariat of the Convention on Biological Diversity, the index offers a standardized framework for assessing biodiversity in urban areas. It consists of a city profile that provides contextual information (such as climate, geography, population, and governance), and 28 indicators, each scored on a scale from 0 to 4, organized under three pillars: native biodiversity, ecosystem services, and governance and management of biodiversity. The scoring system is flexible and intended to be used comparatively over time, enabling cities to track progress against their own baselines and to set targets for improvement. It is designed to build institutional capacity, raise awareness, and support urban planning by integrating biodiversity into decision-making. It encourages inter-agency cooperation and supports evidence-based prioritization of actions and resource allocation.

GENERAL PURPOSES

Spatial Analysis & Mapping	Ecosystem Services Assessment	Planning & Decision Support
— Mapping green infrastructure / green spaces / urban vegetation — Mapping habitats — Mapping / assessing biodiversity — Assessing landscape structure (e.g., connectivity)	— Assessing urban heat mitigation / cooling — Assessing flood risk mitigation/ runoff management — Assessing recreation / access to green space — Assessing other ecosystem services	— Assessing the impacts of plans / strategies / actions (including nature-based solutions) — Monitoring the implementation of plans / strategies — Facilitating global-local alignment with biodiversity targets

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, 7, and 9.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: City

COST: Free
Data collection costs depend on the city and availability of necessary data.

TECHNICAL SKILLS ♦♦♦♦♦
The tool mainly involves data collection, data entry into spreadsheets, and basic statistical understanding. The calculation of some indicators may require basic analytical or GIS skills (depends on data availability). Some familiarity with biodiversity concepts and urban ecology indicators helps for interpretation.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
Calculating the index requires diverse data, some from existing sources, others needing surveys or expert input. Though preparation may be demanding, the index is designed to be practical and feasible, avoiding the need for exhaustive or highly specialized datasets.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

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Box A6. Green Infrastructure Framework factsheet

Green Infrastructure Framework (Cluster 2) [Link]

TOOL DESCRIPTION – Spatial model, Dashboard / Online visualisation

The Green Infrastructure Framework is a national planning and assessment tool developed by Natural England to support the design, delivery, and monitoring of green infrastructure across England. It provides a spatial evidence base and a set of standards to help local authorities, developers, and planners integrate GI into urban and rural planning. The framework includes an interactive map viewer, the Green Infrastructure Mapping Database, and the Green Infrastructure Standards. It supports the creation of multifunctional, accessible, and nature-rich green spaces that deliver ecosystem services, enhance biodiversity, and improve public health and wellbeing. The tool is designed to align with national policies and strategies, including the Environment Act, Biodiversity Net Gain, and the Levelling Up agenda.

GENERAL PURPOSES

Spatial Analysis & Mapping	Ecosystem Services Assessment	Planning & Decision Support
— Mapping green infrastructure / green spaces / urban vegetation — Mapping habitats — Mapping / assessing biodiversity — Assessing landscape structure (e.g., connectivity)	— Assessing urban heat mitigation / cooling — Assessing flood risk mitigation / runoff management — Assessing recreation / access to green space — Assessing other ecosystem services	— Informing decisions by providing access to pre-processed data layers — Assessing the impacts of plans / strategies / actions (including nature-based solutions) — Monitoring the implementation of plans / strategies

INTENDED USERS: City decision-makers | Scientists | Consultants | NGOs | Business | General public

CONTRIBUTION TO URBAN NATURE PLANS: All steps from 1 to 10.

CONTRIBUTION TO NRR: Yes

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
Basic GIS and planning knowledge is helpful but not essential; the tool is designed for broad user accessibility.

MAINTENANCE STATUS
There is evidence of maintenance in the recent past (new version available).

DATA REQUIREMENTS ♦♦♦♦♦
The tool includes pre-processed national datasets, with the option to add local data. However, adoption in other countries is challenging, as it would require centralized data provision.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Grey literature

TRANSFERABILITY: No – it is designed only for a specific context. The tool is tailored to England's policy and planning context and is not directly transferable to other countries. Adapting it would require new data and alignment with local standards and planning frameworks.

Box A7. Green Scape CE Visual mapping platform factsheet

Green Scape CE Visual mapping platform (Cluster 2)	[Link]

TOOL DESCRIPTION – Dashboard / online visualization tool, and Online computation tool

The Visual Mapping Platform (GVMP), developed under the Interreg GreenScape CE project, supports pilot actions in five case studies by promoting urban climate-proofing through renaturing. This interactive, map-based tool aids the planning of green and blue infrastructure—such as parks, greenways, rivers, and lakes—in urban areas.

It offers three key tools:

— Accessibility Tool – assesses citizens' access to green spaces;
— Nature-Based Solutions (NBS) Tool – evaluates the effectiveness of sustainable infrastructure;
— Connectivity Tool – measures how well green spaces are linked into a cohesive network.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City

COST: Free Registration is required.	**TECHNICAL SKILLS** ♦♦♦♦♦	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ It requires data on existing green spaces and infrastructure.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data	**INPUT DATA FORMAT** — Geospatial data **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Local authority use

TRANSFERABILITY: Yes – it can be used in cities all over Europe. The platform contains data for specific Central European pilot cities: Milan, Ptuj, Szeged, Warsaw, Zagreb.

Box A8. NATURVATION Atlas factsheet

NATURVATION Atlas (Cluster 2)	[Link]

TOOL DESCRIPTION – Catalog

The Urban Nature Atlas, developed under the NATURVATION project, is a comprehensive database of nature-based solutions (NbS) in cities. Based on a survey of 100 European cities, it enables analysis of socio-economic and innovation patterns related to urban NbS and now includes global cases beyond Europe. Recently updated, the Atlas features a new search engine, expanded analytical capabilities, and options for users to submit and manage their own cases. Hosted on a permanent platform, it offers interactive access to over 1,000 NbS examples, serving as a valuable resource for researchers, policymakers, and practitioners.

GENERAL PURPOSES

Planning & Decision Support

— Exploring more than 1000 examples of nature-based solutions.

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs **|** Business**|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 1, 2, 3, and 6. | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Free	**TECHNICAL SKILLS** ♦♦♦♦♦ It is designed as a user-friendly, web-based platform with intuitive search, filtering, and browsing features.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Calculating the index requires diverse data, some from existing sources, others needing surveys or expert input. Though preparation may be demanding, the index is designed to be practical and feasible, avoiding the need for exhaustive or highly specialized datasets.	**TYPE OF INPUT DATA** No needed.	**OUTPUT DATA FORMAT** — Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A9. SIK-Hub factsheet

SIK-Hub (Cluster 2) [Link]

TOOL DESCRIPTION – Dashboard / Online visualization tool

This tool is an interactive online application for exploring, downloading, and synthesising traits of Urban-Forest Nature-Based-Solutions (UF-NBS) generated for selected case studies. It allows a quick assessment of spatial explicit indicators for walkability (recreational services) and functional connectivity (biodiversity) based on the visualisation, analysis, and story-telling of spatial data and information. The tool also hosts a dashboard as an advanced tool that allows the user to explore the data through interactive maps, graphs and tables. Other advanced functions allow the user to apply filters to the data, add their own data to the map, export the data and print the map.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation — Assessing landscape structure (e.g., connectivity)	— Assessing recreation / access to green space	— Informing decisions by providing access to pre-processed data layers

INTENDED USERS: City decision-makers **|** Scientists **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEP 6	**CONTRIBUTION TO NRR:** Yes

SCALE: Single green element/patch, and City

COST: Free There could be costs related to processing data for other cities (esp. when running on ESRI engines).	**TECHNICAL SKILLS** ♦♦♦♦♦ The tool has several features – from simple visualisations to an advanced dashboard.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Given that the tool currently covers only five cities, additional data would be required for its application to a broader set of urban contexts.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment — Policy, governance and management	**INPUT DATA FORMAT** — Geospatial data **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: No – it is designed only for a specific context. The current availability for five cities could be expanded.

Box A10. BeeWalk factsheet

BeeWalk (Cluster 3) [Link]

TOOL DESCRIPTION – Inventory and Monitoring Tool
BeeWalk is a citizen science tool to record and monitor bumblebee diversity along a fixed route. Volunteers walk the route every month from March to October, identify and count the bumblebees they come across the transect, and submit these records to the platform.

GENERAL PURPOSES
Spatial Analysis & Mapping
— Mapping / assessing biodiversity

INTENDED USERS: City decision-makers | Scientists | Consultants | General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9 | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch

COST: Free No direct costs, but requires human resources for volunteer support, data processing and storage, and website maintenance.	**TECHNICAL SKILLS** ♦♦♦♦♦ Good knowledge of bumblebee species is needed for identification, though support is available.	**MAINTENANCE STATUS** There is evidence of maintenance in the recent past (new version available).
DATA REQUIREMENTS ♦♦♦♦♦ Not needed: cities can only download the data.	**TYPE OF INPUT DATA** — Land use / land cover — Biodiversity data	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) **OUTPUT DATA FORMAT** — Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature | Grey literature

TRANSFERABILITY: No – it is designed only for a specific context (Great-Britain).

Box A11. Biodiversity Net Gain factsheet

Biodiversity Net Gain (Cluster 3)	[Link]

TOOL DESCRIPTION – Spreadsheet

Biodiversity Net Gain (BNG) requires that development projects deliver a measurable improvement in biodiversity, resulting in more or better-quality habitat than existed before. Developers must achieve at least a 10% net gain.

Biodiversity is measured using standardized biodiversity units, calculated with a statutory metric that assesses a habitat's value based on its size, condition, type, and strategic significance. For newly created or enhanced habitats, the metric also accounts for the difficulty of delivery and the time needed to reach the target condition.

GENERAL PURPOSES

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: City decision-makers **|** Business **|** Consultants **|** Land managers **|** Developers

CONTRIBUTION TO URBAN NATURE PLANS: STEP 10. | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch

COST: Free
Calculating BNG requires data acquisition from the field to assess the baseline / current state of biodiversity before development.

TECHNICAL SKILLS ♦♦♦♦♦
Skills in biodiversity assessment and knowledge of the English planning law are needed.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
Data about the site where development is planned (e.g., habitats, hedges and watercourses).

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
OUTPUT DATA FORMAT
— Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No – it is designed only for a specific context. At the moment, BNG is legally binding in England. However, the approach can be adjusted for local conditions and legislation in other contexts.

Box A12. Blue Green Factor Qgis tool factsheet

Blue Green Factor Qgis tool (Cluster 3) [Link]

TOOL DESCRIPTION – Q-GIS App

The Bluegreen Factor (BGF) is a norm promoting blue-green development in municipal building zones by assesses the quality of blue-green structures, which includes water bodies like lakes and rivers (blue) and natural areas such as parks and gardens (green). The BGF norm weights blue-green structures and measures. The sum of these weighted values, divided by the area of the plot, gives the BGF value for the project. The BGF-QGIS app automates this task by allowing the user to map and digitize blue-green structure typologies and measures. It integrates a cost module which calculates the investment and maintenance cost per blue-green structure and measures as well as for the total project area.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Assessing landscape structure (e.g., connectivity)

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEP 7.

CONTRIBUTION TO NRR: No

SCALE: Single green element / patch

COST: Free	**TECHNICAL SKILLS** ♦♦♦♦♦	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Calculating the index requires diverse data, some from existing sources, others needing surveys or expert input. Though preparation may be demanding, the index is designed to be practical and feasible, avoiding the need for exhaustive or highly specialized datasets.	**TYPE OF INPUT DATA** — Land use / land cover — Infrastructure and built environment — Policy, governance and management	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes - it can be used in all cities worldwide. Although it works also for cities outside Norway, it supports the implementation of a Norwegian regulation.

