



Tools for developing Green Infrastructure Networks

Deliverable D.T1.1.2- Review of tools to facilitate GI use/design in urban/peri-urban settings, based on multiple ESS, habitats & connectivity

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Tools for developing Green Infrastructure Networks

What is LUIGI?

"Linking Urban and Inner-Alpine Green Infrastructure: Multifunctional Ecosystem Services for more liveable territories" (LUIGI) is a 33-months project funded by the European Union (EU) through the Interreg Alpine Space (AS) programme. The project involves 14 partner institutions and 26 observers from Austria, France, Germany, Italy, Slovenia, and Switzerland.

By recognizing the anthropogenic pressures on Alpine Space ecosystems and the benefits that those deliver to a wider area beyond mountain regions, **LUIGI aims to strengthen the link between mountain ecosystems and urban centers at the foot of the Alps, based on sound economic and social exchanges**. The LUIGI project seeks to i) recognize the benefits deriving from a green infrastructure (GI) network developed between mountain/rural and urban areas, ii) valorize their potential for a sustainable economic development, and iii) contribute to assuring higher quality of life harnessing the benefits deriving from the natural capital. The project targets actors involved along the urban/rural value chain, civil society, planners, and policy makers in order to foster investments, planning, and the maintenance of GI throughout the Alpine Space territory. LUIGI will provide guidance to support, among other things, i) the development of GI networks , ii) the assessment/evaluation of the environmental, social and economic benefits deriving from GI iii) effective and innovative governance and management of GI, and iv) the development of business models around the societal benefits of GI, and the mobilization of financial resources to support them.

LUIGI meets the priority of the Alpine Space programme of achieving a liveable Alpine Space, and especially its objective to enhance the protection, the conservation, and the ecological connectivity of Alpine Space ecosystems. The project is furthermore aligned with the objectives of the EU strategy for the Alpine Region (EUSALP), which aims to ensure sustainability in the Alps, and, more specifically, to develop ecological connectivity in the whole EUSALP territory.

The first Work Package

The first work package of the project "LUIGI" will spotlight the multiple benefits (ecological, economic, social, and cultural) of GI as a "common natural capital" and an ecosystem services provider. Its main output will be to illustrate the state of the art and delineate guidelines for the conservation and the enhancement of the provision of multiple ecosystem services deriving from GI. More specifically, it aims to provide a summary of existing knowledge and best practices on ecosystem services, GI design, and their interaction within the Alpine Space and the pilot regions. The results will feed into the other work packages and support all project activities.

Introduction

This is the second deliverable of the first work package of the Interreg Alpine Space project LUIGI-Linking Urban and Inner-Alpine Green Infrastructure: Multifunctional Ecosystem Services for more liveable territories. It aims to **provide guidance to local authorities, decision makers, researchers, and practitioners willing to develop green infrastructure (GI) networks in the Alps and beyond**.

The first deliverable DT1.1.1 "Green Infrastructure for the Alpine Space: from theory to practice" explained what Ecosystem Services (ESS) and Green Infrastructure are, illustrated the role of Green Infrastructure in European policy, in the EUSALP macroregional Strategy, and in the Alpine Space programme, and presented past EU-funded project on GI. Moreover, it spotlighted the importance of scale, ecological connectivity, participatory processes, and inter-sectoral and transboundary cooperation for the development of GI networks that maximize environmental, social, and economic benefits. Finally, the deliverable described the most common and important GI components found in the alpine region and spotlighted their associated ecosystem services.

This deliverable, DT1.1.1 "Tools for developing Green Infrastructure Networks", seeks to go one step further, and support public authority and professionals in developing such networks in practice, in their study area. This deliverable indeed selected and gathered in one place a variety of useful opensource and accessible tools and methodologies that can support practitioners in different stages of GI development. The format of this deliverable aims to make this report easy to browse and obtain the information required to decide which tool is best suited for the needs of the user. These toolkits provide the frameworks and the software to analyse the ecological connectivity of the landscape; to map, assess and quantify Ecosystem Services (i.e. the benefits that society derives from nature); and to create participatory process for decision making and conflict resolution. The tools can help answering questions such as:

- Where would habitat restoration be most beneficial for the overall structural and functional connectivity of my study area?
- Which areas limit the movement and the dispersal of xxx target species in my study area?
- Where and to which degree are Ecosystem Services provided in my study area?
- What would be the economic and social value of developing GI in my study area?
- How can I involve stakeholders in a discussion about GI?

1.Factsheet of the tools

The first part of this deliverable reviews and presents a series of tools and methodologies that can be used to plan, design, or manage Green Infrastructure networks across the Alpine Space. When using the tools of this report, we recommend always referencing the tools and the authors. The tools are presented as a series of factsheets, which describe the tools, their technical and linguistic requirements, their geographical scope, and the level of difficulty required to use them. Link to the tools and further resources are provided. All tools are available for free, but some might require the user to register. Five main categories of tools and methodologies have been identified, which divide them according to their purpose and focus. In each category, the tools are presented along a gradient of complexity.

The following five categories of tools are discussed in the next sections:

- Ecological connectivity analysis
- Mapping and assessment of ESS
- Quantifying the benefits of ESS
- Participatory processes

Category 1: Ecological connectivity analysis

This suite of tools has been developed to assess habitat fragmentation and the level of ecological structural connectivity of the study areas. To determine functional connectivity, information about the ecology and the biology of target species should be provided. The tools identify and prioritize areas where restoring habitat would be most beneficial for the overall connectivity of the study area.

The tools presented in this chapter can thus help the users understand the best and most efficient way to link patches of favorable habitat to ensure that there is an adequate degree of connectivity in the landscape.

Connecting landscapes provides a conceptual framework and a roadmap for conducting such analyses.

Jecami 2.0 explains what connectivity is and allows to i) visualize pre-calculated levels of connectivity and ii) analyse which variables determine such results. Available for the Alpine Region and specific pilot sites.

Condatis assesses ecological connectivity and identifies optimal areas for habitat restoration/creation.

GUIDOS and **CONEFOR** can be used in combination to determine connectivity pathways and assess the importance of habitat and land use for connectivity.

Connecting Landscapes

A step-by-step guidance to connectivity analysis

http://www.landscope.org/focus/connectivity/

Authors: LandScope America (collaborative project of NatureServe and the National Geographic Society). Contact through the website.

Year: 2014

open access, web-based

Geographic relevance: global

Tool languages: English

Technical expertise requirement: None. This is not a technical tool, but a theoretical guidance

Resource requirement: None. Technical resources differ according to the chosen connectivity modeling tool Roadmap for Assessing Co

Users: The tool is suitable for unexperienced users or whoever needs a step-bystep guidance in how to approach a connectivity assessment, and individuals needing to determine which types of data are needed to map connectivity.

Description of tool: The site provides a step-by-step roadmap of the activities needed to conduct a connectivity assessment, from the definition of scopes and goals, to choosing the right modelling approach and tool, to the incorporation of results into decision-making processes. The guidance also provides an overview of the required resources. Each step is described sequentially, including a list of previous steps that one should have addressed/tackled before carrying on. It is possible to directly navigate to any activity of interest or start from the initial step and go through them all sequentially. The tool was developed mainly for those that are relatively new to connectivity practices, but experienced users may also find it useful to learn new methods, tools, and resources or to contribute with such information to the site.

