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GRETA - “GReen infrastructure: Enhancing biodiversity and ecosysTem services for territoriAl development”

Applied Research

Scientific Annexes to the Final Report

Version 30/07/2019

This applied research activity is conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Acknowledgements
We would like to thank the Members of ESPON Contact Points and the Members of ESPON Monitoring Committee for their support. in identifying questionnaire respondents particularly for the policy and governance analysis undertaken at national level and in identifying key stakeholders in the case studies.
We would like to thank the stakeholders in the case studies that generously collaborated with GRETA research and shared their insight into green infrastructure throught the online consultations, phone interviews and meetings.

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Contact: info@espon.eu

ISBN 978-99959-55-36-6

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Annex I: Green Infrastructure and Ecosystem Services Assessment in European Regions and Cities

Annex I-A: Detailed description of the datasets used for mapping Green Infrastructure (GI) at the landscape and city level.

ID	Dataset	Temporal reference	Geographic Coverage	Resolution / Scale	Provider, technical description, and use in the context of GI assessment
1	Natura 2000 Network (N2K)	Annual 2012	EU-28	1: 100 000	European Environment Agency (EEA); The core elements of the potential GI network at the landscape level, i.e. the 'hubs', are the Natura 2000 sites for the year of 2012. The aim of these sites is to ensure the long-term persistence of Europe's most valuable and threatened species and habitats, listed under both the Birds Directive (79/409/EEC, amended as 2009/147/EC) and the Habitats Directive (92/43/EEC). Currently, the Natura 2000 network consists of more than 27,000 sites covering more than 18% of EU land (European Commission, 2016[1]). This coverage is higher in some countries like Spain, where about 27% of the land is covered by Natura 2000 sites (European Commission, 2016). The Natura 2000 sites are a central part of the European GI: they harbour many of Europe's remaining healthy ecosystems and biodiversity. It also provides a legal and organisational framework which can contribute to the long-term security, efficiency and cost-effectiveness of investments in green infrastructure[2]. Therefore, the importance of maintaining, or when possible improving, the connectivity of the Natura 2000 network is well recognized in the

[1] European Commission, 2016. Mid-term Review of the EU Biodiversity Strategy. Available at. Natura 2000 Nature and Biodiversity Newsletter. 39, January 2016. http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/nat39_en.pdf.

[2] http://ec.europa.eu/environment/nature/natura2000/financing/docs/ENV-12-018_LR_Final1.pdf

					Habitats Directive. The EU Member States (MS) are encouraged to conserve or restore the features of the landscape that increase the ecological coherence of the network and allow for the migration, dispersal and genetic exchange of wild species[3] . As the network of Natura 2000 stems from the Birds and Habitats Directives, only the EU MS have designated these areas. Therefore, the geographic coverage is constrained to the EU-28 countries, excluding four countries of the ESPON 2020 Cooperation Programme, namely Iceland, Liechtenstein, Norway and Switzerland, as well as EU Candidate and Potential Candidate Countries. Natura 2000 data is updated and available on a yearly basis since 1994, but only for the countries participating to the EU in each specific year. In 2000, the EU consisted of 15 Member States (EU-15). In 2004, 10 more countries joined (EU-25). In 2007 Bulgaria and Romania accessed (EU-27). Croatia is currently the last country which joined the EU (EU-28).
2	Emerald Network	2011	Switzerland and West Balkan countries	1: 100 000	Council of Europe; The Emerald Network is conceptually similar to the Natura 2000 network, but it incorporates a wider group of countries, including most of the members of the Council of Europe[4]. It is an ecological network of Areas of Special Conservation Interest (ASCIs) set up by the Contracting Parties to the Bern Convention. As the EU is also a signatory to the Bern Convention, the Natura 2000 network is in practice the contribution of the EU to the Emerald Network (Council of Europe, 2010[5]). In Europe, the Emerald Network works as an extension to non-EU countries of Natura 2000: its concept and implementation aims at a high degree of synergy with the latter. However, unlike the more mature Natura 2000, the Emerald Network

[3] Natura 2000 sites, public forests and riparian corridors: The connectivity backbone of forest green infrastructure
[4] EEA report 05/2012
[5] Council of Europe, 2010a, The Emerald Network: A tool to protect Europe´s natural habitats. Council of Europe, 8 pp. (http://www.coe.int/t/dg4/ cultureheritage/nature/EcoNetworks/Documents/ Plaquette_en.pdf).