Box A13. GI-Val tool factsheet

GI-Val tool (Cluster 3) [Link]

TOOL DESCRIPTION – Spreadsheet

GI-Val is a toolkit which translates the benefits of green infrastructure into tangible, measurable data, enabling a more comprehensive understanding of their value. It is aimed at quantifying GI benefits, supporting decision-making, communicating values related to GI, and being scalable.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping / assessing biodiversity	— Assessing urban heat mitigation / cooling — Assessing flood risk mitigation / runoff management — Assessing air quality improvement / air purification — Assessing recreation / access to green space — Assessing other ecosystem services	— Assessing the impacts of plans / strategies / actions (including nature-based solutions) — Assessing the value (monetary valuation and non-monetary values) of Green Infrastructure

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 9. | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch

COST: Free | **TECHNICAL SKILLS** ♦♦♦♦♦ | **MAINTENANCE STATUS:** No

| **DATA REQUIREMENTS** ♦♦♦♦♦
Estimated time investment: approximately 2 days per site for data input. Some background data needed (see Annex 4 at this link). Some guidance available in the User Guide. | **TYPE OF INPUT DATA**
— Land use / land cover
— Socio-demographic and economic data
— Infrastructure and built environment
— Policy, governance and management | **INPUT DATA FORMAT**
— Tabular / attribute data (linked to spatial units)
OUTPUT DATA FORMAT
— Tabular / statistical outputs |

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: No – it is designed only for a specific context. Probably only in the UK.

Box A14. Green Area Factor Tool factsheet

Green Area Factor Tool (Cluster 3)   [Link]

TOOL DESCRIPTION – Spreadsheet

The Green Area Factor, developed in Finland, is a practical, Excel-based tool for urban planning. It represents a performance-based green area indicator, a policy instrument ensuring a minimum level of greening in urban property development. The factor is calculated as the ratio of scored green area to lot area. Green elements are weighted based on their ecological effectiveness—such as vegetation, permeable surfaces, or runoff water solutions—and users can choose from 39 elements to meet the target. This allows flexibility in lot design.

The tool can be integrated into zoning regulations or used in construction permit processes. Similar tools include Berlin's Biotope Area Factor BAF, Stockholm's Green Area Factor GYF, and Oslo's Blue-Green Factor BGF. While differing in complexity and goals, these tools often weight elements based on their role in supporting biodiversity or delivering ecosystem services like rainwater management or air purification.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies
— Facilitating global-local alignment with biodiversity targets

INTENDED USERS: City decision-makers **|** Consultants **|** Business **|** Developers **|** (Landscape) Architects

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 6, 9, and 10.

CONTRIBUTION TO NRR: No

SCALE: Single green element / patch, and Neighbourhood

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
The tool requires basic proficiency in Excel and understanding of urban planning principles.

MAINTENANCE STATUS
There is evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
Requires data on existing green spaces and infrastructure, plus detailed project data from developers.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Infrastructure and built environment

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No – it is designed only for a specific context. Green elements and their weights are defined according to local conditions and goals, making direct transfer to other biogeographical areas challenging. However, with appropriate adjustments, the tool could be adopted by cities across Europe.

Box A15. i-Tree Design factsheet

i-Tree Design (Cluster 3) [Link]

TOOL DESCRIPTION – Online computation tool

i-Tree Design is a web-based tool developed by the USDA Forest Service to help urban planners, landscape architects, and community stakeholders assess and visualize the environmental benefits of trees in urban and suburban areas. Part of the broader i-Tree suite, it focuses on estimating ecosystem services provided by individual trees or small groups, including air pollution removal, carbon sequestration and storage, stormwater interception, and energy savings from shading and wind buffering. Users input tree species, size, location, and environmental context to model benefits over time. The tool supports rapid scenario analysis and generates visual outputs—charts and maps—to communicate the value of urban trees to decision-makers and the public. It draws on extensive ecological databases and incorporates regional climate and pollution data for location-specific accuracy.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing other ecosystem services (carbon storage and sequestration)

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 7 and 8. | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch, and Neighbourhood

COST: Free
The tool is free to use and accessible via web browser without a subscription or license fee.

TECHNICAL SKILLS ♦♦♦♦♦
i-Tree Design is easy to use, requiring only basic computer skills. No GIS, programming, or advanced data handling is needed. Users enter tree species, size, and location, and receive clear charts and reports. Some knowledge of urban forestry helps with interpretation. Technical skills are only needed for advanced integration with GIS or other tools.

MAINTENANCE STATUS
There is evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
Only location data for features (e.g. trees, houses) is required, though tree details like species, diameter, and condition can be challenging to obtain.

TYPE OF INPUT DATA
— Biophysical data
— Biodiversity data

INPUT DATA FORMAT
— Data entered through online form

OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide. Currently works in the USA (incl. Puerto Rico, Guam, US Virgin Islands), Canada, Mexico, Colombia, New Delhi, South Korea, and New Zealand. While i-Tree Design can be applied globally, its calculations rely on region-specific data (e.g. climate, pollution, species growth) optimized for North America. Accuracy elsewhere may require local data input, but full localization is not yet supported.

Box A16. NATURE Tool factsheet

NATURE Tool (Cluster 3) [Link]

TOOL DESCRIPTION – Spreadsheet

The NATURE Tool is an Excel-based tool for assessing the impact of land-use and management changes on natural capital. It evaluates up to 17 ecosystem services plus physical and mental health benefits using a scoring system that reflects both the direction and magnitude of impacts. Scores are weighted by policy priorities to produce an overall 'people score' for the project. Co-developed with over 30 industry and stakeholder partners, the tool is free to use across the UK and applicable at various project stages and scales. Minimum inputs include site boundaries, habitat data, and greenspace accessibility. Local or corporate versions can be customized with predefined priorities, giving development projects clear, measurable natural capital objectives.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: City decision-makers | Scientists | Consultants | NGOs | Business

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 3 and 6. | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
The tool mainly involves data collection, data entry into spreadsheets, and basic statistical understanding. The calculation of some indicators may require basic analytical or GIS skills (depends on data availability). Some familiarity with biodiversity concepts and urban ecology indicators helps for interpretation.

MAINTENANCE STATUS
There is evidence of maintenance in the recent past (new version available).

DATA REQUIREMENTS ♦♦♦♦♦
Minimum requirements include a defined site boundary, habitat data, and greenspace accessibility. See the full data checklist here.

TYPE OF INPUT DATA
— Land use / land cover
— Biodiversity data
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data,
— Tabular / attribute data (linked to spatial units)

OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Grey literature

TRANSFERABILITY: Yes – it can be used in cities all over Europe. Although primarily developed for UK, there is evidence of use in other contexts, including Sweden and Finland.

Box A17. Place Standard Toolbox factsheet

Place Standard Toolbox (Cluster 3) [Link]

TOOL DESCRIPTION – Assessment Framework

The Place Standard is a publicly accessible, web-based framework developed in Scotland to support structured, community-centred evaluations of urban environments. Built around 14 thematic questions, it facilitates discussion on both physical aspects (e.g., green spaces, infrastructure, transport) and social dimensions (e.g., participation, safety, wellbeing). Each theme is rated on a scale from one (indicating significant need for improvement) to seven (very good), with users recording responses on "what is good" and "what could be improved." The results are presented in a compass-style visual that aids communication and enables comparison over time.

The tool is highly inclusive, usable by individuals or groups, and features tailored versions for children, design professionals, climate resilience, and air quality. It offers downloadable guidance, case studies, and training materials to support facilitation across diverse audiences. As a conversation-based diagnostic and planning support tool, it helps surface local perceptions and priorities. It is widely used in community planning, spatial design, and regeneration to promote inclusive decision-making, climate adaptation, and wellbeing.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans/strategies
— Supporting inclusive community engagement and place-based dialogue to inform planning and regeneration strategies

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** General public **|** Community Facilitators

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 3, 4, and 8 | **CONTRIBUTION TO NRR:** No

SCALE: Neighbourhood

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
It is designed for easy, broad community participation without the need for GIS, programming, or advanced data handling skills.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
The tool primarily relies on community surveys and participatory workshops, which do not require complex or hard-to-obtain datasets.

TYPE OF INPUT DATA
— Socio-demographic and economic data
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A18. Scottish improvement service – How to map a 20-minute neighbourhood factsheet

Scottish improvement service – How to map a 20-minute neighbourhood (Cluster 3) [Link]

TOOL DESCRIPTION – Code/package
A step-by-step guide for conducting a 20-minute neighbourhood network analysis in ArcGIS Pro, including an ArcPy script. The analysis creates service areas around daily-use facilities and combines them to assess service density within a given area. The final output is a map showing levels of access to essential services—such as green space, transport, shopping, employment, and healthcare—within a 20-minute walking distance.

GENERAL PURPOSES
Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Assessing strengths/weaknesses in neighbourhood access to facilities/needs.

INTENDED USERS: City decision-makers | General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 3, 4, 5, 6, 7, 8. and 9.

CONTRIBUTION TO NRR: Yes, indirectly

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free	TECHNICAL SKILLS ♦♦♦♦♦	MAINTENANCE STATUS
Resources are needed to compile data and engage with communities if used alongside Place Standard. Access to ArcGIS is also required, which is not free. Additional time is needed for community consultations.	The Scottish Improvement Service have produced a guide, co-designed with communities, Planners, Scottish Government and Public Health Scotland. This guidance is quite straightforward for users that are familiar with ArcGIS (Pro).	Recently released

DATA REQUIREMENTS ♦♦♦♦♦	TYPE OF INPUT DATA	INPUT DATA FORMAT
Requires GIS data, which is typically available to local authorities.	— Land use / land cover — Biophysical data — Biodiversity data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment — Policy, governance and management	— Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide. Designed for Scotland, the ArcGIS-based tool can be adapted elsewhere using similar local data. It guides users to data sources and provides weightings for analysis. In France, for example, one could start with national datasets and refine by region. It's recommended to use it alongside the Place Standard Tool, which captures community input through collaborative engagement.

Box A19. TESSA (Toolkit for Ecosystem Service Site-based Assessment) factsheet

TESSA (Toolkit for Ecosystem Service Site-based Assessment) (Cluster 3)   [Link]

TOOL DESCRIPTION – Spreadsheet

TESSA is a site-based easy-to-use toolkit designed to help non-specialists assess the benefits people receive from nature at specific sites. Initially developed by a consortium of conservation organizations, it can be used by anyone, including the private sector and those with no prior knowledge of ecosystem services. It includes an introduction to the concepts of ecosystem services and natural capital, guidance on how to conduct a preliminary scoping appraisal to identify important services and beneficiaries, decision trees to identify the best methods to use for each service, and links to a set of simple low-cost methods for measuring ecosystem services either qualitatively or quantitatively. Worked examples are provided, as well as instructions for collecting site-specific data where appropriate (including field surveys and stakeholder input). There is also guidance on how to communicate results to decision-makers. TESSA emphasizes the comparison of ecosystem service values under current and alternative land-use scenarios, helping decision-makers understand trade-offs and make informed choices. It can be particularly useful in contexts where data and technical capacity are limited, offering a low-cost, accessible approach to ecosystem service assessment that supports conservation and sustainable development goals.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping habitats
— Mapping/assessing biodiversity
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: Scientists | City decision-makers | Consultants | Business | NGOs | General public | Community groups | Practitioners

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 3, 4, 5, 6, 8, and 9. | **CONTRIBUTION TO NRR:** No.

SCALE: Biodiversity-rich sites in rural or natural areas. Some components of the tool can be used in cities.

COST: Free
TESSA is open-access and freely downloadable. Some assessments may require field data collection, which could lead to costs.

TECHNICAL SKILLS ♦♦♦♦♦♦
TESSA is designed for non-experts and does not require advanced technical skills. However, it does require some training in environmental science.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦♦
TESSA is designed for data-poor contexts. It provides guidance for collecting necessary data through fieldwork and stakeholder engagement.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters
— Field observations, interviews.
OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature | Grey literature | Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A20. ADMS-Urban factsheet

ADMS-Urban (Cluster 4a) [Link]

TOOL DESCRIPTION – Custom software
ADMS-Urban is an urban air quality model for multiple urban source types, taking into account a range of factors regarding urban morphology. It can be linked to a regional air quality model.