Why should I use this tool? Use this step-by-step guide at the beginning of any connectivity assessment, in combination with technical tools listed here or in ConnectingLandscapes.

Link to video or materials:

- The resource is intended to complement Conservation Corridor, North Carolina State University's site on the science of connectivity and related modeling tools.
- Additional resources on habitat connectivity: <u>http://www.landscope.org/focus/connectivity/Additional%20Connectivity%20Guidance/</u>



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Jecami 2.0

A web-based tool for visualizing and analyzing ecological connectivity

https://www.jecami.eu/

Authors: AlpBioNet 2030 - Web development by Parc Naziunal Svizzer.

Year: 2018- Jecami version 2.0

open access, web-based

Geographic relevance: EUSALP territory and the following sub regions in more detail: Mont Blanc; Rhaetian Triangle; Hohe Tauern; Prealpi Giulie-Triglav; Northern Limestone Alps; Berchtesgaden-Salzburg

Tool language: English, Italian

Technical expertise requirement: none

Resource requirement: internet connection

Users: anyone with a general interest in Ecological connectivity, wildlife management, spatial planning.

Description of tool: JECAMI (Joint Ecological Continuum Analyzing and Mapping Initiative) is a webbased map application, based on GIS data, which allows the visualization and the analysis of ecological connectivity in any given area of the EUSALP territory. For the wider public, the tool is an attractive and easy-to-understand introduction to the topic of ecological connectivity (EC). With the aid of simple games ("Love story"; "the Economist"; "Find the best Location") the user can explore the importance of EC and related spatial conflicts. The summarized project results section contains the SACA layers of the regional and the Alpine analysis. Strategic Alpine Connectivity Areas (SACA) are ecological conservation areas where ecological connectivity i) already works quite well, ii) should be improved or, iii) is very limited. For ecological connectivity experts, the tool addresses EC at i) the Alps scale and ii) subregions scale, in more detail. A Continuum Suitability Index (CSI) has been developed for each SACA and represents a model for structural connectivity. A series of layers shows the impact that each of the following indicators has on EC: Population; Land use; Fragmentation; Topography; Environmental protection. These indicators can be analysed for any specified area. The user can obtain values of CSI and SACA for user-selected and/or pre-defined areas, print a Pdf of the selected layers and map, and export or share the results of the tool.

Why should I use this tool? This tool is useful for engaging non experts through games and the visualization of pre-calculated connectivity levels. Experts can quickly analyse which are the main factors determining the level of connectivity of an area, importing personal data if needed.

^T Link to videos or materials:

User Guide: <u>https://www.jecami.eu/static/mapViewer/docu/jecami_userguide.pdf</u>



Data needed:

• (Optional) User input Data need to be in the WGS84 Web Mercator coordinate system (epsg3857) and should be KML file.

How it looks like:





Resource requirement: ArcGIS for input raster file preparation

Users: decision-makers or practitioners willing to assess the current or potential ecological connectivity of an area.

Description of tool:

Condatis is a user-friendly tool for identifying the best locations for habitat creation and restoration to enhance existing habitat networks and increase connectivity across landscapes. More specifically, Condatis i) highlights pathways that allow both the dispersal and multiplication of species as they cross a landscapes, ii) pinpoints bottleneck in the habitat network, iii) shows the areas of habitat where species vulnerable to extinction are more likely to survive, iv) ranks the most feasible sites for habitat creation and restoration to enhance the existing habitat network efficiently, v) allows new habitat to be added interactively to test the impact of habitat creation in precise locations. The tool generates maps of potential new habitats and of potential restoration areas.

Why should I use this tool? This tool allows to conduct sound connectivity analysis for assessing the connectivity of GI network and identifying critical sites or potential new areas of the network. This tool is particularly user- friendly and does not require high technical skills.

Link to videos or materials:

- Introduction video: <u>http://wordpress.condatis.org.uk/about-the-software</u>
- Training resources (data requirement, training exercise and Basic GIS training courses): <u>http://wordpress.condatis.org.uk/about-the-software/training-resources</u>
- User Guide: <u>http://wordpress.condatis.org.uk/about-the-software/downloads</u>

Data needed:

- Habitat raster maps for the species under consideration
- Reproductive rate and Dispersal distance of target animal species

• All raster files should be in the same geographical projection system and must have the same spatial resolutions (i.e. same pixel size, expressed in meters), have the same spatial extent, be in geoTIFF format.

How it looks like:

<u>Buglife</u> used Condatis to assess the current connectivity of proposed corridors and to identify where small patches of habitat creation would results in a major increase in connectivity for pollinator species across the landscape of North West England. Condatis was first used to assess the current flow (left) of Habitat Area map to show the species movement through the landscape. Then, it was possible to assess the overlap of the resulting calculated flow of species with the proposed routes(right) for which an automatically generated source and target at the northern and southern border of the landscape was used.



GUIDOS

Image analysis tool for fragmentation and connectivity assessments



https://forest.jrc.ec.europa.eu/en/activities/lpa/gtb/

Authors: Vogt & Riitters (Joint Research Centre, European Commission). peter.vogt@europa.eu

Year: 2020, version 2.9

open access, desktop application to be downloaded

Tool languages: English

Geographic relevance: global

Technical expertise requirement: basics of ecological spatial modelling

Resource requirement: Computer with a minimum of 2 GB RAM (the more the better)

Users: Experts willing to conduct detailed connectivity analysis.

Description of the tool:

Guidos (Geographical User Interface for the Description of image Objects and their Shapes) Toolbox is a set of customized, thematically grouped raster image analysis methodologies provided in a graphical user interface. The Toolbox provides a generic framework that is applicable to image analysis at any scale and for any kind of digital raster data. The Toolbox contains a wide selection of dedicated algorithms and tools designed to objectively describe and quantify various spatial properties of image objects and digital raster data.

The MSPA (Morphological Spatial Pattern Analysis) module automatically detects connectivity pathways and can be combined with Conefor for further connectivity analysis. The MSPA detect shape and connectivity of objects (identify links, corridors, and other features).

The Network analysis module allow the automatic detection of connectivity pathways between core areas based on the result of the MSPA. In addition, it provides a ranking in relevance of the detected patches. Useful Toolbox outputs are: Image analysis of raster files, Structural connectivity assessment, Cost analysis including detection of least cost path and user-driven cost ranges, Statistical summaries and indices, maps and categorisation of shape, connectivity, and spatial arrangement of image objects.

Why should I use this tool? This tool allows to perform detailed analysis of raster images which can then be used to perform ecological connectivity assessments, in combination with Conefor.

Link to video or materials:

- Installation Guide : <u>https://ies-ows.jrc.ec.europa.eu/gtb/GTB/GuidosToolbox_Installation.pdf</u>
- Guidos Toolbox Workshops webpage: <u>https://forest.jrc.ec.europa.eu/en/activities/lpa/gtb-workshops/</u>
- User Guide: <u>https://ies-ows.jrc.ec.europa.eu/gtb/GTB/GuidosToolbox_Manual.pdf</u>

Data needed:

• Raster images (ex. Land cover classes, resistance layer, etc.), as required by each module

How it looks like:

This map taken from the MagicLandscape Interreg Central Europe project illustrates the software interface showing the MSPA pattern analysis with different morphological feature classes in different colours as in the legend.