					is only at the beginning stages of a multi-year process of assessing sites and building out the network[6]. In December 2011, the Standing Committee to the Bern Convention officially nominated as 'Candidate Emerald sites' a number of sites proposed by Switzerland and six West Balkan countries (i.e. Macedonia, Montenegro, Serbia, Albania, Bosnia and Herzegovina, and Kosovo[7]), which are hereafter used as core elements (i.e. 'hubs') of the GI network in those countries.
3	CORINE Land Cover (CLC)	2012	EEA-39	MMU 25 ha; MMW 100m.	European Environment Agency (EEA) under the framework of the Copernicus programme; The 'links' of the GI network at the landscape level can be approximated by specific land use and land cover (LU/LC) classes, as previously proposed by Maes et al. (2015), Mubareka et al. (2013) and Wickham et al. (2010), to cite but a few. At the landscape level, the distribution of potential links is derived from LU/LC classes mapped by the CORINE Land Cover inventory of 2012 at 100m spatial resolution. CLC2012 covers all ESPON countries and provides the most recent and standard wall-to-wall overview of the European landscape elements[8]..
4	High nature value (HNV) farmland	2012	EEA-39	100m	European Environment Agency (EEA); The High Nature Value Farmland map comes from a growing recognition that the conservation of biodiversity in Europe depends on the continuation of low intensity farming systems (Paracchini et al., 2008[9]). The general goal of this data is to estimate the distribution and presence likelihood of HNV farmland across the whole European territory. As similar as

[6] EEA report 05/2012

[7] EEA report 05/2012

[8] Soukop, T., Büttner, G., Feranec, J. et al., 2016a, 'CORINE Land Cover 2012 (CLC2012): Analysis and Assessment', in: Feranec, J., Soukup, T., Hazeu, G. and Jaffrain, G. (eds), *European landscape dynamics. CORINE Land Cover data*, CRC/Taylor & Francis, Boca Raton, Florida, pp. 93-98.

[9] Paracchini, M. L.; Petersen, J.-E.; Hoogeveen, Y.; Bamps, C.; Burfield, I. and van Swaay, C., 2008. High Nature Value Farmland in Europe. An estimate of the distribution patterns on the basis of land cover and biodiversity data. JRC Scientific and Technical Reports. European Communities, Luxembourg.

					for CLC, HNV farmland is mapped for the year of 2012 at 100m spatial resolution. In the context of GI mapping at the regional level, it allows one to remove from the GI analysis all agricultural areas that are intensively managed and do not supply sustainable ecosystem services supporting different policy objectives
5	Copernicus High Resolution Layer (HRL) Imperviousness	2012	EEA-39	20m aggregated to 100m	European Environment Agency (EEA) under the framework of the Copernicus programme; The imperviousness HRL was produced in the framework of the Copernicus program. It captures the spatial distribution of artificially sealed areas, including the level of sealing of the soil (1 – 100%) per area unit. The data layer is used for the EEA indicator on imperviousness and imperviousness change, showing the average annual change in imperviousness for a given reference unit (i.e. per 10 km grid). It was computed for the year of 2012 at a spatial resolution of 20m. It covers all ESPON countries and is used in GRETA to complement the OSM layer, i.e. to identify breaks in the natural and semi-natural 'links' not mapped in the CLC2012.
6	Motorway	2017	Global	Line layer	OpenStreetMap (OSM); OSM is a community project to create free, open data maps of the world. Data is licensed under the Open Data Commons Open Database License. For the purpose of the work developed in the GRETA project, the OSM layer is used to detect thin breaks in the 'links' connecting 'hubs' of the GI network, namely those caused by motorways, as CLC is not able to detect linear features with a width smaller than 100m.
7	Maps of ecosystem services – MAES working group report	2010	EU-28	100 m; 1km; 10km	Maes, J., Fabrega, Domenech N., Zulian, G., Barbonsa, A., Vizcaino, P., Ivits, E., Polce, C., Vandecasteele, I., Mari Rivero, I., Guerra, C., Perpina Castillo, C., Vallecillo, S., Baranzelli, C., Barranco, R., Batista e Silva, F., Jacobs-Crisoni, C., Trombetti, M., and Lavalle, C. (2015). Mapping and Assessment of Ecosystems and their Services: Trends in ecosystems and

	published in 2015				ecosystem services in the European Union between 2000 and 2010. Publications Office of the European Union, Luxemburg; This dataset contains values for 24 indicators of ecosystem services (ES) based on data which were available for the first decade of the 21st century. The indicators are derived from statistical, remote sensing and modelled data collected across the EU-28 MS for the 2010 reference year. These maps have different spatial resolutions, ranging from 100m to 1km and up to 10km, depending on the input data for their computation. The dataset acts as a reference for a set of ecosystem services maps at the EU scale which can be used for further and other assessments and studies.
8	Map of European Ecosystem types (MEE)	2006	EEA-39 (1)	1 ha	European Environment Agency (EEA) in support to EU biodiversity strategy to 2020 Target 2 Action 5; Ecosystem classification for land and freshwater ecosystem types based on EUNIS classification. The data set aims to combine spatially explicit land cover information with non-spatially referenced habitat information to improve our knowledge about ecosystems and their distribution across Europe. In the context of GI mapping, the MEE is used to normalize ES according to ecosystem types.
9	Urban Atlas	2006 2012	EU-28+EFTA + West Balkan and Turkish Cities	0.25-1ha	European Environment Agency (EEA) under the framework of the Copernicus programme (joint initiative of the European Commission Directorate-General for Regional and Urban Policy); The European Urban Atlas provides reliable, inter-comparable, high-resolution land use and land cover data for around 800 Functional Urban Areas (FUA) for the 2012 reference year in EEA39 countries. FUA comprises the local administrative unit (LAU) in which the majority of the population lives in an urban centre of at least 50 000 inhabitants and the respective commuting zone. The Urban Atlas spatial data complement the city statistics collected by

					Eurostat in the framework of the Urban Audit programme. The built-up classes are combined with density information on the level of sealed soil derived from the HRL Imperviousness to provide more detail in the density of the urban fabric. Finally, the Urban Atlas product is complemented and enriched with functional information (road network, services, utilities etc) using ancillary data sources such as local city maps or online map services.. The Urban Atlas is used to map GI and its temporal changes at city level.