GENERAL PURPOSES
Ecosystem Services Assessment
— Assessing air quality improvement / air purification

INTENDED USERS: Scientists | City decision-makers

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City and Metropolitan area / landscape

COST: Licence	**TECHNICAL SKILLS** ♦♦♦♦♦ Support and training offered, model is likely not simple to operate.	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ Complex data, some available through tool developers or provided links, but own data needs to be added.	**TYPE OF INPUT DATA** — Environmental pressures and hazards — Infrastructure and built environment, — Traffic flow	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphic output

EVIDENCE OF USE: Scientific literature | Grey literature

TRANSFERABILITY: Yes - it can be used in all cities worldwide.

Box A21. ENVI-Met factsheet

ENVI-Met (Cluster 4) [Link]

TOOL DESCRIPTION – Custom Software

ENVI-met is a holistic, three-dimensional microclimate modelling software designed to simulate and analyse surface-plant-air interactions in complex urban environments. The tool is widely used in urban climate research, environmental planning, and the design of climate-adaptive cities. It allows for high-resolution, microscale simulations of atmospheric processes—such as air and surface temperature, wind flow, humidity, radiation balance, and pollutant dispersion—typically down to a spatial resolution of 0.5–5 metres and a time step of seconds to hours.

ENVI-met is particularly valued for assessing the impact of urban greening, materials, and building morphology on thermal comfort, urban heat island mitigation, and overall climate resilience. It supports scenario-based analysis, enabling planners and researchers to test interventions such as tree planting, green roofs, permeable surfaces, or changes to street design. The model integrates vegetation, soil, radiation, and fluid dynamics in a unified framework, offering a realistic representation of urban microclimates.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation	— Assessing urban heat mitigation / cooling	— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9. | **CONTRIBUTION TO NRR:** No

SCALE: Single green element / patch, and Neighbourhood

COST: Yes, you must buy a licence. Business License: €1,900–2,900/year, depending on user type (e.g., public or commercial sector). University License: €1,500/year, covering up to 50 devices per department. Student License: €300/year, valid for one year with proof of enrolment. Free Trial: Available with limitations on domain size and output features.	**TECHNICAL SKILLS ♦♦♦♦♦** Effective use of ENVI-met requires advanced technical skills, including GIS proficiency, knowledge of urban microclimates and environmental data, and experience with data analysis and simulations. A background in environmental science, urban planning, or a related field is recommended. Programming is not essential but useful for advanced tasks.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦♦ For a typical neighbourhood-scale project, initial data collection and preparation can take from several days to a few weeks, particularly when starting from raw or fragmented datasets.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A22. MUKLIMO factsheet

MUKLIMO (Cluster 4a)   [Link]

TOOL DESCRIPTION – Spatial model

A 3-dimensional microscale urban climate model designed to simulate urban atmospheric conditions, particularly focusing on the urban heat island effect and the impact of land use changes (including changing green/grey area distribution) on local climates. The model can produce 3-dimensional wind, air temperature and air humidity fields. It simulates the intensity and spatial distribution of urban heat islands under various scenarios based on the downscaling of regional climate projections and estimates human thermal stress using indices like the perceived temperature. The thermodynamic version adds prognoses for the heat and moisture budget of the atmosphere, including a one-dimensional soil model accounting for heat and moisture fluxes and a canopy model to simulate vegetation-atmosphere interactions.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: Scientists **|** Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free
MUKLIMO_3 is available upon request for non-commercial research and educational purposes. However, development and support has been discontinued.

TECHNICAL SKILLS ♦♦♦♦♦
Users should possess expertise in atmospheric sciences, urban climatology, and numerical modelling. Familiarity with GIS and data processing tools is also essential.

MAINTENANCE STATUS
No.

DATA REQUIREMENTS ♦♦♦♦♦
Requires comprehensive datasets, including high-resolution land use maps, detailed meteorological observations, and soil characteristics. Data preprocessing and validation are critical for accurate simulations.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Unclear.

Box A23. UMEP (Urban Multi-scale Environmental Predictor) factsheet

UMEP (Urban Multi-scale Environmental Predictor) (Cluster 4a)   [Link]

TOOL DESCRIPTION – Code/package

The Urban Multi-scale Environmental Predictor (UMEP) is a QGIS plugin that can be used for a variety of applications related to outdoor thermal comfort, urban energy consumption, climate change mitigation etc. It consists of a coupled modelling system which combines "state of the art" 1D and 2D models related to the processes essential for scale-independent urban climate estimations. These models include SOLWEIG (outdoor thermal comfort), SUEWS (urban energy balance), SEBE (solar energy on building envelopes) and Urban Weather Generator (urban heat island). Each model contains a "pre-processor" module to generate the required input data, a "processor" module to run the model, and a "post-processor" module to visualize and analyse the outputs.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling

INTENDED USERS: Scientists **|** Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 7. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free It uses open source data and an open source version of GIS. This could make it difficult for some cities as their systems may stop them from using QGIS.	**TECHNICAL SKILLS ♦♦♦♦♦** Good command of QGIS and data handling required (eg meteo data need to be formatted in specific ways)	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ Some input data might not be easily available (e.g., canopy height). The tools is very specific about the type of data it will accept	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A24. Urban Weather Generator factsheet

Urban Weather Generator (Cluster 4a) [Link]

TOOL DESCRIPTION – Code/package

The Urban Weather Generator (UWG) model is based on energy conservation principles and is a bottom-up building stock model, designed to apply to street canyons. The model takes input parameters that describe urban morphology, geometry, and surface materials. The urban morphology parameters are similar to those used for existing building energy performance simulations. It estimates the hourly urban canopy air temperature and humidity using weather data from a nearby rural weather station. As inputs, it takes a rural epw file and an *.xml (or *.xlsm) file which describes your urban canyon. The output is a morphed weather file [epw] that captures urban heat island effect and is compatible with many building performance simulation programs. It requires familiarity with building energy models and meteorology data, with input parameters needed for aspects like building construction, albedo, size and use, among many others. Some default parameters are suggested, but others such as horizontal building density within a set area will need pre-calculating using GIS software. The tool is designed in a US context.

GENERAL PURPOSES

Ecosystem Services Assessment

— Assessing urban heat mitigation / cooling

INTENDED USERS: Scientists | Consultants

CONTRIBUTION TO URBAN NATURE PLANS: No.	**CONTRIBUTION TO NRR:** No.

SCALE: Single green element / patch and Neighbourhood

COST: Free There do not seem to be external costs.	**TECHNICAL SKILLS** ♦♦♦♦♦ The large amount of input data requires a broad level of knowledge (building energy models, meteorology), and some technical skills in preparing input files, as well as GIS and Matlab to calculate some input data parameters.	**MAINTENANCE STATUS** No.
DATA REQUIREMENTS ♦♦♦♦♦ Appears to require a lot of detailed user inputs, e.g. building height, buildings closeness, individual building construction and heat-gain from occupants, equipment etc. These parameters are for building energy models. Also requires familiarity with meteorological parameters (e.g. daytime and nighttime boundary layer height, vertical stability, …). The guidance document suggests default values for parameters and plausible ranges, but only for some parameters. External links are provided as reference sources for parameter values, but some of these links go to landing pages, requiring more navigation of websites to find the information needed.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Infrastructure and built environment	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A25. Fragstats factsheet

Fragstats (Cluster 4b)	[Link]

TOOL DESCRIPTION – Custom software

FRAGSTATS is a tool to assess landscape structure. It is a spatial pattern analysis program for categorical maps representing the landscape mosaic model of landscape structure. The landscape subject to analysis is user-defined and can represent any spatial phenomenon. FRAGSTATS simply quantifies the spatial heterogeneity of the landscape as represented in the categorical map; it is incumbent upon the user to establish a sound basis for defining and scaling the landscape in terms of thematic content and resolution and spatial grain and extent.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Assessing landscape structure (e.g., connectivity)

INTENDED USERS: Scientists | City decision-makers | Consultants | NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEP 5.	**CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: City and Metropolitan area / landscape

COST: Free	**TECHNICAL SKILLS ♦♦♦♦♦** Running the tool requires a strong background in landscape ecology and knowledge of the metrics adopted. Importantly, the output from FRAGSTATS is meaningful only if the landscape as defined is meaningful relative to the phenomenon under consideration. Therefore, correct interpretation of the results is incumbent upon the user to establish a sound basis for defining and scaling the landscape in terms of thematic content and resolution and spatial grain and extent.	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ Raster data preparation usually requires medium effort, but it depends on what data is used.	**TYPE OF INPUT DATA** — Land use / land cover	**INPUT DATA FORMAT** • Geospatial data **OUTPUT DATA FORMAT** • Geospatial data • Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A26. GuidosToolbox factsheet

GuidosToolbox (Cluster 4b) [Link]

TOOL DESCRIPTION – Custom software

GuidosToolbox is a software suite for analysing digital raster data. Designed to support interdisciplinary applications, it provides a wide range of thematically grouped geometric analysis tools provided in a graphical user interface and for all popular operating systems. Built on three principles—spatially explicit information, quantitative indicators, and generic flexibility—it enables users to detect spatial patterns, quantify trends, and adapt analyses to diverse datasets and scales. Originally created for environmental remote sensing applications, GuidosToolbox now serves as a universal framework for extracting and reporting spatial object properties in any raster imagery, supporting both scientific research and practical decision-making in fields like ecology, urban planning, and remote sensing.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Mapping habitats
— Assessing landscape structure (e.g., connectivity)

INTENDED USERS: Scientists

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City and Metropolitan area / landscape

COST: Free	TECHNICAL SKILLS ♦♦♦♦♦ Medium technical skills are needed to run the software and prepare data, advance knowledge of landscape metrics is needed to understand the results. ability to handle geospatial data might be required for pre-processing input layers.	MAINTENANCE STATUS Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ Raster images. Some of them, such as land use land cover maps, can be found online for free e.g. from Copernicus.	**TYPE OF INPUT DATA** — Land use / land cover	**INPUT DATA FORMAT** — Geospatial data **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A27. BeST (Benefits of SuDS Tool) factsheet

BeST (Benefits of SuDS Tool) (Cluster 4c) [Link]

TOOL DESCRIPTION – Spreadsheet

BeST (Benefits of SuDS Tool) is a spreadsheet-based tool developed by CIRIA (Construction Industry Research and Information Association, a UK-based not-for-profit organization) to help users evaluate the multiple benefits of Sustainable Drainage Systems (SuDS). It provides a structured approach to assessing a wide range of benefits, including water quality, flood risk mitigation, amenity, biodiversity, and climate regulation. BeST supports decision-making by enabling users to qualitatively, quantitatively, and monetarily assess SuDS interventions. It is designed for use by practitioners, consultants, and local authorities to build business cases for SuDS implementation and to compare different options. The tool includes a user guide, case studies, and a benefits assessment framework that aligns with ecosystem services and natural capital approaches.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green spaces
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: Scientists **|** City decision-makers **|** Business **|** Consultants **|** NGOs **|** Water managers **|** Engineers **|** Practitioners

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 8, and 9.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free
BeST is freely available for download from the susdrain website.

TECHNICAL SKILLS ♦♦♦♦♦
Basic spreadsheet skills are sufficient. Guidance is provided in the user manual.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
The tool provides default values and guidance for data entry. Users can input site-specific data to improve accuracy.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters
OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: Yes – it can be used in cities all over Europe.
Developed in the UK but applicable in other contexts with appropriate data input.