Further read:

• Peter Vogt & Kurt Riitters (2017) GuidosToolbox: universal digital image object analysis, *European Journal of Remote Sensing*, 50:1, 352-361, DOI: 10.1080/22797254.2017.1330650



Technical expertise requirement: GIS knowledge. Available with an (easier) graphical interface or a command line interface (where R language is needed)

Resource requirement: GIS extensions for required input files

Users: Experts willing to conduct detailed connectivity analysis.

Description of tool:

Conefor is a software package that allows the quantification of the importance of different habitat areas and links for the maintenance and improvement of landscape connectivity. Moreover, it allows to evaluate the impact of habitat and land use changes on connectivity. The tools are conceived for supporting decision-making processes in conservation and landscape planning, through the identification and prioritization of critical sites for ecological connectivity. According to habitat requirements and distribution, and species' dispersal characteristics, the tool allows to compute overall connectivity and the importance of nodes. This allows to obtain i) maps of habitat areas, ii) maps of functionally connected regions iii) maps of critical areas for connectivity. According to the level of expertise, the tool can be used with a graphical user interface (windows only) or with a command line interface. The tool allows to analyse symmetric and asymmetric connectivity, i.e. cases in which the probability of dispersal from a node x to a node y is different than in the opposite direction, (e.g.-wind dispersal or source-sink population dynamics).

Why should I use this tool? this tool allows to conduct sound connectivity analysis for assessing the connectivity of GI network and identifying critical sites or potential new areas of the network. With respect to Condatis, this tool requires more technical skills and is often used in combination with GUI-DOS.

Link to video or materials:

• User Guide:

version2.2:<u>http://www.conefor.org/files/usuarios/CS22manual.pdf</u> update version 2.6: <u>http://www.conefor.org/files/usuarios/Manual_Conefor_26.pdf</u>

Data needed or used for the running of platform:

• Patches' nodes and connections file produced through the GIS extensions. Files have to be in the exact format required by Conefor and can only be produced with the GIS extensions that have been developed specifically for this purpose.

Further read:

Saura, S. & J. Torné. 2009. Conefor Sensinode 2.2: a software package for quantifying the importance of habitat patches for landscape connectivity. Environmental Modelling & Software 24: 135-139.

Further tools for connectivity analysis:

- A webpage featuring a toolbox of over 20 tools for conservation and connectivity: <u>http://conservationcorridor.org/corridor-toolbox/programs-and-tools/</u>
- An Excel-matrix summarizing available modeling tools: <u>http://www.landscope.org/fo-cus/connectivity/Step%206/Step%206%20Related%20Content/</u>

Category 2: Mapping and assessment of ESS

This suite of tools has been developed to visualize, map, and assess the ecosystem services (ESS) delivered by the territory. They allow to see to which extent are different benefits being provided by different areas, and to understand which areas contribute the most to the delivery of each of the ecosystem services considered. This information can help public authorities and practitioners working on regional development determine how to best manage the territory to maximise the delivery of benefits.

The tools presented in this section can be used, for example, to identify hotspots of multifunctionality or areas, important for delivering key services, which should be protected or restored. These tools can therefore help determine where to develop GI networks and how to address unbalances in the provision or supply of ecosystem services.

AlpES WebGIS allows to visualize at the municipal scale the pre-calculated values of the flow, supply, and demand of 8 key ecosystem services in the Alpine Space region.

InVEST allows users to calculate a range of Ecosystem Service indicators by providing the respective spatially explicit models and requiring users to insert local data.

ARIES is an advanced and comprehensive modelling environment for assessing Ecosystem Services and how these relate to pressing environmental management questions.

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AlpES WebGIS

Visualizing ecosystem services indicators at municipal level in the Alpine Space

Alpine Space

<u>www.alpes-webgis.eu</u>

Authors: Institute for Interdisciplinary Mountain Research, Austrian Academy of Science Innsbruck, within the Interreg Alpine Space AlpES project. <u>nadine.hoube@oeaw.ac.at</u>

Year: 2018

open access, web-based

Geographic relevance: Alpine Space Tool languages: English, German, French, Italian, Slovenian

Technical expertise requirement: none

Resource requirement: internet connection

Users: Anyone with a general interest in landscape planning and ecosystem services.

Description of tool:

The AlpES WebGIS is an interactive and easy-to use tool, developed within the AlpES project with the aim to make the spatial data results available to the stakeholders and the public in an easy and approachable way. The AlpES WebGIS displays eight ecosystem service indicators developed during the course of the project: i) Surface water for drinking, ii) Biomass production from grasslands, iii) Fuel wood iv)Filtration of surface water by ecosystem types v) Protection of areas against avalanches, mudslides, and rockfall vi) CO2 sequestration by forests and bogs vii) Outdoor recreation activities viii) Symbolic plants, animals, and landscapes. Users can display ESS data online, create their own ecosystem service-related maps, and print them. They can inform themselves about the state of individual ESS in a specific municipality or region within the Alpine Space. Users can also compare the different ESS indicators (demand, supply, and flow) of the eight selected ESS within a municipality or between several municipalities. It is possible to download municipality-based ecosystem service indicators for a single selected municipality or for the whole Alpine Space at once. The AlpES WebGIS is linked to the alpine knowledge platform WIKIAlps (www.wikialps.eu) where one can find important information about the AlpES project, and answers to questions that might occur when working with the AlpES WebGIS.

Why should I use this tool? This tool allows decision makers and stakeholders to easily visualize, up to municipal level, already calculated ecosystem services that are important for the Alpine region. Maps and data customized to the user needs can be easily exported.

Link to video or materials:

- AlpES project website: <u>https://www.alpine-space.eu/projects/alpes/en/home</u>
- WIKIAlps: <u>http://www.wikialps.eu/doku.php</u>
- User Guide: <u>http://www.wikialps.eu/lib/exe/fetch.php?media=wiki:tutorial19.pdf</u>

How it looks like:



InVEST

Assessment, mapping, and quantification of ecosystem services



https://naturalcapitalproject.stanford.edu/software/invest

Authors: The Natural Capital project (a partnership among the Stanford University, WWF, The Nature Conservancy, and the Institute on the Environment at the University of Minnesota.) <u>contact@naturalcapitalproject.org</u>

Year: 2017, InVEST 3.8.2

🔒 🔹 open access, stand-alone, desktop-based

Geographic relevance: global

Tool languages: English

Technical expertise requirement: good knowledge of spatial data formats and basic-intermediate skills in GIS software

Resource requirement: QGIS or ArcGIS for the visualization of results

Users: Decision-makers, stakeholders, NGO/Non-profit Organisations; conservation Organisations, government Agencies, local Authorities, corporations, scientists, analysts.

Description of tool:

InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) is a suite of free, open-source software models used to map and value the goods and services from nature that sustain and fulfill human life. Governments, non-profits, international lending institutions, and corporations all manage natural resources for multiple uses and inevitably must evaluate tradeoffs among them. The multi-service, modular design of InVEST provides an effective tool for balancing the environmental and economic goals of these diverse entities. InVEST enables decision makers to assess quantified tradeoffs associated with alternative management choices and to identify areas where investment in natural capital can enhance human development and conservation. The toolset includes distinct ecosystem service models designed for terrestrial, freshwater, marine, and coastal ecosystems, as well as a number of "helper tools" to assist with locating and processing input data and with understanding and visualizing outputs. Invest creates maps, curves and balanced sheets addressing questions at local, regional, and global scales, and assesses possible trade-offs between land-use options and scenarios. InVEST models are spatially explicit, using maps as information sources and producing maps as outputs, and presents results in either biophysical terms (e.g. tons of carbon sequestered) or economic terms (e.g. net present value of that sequestered carbon).