Links to datasets and complete technical details:

1.	http://natura2000.eea.europa.eu/ https://bd.eionet.europa.eu/activities/Natura_2000 http://ec.europa.eu/environment/nature/natura2000/data/index_en.htm http://ec.europa.eu/environment/nature/knowledge/rep_habitats/index_en.htm
2.	https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search;jsessionid=4EA941D5564C646D3A911CBF75B0D4BF#/metadata/3b762efd-60fe-447d-99e0-9bdcd00262b7
3.	http://land.copernicus.eu/pan-european/corine-land-cover/view
4.	https://www.eea.europa.eu/data-and-maps/data/high-nature-value-farmland
5.	http://land.copernicus.eu/pan-european/high-resolution-layers/imperviousness/view
6.	https://www.openstreetmap.org
7.	http://data.jrc.ec.europa.eu/collection/maes http://esp-mapping.net/Home/
8.	http://biodiversity.europa.eu/maes/mapping-ecosystems/map-of-european-ecosystem-types https://projects.eionet.europa.eu/eea-ecosystem-assessments/library/draft-ecosystem-map-europe/es_mapping_draft_report-terrestrial-ecosystems
9.	http://land.copernicus.eu/local/urban-atlas

Annex I-B: Ecosystem services description and rationale for including in different policy assessments. All datasets collected from the work of Maes, Fabrega et al. (2015).

Ecosystem Service	Description	Contribution to biodiversity sector	Contribution to climate change and disaster risk reduction sector	Contribution to water management sector
Gross Nutrient Balance (GNB)	The GNB (ton/hectare) includes Nitrogenous Emissions from livestock production and the application of manure and fertilizers. These nitrogenous emissions include: - Ammonia (NH3) contributing to acidification, eutrophication and atmospheric particulate pollution, and - Nitrous oxide (N2O), a potent greenhouse gas contributing to global warming.		The closer the balance goes towards 0, the higher the contribution to mitigate global warming, as no nitrogenous gases are emitted.	
Habitat Quality index (HQi)	The HQi expresses the relative species richness of common birds as a ratio between local and regional species richness (Dimensionless, 0-1).	The higher the richness of species, the more biodiversity.		
Net Ecosystem Productivity (NEP)	Measure of standing biomass (Dimensionless, 0-1).	Recent experiments have found that NEP is also a function of plant species richness and functional diversity. The higher the NEP, the more biodiversity.	The higher the productivity, the more carbon can be absorbed.	
Relative Pollination (RP)	Index of relative pollination potential, which is defined as the relative potential or relative capacity of ecosystems to support crop pollination (Dimensionless, 0-1).	The higher the model values, the higher quality of natural habitats, in particular forest edges, grasslands rich in flowers and riparian areas, which offer suitable sites for wild pollinator insects.		

Soil Erosion Control (SEC)	Capacity of ecosystems to avoid soil erosion (Dimensionless, 0-1).		The less erosion, the lower nutrient input and risk of water pollution, eutrophication.
Water Purification (WP)	In-stream nitrogen retention efficiency (Dimensionless, 0-1).		The more retention efficiency, the higher capacity of biota in biochemical and physicochemical processes to remove wastes and pollutants from the aquatic environment.
Water Retention Index (WRI)	Composite indicator developed to assess the capacity of the landscape to regulate and retain water passing through it (Dimensionless, 0-10).	The more capacity to retain water, the lower probability of natural hazards, such as floods and droughts.	The more capacity to retain water, the higher capacity to groundwater recharge and lower water runoff, which reduces downstream pollution and poor water quality.
Recreation Potential (RecPot)	Potential for citizens outdoor recreation (Dimensionless, 0-1).	Assessment of potential GI functional performance for human wellbeing. The higher the values of the indicator, the more capacity of the GI to contribute to human health and quality of life.	

Annex I-C: Protocol for mapping a potential GI network serving multiple land use for the land.

This annex presents in full detail the steps of the methodological approach described in subsection 3.1 (Final main Report), which was used to map the spatial distribution of the physical GI network at the landscape level (see glossary of terms in the Final main Report for a definition), as well as the methodological approach to evaluate the potential of the physical GI network to provide multiple Ecosystem Services (ES) that support the implementation of the selected sectoral policies within the whole ESPON MS. Since the potential GI network is derived from the combination of two steps, i.e. Physical Mapping (PM) and Ecosystem Service Mapping (ESM), this annex is further divided into two subsections addressing each step.