Box A28. BlueHealth Toolbox factsheet

BlueHealth Toolbox (Cluster 4c) [Link]

TOOL DESCRIPTION – (several tools)

The BlueHealth Toolbox comprises six tools that gather data on the environmental characteristics of blue spaces; how these spaces are used; the behaviours of people within them; and the perceptions, experiences and health status of people who engage with blue spaces directly (through visiting them), or indirectly (by living nearby). Such assessments of blue spaces can help tackle public health challenges linked to disease, mental health issues, and the impacts of climate change. The six tools included in the toolbox are: BlueHealth Environmental Assessment Tool (BEAT), providing measures of the environmental character of a blue space; BlueHealth Decision Support Tool (DST), identifying the key health-related risks and benefits of a given blue space; BlueHealth Behavioural Assessment Tool (BBAT), determining how people use blue spaces; BlueHealth Community Level Survey (BCLS), questionnaire designed to find out how communities engage with blue spaces, their perceptions, and how blue spaces might affect individual and community wellbeing; SoftGIS, a participatory mapping tool; and BlueHealth International Survey (BIS), online questionnaire operating at a higher spatial scale than BCLS. Each tool is designed to work at a particular spatial scale – from site to country level. Used in combination within a single and integrated assessment framework, these tools provide a variety of rich data sets. All tools can be used at any point in the process of changing a blue space. However, while the primary purpose is to assess changes in blue spaces and their impact on public health, the tools can also be used to map the existing characteristics of blue spaces.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing recreation / access to green space
— Assessing other ecosystem services (health benefits of blue space)

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: Scientists | City decision-makers | Consultants | NGOs | General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, but only limited to blue infrastructure.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free
The toolbox is free, but human resources and funding are needed to run the tools.

TECHNICAL SKILLS ◆◆◆◆◆
Considering the variety of tools available in the toolbox, the technical skills required depend on the tool to be used.

MAINTENANCE STATUS
Recently released (but no evidence of support after 2020)

DATA REQUIREMENTS ◆◆◆◆◇
The score is an average, considering that input data requirements depend on the specific tool being used. Some tools have multiple versions for different users (e.g., professionals and community groups). Access to map databases is needed to run the two GIS components.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature | Grey literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A29. GIF-Mod (Green Infrastructure Flexible Model) factsheet

GIF-Mod (Green Infrastructure Flexible Model) (Cluster 4c) [Link]

TOOL DESCRIPTION – Custom software

GIFMod is a computer program that can be used to construct models for evaluation of the performance of stormwater green infrastructure (GIs) and other types of urban and agricultural best management practices (BMPs). The program is designed to provide a good level of flexibility to the users to set up the model configuration and to select the processes governing the hydraulics and water quality. Therefore, GIFMod can be applied to evaluate a wide variety of GI-related water quality problems. A model built using GIFMod should be conceptualized as an interconnected set of different types of media ranging from surface water to vadose zone and groundwater. Modelling of GI performance in GIFMod can be done in three levels including hydraulics, particle transport and constituent fate and transport. A GI model can be constructed by a combination of blocks representing surface water ponds, streams, overland flow, unsaturated soil, saturated media and storage that are connected either through natural interfaces, pipes or other user-defined connectors.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management

INTENDED USERS: Scientists

CONTRIBUTION TO URBAN NATURE PLANS: No. | **CONTRIBUTION TO NRR:** No.

SCALE: Single green element / patch

COST: Free	**TECHNICAL SKILLS ♦♦♦♦♦**	**MAINTENANCE STATUS** No.
DATA REQUIREMENTS ♦♦♦♦♦	**TYPE OF INPUT DATA** — Biophysical data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Tabular / statistical outputs — Charts / graphical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: No - it is designed only for a specific context.

Box A30. Green Values (National Stormwater Management Calculator) factsheet

Green Values (National Stormwater Management Calculator) (Cluster 4c)   [Link]

TOOL DESCRIPTION – Online computation tool
The Green Values Stormwater Management Calculator is designed to help plan green infrastructures to prevent flooding, by comparing the performance, costs, and benefits of the interventions. It is mainly run at site level –house, commercial estate, urban park, urban farm, school,…– but can also be run for a larger area. The tool evaluates the GI practices needed to meet the necessary capacity for buffering stormwater in a cost-effective way.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation	— Assessing flood risk mitigation / runoff management	— Informing decisions by providing access to pre-processed data layers

INTENDED USERS: City decision-makers **|** Business **|** Consultants **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 7.	**CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free Free for non-commercial use. It requires account registration. Commercial use may require licensing.	**TECHNICAL SKILLS** ♦♦♦♦♦ It appears that some knowledge of housing, landscaping and NBS is required to use the tool.	**MAINTENANCE STATUS** No (latest updates in 2020/2021)
DATA REQUIREMENTS ♦♦♦♦♦ In principle, you need detailed data on the sites, mainly in terms of land cover, types of housing, types of roof and amount of current landscaping.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Infrastructure and built environment	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: No

TRANSFERABILITY: No – it is designed only for a specific context. Calibrated and validated for the USA (meteo, cost, metrics).

Box A31. i-Tree Hydro factsheet

i-Tree Hydro (Cluster 4c) [Link]

TOOL DESCRIPTION — Custom software

i-Tree Hydro is a stand-alone desktop application designed to simulate the effects of changes in urban tree cover and impervious surfaces on the hydrological cycle, including streamflow and water quality, for watershed and non-watershed areas. It is developed for land cover scenario analysis. It is a vegetation-specific urban hydrology model, developed to model urban vegetation effects to quantify the impacts of changes in tree and impervious cover on local hydrology to aid in management and planning decisions. The graphical user interface is currently in active, and for development potential users are deferred to HydroPlus in the i-Tree Research Suite.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management

Planning & Decision Support
— Assessing the impacts of plans/strategies/actions (including nature-based solutions)

INTENDED USERS: Scientists **|** City decision-makers **|** Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 6.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: City and Metropolitan area / landscape

COST: Free
The HydroPlus webpage indicates that technical assistance is not free.

TECHNICAL SKILLS ♦♦♦♦♦
The website states it is designed to be simple enough for non-experts to understand, but robust enough for defensible results. Tabulated/graph output is not directly interpretable by non-experts.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)

OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide (mostly US-focused though).

Box A32. MIKE URBAN + factsheet

MIKE URBAN + (Cluster 4c) [Link]

TOOL DESCRIPTION – Spatial model

An integrated software platform for modelling, analysing, and managing urban water systems, including water distribution, stormwater drainage, wastewater collection, rivers, and floodplains. It provides: Hydraulic and Hydrological Modelling: Simulate water flow in distribution networks, sewer systems, rivers, and floodplains. Water Quality Analysis: Assess pollutant transport, sediment dynamics, and ecological impacts. Flood Risk Assessment: Model urban flooding scenarios, evaluate mitigation measures, and plan emergency responses. Real-Time Control: Design and test control strategies for pumps, gates, and valves to optimize system performance. GIS Integration: Leverage spatial data through integration with ArcGIS Pro for enhanced analysis and visualization.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing other ecosystem services (water quality, sediment dynamics)

Planning & Decision Support
— Monitoring the implementation of plans/strategies

INTENDED USERS: Scientists **|** City decision-makers **|** Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood and City

COST: Licence.
MIKE+ is a commercial software requiring a paid license. Pricing varies based on modules and usage. Cloud Deployment: Available on a pay-as-you-go basis via Microsoft Azure Marketplace.

TECHNICAL SKILLS ♦♦♦♦♦
Users should have expertise in hydrology, hydraulics, and GIS. Familiarity with modelling concepts and data handling is essential.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
Requires comprehensive and accurate datasets for effective model
ling. Data collection and preprocessing can be resource-intensive.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A33. MUSIC (Model for Urban Stormwater Improvement Conceptualisation) factsheet

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) (Cluster 4c)

TOOL DESCRIPTION – Custom software

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) is Australia's leading software tool for designing and evaluating water sensitive urban design (WSUD) systems. Developed by eWater, it simulates stormwater behaviour in urban catchments and assesses the performance of various stormwater treatment systems. MUSIC supports urban planners, engineers, and decision-makers in conceptualizing and optimizing stormwater management strategies to meet water quality objectives. It models a wide range of treatment devices (e.g., wetlands, bio-retention systems, rainwater tanks) and evaluates their potential for stormwater harvesting and reuse and the effects on downstream flows, including their effectiveness in reducing pollutants like suspended solids, phosphorus, and nitrogen. Therefore, it can be used to compare different treatment options in terms of water quantity, quality, and cost/benefits. According to the provider, the tool is grounded in decades of Australian research and is widely used by local governments, consultants, and universities.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing other ecosystem services (water purification, reuse potential, etc.)

Planning & Decision Support
— Assessing the impacts of plans/strategies/actions (including nature-based solutions)
— Monitoring the implementation of plans/strategies

INTENDED USERS: Scientists **|** City decision-makers **|** Consultants **|** Business **|** NGOs **|** Urban planners **|** Engineers **|** Water managers

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 8, and 9. **CONTRIBUTION TO NRR:** No.

SCALE: Single green element / patch and Neighbourhood

COST: Licence.
MUSIC is commercial software licensed via eWater, with pricing based on user type (e.g. government, consultant, academic). Additional costs may apply for training, support, or data. More info here.

TECHNICAL SKILLS ♦♦♦♦♦
Users need a good understanding of hydrology, stormwater systems, and WSUD principles. Familiarity with spatial data and model configuration is important, though the provider clarifies that no programming is required. Guidance is available through documentation and training.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
MUSIC requires detailed rainfall data, catchment characteristics, and treatment system parameters. While some default values are provided, site-specific data improves accuracy.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters
OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No – it is designed only for a specific context. The current version of MUSIC is tailored to Australian conditions, especially rainfall and pollutant data, and it makes reference to specific national

regulations. It could possibly be adapted for use in other regions with appropriate local data and treatment devices tailored to the different local contexts.

Box A34. SWAT (Soil and Water Assessment Tool) factsheet

SWAT (Soil and Water Assessment Tool) (Cluster 4c) [Link]

TOOL DESCRIPTION – Custom software

The Soil and Water Assessment Tool (SWAT) is a robust, process-based, semi-distributed hydrological model developed by the USDA Agricultural Research Service. It is designed to predict the environmental impact of land use, land management practices, and climate change on water, sediment, and agricultural chemical yields in large, complex watersheds over long periods. SWAT integrates data on topography, soils, land use, weather, and agricultural management to simulate key watershed processes including surface runoff, evapotranspiration, infiltration, nutrient cycling, erosion, and crop growth.

SWAT divides a watershed into multiple sub-basins and further into hydrologic response units (HRUs), which are unique combinations of land use, soil type, and slope. This structure allows for detailed spatial representation without excessive computational demand. SWAT is widely used for scenario analysis, particularly for evaluating conservation practices, pollutant load reductions, and water resource planning. Its outputs support decision-making for sustainable land and water management.

The model is open-source, with a strong international user community and frequent updates through the SWAT website and related platforms. It has been extensively validated and applied worldwide, particularly in agricultural landscapes, making it a key tool in catchment hydrology, water quality assessment, and integrated watershed management.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans/strategies/actions (including nature-based solutions)
— Monitoring the implementation of plans/strategies

INTENDED USERS: Scientists | City decision-makers | Consultants | Business | NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free.
The SWAT tool itself is free and open-source, with no license or subscription fees for downloading or using the core model and its common GIS interfaces (ArcSWAT, QSWAT). However, there can be indirect costs associated with using SWAT, including costs for data acquisition and costs related to training, staff time, or consulting services to run, calibrate, and interpret the model.