Why should I use this tool? Invest allows to map and assess a variety of ESS using spatially explicit models that require user data input. The tool also provides virtual training opportunities. The maps and information it produces support decision-makers in managing natural capital.

Link to video or materials:

- Online training course of the Stanford University: An introduction to the Natural Capital Approach:
 - https://online.stanford.edu/courses/soeees-xncp-101-introduction-natural-capital-approach
- Individual Sample Datasets and Data Sources for InVEST: <u>https://naturalcapitalproject.stanford.edu/software/invest</u>
- User Guide: <u>http://releases.naturalcapitalproject.org/invest-userguide/latest/</u>

Data needed or used for the running of platform:

InVEST requires spatially explicit data sets (vector or raster) and additional information such as the values for different variables for the existing land use types in the study area. Different ecosystem service models require different datasets. For detailed information, refer to the InVEST User Manual. Example: For the estimation of carbon storage and sequestration over time, it is required to have land use and land cover map, carbon stock values in four carbon pools (above- and belowground biomass as well as soil and dead organic matter)

How it looks like:

| | Crop P | ollination: loaded | from autosave | | — | | \times |
|------|--------|------------------------|-----------------|------------------------------------|----------|------------------|--------------|
| File | Edit | Development | Help | | | | |
| | | | | InVEST version 3.8.7 Model docum | entation | <u>Report ar</u> | <u>issue</u> |
| | × | Workspace | | | | | |
| | ~ | Results suffix (optior | nal) | | | | 0 |
| | × | Land Cover Map (Ra | aster) | | | | 0 |
| | × | Land Cover Biophysic | cal Table (CSV) | | | | 0 |
| | × | Guild Table (CSV) | | | | | 0 |
| | ~ | Farm Vector (Vector | r) (optional) | | | | 0 |
| | | | | | | X R | un |



Users: Modelers or Researchers/practitioners, working on science-policy interface and socio-ecological systems.

Description of tool:

ARIES (Artificial Intelligence for Ecosystem Services) is a networked software technology that redefines ESS assessment and valuation for decision-making. ARIES strives to quantify the benefits that nature provides to society in a manner that accounts for dynamic complexity and its consequences, but keeps models clear enough to users to remain understandable, usable, and adaptable to conditions of varying data availability. To be relevant to policy and decision making, scientific tools must consider the linkages between people and nature – termed "coupled human-natural systems. ARIES integrates scientific data and models that simulate and integrate environmental and socioeconomic systems, deepening our understanding of the natural world and of how the choices society makes can impact future economic prosperity and environmental sustainability. The k.LAB software used in ARIES is designed to address linked socioeconomic-environmental modelling problems. It helps in spatial mapping, quantification, and economic valuation of ESS; natural capital accounting; optimization of payment schemes for ESS; conservation and spatial policy planning; forecasting of changes in ESS provision. The tool produces maps and quantitative data on ESS and can be used at different scales. Modelers can contribute to the development of the tool, while researchers and practitioners can use the tool with local data and context to answer research questions.

Why should I use the tool? This tool offers one of the most comprehensive, sophisticated, and holistic approaches to assess ecosystem services, their flows, and related management questions. The use of the tools requires specific training, but it allows to use ESS models to address and solve many sustainability problems.

Link to video or materials:

 K.LAB: Al- powered knowledge integration to address the most complex sustainability problems: <u>https://www.youtube.com/watch?v=xyI9MzB6hg8</u>

- ARIES Explorer: Introduction and early preview: https://www.youtube.com/watch?v=vsWGkMBpI9Y
- Training and learning platform, International Spring University on Ecosystem Services Modelling : <u>https://springuniversity.bc3research.org/isu-2019/</u>

Data needed:

- Spreadsheets, databases (e.g. Access), maps (global maps are available by default online) or GIS databases
- Users can add their models (and data) to the network. These input models can become available to other users (paradigm of collaborative modelling)

How it looks like:

The U.S Geological Survey combined maps generated using ARIES for four ecosystem services (carbon sequestration and storage, water supply, aesthetic value and sediment regulation) with cultural ecosystem services mapped using SolVES for six national forests in Colorado and Wyoming. With the use of spatial statistical methods, they mapped hotspots and coldspots of these services, having different implications for public land management.



Category 3: Quantifying the Benefits of ESS

This suite of tools has been developed to support public authorities and practitioners in quantifying the benefits of Ecosystem Services and GI, often in monetary terms. The user will need to provide in most cases information and data about local social, environmental, and economic aspects.

The tools can be used, for example, to assess the benefits of protecting land or developing Green-Blue Infrastructure.

i-Tree quantifies the community benefits of trees at different scales.

Bfst assesses and monetizes the values of green-blue GI such as sustainable urban drainage systems and natural flood management measures.

SolvES allows to assess, map, and quantify social, non-market values attached to (especially cultural) ecosystem services such as aesthetics and recreation.

Co\$ting Nature quantifies the opportunity costs and the value of protecting land, and analyses how policy changes affect ESS provision.

Please note that also some functionalities of **InVEST** quantify certain ecosystem services in economic terms.

i-Tree

Assessing of the benefits of community trees and forests

<u>https://www.itreetools.org/</u>

Authors: USDA Forest Service and numerous cooperators.

Year: 2016, version 6.0

open access, desktop and web-based

Geographic relevance: US, Canada, Australia, UK, Mexico, South Korea, Columbia, and most of Europe

Tool languages: English. Support is available in French, German, Italian, Spanish, Portuguese, Chinese, Japanese, Korean

Technical expertise requirement: natural resource management

Resource requirement: A performing computer, Excel, Access, Adobe Reader

Users: Non-profit organizations, consultants, volunteers, researchers, students.

Description of tool:

i-Tree is a state-of-the-art, peer-reviewed software suite that provides urban and rural forestry analysis and benefits assessment tools. i-Tree offers several applications that provide managers and advocates with tools to quantify ecosystem services and benefit values of community trees and forests at multiple scales. The ability to articulate the significance of trees and forests in terms of pollution mitigation, storm water run-off reduction, carbon sequestration and storage and more allows i-Tree users to improve tree and forest management, plan strategically, increase awareness, engage decision makers and build new partnerships. This tool was developed in the United States, therefore one should refer to the "international overview" to find information on how to make i-tree tools work outside the US. i-Tree tools currently available internationally are: i-Tree Canopy- Estimates tree cover and tree benefits for a given area with a random sampling process that lets you easily classify ground cover types. i-Tree Eco - uses 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 Database - An online system for i-Tree users to submit new data for i-Tree model integration. A mobile app is available for field data collection via smartphone, tablets etc.

Why should I use this tool? This suite of tools includes very well developed and user-friendly tools readily available for use in Europe that help assess all the benefits to the community deriving from trees and forests. Other tools, developed for the US, can be adapted for European use.

Link to video or materials:

 Video learning (Introduction, Download and basic Desktop Installation): <u>https://www.itreetools.org/support/resources-overview/video-learning</u>



- International tool summary: <u>https://www.itreetools.org/documents/552/International_iTree_Tools_Sum-mary_17Jan2019.pdf</u>
- User Guide: <u>https://www.itreetools.org/support/resources-overview/i-tree-manuals-workbooks</u>

Data needed:

- User collected field data
- Climate data
- Land-use and land cover type and % cover.
- Tree data (e.g. species, height, DBH, tree crown measurements).