Annex I. C-1. – Introduction to the methodological approach to map Green Infrastructure

The two steps (PM and ESM) of the methodological approach aim at integrating the two key underlying principles of a GI network, as defined by the EC (2013) and similarly stressed by other authors (e.g. Mell 2017) – *connectivity* and *multifunctionality*. These concepts are interrelated in a hierarchical manner. *Connectivity* comes first and refers to the enhancement of species' ability to move between areas, and can be of a structural nature (i.e. habitat continuity) or functional nature (i.e. how landscapes allow various species to move and expand to new areas without necessarily being physically connected) (Baro et al. 2015). Generally, two main components are identified to promote connectivity: *hubs* and *links*. Hubs are areas of known ecological value that act as an 'anchor' for a variety of ES, which also provide source and sink habitats for species dispersing through the landscape (Benedict and McMahon 2002; Wickham et al. 2010). Links are the corridors that connect the ecosystems together, facilitating the movement of species and the flow of ecological processes that benefit human well-being (Lafortezza et al. 2013). Links can embrace natural and semi-natural areas, forests of all types, pasture lands, agriculture lands, wetlands, rivers and all space that is either low-intensity or free from human use, with or without vegetation cover, provided those areas are biodiversity rich and managed in a way that provides multiple ES. In the framework of GRETA, connectivity is addressed by means of the Physical Mapping (PM) approach.

Multifunctionality, on the other hand, represents the ability of the GI elements (i.e. hubs and links) to simultaneously provide multiple ES and other benefits in the same spatial area (Mell, 2017). This could constitute, for example, a park with many trees within a densely populated urban area that offers aesthetic appeal, cools the microclimate, provides a recreational opportunity and serves to functionally connect habitats for certain species. Multifunctionality relates to potential use of the land with a focus on multiple purposes, either within a single policy sector or across policy sectors and human activities (economic, social and cultural). The potential multifunctional use of the land can be approximated by the number of ES supplied by the GI network at each locale, as each ES is supporting one or more policy demands. For example, the capacity of ecosystems to regulate and retain water passing through a specific geographical area determines the probability of occurrence of natural hazards (e.g. floods), but also impacts on water quality and downstream pollution. Therefore, an ecosystem providing a single ES might potentially supply the conditions for multifunctional uses of the land. In the framework of GRETA, multifunctionality is addressed by means of the Ecosystem Service Mapping (ESM) approach.

The two-step methodological approach presented in GRETA is relative and scalable (i.e. it can be applied at different spatial scales, targeting different policies, be built upon many different ES, and the outputs can be standardized for different regions), and depends mainly on the availability of spatial data at the requested resolution for the analysis. In the context of GRETA project, used datasets are standardized at European scale and provide homogeneous information for comparing the outputs across all ESPON MS. Still, at the national and local scales, more detailed datasets can be used (when available) for planning activities.

Annex I. C-2. – Methodological approach to physical Green Infrastructure assessment

The physical assessment of GI relates to the identification and mapping of ecological networks. As already mentioned, the two primary elements of an ecological network are 'hubs' and 'links', as described in Section 3 of the Final (main) Report. Hubs are natural and semi-natural areas of known ecological value, and links are the natural and semi-natural corridors connecting the hubs together. A set of at least two hubs connected by one or more links constitutes a potential GI (sub-)network (as shown in Figure 6 Section 3 of the Final (main) Report).

The methodological approach to assess the spatial distribution of a physical GI network can be further divided in three sub-steps (Figure 1):

a) Identification and mapping of 'links' (Panels A-D);
b) Identification and mapping of 'hubs' (Panel E);
c) Integration of 'hubs' and 'links' into a potential physical GI network (Panels F-G).

¡Error! No se encuentra el origen de la referencia. describes the mapping process of the physical GI network at the landscape level (see glossary of terms in the Final main Report for a definition). The maps in **¡Error! No se encuentra el origen de la referencia.** are snapshots of the input data at their original spatial resolution (see Annex I-A for details). It focuses on a geographical area covering one of the case studies of this project, i.e. the Euroregion Nouvelle Aquitaine, Euskadi, Navarra. Figure 1 contains a legend that helps the reader to individualize the different steps described along the following subsections.