TECHNICAL SKILLS ♦♦♦♦♦
Users typically include hydrologists, environmental scientists, and GIS professionals. While SWAT requires moderate to advanced technical skills (especially in data handling and model calibration), it is supported by a large user community, tutorials, and training sessions, making it accessible to users with the necessary background.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
In well-studied regions, most data is freely available. In less-documented areas, collecting high-resolution land use, soil, weather, and management practice data can be time- and resource-intensive. Calibration data may also be hard to obtain. For medium-to-large watersheds, data preparation can take weeks to months.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A35. SWMM (Storm Water Management Model) factsheet

SWMM (Storm Water Management Model) (Cluster 4c) [Link]

TOOL DESCRIPTION – Custom software

SWMM is a simulation tool developed by the U.S. EPA for modelling stormwater, wastewater, and drainage systems in urban areas. It handles single-event or continuous rainfall-runoff simulations, accounting for processes like runoff, infiltration, and pollutant transport. SWMM can model complex drainage networks, including pipes, channels, pumps, and storage units. It also supports the evaluation of green infrastructure and low-impact development practices (i.e. bioretention cells and permeable pavements). SWMM is open-source and offers both a graphical interface and text-based input for detailed hydrologic and hydraulic analysis.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff

INTENDED USERS: Scientists **|** City decision-makers **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free.	**TECHNICAL SKILLS** ♦♦♦♦♦ It requires an understanding of hydrology, hydraulics, and of the specific input data and parameters required.	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ The specific input data and parameters required may not be readily available (e.g. water quality data or drainage network data).	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A36. UrbanBEATS factsheet

UrbanBEATS (Cluster 4c)   **[Link]**

TOOL DESCRIPTION – Code/package

An integrated spatio-temporal modelling tool developed to assist in Water Sensitive Urban Design (WSUD) interventions. It enables users to assess various urban development and water management scenarios by simulating interactions between urban form and water infrastructure. It aids in identifying suitable areas for green interventions, prioritizing actions, and evaluating their potential impacts.

GENERAL PURPOSES

Ecosystem Services Assessment	**Planning & Decision Support**
— Assessing flood risk mitigation / runoff management	— Assessing the impacts of plans/strategies/actions (including nature-based solutions)

INTENDED USERS: Scientists

CONTRIBUTION TO URBAN NATURE PLANS: STEP 7.	**CONTRIBUTION TO NRR:** No.

SCALE: Neighbourhood and City

COST: Free.	**TECHNICAL SKILLS ◆◆◆◆◆** Highly specialised knowledge is required to understand and run the models.	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ◆◆◆◆◆◆ Data on assets value, particularly, might not be easily available.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Charts / graphical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A37. WMOST (Watershed Management Optimization Support Tool) factsheet

WMOST (Watershed Management Optimization Support Tool) (Cluster 4c)   [Link]

TOOL DESCRIPTION – Custom software

The Watershed Management Optimization Support Tool (WMOST) is an integrated decision-support software developed and maintained by the U.S. Environmental Protection Agency (EPA) to assist planners, watershed managers, and decision-makers in evaluating and optimizing stormwater and watershed management strategies. It considers a broad range of strategies, including both green infrastructure (e.g., bioretention, permeable pavements, green roofs, urban trees) and grey infrastructure (e.g., pipes, detention basins). WMOST integrates multiple modelling components to simulate hydrologic, water quality, and economic outcomes of various green and grey infrastructure practices across urban and suburban watersheds. The tool facilitates comprehensive cost–effectiveness analysis by combining hydrologic modelling, pollutant load estimation, and financial data, allowing users to prioritize management practices to meet water quality goals efficiently. WMOST supports scenario analysis, enabling comparison of alternative combinations of management practices to optimize watershed-scale benefits such as reduced runoff, pollutant load reduction, and cost savings.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans/strategies/actions (including nature-based solutions)
— Monitoring the implementation of plans/strategies

INTENDED USERS: Scientists | City decision-makers | Business | Consultants | NGOs | Water utilities | Watershed managers

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free.
WMOST is a free, open-source tool provided by the EPA, with no direct costs for downloading or using the software. However, users should consider potential costs related to acquiring necessary data, ensuring compatible software, and obtaining training or support as needed.

TECHNICAL SKILLS ♦♦♦♦♦
A solid technical background in engineering or environmental planning is required. Users should understand stormwater management, be proficient with Excel, and be comfortable handling spatial and tabular data. Some experience with economics is also beneficial.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
In cities with good data infrastructure, setting up WMOST is manageable. In data-poor areas, significant effort is needed to build usable datasets. Converting raw GIS and monitoring data into model-ready tables requires GIS and data management skills and may take days to weeks, with possible added costs.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment
— Policy, governance and management

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Scientific literature | Grey literature | Local authority use

TRANSFERABILITY: No – it is designed only for a specific context. The tool is tailored to U.S. regulatory and data frameworks. It is conceptually transferable and technically adaptable to cities across Europe and beyond, but such adaptation for use in Europe would imply significant customization.

Box A38. EcoActuary factsheet

EcoActuary (Cluster 4d) [Link]

TOOL DESCRIPTION – Online computation tool

EcoActuary is an open-access spatial modelling tool inspired by catastrophe models and designed for strategic planning aimed at risk mitigation. It assesses flood risk and the impacts of land use, climate change, and green infrastructure investments. Developed by King's College London and AmbioTEK, it integrates global datasets and spatial models to simulate biophysical and socio-economic processes. The tool evaluates how green and grey infrastructure can mitigate risks to insured and uninsured assets, supporting ecosystem-based adaptation and NBS. It is particularly useful for scenario modelling, risk finance optimization, and identifying co-benefits of biodiversity conservation. EcoActuary is accessible to non-commercial users and can be used with built-in global datasets or customised with user-provided data.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: Scientists | City decision-makers | Business | Consultants | NGOs | Insurance companies | Catastrophe modelers | Planners

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, 8, and 9.	**CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free Free for non-commercial use. It requires account registration. Commercial use may require licensing.	**TECHNICAL SKILLS ♦♦♦♦♦** Basic use with default datasets requires minimal GIS skills. You need to be able to understand the general principles and navigate the datasets, but then you are guided through the process. Custom data integration requires moderate GIS and data handling skills.	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ The tools retrieve autonomously the required input data for application anywhere globally. However, application with custom data will take much longer depending on the availability, level of processing, format and consistency of those datasets and requires GIS capacity.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Grey literature | Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A39. ESTIMAP – Pollination (urban) factsheet

ESTIMAP – Pollination (urban) (Cluster 4d) [Link]

TOOL DESCRIPTION – Spatial model

The ESTIMAP urban pollination model is a modified version of the ESTIMAP pollination model used to assess potential pollinator contributions to agricultural production at continental scale. The model uses multiple layers of look-up tables to assess the suitability of land units for pollinators. The urban adaptation uses a modified set of land cover categories, and a simplified approach to habitat suitability. The model has been applied in case studies in Oslo, Norway and the Hannover Region, Germany. The model takes a similar approach as the InVEST pollination model.

GENERAL PURPOSES

Ecosystem Services Assessment

— Assessing other ecosystem services (pollination)

INTENDED USERS: Scientists **|** City decision-makers

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 9.	**CONTRIBUTION TO NRR:** No.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free Unclear, as there is no clear webpage or repository.	**TECHNICAL SKILLS ♦♦♦♦♦** Actually unclear, but likely that it is not easy, as developers always seem to be part of any effort using the model.	**MAINTENANCE STATUS** Unknown
DATA REQUIREMENTS ♦♦♦♦♦ Different maps and data types needed, as well as consultation of experts to adjust input tables to local situation.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide

Box A40. ESTIMAP – Recreation (urban) factsheet

ESTIMAP – Recreation (urban) (Cluster 4d) [Link]

TOOL DESCRIPTION – Spatial model

The ESTIMAP recreation model measures the capacity of ecosystems to provide nature-based outdoor recreational and leisure opportunities. It is an 'Advanced multiple layer LookUp Tables" model which measures the capacity of ecosystems to provide nature-based recreational and leisure opportunities. The model assigns ecosystem services scores to land units based on cross-tabulation and spatial composition derived from overlaying thematic maps. Ecosystem services scores for each input layer are derived from the literature and an expert-based approach.

It integrates ecosystem-based potential, which estimates the potential capacity of ecosystems to support nature-based recreation activities, and human inputs, which integrates a proximity-remoteness concept in relation to road networks and residential areas.

GENERAL PURPOSES

Planning & Decision Support

Assessing recreation / access to green space

INTENDED USERS: Scientists **|** City decision-makers **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 9. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: City, and Metropolitan area / landscape

COST: Free The tool can be used as a QGIS plug-in.	**TECHNICAL SKILLS** ♦♦♦♦♦	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦ Quite data intensive for detailed assessment at the city scale, but it can also be run with simpler dataset.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data **OUTPUT DATA FORMAT** — Geospatial data

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: Yes - it can be used in all cities worldwide.

Box A41. Nature discovery map for schools factsheet

Nature discovery map for schools (Cluster 4d)	[Link]

TOOL DESCRIPTION – Dashboard / online visualization tool

The tool is an interactive map-based platform designed to map vegetation features in school grounds in Scotland. It combines mapped features with survey data, basically derived from teachers and pupils. The core of this tool represents a dashboard that allows multiple filtering options for engaging with the mapped and surveyed material.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers

INTENDED USERS: City decision-makers **|** General public **|** Schools

CONTRIBUTION TO URBAN NATURE PLANS: STEP 8.	**CONTRIBUTION TO NRR:** No.

SCALE: Single green element / patch

COST: Free Free for non-commercial use.	**TECHNICAL SKILLS** ♦♦♦♦♦ No guidelines and not easy to navigate.	**MAINTENANCE STATUS** Recently released
DATA REQUIREMENTS ♦♦♦♦♦	**TYPE OF INPUT DATA** — Socio-demographic and economic data — Survey data	**INPUT DATA FORMAT** — Non spatial values / parameters — Photos **OUTPUT DATA FORMAT** — Vector maps — Charts / statistical outputs

EVIDENCE OF USE: not available

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A42. ORVal (Outdoor Recreation Valuation Tool) factsheet

ORVal (Outdoor Recreation Valuation Tool) (Cluster 4d)   [Link]

TOOL DESCRIPTION – Online computation tool
The ORVal (Outdoor Recreation Valuation) tool, developed by the University of Exeter, is an innovative GIS-based decision-support system designed to quantify and value outdoor recreational ecosystem services. It integrates spatial data on natural environments with visitor use patterns to estimate the economic value of outdoor recreation across landscapes. By combining environmental attributes such as habitat quality, accessibility, and recreational infrastructure with user-generated data, ORVal provides spatially explicit assessments of recreational benefits derived from natural areas. This tool supports policymakers, land managers, and planners in understanding and balancing the trade-offs between conservation, development, and recreation.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation	— Assessing recreation / access to green space — Estimating the economic value of green spaces	— Informing decisions by providing access to pre-processed data layers — Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: Scientists **|** City decision-makers **|** Consultants **|** NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 8. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

| **COST:** Free
The ORVal tool is free to use and does not require a license or subscription. It is publicly accessible via the University of Exeter's Land, Environment, Economics and Policy Institute (LEEP) website. While the tool itself is free, users may incur costs related to data collection or purchase if they wish to conduct analyses beyond the tool's built-in datasets. | **TECHNICAL SKILLS** ♦♦♦◇◇
It is designed to be user-friendly and accessible to planners, policymakers, and environmental professionals with some background in spatial data and ecosystem services but without needing specialist GIS or coding expertise. | **MAINTENANCE STATUS**
Evidence of maintenance in the recent past (new version available) |

| **DATA REQUIREMENTS** ♦♦◇◇◇
The effort to collect data for ORVal depends on the analysis scope. The tool includes preloaded datasets for many areas, allowing quick assessments. However, collecting up-to-date spatial data on greenspaces, visitors, and environmental features can be time-consuming. | **TYPE OF INPUT DATA**
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data
— Infrastructure and built environment | **INPUT DATA FORMAT**
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters
OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives |

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No – it is designed only for a specific context. Designed for England and Wales only and calibrated using region-specific spatial and visitor data. While the tool's framework and methodology are transferable and provide a strong foundation, the tool itself cannot simply be applied without local adaptation and recalibration, which would require significant redevelopment. It can serve as a model to

develop similar valuation tools tailored to other regions or cities by integrating their own spatial and visitor data.