How it looks like:



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| Particulate | Particulate Matter less than 2.5 microns removed annually | | | | prin | t out a |
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Resource requirement: Microsoft Excel

Users: Stakeholders; decision-makers, developers, local authorities, utility companies, architects, engineers, planners, and economists.

Description of tool:

Bfst (Benefits of SuDS Tool- valuing the benefits of blue-green infrastructure) makes assessing the benefits of blue-green infrastructure easier, without the need for full scale economic inputs. It is used to assess and monetise many of the financial, social, and environmental benefits of blue-green infrastructure. The results enable users to understand and quantify the wider value of sustainable drainage systems and natural flood management measures. This can support investment decisions and help to identify stakeholders and find potential funding routes. BeST provides guidance to help practitioners estimate the benefits of Sustainable Drainage Systems (SuDS) without the need for specialist economic input. Estimates are based on the performance of the whole drainage system rather than individual components. BeST uses the ecosystem services approach to understand the overall benefits that SuDS provide over conventional piped drainage. Using values input by the user, it provides support to quantify and monetise the benefits of a SuDS scheme for a given area over a specified time period. The benefits are presented as a series of graphs and charts that are based on the ecosystem service and Bottom Line (accounting) frameworks. (Description from the https://ecosys-Triple temsknowledge.net/best-benefits-suds-tool.) This tool was developed originally for the United Kingdom. Values in the spreadsheet should therefore be updated and adapted to EU/country-specific prices, values, and currency.

Why should I use this tool? This tool is very adaptable to the need of the user, as it is based on an excel file, where values can be updated according to the context. It therefore provides an easy-to-obtain but informative overview of the benefits of a SuDS system in particular, but also of other GI with similar characteristics.

Link to video or materials:

- Tool explanation and tutorials: <u>https://www.youtube.com/watch?v=_9uM3z3NUVI&list=PLinYZSz1gzVV8C62jTIlo-</u> <u>QFn7br8s7Xbw&index=3</u>
- User Guide: <u>https://www.susdrain.org/files/resources/BeST/w047b_bst_guidance_re-lease_5_v0b_issued.pdf</u>

Data needed:

Examples of data provided by the user:

- Site data
- SuDS components and Habitat type
- Number/type of homes and number of people affected by a change in flood risk,
- Avoided drainage / sewerage infrastructure costs.
- Volume of water infiltrating for groundwater recharge.
- Change in energy use due to reduced wastewater pumping.
- Number of properties adopting rainwater harvesting, household water consumption rates.
- Change in wastewater flow and runoff and Current and projected water quality status.

Recommendations for Optimal use:

• B£st should be applied at the largest possible scale for greater benefits calculation (some benefits may be significant only above a certain scale)

How it looks like:

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| PROJECT DETAILS - Name: Burpham Court Farm, Assmt. Version: 1, Date: Feb 2019. | | | to evaluate benefits | |
| KEY Input Data Select Information | Calculation / Ouput | | | - |
| Evidence: Qualitative summary and written evidence | | | Project Data | |
| Intere are a tage number of trees are being planted. | | | 3£ST Guidance | |
| 3 | | | website for feedback | |
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| | | | | |
| Notes Overview of the sections to help assess the sequestered carbon value Only complete one section. Trees should be planted for a long time period. New trees only, not as part | of a like for like replacement strategy. | | | |
| SECTION CS1 SECTION CS2 | SECTION CS3 | Section C54 | | |
| You have undertaken an You require support to assess the ca independent or more detailed sequestration from trees planted ar assessment of carbon of the scheme sequestration as a result of planting | bon You require support to assess the carbon part sequestration from restoring flood plains | You have assessed the amount of carbon for woodlands (e.g. using the Forestry Commission Woodlands Carbon COZDE Calculator) and wish to estimate the monetised value | | |

SolVES

GIS application for the assessment, mapping, and quantification of perceived social values of ecosystem services



<u>https://www.usgs.gov/centers/gecsc/science/social-values-ecosystem-services-solves?qt-sci-ence_center_objects=0#qt-science_center_objects</u>

Authors: USGS Geoscience and Environmental Chance Science Centre (GECSC) <u>bcsherrouse@usgs.gov</u>

Year: 2015, SolVES 3.0

Geographic relevance: global

open access, desktop-based

Tool languages: English

Technical expertise requirement: ESRI ArcGIS and spatial modeling knowledge

Resource requirement: ESRI ArcGIS 10 software (with Spatial Analyst extension), Maxent maximum entropy modeling software version 3.3.3k., NET Framework, Java

Users: researchers, stakeholders, decision-makers willing to understand the social value of ecosystem services and environmental features.

Description of tool:

SolVES (Social Values for Ecosystem Services) incorporates quantified and spatially explicit social-values information into ecosystem service assessments. Social values are defined as the perceived, nonmarket values the public ascribes to ecosystem services, particularly cultural services, such as aesthetics and recreation. SolVES was originally developed to address the need to account for differing values, attitudes, and preferences among diverse stakeholders in the analysis of tradeoffs among ecosystem services. SolVES incorporates social values into the ecosystem service assessment process by quantifying and mapping these values across a study area and by providing a spatial, nonmonetary metric statistically related to characteristics of the underlying physical environment. 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. SolVES 3.0 provides functionality to assess, map, and quantify social values such as aesthetics, biodiversity, and recreation. SolVES generates social-value maps and produces robust models describing the relationship between social value intensity and explanatory environmental variables. Social-value models can be transferred to physically and socially similar areas.

Why should I use this tool? Assessing the social values of ecosystem services is very important, as they are hard to translate in monetary terms, and are important public goods that bypass the economy. Decision makers require estimates of social values beyond those defined economically to assess the full range of ecosystem values. This tool allows you to assess and map them and understand which environmental variables and ecosystem services most contribute to obtain social values.

Link to video or materials:

- Quick start tutorial: https://gec.cr.usgs.gov/solves/downloads/SolVES_V3_QuickStart.pdf
- Sample survey: <u>https://gec.cr.usgs.gov/solves/downloads/PSI_Final_Survey.pdf</u>
- User Guide: https://pubs.usgs.gov/of/2015/1008/pdf/ofr2015-1008.pdf

Data needed:

- Environmental data in raster files, with common projection
- User Survey data (e.g. use attitude, attitude types)
- User Spatial data (study area polygon and survey points)

How it looks like:



Co\$ting Nature

Policy Support System for ecosystem service assessment, conservation prioritization and analysis of pressures and threats on carbon and biodiversity

http://www.policysupport.org/costingnature

Authors: Kings College London (models), AmbioTEK (software) and United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC) (applications), <u>plcysupprt@gmail.com</u> (technical and support enquiries)

Year: (2013?)- version 3.

open access, web-based

Geographic relevance: globally applicable, local relevance Tool languages: English, Spanish

Technical expertise requirement: GIS skills when using own data

Resource requirement: GIS software to view and analyze output maps (raster format), even though not essential. The software works better with Chrome or Mozilla Firefox, JavaScript enabled.

Users: Conservation and development NGOs, GO and NGO Policy analysts, agriculture and industry managers, education, and academic research.