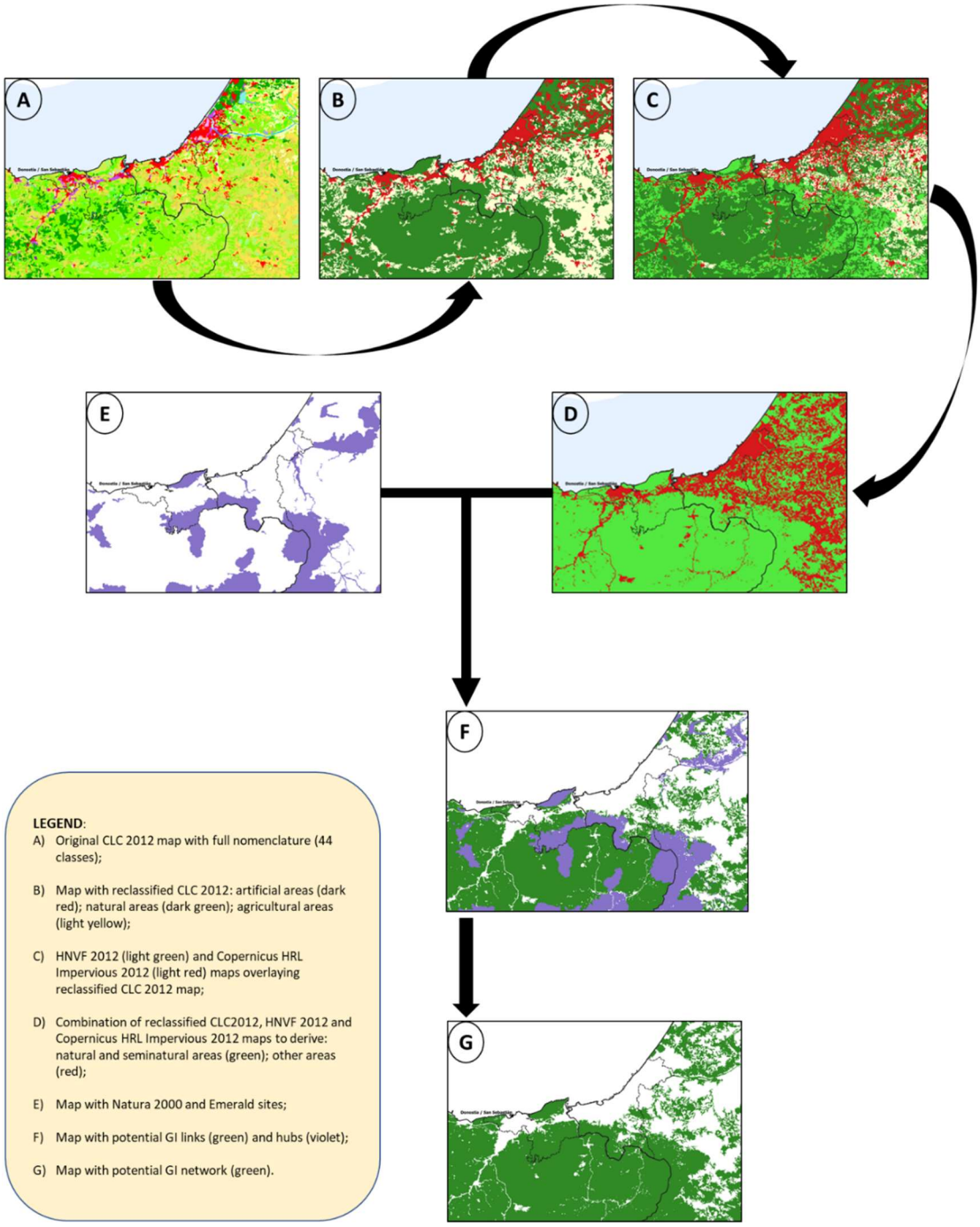


Figure 1 Input data and steps of the methodological approach for mapping the spatial distribution of a physical GI network at landscape level. The maps cover the region of the case study "Euroregion Nouvelle Aquitaine, Euskadi, Navarre".

Identification and mapping of 'links' (Panels A-D)

The choice of the 'links' to be included in the potential GI network depends on the land use and land cover classes that fit to the working definition of GI (see definition in glossary of terms in the Final (main) report): "natural and semi-natural areas with other environmental features". The CORINE Land Cover map of 2012 (CLC2012) at 1ha spatial resolution was used as a primary layer to identify potential GI 'links' in the European landscape (Panel A). This layer covers all ESPON countries and provides the most recent and standard wall-to-wall overview of the European landscape elements.

Following the approach to physical GI mapping proposed by Maes, Barbosa et al. (2015), all impervious areas (i.e. those mapped in CLC Level 1 class 1, HRL Imperviousness elements and OSM Motorways – see Annex I-A for description of datasets) were not included in the physical GI network at the landscape level (Panel B), as these act as fragmentation elements that have a barrier effect on the spatial distribution of the potential GI patches. Similarly, all arable land (rainfed and irrigated) and vineyards were not considered as elements of the physical GI network (Panel B). These classes are intensively managed, which drastically diminishes the capacity of the corresponding ecosystems to supply ES (Maes, Barbosa et al., 2015). Other permanent crops and pastures that are classified as 'High Natural Value Farmlands' (Paracchini et al., 2008) were selected as part of the potential GI network at the landscape level (Panel C). Finally, the remaining natural and semi-natural landscape features (as classified in the CLC nomenclature) were selected and used to identify all possible contiguous spatial 'links' between the GI 'hubs', i.e. the Natura 2000 and Emerald Network sites (Panel D).

Identification and mapping of 'hubs' (Panel E)

In the framework of GRETA, the 'hubs' of the physical GI network at the landscape level are the Natura 2000 and the Emerald Network sites (Panel E).

Mapping of the physical Green Infrastructure network

The physical GI network is then mapped by merging all 'links' connecting two or more 'hubs' (Panel F); all the remaining 'hubs' and 'links' are not considered as part of the potential physical GI network, except in the case that their total area is larger than 10 km^2 (Panel G). Verboom et al. (2014) have shown that an area larger than 10km^2 allows landscape elements to maintain habitats and ecosystems that provide sustainable services and therefore can be considered as part of a physical GI network at the landscape level.