Box A43. City Explorer Toolkit factsheet

City Explorer Toolkit (Cluster 5) [Link]

TOOL DESCRIPTION – Online computation tool

The City Explorer Toolkit, developed by the UK Centre for Ecology & Hydrology (UKCEH), is an interactive web-based tool that supports urban planning through spatial analysis of green and blue spaces. It allows users to modify land cover data, run ecosystem service models, and assess planning scenarios. By integrating environmental, social, and demographic data, the tool estimates the supply and demand of ecosystem services and identifies optimal locations for nature-based solutions—such as cooling, air quality improvement, and noise reduction—targeting communities most in need. It promotes equitable, evidence-based urban greening to improve health, wellbeing, and climate resilience across UK cities. Current models include air pollution removal, hot-day cooling, surface flood risk, and noise mitigation (the latter two in the offline version). Models in development include above-ground carbon stocks and greenspace accessibility.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing air quality improvement / air purification
— Assessing flood risk mitigation / runoff management
— Assessing noise mitigation by vegetation
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon stocks in vegetation)

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies
— Assessing the value (monetary valuation and non-monetary values) of Green Infrastructure

INTENDED USERS: City decision-makers | Scientists | Consultants | NGOs | Business | Public health professionals

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, 7, and 9 | **CONTRIBUTION TO NRR:** Yes

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free
City-specific versions are released for free as available. Tailored versions can be developed by UKCEH, with costs depending on project scope.

TECHNICAL SKILLS ♦♦♦♦♦
Full understanding requires technical expertise, but guided workflows make it easy to run. Users should be comfortable with web dashboards, maps, charts, and basic stats. Urban planning or environmental knowledge is helpful.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
Pre-built city version: Very low user effort; preloaded with high-quality datasets (land cover, air quality, heat, demographics, infrastructure). Custom version: Moderate effort may be needed, depending on data availability and local engagement, including ecosystem service valuation and output interpretation.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs
— Reports / narratives

EVIDENCE OF USE: Grey literature | Local authority use

TRANSFERABILITY: Yes – it can be used in cities all over the world. Online versions are set up for UK and Denmark case studies. Case studies running the models offline include cities in Africa, Asia, Latin America.

ECOPLAN – QuickScan and Scenario Evaluator (Cluster 5) [Link]

TOOL DESCRIPTION – Code/package, QGIS application

The ECOPLAN tool set consists of multiple tools, of which the QuickScan and Scenario Evaluator are jointly assessed here. The tool enables the assessment of 18 ecosystem services for Flanders, Belgium. QuickScan focuses on potential changes at the level of a project area. Therefore, the tool summarises and compares the overall impact of scenarios (a before and after situation). However, this tool can also be used to compare the ecosystem services delivery between areas. The result table derived from the maps provides a quantitative and monetary valuation of ecosystem services for specific study areas, municipalities, provinces, etc.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation

Ecosystem Services Assessment
— Assessing recreation / access to green space
— Assessing urban heat mitigation / cooling
— Assessing other ecosystem services (health benefits of blue space)

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies

INTENDED USERS: City decision-makers **|** Scientists **|** Consultants **|** NGOs **|** Business

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦

MAINTENANCE STATUS: No

DATA REQUIREMENTS ♦♦♦♦♦
An established database for Flanders appears to be available for use with the QGIS plug-in to run the tool.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No – it is designed only for a specific context (Flanders, Belgium).

Box A45. EcoServ-GIS factsheet

EcoServ-GIS (Cluster 5) [Link]

TOOL DESCRIPTION – GIS-based Toolkit

EcoServ-GIS is a Geographic Information System (GIS) toolkit, developed by Durham Wildlife Trust and partners, for mapping ecosystem services at a city to regional scale. The toolkit generates maps illustrating the need for each service as well as the capacity for service provision, using scientifically-based standardised methods and widely available datasets to incorporate aspects of the physical landscape (e.g. habitat) and socio-economic factors (e.g. health deprivation). It provides users with the facility to overlay these maps to show how well demand and capacity coincide in space, highlighting those natural areas providing high levels of service delivery that should be conserved, as well as those that are most in need of measures aimed at improving single or multiple service delivery. The outputs can also be used to create Ecological Habitat Network maps (to show where areas are more or less connected to a wider network of sites for focal species) and Biodiversity Opportunity Area Maps (to identify areas where habitat creation or habitat buffering might be suitable). The latest version includes tools to map nine services, including ones that grade greenspace according to the opportunities they provide for enjoying nature and wildlife.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon storage and sequestration)

INTENDED USERS: City decision-makers **|** Scientists **|** NGOs **|** Planners

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Neighbourhood, City, and Metropolitan area / Landscape

COST: Free It requires an ArcGIS licence and a license for OS MasterMap (which is a digital product of the UK mapping agency). Costs can range from £15,000 to £70,000+, depending on scale, the data used and delivery approach.	**TECHNICAL SKILLS** ♦♦♦♦♦ The tool is designed for experienced GIS professionals or advanced users with good technical and analytical capabilities. New users will likely need training or support to use it confidently.	**MAINTENANCE STATUS:** No
DATA REQUIREMENTS ♦♦♦♦♦ The tool requires a large amount of data and significant effort would be required to collate it. Compared with other tools, it uses more simplified process models, reducing the need for academic or specialist input.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment — Policy, governance and management	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No - it is designed only for a specific context. It uses input data specifically produced for the UK, so applying it to cities elsewhere in Europe or globally would require: substituting local spatial data, adjusting the models to reflect local ecosystems and social conditions, and potentially recalibrating the service supply and demand functions.

Box A46. EcoservR factsheet

EcoservR (Cluster 5) [Link]

TOOL DESCRIPTION – Code / package

The EcoservR tool is a UK focused tool for mapping natural capital assets and ecosystem services, based on UK national datasets. The tool is an updated version of Ecoserv-GIS. The toolkit generates an environmental baseline classifying over 200 habitat types, and uses spatial models to map their capacity to provide a range of ecosystem services (scored Low to High), as well as the demand for them. The included services are nearly all regulating services, with multiple also relevant in urban contexts. The main website claims it produces sensitive results to assess spatial changes that are relevant at neighbourhood and city scale. Seemingly a beta-version is only available, although the tool's webpages state the tool should have been released between 2021-2023.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Mapping habitats

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon storage, water purification, pollination, noise regulation)

INTENDED USERS: Not explicitly stated, but developed and used by researchers to inform policy and planning.

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 9. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free
Some of the required input data requires a license (OS MasterMap).

TECHNICAL SKILLS ♦♦♦♦♦
Requires use of R package. The exact level of knowledge is difficult to assess without downloading the R package and using the tool.

MAINTENANCE STATUS
There is evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
Data inputs include multiple layers (some compulsory, others optional). These include: land cover / land use, rights of way, population, index of multiple deprivation.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data
— Policy, governance and management

INPUT DATA FORMAT
— Geospatial data
OUTPUT DATA FORMAT
— Geospatial data

EVIDENCE OF USE: Grey literature

TRANSFERABILITY: No – it is designed only for a specific context (England/UK).

Box A47. Ecosystem Intelligence factsheet

Ecosystem Intelligence (Cluster 5) [Link]

TOOL DESCRIPTION – Online computation tool

The tool utilizes geospatial data to assess ecosystem services provided within a site. The following ES are included: air quality, biodiversity, carbon sequestration, soil quality and erosion, water quantity, water quality, wellbeing. The goal of this tool is to identify performance gaps to inform budgeting and design as well as use site-level data to identify interventions to maximize benefits in ecosystem service performance. The tool allows ecosystem benefits to be measured using a common unit of service hectares. The Screening module allows easy selection of land types, and the Detailed Module allows the assumptions to be replaced by site measured data.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping / assessing biodiversity

Ecosystem Services Assessment
— Assessing air quality improvement / air purification
— Assessing other ecosystem services, carbon sequestration, soil quality and erosion, water quantity and quality

INTENDED USERS: City decision-makers **|** Consultants **|** NGOs **|** Business

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, and 7.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Yes, a license purchase is required. Bespoke costing packages can be agreed.	TECHNICAL SKILLS ♦♦♦♦♦ A knowledge of environmental geosciences would be very beneficial when using the design module of the tool.	MAINTENANCE STATUS Recently released
DATA REQUIREMENTS ♦♦♦♦♦ The Screening Module only requires Land Cover Types and will be applicable to its use here. The Detailed Module can have more site specific data entered in.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Biodiversity data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs

EVIDENCE OF USE: Scientific literature **|** Grey literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Box A48. EnhancES factsheet

EnhancES (Cluster 5) [Link]

TOOL DESCRIPTION – Open-source GIS-tool

EnhancES is an open-source GIS-based toolbox for assessing and mapping ecosystem services (ES, CICESv5.1) in urban areas. EnhancES is planned to include models for 3 provisioning, 11 regulating and 6 cultural ES, among them: base flow regulation/groundwater; flash flood regulation; temperature regulation; carbon sequestration and storage; particulate matter (PM10)-filtration; visual screening; pollination; nursery populations/habitats; activities promoting recuperation through interactions with nature, aesthetic experiences. Currently, 6 tools are available. ES are assessed on ratio-, ordinal or binary scales. Standardization of ES scores is available for comparisons. EnhancES is ready to be used across scales applying hierarchical classifications for land use/biotope types. Some components of EnhancES adapt approaches from other ecosystem service models, including ESTIMAP and i-Tree.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: Scientists **|** Consultants **|** NGOs **|** Business

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, 8, and 9.

CONTRIBUTION TO NRR: Yes.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
GIS knowledge is required.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
EnhancES models require different sets of input data (WorldCover, EU Urban Atlas, biotope type maps). Depending on the scale and data availability, users can choose more general land use types, such as forests, or specific biotope types, such as deciduous forests composed of certain tree species. Soil data is limited and varies with tools.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Infrastructure and built environment

INPUT DATA FORMAT
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in cities worldwide for humid subtropical and temperate city environments.

Box A49. GreenKeeper factsheet

GreenKeeper (Cluster 5) [Link]

TOOL DESCRIPTION – Online computation tool

GreenKeeper is an online decision-support tool designed to help urban planners, developers, and policymakers assess the value and performance of green infrastructure in urban areas. Developed through a collaboration between the University of Sheffield, Vivid Economics, and Barton Willmore, it combines spatial data, economic evaluation, and user behaviour insights to quantify the environmental, economic, and social values of green infrastructure, enabling the user to identify the complete value of a single green space or compare it with other similarly sized/local spaces. GreenKeeper evaluates ecosystem services such as health and wellbeing, recreation, property value uplift, and climate resilience. It supports evidence-based planning and investment in urban nature, helping cities optimize the design, location, and function of green infrastructure. It can also be used to build a whole portfolio or city-wide green infrastructure network value.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon sequestration, physical Health & wellbeing)

INTENDED USERS: Consultants **|** City decision-makers **|** Business **|** NGOs **|** General public **|** Urban planners **|** Developers **|** Landscape architects

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, 7, 8, and 9. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape.

COST: Licence GreenKeeper is a commercial tool, typically acquired by local authorities or developers. Pricing is project-based. Estimating costs is not possible without requesting information from the provider.	**TECHNICAL SKILLS** ♦♦♦♦♦♦ Designed for planners, consultants and developers. No programming is required, but understanding of spatial planning and green infrastructure is helpful/required. This evaluation provided in this table refers to the online version of the tool that can be autonomously used. Alternatively, a consultancy service based on the tool is also available.	**MAINTENANCE STATUS** Not known
DATA REQUIREMENTS ♦♦♦♦♦♦ GreenKeeper uses a combination of built-in datasets and user-provided data. It offers guidance on data preparation. User-provided data requires data acquisition and preparation.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Geospatial data — Tabular / attribute data (linked to spatial units) — Non spatial values / parameters **OUTPUT DATA FORMAT** — Geospatial data — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Grey literature **|** Local authority use

TRANSFERABILITY: No - it is designed only for a specific context. Currently a UK-focused tool tailored to UK datasets and planning frameworks, but it is adaptable to other European contexts with appropriate data.