Description of tool

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Co\$ting Nature is a web-based policy-support tool for natural capital accounting and analysis of ecosystem services provided by natural environments. Its focus is on costing nature (understanding the resource, e.g. the land area, and the opportunity cost of protecting nature to produce ecosystem services) as opposed to valuing nature (i.e. how much someone is willing to pay for it). The tool estimates the current provision of water, carbon and tourism services and identifies the beneficiaries, then analyses current environmental pressures, future threats, and conservation priority. Users can then apply scenarios for climate, land-use, or land management change, and examine the impacts on ecosystem services and the implications for beneficiaries. The tool can be used to assess the impacts of human interventions for conservation prioritisation and planning. The tool creates ESS economic value maps and summary tables, and maps of local, national, and global beneficiary types.

Why should I use this tool? This tool can be applied worldwide, and it is used in many contexts to understand what effect policy decision might do to the current provision of ESS. It allows to assess ESS or to analyse threats and pressures to their provision. The user can upload his own set of data.

Link to video or materials:

- Co\$ting Nature-Policy Support System documentation: <u>https://docs.google.com/document/d/1t_JxjV82A58YoaAxSLZRrYMoxhFYJYZD3qbjCCt-MIo/edit#id.pgnojt-km9bo</u>
- Self-paced training videos and exercise material: <u>http://www.policysupport.org/costingnature/training</u>



- Example applications:
 <u>http://www.policysupport.org/costingnature/example-applications</u>
- User Guide: <u>https://docs.google.com/document/d/1t_JxjV82A58YoaAxSLZRrYMoxhFYJYZD3qbjCCt-MIo/edit</u>

Data needed:

- Global spatial data (GIS, remote sensing, e.g. for land-use and carbon storage) are provided with the standard tool
- Personal local datasets provision is possible. Spatial datasets should have a resolution of 1 square km or 1 hectare.

How it looks like:



Category 4: Participatory processes

This suite of tools supports public authorities and practitioners to conduct participatory processes, involving citizens in decision-making and planning. Most of the tools present here provide conceptual frameworks and roadmaps for effective public engagement at different stages of GI development.

The tools can thus be, for example, used to identify target groups, involve stakeholders, develop strategies, resolve conflicts, reveal preferences, survey the community, conduct workshops etc.

USER PARTICIPATION provides a roadmap and guidance for involving citizen in developing strategies.

World Cafè provides a methodology and framework for effective stakeholder interaction.

The Conflict Management Toolkit provides a framework for identifying, managing, and resolving emerging human-nature conflicts.

QUICKScan presents a participatory spatial modelling method that links stakeholders and decision maker knowledge and preferences to available spatial and statistical data, visualizing results in interactive maps, summary charts and trade-off diagrams.

Tools for developing Green Infrastructure Networks

USER PARTICIPATION

Toolbox of smart participatory methods & tools

Participatory methods and tools for the involvement of citizens into urban innovation



https://www.user-participation.eu/

Authors: URBAN UNNO Interreg Central Europe project, info@user-participation.eu

A

Year: 2019

Geographic relevance: global

open access, web based

Tool languages: English, German, Polish, Hungarian, Italian, Slovenian, Croatian

Technical expertise requirement: Teamwork capabilities (communication capabilities, engagement capabilities, active listening, collaboration)

Resource requirement: none, this is not a technical tool, but a theoretical guidance

Users: stakeholders, decision-makers, planners, researchers with at least some basic experience with participatory processes (e.g. workshops).

Description of tool:

This tool is a guidance to support planning urban innovation processes, such as the development of urban development strategies and smart urban solutions through participatory processes that involve citizens, stakeholders, end-users, and consumers. It is properly designed as a manual that guides the users through different stages (in the picture below), from the identification of the target groups at an early stage, to the maintenance of relationships after the interactive event, passing through different ways of communication channels and technologies (e.g. social media) suitable to different scenarios, and giving an insight into practical participatory methods (e.g. World café), giving precise information on the number of people that have to be involved and the time requirements.



Why should I use this tool? The toolbox will guide you through the planning of participatory process step-by-step, the best way is to follow it starting from step one.

Link to videos or materials:

URBAN INNO project: http://interreg-central.eu/Content.Node/URBAN-INNO.html

How it looks like:

| USER PARTICIPATION | ABOUT PARTICIPATORY PROCESS - PLANNING THE PROCESS - LIST OF EXPERTS CONTACTS | | | |
|---|--|--|--|--|
| About | C DEFINING A PROBLEM & OBJECTIVES | | | |
| Participatory process > | DEFINING A PROBLEM & OBJECTIVES | | | |
| Planning the process > | | | | |
| ⊖ Overview | Define a problem you want to solve | | | |
| STEP 1 − Defining a problem & objectives | Define objectives you want to achieve | | | |
| STEP 2 - Building relationships | | | | |
| ら STEP 3 – Invitations | The problem and objectives has to be clear to you and to anyone joining the | | | |
| STEP 4 − Starting interactions | process regardless of their previous knowledge or education. | | | |
| STEP 5 – Participatory methods | | | | |
| STEP 6 − Documentation (how to produce results) | NOW, ask yourself | | | |
| ⊖ STEP 7 – Follow-up | • Do I need to enter into participatory process to achieve this objectives | | | |
| STEP 8 – Continued interactions | or can I achieve them in another way ? | | | |
| List of Experts | Am I at the initial stage of the development of solution and I'm not simply looking for approval of solutions? | | | |
| Contacts | | | | |
| | ⑦ If YES, enter the process with STEP 2 | | | |
| | If NO, you are at the wrong place | | | |

World café

Participatory methods and tools for the involvement of citizens

http://www.theworldcafe.com/

Authors: The World Café Community Foundation

Geographic relevance: global

Technical expertise requirement: Teamwork capabilities (communication capabilities, engagement capabilities, active listening, collaboration)

Resource requirement: A hospitable space to host the event.

Users: everyone willing to discuss new development opportunities, from decision makers to citizens.

Description of the tool:

World Café is a laboratory based participatory process developed by Juanita Brown and David Isaacs in 1995, which is a global movement that support conversations that matter in governmental and community settings all over the world. The World Café is an efficient method for creating living networks of collaborative dialogues around questions that matter everyone's life. The method is built on seven integrated design principles and can be modified to meet a large variety of needs, according to the specific contexts on which it is applied. World Café are structured around conversations rounds lasting approximately 20 minutes each. During the first round, small groups sketch and discuss ideas, then people move to other tables as "ambassadors of ideas" to be injected into other conversation clusters so that questions and themes begin to connect and, as knowledge grows, action possibilities emerge.

Why should I use this tool? The World Café methodology is a simple, effective, and flexible format for hosting large group dialogues.

Link to videos or materials:

- A Quick Reference Guide: http://www.theworldcafe.com/wp-content/uploads/2015/07/Cafe-To-Go-Revised.pdf
- World Café method video: https://www.youtube.com/watch?v= 0d0Gybg-I0
- Further reading material, interviews, and articles are available on the webpage



Tool languages: English

How it looks like:



Further read:

• Juanita Brown and David Isaacs with the World Café Community of Practice. 2005. *The World Café: Shaping our future through conversations that matter*. Berret-Koehler Publisher, Inc. San Francisco

Tools for developing Green Infrastructure Networks

Conflict Management Toolkit

human-nature conflict resolution toolkit for ecological connectivity in the Alps



https://www.alpine-space.eu/projects/alpbionet2030/deliverables/eurac_alpbionet2030_toolkit_dic19_web.pdf

Authors: Maino, Favilli and de Bortolo (Eurac research). federica.maino@eurac.edu

Geographic relevance: global, with an alpine focus

Tool languages: English

Technical expertise requirement: Teamwork capabilities (communication capabilities, engage ment capabilities, active listening, collaboration)

Resource requirement: none, this is not a technical tool, but a theoretical guidance

Users: local administrators, decision-makers, researchers, and practitioners.