Annex I. C.3 – Methodological approach to multifunctional Green Infrastructure assessment

To assess the functional performance of the physical GI network, i.e. the capacity of the network to provide multiple services or support multiple uses simultaneously in the same geographical area, we followed an ESM framework, which can be further divided into the following sub-steps (Figures 2 and 3):

a) Identification of ES that contribute to the implementation of a specific policy sector(Panel A, Figure 2);

b) Normalization of ES (statistical analysis not shown);

c) Multifunctional assessment of the physical GI network for a single policy framework (Panel B and C, Figure 2; three top panels Figure 3);

d) Multifunctional assessment of the physical GI network for multiple policy frameworks (Figure 3, bottom panel).

Figures 2 and 3 show input ES maps at their original spatial resolution and the output maps of potential GI networks supporting the goals of single and multiple policy sector at 1ha spatial resolution. **¡Error!**

No se encuentra el origen de la referencia. contains a legend that helps the reader to individualize the different steps described along the following subsections.

Identification of Ecosystem Services that contribute to the implementation of a specific policy framework (Panel A, Figure 2)

In the framework of GRETA, ES were selected as proxies to evaluate the potential of the physical GI to serve the implementation of a specific policy sector– see Annex I-B for a full description of ES selected within each policy framework. For each policy framework, three ES were selected from the MAES database. ES may serve only a single policy sector, but there are ES providing one or more benefits to human well-being and the environment. In these cases, ES serve as a proxy for the capacity of the network to fulfil multiple goals of different policy frameworks (e.g. Water Retention Index that serves simultaneously the goals of the water management sector and climate change and disaster risk reduction). As an example to illustrate this concept, the multifunctional assessment of a potential GI network serving the purposes of biodiversity policies may consider the capacity of ecosystems to maintain sustainable habitats for animals (ES Habitat Quality), insects (ES Relative Pollination) and plants (ES Net Ecosystem Productivity). Figure 2 (Panel A), shows snapshots of these ES maps at their original spatial resolution for the example case.

Normalization of Ecosystem Services by ecosystem type

The ES described in Annex I-B strongly differ in the units, range of output values and spatial resolution. Therefore, to enable the analysis of the functional performance of the physical GI network serving different policies at each geographic location, the ES maps were made consistent by aggregation to a common spatial resolution and normalizing of their values to a common range and unit.

First, selected ES were converted to a spatial resolution of 1ha, the same resolution of the physical GI map (Figure 2, Panel B). In the sequence, a threshold approach was used to normalize the values of ES to a common scale (Byrnes et al. 2014). The threshold approach aims at reclassifying the original values of the ES into categorical classes describing the “potential” of the ecosystem to provide a service at high or low level (Byrnes et al. 2014; de la Fuente et al. 2018), i.e. if its values for a specific geographical area exceed (or in opposition fall below) some pre-defined threshold of ‘functionality’ for the respective ecosystem type. In the framework of GRETA, to evaluate whether an ES is performing at high (respectively low) level in a geographical area, we selected the median of the ES for each ecosystem type across the EU. For example, if a forest element has an ES value above the median of all forest elements in the landscape, then it is reclassified into a high level performing categorical class; otherwise it is classified in the low-level categorical class.

The Map of European Ecosystem types (see Annex 1-A for a reference) was used as a reference for reclassifying ES indicators at each location into the two performing classes, i.e. above or below the median. The ecosystems considered for this statistical analysis were: 'Coastal', 'Inland water', 'Wetlands', 'Grassland', 'Heathland and shrub', 'Woodland and forest', and 'Sparsely vegetated land'. We intentionally used a standard statistical threshold (i.e. the median) to perform the normalization of ES indicators within each ecosystem type because at the EU landscape level it is impractical and almost

inaccessible to determine local thresholds that fit the condition of each ecosystem. Still, at the local level the threshold can be fine-tuned using expert knowledge about the ecosystem condition and fine-tune the quality of the results.