Box A50. InVEST factsheet

InVEST (Cluster 5)   [Link]

TOOL DESCRIPTION – Custom software

InVEST is designed to inform decisions about natural resource management. Essentially, it provides information about how changes in ecosystems are likely to lead to changes in the flows of benefits to people. Decision-makers, from governments to non-profits to corporations, often manage lands and waters for multiple uses and inevitably must evaluate trade-offs among these uses. InVEST's multi-service, modular design provides an effective tool for exploring the likely outcomes of alternative management and climate scenarios and for evaluating trade-offs among sectors and services. For example, government agencies could use InVEST to help determine how to manage lands, coasts, and marine areas to provide a desirable range of benefits to people or to help design permitting and mitigation programs that sustain nature's benefits to society. Conservation organizations could use InVEST to better align their missions to protect biodiversity with activities that improve human livelihoods. Corporations, such as consumer goods companies, renewable energy companies, and water utilities, could also use InVEST to decide how and where to invest in natural capital to ensure that their supply chains are sustainable and secure. There are some urban-specific modules for ecosystem services in the toolkit (e.g. urban cooling, urban stormwater retention and urban flood risk mitigation).

InVEST can help answer questions like:
— Where do ecosystem services originate and where are they consumed?
— How does a proposed forestry management plan affect biodiversity, water quality, and recreation?
— How will climate change and population growth impact ecosystem services and biodiversity?

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Informing decisions by providing access to pre-processed data layers
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)
— Monitoring the implementation of plans / strategies
— Assessing the value (monetary valuation and non-monetary values) of Green Infrastructure

INTENDED USERS: Scientists **|** City decision-makers **|** Consultants **|** Business

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, and 6. | **CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City and Metropolitan area / landscape

COST: Free
You'll need resources for technical support, a GIS system and a way of collecting and collating your baseline data.

TECHNICAL SKILLS ♦♦♦♦♦
Needs GIS expertise.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ♦♦♦♦♦
Need GIS expertise and you can't use this tool if you don't already have the baseline data.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Biodiversity data

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature

Box A51. i-Tree ECO factsheet

i-Tree ECO (Cluster 5) [Link]

TOOL DESCRIPTION – Custom software

i-Tree Eco version 6 is a flexible software application designed to use data collected in the field from single trees, complete inventories, or randomly located plots throughout a study area along with local hourly air pollution and meteorological data to quantify forest structure, environmental effects, and value to communities. i-Tree Eco provides among others analyses of:

1. Ecosystem services:
— Pollution removal and health impacts
— Carbon sequestration and storage
— Hydrology effects (avoided run-off, interception, transpiration)
— Building energy effects
— Tree bio-emissions
2. Structure and composition analyses:
— Species condition and distribution
— Leaf area and biomass
— Species importance values
— Diversity indices and relative performance

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Mapping habitats
— Mapping/assessing biodiversity

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing other ecosystem services

INTENDED USERS: Scientists | City decision-makers | Consultants | NGOs | Educators | Advocates

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 8, and 9. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Single green element / patch, Neighbourhood, and City

COST: Free To run i-Tree specific detailed tree features data are needed (typically from field measurements)	**TECHNICAL SKILLS** ♦♦♦♦♦♦	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ Detailed tree features data need to be available or collected from the field e.g. Total Tree Height, Live Tree Height, Height to Live Crown Base, Live Crown Width, Percent Crown Missing, Crown Health, Crown Light Exposure, DBH, and other data such as: Cover Under Canopy, Direction to Building.	**TYPE OF INPUT DATA** — Biophysical data — Biodiversity data — Environmental pressures and hazards — Infrastructure and built environment	**INPUT DATA FORMAT** — Tabular / attribute data (linked to spatial units) **OUTPUT DATA FORMAT** — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.
Originally designed for USA, but it can be used in international cities (with some limitations)
https://database.itreetools.org/#/viableLocations

Box A52. i-Tree Landscape factsheet

i-Tree Landscape (Cluster 5) [Link]

TOOL DESCRIPTION — Online computation tool

The i-Tree Landscape tool allows users in the US to explore tree canopy, land cover, and demographic information in their community and to identify priority planting and protection areas. It works online on a large amount of pre-loaded maps and datasets, including tree canopy and census data, which are used to run the i-Tree models in background. The tool guides the user through 5 stages: find locations (where the user chooses on a map a boundary area to analyse), explore location data (where information on land cover and canopy cover are provided), see tree benefits (where i-Tree models are used to estimate tree canopy benefits in terms of carbon dioxide and air pollution removal, and stormwater impacts), prioritize tree planting (where the user can choose between pre-defined scenarios prioritizing the impacts on overall population, minorities, or low-income community groups, or define its own scenario by assigning weights to different criteria), and build a report (where it is possible to use templates or customize elements from the previous steps to be included in the final output). It is mainly aimed at promoting awareness of tree canopy benefits, supporting advocacy of community groups, and providing helpful information to local decision-makers.

GENERAL PURPOSES

Spatial Analysis & Mapping	**Ecosystem Services Assessment**	**Planning & Decision Support**
— Mapping green infrastructure / green spaces / urban vegetation	— Assessing flood risk mitigation / runoff management — Assessing air quality improvement / air purification — Assessing other ecosystem services (carbon storage)	— Informing decisions by providing access to pre-processed data layers — Assessing the impacts of plans/strategies/actions (including nature-based solutions)

INTENDED USERS: City decision-makers **|** NGOs **|** General public

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, and 7. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape.

COST: Free	**TECHNICAL SKILLS** ♦♦♦♦♦ The tool guides the users through the different steps from selecting an area to exploring the data and current tree benefits, to prioritize tree planting areas based on available indicators, to explore the impacts of planting scenarios. Inputs are required only to select the area and to define custom scenarios beyond those pre-defined by the tools.	**MAINTENANCE STATUS** Evidence of maintenance in the recent past (new version available)
DATA REQUIREMENTS ♦♦♦♦♦ All datasets are pre-loaded.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data — Infrastructure and built environment	**INPUT DATA FORMAT** No input data needed. **OUTPUT DATA FORMAT** — Tabular / statistical outputs — Charts / graphical outputs — Reports / narratives

EVIDENCE OF USE: Scientific literature **|** Grey literature **|** Local authority use

TRANSFERABILITY: No – it is designed only for a specific context. Currently works only in the conterminous US. It could be extended to other contexts, provided that data is available.

Box A53. LIFE Viva Grass Integrated Planning Tool factsheet

LIFE Viva Grass Integrated Planning Tool (Cluster 5)	[Link]

TOOL DESCRIPTION – Spatial model

The "Viva Grass Integrated Planning Tool" (further – "Viva Grass tool") is a support tool for decision making and planning sustainable use and management of grasslands. It enables integration of grassland ecosystem services into planning and decision making by linking biophysical grassland data (e.g. land quality, relief, land use/habitat types) with expert estimates of the ecosystem services as well as socio-economic context. The tool is integrated into an online GIS working environment and allows users:
— to assess the supply and trade-offs of grassland ecosystem services in user-defined areas
— to develop ecosystem-based grassland management and planning scenarios

The "Viva Grass tool" is tested in nine case study areas across the three Baltic States of Estonia, Latvia and Lithuania. The "Viva Grass Tool" combines information on land use (semi-natural, permanent and cultivated grasslands, arable land), data on natural conditions (land quality & slope) and expert assessments of ecosystem services in different grassland types to create distribution maps of ecosystem services. It offers the spatial visualisation of ecosystem services' bundles and trade-offs as well as hotspot and coldspot areas, which helps to make decisions on the most beneficial use of grasslands, from nature's as well as people's point of view.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing other ecosystem services

INTENDED USERS: Scientists | Consultants | Non-urban decision-makers | Farmers

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 9.	**CONTRIBUTION TO NRR:** Yes, indirectly.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free	**TECHNICAL SKILLS ♦♦♦♦♦** Many different modules linked to the tool.	**MAINTENANCE STATUS** Unclear.
DATA REQUIREMENTS ♦♦♦♦♦ Many different data layers needed in different modules of the tool.	**TYPE OF INPUT DATA** — Land use / land cover — Biophysical data — Socio-demographic and economic data — Environmental pressures and hazards — Policy, governance and management	**INPUT DATA FORMAT** — Geospatial data **OUTPUT DATA FORMAT** — Geospatial data

EVIDENCE OF USE: Scientific literature | Grey literature

TRANSFERABILITY: Yes – it can be used in cities all over Europe.

Box A54. LUCI (Land Utilisation & Capability Indicator) factsheet

LUCI (Land Utilisation & Capability Indicator) (Cluster 5)   **[Link]**

TOOL DESCRIPTION – Spatial model

LUCI (Land Utilisation & Capability Indicator) is a spatially explicit model developed by the UK Centre for Ecology & Hydrology (UKCEH) to assess and map the capacity of landscapes to provide various ecosystem services. It simulates the flow of water and nutrients across the landscape, identifying areas that contribute to or benefit from services such as flood mitigation, water quality improvement, carbon sequestration, and habitat connectivity. LUCI integrates spatial data on land cover, soil type, topography, and hydrology to evaluate the effectiveness of land use in delivering these services.

The model operates at a catchment scale and provides outputs in the form of maps that highlight areas of high or low service provision, allowing for the identification of potential trade-offs and synergies between different ecosystem services. It also supports scenario analysis, enabling users to explore the impacts of land use changes or management interventions on ecosystem service delivery.

LUCI is implemented as an ESRI GIS toolbox, requiring standard GIS software with a spatial analyst license. It is freely available for use by not-for-profit organizations, including universities and government agencies. The tool has been primarily tested in temperate climates and is particularly useful for land use planning, environmental management, and policy development aimed at enhancing ecosystem service provision in rural and peri-urban areas.

It should be noted that while LUCI has been used in recent years, the tool is not available on its regular website.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping habitats
— Mapping/assessing biodiversity
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing flood risk mitigation / runoff management
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans / strategies / actions (including nature-based solutions)

INTENDED USERS: Scientists | Consultants | City decision-makers | NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 4, 5, 6, 7, and 9.   **CONTRIBUTION TO NRR:** No.

SCALE: Metropolitan area / landscape

COST: Free
Some indirect costs may apply: GIS software license, high-resolution spatial input data.

TECHNICAL SKILLS ♦♦♦♦♦
Strong GIS skills are needed.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
LUCI requires a range of detailed, high-resolution spatial datasets—such as land use/land cover, digital elevation models, soil characteristics, and hydrology—which must be accurately aligned, reclassified, and linked to model parameters.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data

INPUT DATA FORMAT
— Geospatial data
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs

EVIDENCE OF USE: Scientific literature | Grey literature | Local authority use

TRANSFERABILITY: Yes – it can be used in cities all over Europe. Has been used in New Zealand, UK, The Netherlands among others.

Box A55. Nature Value Explorer factsheet

Nature Value Explorer (Cluster 5)	[Link]

TOOL DESCRIPTION – Online computation tool

This tool is an online, spatially explicit tool for Flanders that enables users to rapidly assess the biophysical and monetary impacts of land use changes on a range of ecosystem services. Users identify a study area and design planned green-blue interventions. Then the tool retrieves background data and calculates the changes in the provision of ecosystem services (cooling, water infiltration, air/water purification, recreation, carbon storage, and health benefits) associated with the proposed interventions. The tool supports decision-making by providing clear and rapid valuation of nature-based interventions.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon storage, water purification)

Planning & Decision Support
— Assessing the impacts of plans/strategies/actions (including nature-based solutions)

INTENDED USERS: Scientists | City decision-makers | Business | NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 6, 7, and 9. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape.