Description of the tool:

The aim of the tool is to provide an overview of innovative and effective strategies to recognize, prevent and manage human-wildlife conflicts in the Alps, in order to create the necessary social framework and acceptance needed to foster the development and the maintenance of an ecological network in the Alps. The tool was developed for human-wildlife conflict in particular, but the methodologies presented can be applied to other types of human-nature conflict. The toolkit, developed as part of the ALPBIONET2030 project, provides a conceptual roadmap for managing conflict and presents specific tools to be used at each step. i) Identifying and analyzing conflicts, ii) informing and improving scientific knowledge, iii) raising awareness, opening up a dialogue among different competences, iv) favoring the transfer and the coordination at national and international level and vi) managing conflict at the local level are indeed key elements that can, at the same time, prevent conflicts and transform them into opportunities for coexistence. Tools proposed are, for example, conflict analysis, interviews, surveys, articles, blogs, active listening, dialogue, local workshops, meeting etc. The toolkit can for example be used for conflicts arising from predation, sport activities or animal-vehicle collisions.

Why should I use this tool? this tool helps you navigate emerging or existing human-nature conflicts in your local area. It can help you set a plan for the future, improve the awareness and acceptance of people, and find solutions, turning a conflict into an opportunity.

Link to videos or materials:

- Professional video on human-nature conflicts: <u>https://www.youtube.com/watch?v=T89WD5CN678&feature=youtu.be&ab_channel=Alpbi-onet2030</u>
- Proceedings of a workshop on conflicts resolution in Mountain Areas: <u>https://www.alpine-space.eu/projects/alpbionet2030/deliverables/wpt5_delivera-ble_4_workshop_proceedings.pdf</u>

 Overall information on the Alpine mediation strategy for human-nature coexistence (Work Package WP T5 of the Interreg Alpine Space ALPBIONET2030 project): <u>https://www.alpine-space.eu/projects/alpbionet2030/en/project-results/wpt5</u>

How it looks like:





Technical expertise requirement: Teamwork capabilities (communication capabilities, engagement capabilities, active listening, collaboration)

Resource requirement: performing computer

Users: stakeholders, decision-makers, planners, researchers.

Description of tool:

QUICKScan software tool is a spatial modelling environment to combining expert knowledge with spatial and statistical data. Results are visualized in interactive maps, summary charts and trade-off diagrams. QUICKScan is also a participatory spatial modelling method that links stakeholders and decision maker knowledge and preferences to available spatial and statistical data. QUICKScan can be used for a variety of environmental assessments at different spatial scales and at different locations across the world, to analyze societal and environmental conditions, as well as for the diagnose of patterns and interactions. The tool is designed for group use through workshops following an iterative approach that starts from basic rules adding complexity step by step as participants interpret model's results. Successive iterations serve to improve the model, find alternatives, and include other stakeholders' opinions.

Why should I use this tool? The tool is fast and simple, attractive, and user-friendly. It requires little data and can be carried out in a multi-actor setting.

Link to video or materials:

• User Guide: User manual is provided within the downloaded tool

Data needed:

- Experts knowledge and preferences
- Spatial and statistical data
- GIS raster map as basis on which to apply knowledge rules

How it looks like:

| LUIGI - QUICKScan 4.0 beta | | | - a × |
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| Right click on a category folder to add a components Manage classifications | Objectives | | |
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| | Spatial scale | | 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 |
| | Spatial extent | | |
| | Temporal scale | | |
| | Filename | | |

Further read:

 Peter Verweij, Sander Janssen, Leon Braat, Michiel van Eupen, Marta Pérez Soba, Manuel Winograd, Wim de Winter, Anouk Cormont, *QUICKScan as a quick and participatory methodology for problem identification and scoping in policy processes,* Environmental Science & Policy, Volume 66, 2016, Pages 47-61, ISSN 1462-9011 https://doi.org/10.1016/j.envsci.2016.07.010.

Further tools for participatory processes:

• A webpage with an interactive filter that helps you select the method and tool best suited for your specific project needs: <u>http://actioncatalogue.eu/</u>

2. Knowledge hubs

This section of the deliverable spotlights knowledge hubs that gather many useful resources for a range of environmental management questions. In the hubs described in this section it is possible to access reports and results from several projects, to receive news about policy changes or conferences, to attend courses, meet other stakeholders, or access tools. Oppla and Business @ Biodiversity are managed in close collaboration with the European Commission.

Oppla

<u>https://oppla.eu/</u>



Oppla is the EU Repository of Nature-Based Solutions.

It provides a knowledge marketplace, where the latest thinking on natural capital, ecosystem services and nature-based solutions is brought together. Its purpose is to simplify how we share, obtain and create knowledge to better manage our environment. Oppla is an open platform that is designed for people with diverse needs and interests - from science, policy and practice; public, private and voluntary sectors; organizations large and small, as well as individuals. All are welcome and have a part to play in our community. Membership of Oppla is free and includes access to the following services:

- Ask OpplaAsk Oppla: A crowd-sourced enquiry service, where members of the Oppla community help to answer each other's questions.
- MarketplaceOppla Marketplace: A knowledge supermarket where you can obtain guidance, software, data and other useful resources - as well as promote the outputs of your own project or network.
- CommunityOppla Community: An easy-to-use system for networking with other members from around the world.

Over 60 universities, research institutes, agencies and enterprises are contributing to Oppla as part of a joint activity between the OPERAs and OpenNESS projects, funded by the European Commission FP7 Programme.



Tools for developing Green Infrastructure Networks

Business @ Biodiversity



https://ec.europa.eu/environment/biodiversity/business/about-us/index_en.htm

The EU Business @ Biodiversity Platform provides a unique forum for dialogue and policy interface to discuss the links between business and biodiversity at EU level. It was set up by the European Commission with the aim to work with and help businesses integrate natural capital and biodiversity considerations into business practices.

The EU B@B Platform is proud to bring together close to 300 member organisations striving to integrate biodiversity and natural capital considerations into their activities. All types of businesses, from SMEs to larger companies, engaged in business @ biodiversity and natural capital are invited to become active members of the EU B@B Platform and share their best practices. Other interested parties, such as biodiversity conservation NGOs, organisations engaged in sustainable business innovation and national governments, are encouraged to join our community by subscribing to our newsletter.

What will you gain from joining the EU B@B Platform?

- Opportunities for networking and collaboration with like-minded peers through shared experiences and mutual learning;
- Opportunities to engage in working groups and gain knowledge on how to integrate biodiversity and natural capital considerations into your activities and to assess/measure/report your impacts and dependencies on natural capital and biodiversity;
- Opportunities to directly engage with policy makers at EU level;
- Access to key information about recent policy developments and funding opportunities in the area of business and biodiversity through our quarterly newsletter; and
- Access to new business partners and business opportunities across Europe.

ESRI GIS courses on GI



https://www.esri.com/training/catalog/search/

ESRI offers GIS training through web courses, learning documents and story maps. Such courses are very diverse and span from basic introductory lessons into GIS to more advanced training according to the user attitudes and needs. The following courses are web based and can be accessed for free, upon registration.