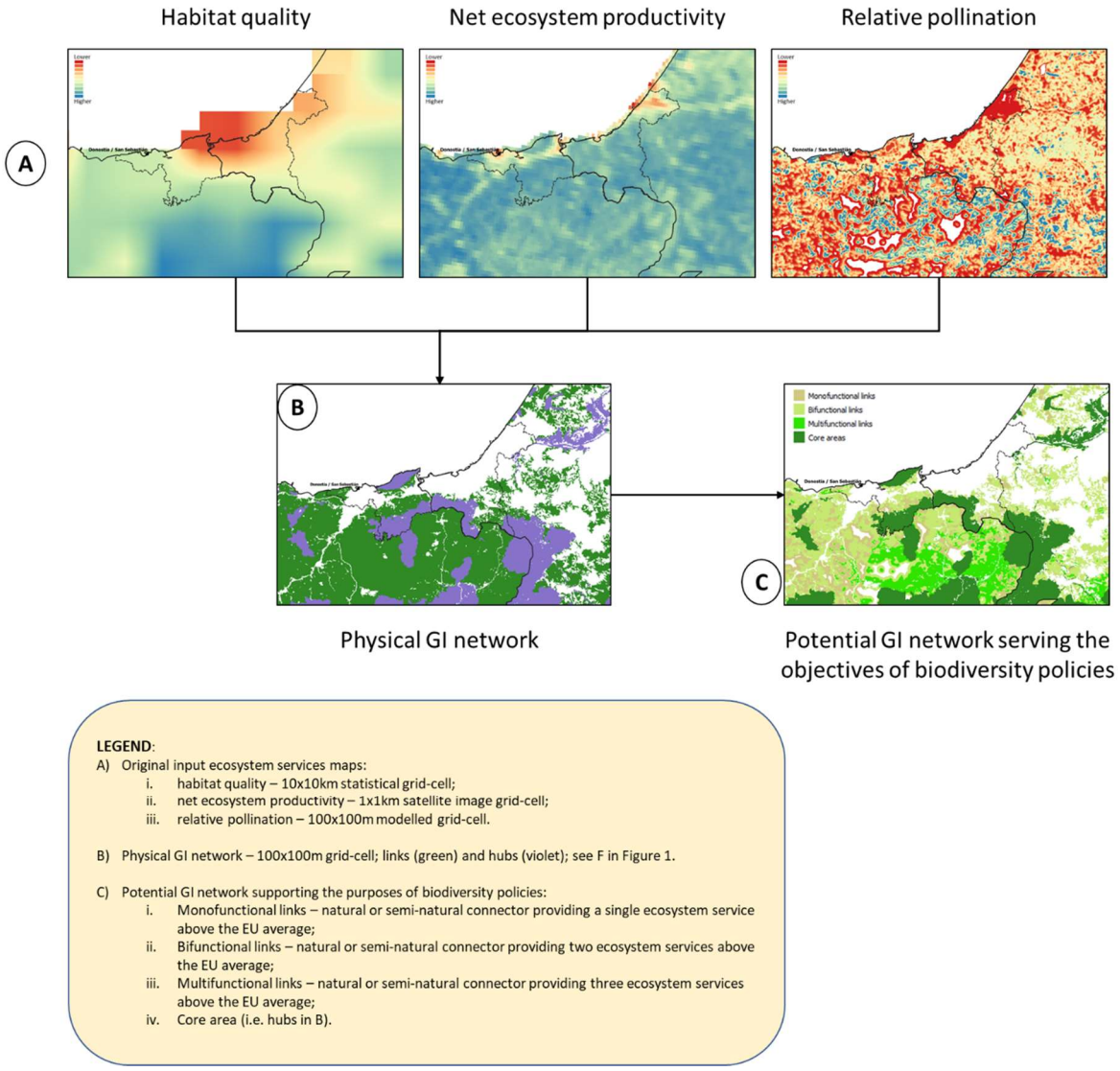


Figure 2 Input data and methodological approach to map the spatial distribution of a functional GI network at landscape level. The maps cover the region of the case study "Basque Bayonne-San Sebastián Eurocity".

Multifunctional assessment of Green Infrastructure for a single policy sector

Multifunctionality in the context of a specific policy framework is defined as the simultaneous performance of multiple ES in the same geographical area. Therefore, to assess the functional performance of the physical network in supporting a specific policy sector at each geographical area, we summed up the number of ES that were reclassified into the high-level performance categorial class, as described in the previous subsection. Since we have considered three ES serving as input for this analysis, the sum of maps results in final values ranging from zero to three. The highest sums (i.e. a value of 3) represent the highest combined capacity of the physical GI network to deliver multiple ES serving a specific policy sector across EU-28 (see Figure 2, panel C, for the Biodiversity example covering the region of the case study "Basque Bayonne-San Sebastián Eurocity"). For each of the three

policy frameworks, i.e. biodiversity, climate change and disaster risk reduction (CC&DRR), and water management, a final categorical map representing the potential of the physical GI network to provide multiple services supporting the purposes of a specific policy across the EU-28 is derived (Figure 3, top 3 panels, shows a snapshot of the full European map for the region of the case study "Euroregion Nouvelle Aquitaine, Euskadi, Navarre"). The final maps for each policy are categorized into 4 main classes, as described in Table 1). The services provided by core areas are not evaluated, as these have already been recognized as having exceptional importance for habitats and ecosystems and are protected by EU legislation[10]. Although the designation of these sites does not automatically guarantee that their conservation status is favourable (e.g. there are Natura 2000 sites that cover artificial areas), it is a valuable first step towards maintaining and/or improving the services that natural habitats and ecosystems can potentially provide.

Table 1 Classes of the potential GI networks maps serving the purposes of individual policies.

Potential GI network class	**Class description**
Monofunctional link	GI connector providing 1 ecosystem service above the median;
Bifunctional link	GI connector providing 2 ecosystem services above the median;
Multifunctional link	GI connector providing 3 ecosystem services above the median;
Core area	'Hub' of the GI network.