COST: Free

TECHNICAL SKILLS ◆◆◆◆◆
Users are required to enter only land use changes.

MAINTENANCE STATUS
Evidence of maintenance in the recent past (new version available)

DATA REQUIREMENTS ◆◆◆◆◆
Data is already embedded in the tool.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data

INPUT DATA FORMAT
No input data needed.

OUTPUT DATA FORMAT
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature | Grey literature | Local authority use

TRANSFERABILITY: No – it is designed only for a specific context (Flanders, Belgium).

Box A56. NC-Model (Natural Capital Model) factsheet

NC-Model (Natural Capital Model) (Cluster 5) [Link]

TOOL DESCRIPTION – Spatial model

The Natural Capital Model consists of a set of ecosystem service models and is designed to determining the biophysical state of the natural capital in the Netherlands (mapping), as well as estimating the effects of existing and new policy and future developments on this natural capital (modelling). The model determines the potential societal demand for goods and services and to what extent ecosystems in the Netherlands meet this demand.

The model can generate figures and spatial maps for thirteen ecosystem services provided by urban, rural and natural areas: drinking water production, wood production, biomass for energy production, pollination, soil fertility, water retention, urban cooling, water purification, pest control, carbon sequestration, air quality regulation, outdoor recreation and natural heritage.

The tool has been used in policy-related questions, including scenario analysis. It is under development, and in its current form can only be used in the Netherlands. Measurements are used in the indicator for the services of drinking water, wood production, carbon sequestration, biomass for energy and natural heritage. For the other ecosystem services the models from the NC-Model are used.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping/assessing biodiversity
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing other ecosystem services

INTENDED USERS: Scientists | Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 9.	**CONTRIBUTION TO NRR:** No.

SCALE: Metropolitan area / landscape

COST: Free
As far as can be determined, the tool is free but requires some other models and resources to generate results. Licencing unclear.

TECHNICAL SKILLS ♦♦♦♦♦
The tool requires a high level of technical skills to run.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
There is a large number of input layers, and some of these need to be pre-modelled/processed. For example, it requires a uniform base land cover map to allow all models to be run. This requires extensive pre-processing. In the current version, the base map has 167 classes, and has to be available at 2.5m grid resolution.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Socio-demographic and economic data
— Environmental pressures and hazards
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature | Grey literature

TRANSFERABILITY: No – it is designed only for a specific context.
The tool is designed for use in the Netherlands. The input data, dependency on other models, and in some cases the parameterisation of models, mean it is only possible to run for the Netherlands. It is documented separately in English and Dutch.

Box A57. R-ECO factsheet

R-ECO (Cluster 5) [Link]

TOOL DESCRIPTION – Code/package

R-ECO is an R-based script developed to measure the supply of urban ecosystem services (ES) across European cities. It calculates 15 ecosystem service indicators spanning provisioning (e.g., food, timber), regulating (e.g., climate regulation, air purification), supporting (e.g., biodiversity), and cultural services (e.g., recreation, aesthetics) based on EU-wide datasets. By integrating spatial and statistical data, R-ECO provides a comprehensive assessment of how urban green infrastructure contributes to sustainability. This tool assists cities in developing greening strategies by identifying areas with deficits in ecosystem services. It supports evidence-based decision-making by highlighting spatial patterns of ES supply at district levels, enabling targeted interventions to improve urban resilience and quality of life. The tool incorporates Multi-Criteria Decision Analysis (MCDA) to synthesize multiple ES indicators into a composite score, facilitating comparative assessments and prioritization.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping green infrastructure / green spaces / urban vegetation
— Mapping/assessing biodiversity
— Assessing landscape structure (e.g., connectivity)

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Monitoring the implementation of plans/strategies

INTENDED USERS: City decision-makers | Consultants

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, 7, and 9. | **CONTRIBUTION TO NRR:** Yes.

SCALE: Neighbourhood, City, and Metropolitan area / landscape

COST: Free

TECHNICAL SKILLS ♦♦♦♦♦
R-ECO requires a relatively high level of technical expertise, as users must be proficient in R programming and have a solid understanding of GIS concepts and spatial data handling.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
R-ECO relies on open-access European datasets such as Urban Atlas, urban tree layers, climate, and socio-economic data, which are generally available through public portals. However, collecting, harmonizing, and processing these diverse datasets requires moderate technical expertise in GIS and R programming. While data availability is good in many regions, some cities may need additional effort to source or complete local data, making the overall effort to run the tool moderate.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Tabular / attribute data (linked to spatial units)
— Non spatial values / parameters

OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature

TRANSFERABILITY: Yes – it can be used in cities all over Europe.

Box A58. SENCE (Spatial Evidence for Natural Capital Evaluation) factsheet

SENCE (Spatial Evidence for Natural Capital Evaluation) (Cluster 5) [Link]

TOOL DESCRIPTION – Spatial model offered as a consultancy service

SENCE (Spatial Evidence for Natural Capital Evaluation) underpins evidence-based decision-making on natural capital and ecosystem services in a spatial context through maps, diagrams and reports. It is based on the concept that the capability of an area of land to deliver ecosystem services depends on factors including habitat, soil and geology, landform and hydrology, how land is managed and how it is culturally understood. The tool is intended to be used to help decision-makers understand the impact of land management decisions on ecosystem services. This should help them to reach more balanced and sustainable decisions where there are trade-offs between increased provision of food, energy and water to meet the demands of a growing population, and the hidden and more visible services provided by ecosystems.

GENERAL PURPOSES

Spatial Analysis & Mapping
— Mapping habitats
— Mapping/assessing biodiversity

Ecosystem Services Assessment
— Assessing urban heat mitigation / cooling
— Assessing flood risk mitigation / runoff management
— Assessing air quality improvement / air purification
— Assessing recreation / access to green space
— Assessing other ecosystem services (carbon storage and sequestration)

INTENDED USERS: City decision-makers | Consultants | Business | NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5, 6, and 7. | **CONTRIBUTION TO NRR:** Yes.

SCALE: City and Metropolitan area / landscape.

COST: Subscription	**TECHNICAL SKILLS** ♦♦♦♦♦	**MAINTENANCE STATUS**
The tool is a consultancy service from Environment Systems. The company runs the tool using a GIS software.	The developers are actually running the tool.	Not known

DATA REQUIREMENTS ♦♦♦♦♦	**TYPE OF INPUT DATA**	**INPUT DATA FORMAT**
Not specified. It is part of the consultancy service to screen available data and provide missing ones.	Unclear	No input data needed. **OUTPUT DATA FORMAT** Unclear

EVIDENCE OF USE: Grey literature | Local authority use

TRANSFERABILITY: Yes – it can be used in all cities worldwide.
It seems that the experts from "Environment Systems" can apply the tools in other regions by tailoring it to the client's needs, data availability and budget. In that sense, it is not completely transferable, in the sense that outputs from different cities will be hardly comparable.

Box A59. SolVES (Social Values for Ecosystem Services) factsheet

SolVES (Social Values for Ecosystem Services) (Cluster 5)	[Link]

TOOL DESCRIPTION – Spatial model

Social Values for Ecosystem Services (SolVES) is designed to assess, map, and quantify the perceived social values of ecosystem services. Social values are the perceived, nonmarket values that the public ascribes to ecosystem services, particularly cultural services, such as aesthetics and recreation. They can be evaluated for various stakeholder groups. These groups are distinguishable by their attitudes and preferences regarding public uses, such as motorized recreation and logging. SolVES derives a quantitative, 10-point, social-values metric, the "value index", from a combination of spatial and nonspatial responses to public value and preference surveys and calculates metrics characterizing the underlying environment, such as average distance to water and dominant landcover. The tool has been widely used globally, initially for areas like national parks, but in many settings now, including for a number of urban case studies. The tool was developed by the US Geological Survey.

GENERAL PURPOSES

Ecosystem Services Assessment
— Assessing recreation / access to green space
— Assessing other ecosystem services

Planning & Decision Support
— Assessing the impacts of plans/strategies/actions (including nature-based solutions)

INTENDED USERS: Scientists | Consultants | NGOs

CONTRIBUTION TO URBAN NATURE PLANS: STEPS 5 and 6.

CONTRIBUTION TO NRR: Yes, indirectly.

SCALE: Single green element / patch, Neighbourhood, City, and Metropolitan area / landscape

COST: Free
Most required input data can be produced using free software.

TECHNICAL SKILLS ♦♦♦♦♦
Use requires familiarity with GIS software, Maxent. The following software are required in order for SOLVES v4.0 to run: QGIS 3.8.2, PostgreSQL 11.7, PostGIS 2.5.3, Maxent 3.4.1.

MAINTENANCE STATUS
Recently released

DATA REQUIREMENTS ♦♦♦♦♦
The tool requires spatial information on where users visited, which requires some form of geo-located data, often surveys.

TYPE OF INPUT DATA
— Land use / land cover
— Biophysical data
— Infrastructure and built environment

INPUT DATA FORMAT
— Geospatial data
— Non spatial values / parameters
OUTPUT DATA FORMAT
— Geospatial data
— Tabular / statistical outputs
— Charts / graphical outputs

EVIDENCE OF USE: Scientific literature | Grey literature

TRANSFERABILITY: Yes – it can be used in all cities worldwide.

Annex 4. List of tools screened by the expert group but not assessed

Tool name
Action Plan of the Partnership Greening Cities
Adaption benchmarking tool
AEA scale
AI dash
Biofin
Bon in a Box
CO-production guidebook
Capital Asset Value for Amenity Trees
Cities with nature – berlin Urban nature pact
Cities with nature – guides
Cities with nature – nature pathways platform
Cities with nature action platform
Cwetlands
Data Basin
eBird
Ecodistr-ICT Integrated Decision Support System platform
Green Cities Framework Handbook
Green City Watch
Green Pass
Green roof prioritization
Guide to business models for financing NBS
Her city
INCA tool
Indicator-Quantification-Change-Impact (IQCI)
IUCN Urban Tool Box
Local Action Toolkit
London data hub
Nature based enterprise platform
NatureServe
NBS business model canvas

Tool name
NBS Framework
PCSWMM
Place value wiki
RECARGA
Scotland's nature network toolbox
stadsträd.se
Toolkit for Restoration Partnerships
UN Challenge driven innovation in cities guide
Urban Governance Atlas
Zoning Map

Annex 5. List of tool inventories

Name	Source
IPBES policy support gateway	https://www.ipbes.net/policy-support
Supplementary Information of Veerkamp et al. 2023	Veerkamp, C. J., Loreti, M., Benavidez, R., Jackson, B., & Schipper, A. M. (2023). Comparing three spatial modeling tools for assessing urban ecosystem services. Ecosystem Services, 59, 101500. https://doi.org/10.1016/j.ecoser.2022.101500
Table 2 in Van Oijstaeijen et al. 2020	Van Oijstaeijen, W., Van Passel, S., & Cools, J. (2020). Urban green infrastructure: A review on valuation toolkits from an urban planning perspective. Journal of environmental management, 267, 110603. https://doi.org/10.1016/j.jenvman.2020.110603
IUCN Nature Based solutions	https://iucn.org/our-work/nature-based-solutions
UKGBC / WGBC	https://ukgbc.org/resource-types/our-work/
ICLEI resource library	https://iclei.org/iclei-library-of-resources/
Eurocities resource library	https://eurocities.eu/resources/
Global Covenant of Mayors resource library	https://www.globalcovenantofmayors.org/resource-library/
UNEP resource and data	https://www.unep.org/publications-data
Landscape Performance	https://www.landscapeperformance.org/
Ecosystems Knowledge Network	https://ecosystemsknowledge.net.testing.ekn3.default.countryscape.uk0.bigv.io/resources/tool-assessor/tool-categories
Naturvation Navigator	https://naturvation-navigator.com/

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