From the course catalogue:

- Introduction to Green Infrastructure Web Course
- Building a Green Infrastructure Strategy Learning Plan composed by 7 Courses
- Building the Foundation for Green Infrastructure Planning Web Course
- GeoPlanner for ArcGIS: Exploring the Green Infrastructure in Your Study Area Web Course
- Green Infrastructure for the GIS Professional Story Map

| My Learning Plans | Create a Learning P | lan |
|---|---------------------|---------|
| Learning plans are sets of resources that help you master focused learning goals. Find learning plans or create your own. | | |
| Search Plans | Ş |) |
| STATUS Active PLAN TYPE Viewing All SORT Recently Enrolled | | |
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| O % Completed © Completed © Errion Aug 15, 2017 Enrolled Sep 24, 2020 © Copy Plan ♠ Assign Plan ♦ Share Plan | Withdraw | |
| | | |
| DOCUMENT Green Infrastructure for the U.S. 19 Pages | Download | |
| Green Infrastructure for the GIS Professional | Launch Story Map | |
| WEB COURSE Introduction to Green Infrastructure 1 Hour | Launch Course | |

Ecosystem Knowledge Network

https://ecosystemsknowledge.net/



The Ecosystem Knowledge network is a UK-based network aiming to equip the public and its members to deliver wellbeing and prosperity through a healthy natural environment. The principles of the ecosystem approach - the primary framework for action in the international Convention on Biological Diversity - drive the work of the Network. It provides resources to help people manage the environment as an asset for the benefit of everyone. The network organizes events, hosts a blog, provides guidance for applying the ecosystem service and the natural capital approach, and reviews useful tools for environmental management.



3. Database links

Local spatially explicit data are often required in order to use the tools presented in the previous section to plan and design GI networks. **This section of the report aims to describe and provide links to some of the main database portals of the EU containing spatially explicit data**. This is by no means an exhaustive list of datasets, but rather a starting point for those seeking data at the EU or pilot regions level. Most data are accessible for download for free or upon registration.

EU

The following database portals provide spatially explicit data relevant for the European Union. The portals should be browsed to find data of interest, which can then usually be downloaded for free or upon registration.

Copernicus Land Monitoring Service

The Copernicus Land Monitoring Service (CLMS) provides geographical information on land cover and its changes, land use, vegetation state, water cycle and earth surface energy variables to a broad range of users in Europe and across the World in the field of environmental terrestrial applications.

https://land.copernicus.eu/

Eurostat-GISCO

Within Eurostat, GISCO is the Geographic Information System of the European Commission. It is responsible for meeting the European Commission's geographical information needs at 3 levels: the European Union, its member countries, and its regions. GISCO contains core geographical data covering the whole of Europe, such as administrative boundaries, and thematic geospatial information, such as population grid data. Some data are available for download by the general public and may be used for non-commercial purposes

https://ec.europa.eu/eurostat/web/gisco/overview

Joint Research Centre Data Catalogue

The Data catalogue of the Join Research centres of the European Union collects a very large number of datasets and collections, available on the website.

https://data.jrc.ec.europa.eu/

European Union Open Data Portal

The European Union Open Data Portal gives you access to open data published by European institutions and bodies. All data found in the portal are free to use and re-use for commercial and non-commercial purposes.

https://data.europa.eu/euodp/en/home

European Data Centres

The Environmental data centre website is the coordinated entry point for European data relevant to the selected theme and products related to the indicators. It provides users with easy searching, viewing and download functions. It also gives links to involved partners and supporting documents.

https://www.eea.europa.eu/data-and-maps/european-data-centres/european-data-centres

EIONET- Central Data Repository

The Central Data Repository is part of the Reportnet architecture. The Central Data Repository is like a bookshelf, with data reports on the environment as submitted to international clients.

http://cdr.eionet.europa.eu/

BISE – Biodiversity Information System for Europe

BISE is a single-entry point for data and information on biodiversity supporting the implementation of the EU Strategy and the Aichi targets in Europe. It brings together facts and figures on biodiversity and ecosystem services, it links the related policies, environmental data centres, assessment and research findings from various sources.

https://biodiversity.europa.eu/

OpenStreetMap https://www.openstreetmap.org/#map=7/42.245/11.799

INSPIRE Geoportal

The portal gives access to spatial data specific for each country

https://inspire-geoportal.ec.europa.eu/

Member States

The following database portals provide spatially explicit data relevant for the pilot regions of the LUIGI project. The portals should be browsed to find data of interest, which can then be downloaded, for free or upon paying a fee depending on the policies and practices of individual countries.

Italy

South Tyrol

Geokatalog Provinz Bozen <u>http://geokatalog.buergernetz.bz.it/geokatalog/#</u>

Lombardy

- Geoportale della regione Lombardia <u>http://www.geoportale.regione.lombardia.it/ricerca</u>
- Sistema informativo territoriale città metropolitana di Milano: <u>https://www.cittametropolitana.mi.it/pianificazione_territoriale/sit/</u>
- Geoportale del comune di Milano
 <u>https://geoportale.comune.milano.it/sit/</u>

Piedmont

- Geoportale della regione Piemonte
 <u>http://www.geoportale.piemonte.it/geocatalogorp/?sezione=catalogo</u>
- Geoportale della Città metropolitana di Torino
 <u>http://www.geoportale.cittametropolitana.torino.it/geocatalogopto/</u>

Austria

- INSPIRE Österreich <u>https://www.inspire.gv.at/Geoportale/Geoportale-der-Laender.html</u>
- Geoland
 <u>http://www.geoland.at/</u>

Südburgerland

Geodaten Burgenland <u>https://geodaten.bgld.gv.at/de/home.html</u>

Salzburg

SAGIS Online <u>https://www.salzburg.gv.at/sagismobile/sagisonline</u>

Switzerland

- Kantonale Geoportale <u>https://www.kkgeo.ch/geodaten/kantonale_geoportale</u>
- Geogr. Shop (Central Graubünden geodata platform) <u>https://geogr.mapplus.ch/shop/</u>
- Sweizerische Eidgenossenschaft <u>https://www.geo.admin.ch/it/home.html</u>

Graubünden

Geoportal der kantonalen Verwaltung <u>https://geo.gr.ch/</u>

Germany

Bavaria

- Geodaten Bayern
 <u>https://www.ldbv.bayern.de/produkte/dienste/geodatenonline.html</u>
- Bayern Atlas <u>https://geoportal.bayern.de/bayernatlas/?topic=ba&lang=de&ca-</u> <u>talogNodes=11,122&bgLayer=atkis</u>
- Statistik Bayern <u>https://www.statistikdaten.bayern.de/genesis/online</u>

- Alpen Biotopkartierung <u>https://www.lfu.bayern.de/umweltdaten/geodaten-</u> <u>dienste/pretty_downloaddienst.htm?dld=biotopkartierung</u>
- Umwelt Atlas Bayern <u>https://www.lfu.bayern.de/umweltdaten/kartendienste/um-weltatlas/hinweis_gfa/index.htm?role=bis;%20u.a.</u>

France

- Géoportail <u>https://www.geoportail.gouv.fr/</u>
- Geocatalogue <u>http://www.geocatalogue.fr/</u>

Slovenia

Slovenian Geoportal <u>http://www.geoportal.gov.si/eng/</u>