Multifunctional assessment of Green Infrastructure for multiple policy frameworks

Multifunctionality in the context of multiple policy sectors is a bivariate and defined as the simultaneous performance of multiple ES serving the purposes of multiple policies in the same geographical area. This performance can be assessed by assembling together the three individual maps of potential GI network serving the purposes of single policy sectors, i.e. biodiversity, CC&DRR, and water management (Figure 3, top 3 panels). The final overview map consists of seven classes, as presented in Table 2 (Figure 3 bottom panel).

Table 2: Classes of the potential GI network map serving the purposes of multiple policies.

Potential GI network class	**Class description**
Monofunctional link serving a single policy	GI connector providing 1 ecosystem service above the median for one policy;
Bifunctional link serving a single policy	GI connector providing 2 ecosystem services above the median for one policy;
Multifunctional link serving a single policy	GI connector providing 3 ecosystem services above the median for one policy;
Monofunctional link serving multiple policies	GI connector providing 1 ecosystem service above the median for two or more policies;
Bifunctional link serving multiple policies	GI connector providing 2 ecosystem services above the median for two or more policies;
Multifunctional link serving multiple policies	GI connector providing 3 ecosystem services above the median for two or more policies;
Core area	'Hub' of the GI network.

[10] http://ec.europa.eu/environment/nature/natura2000/financing/docs/ENV-12-018_LR_Final1.pdf

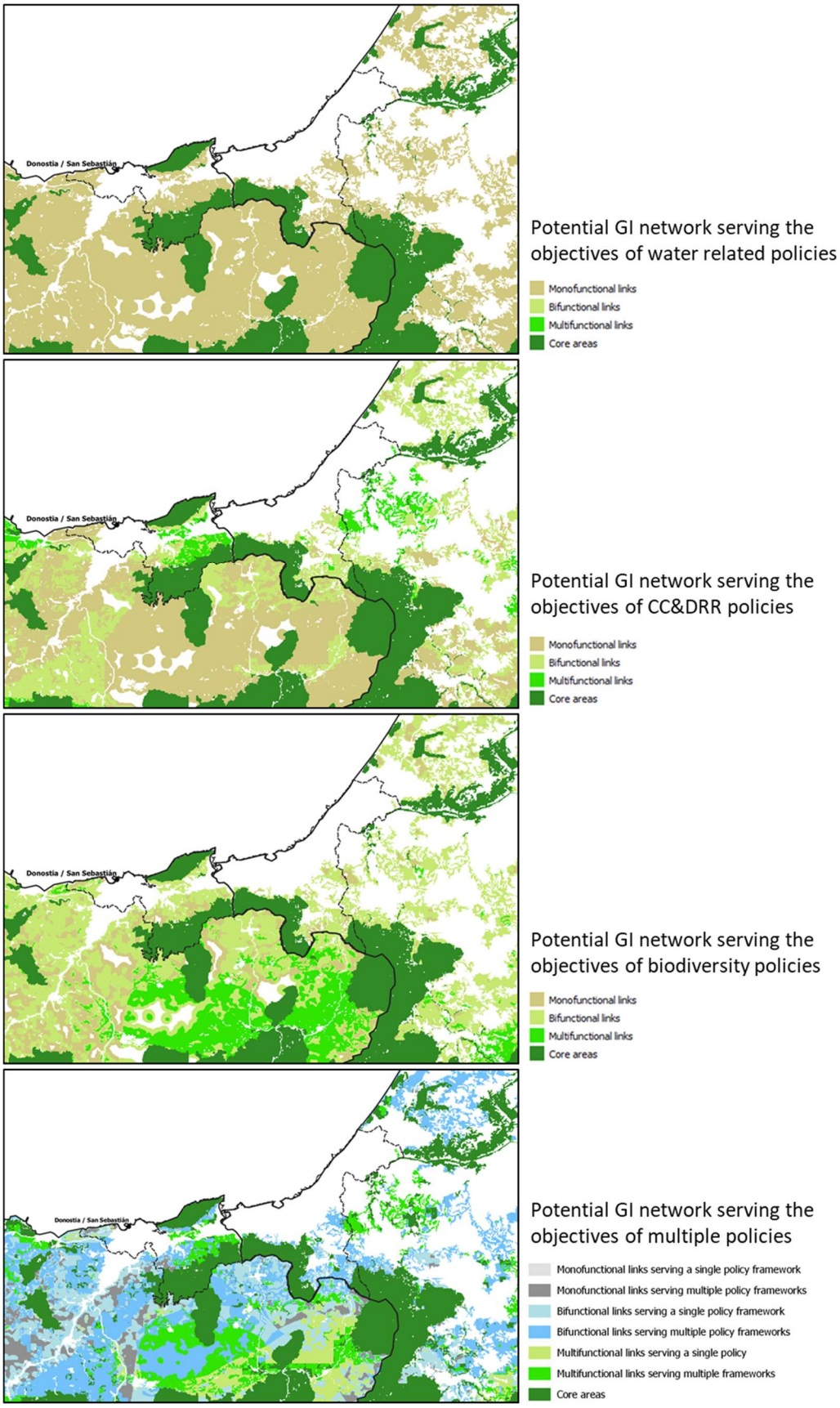
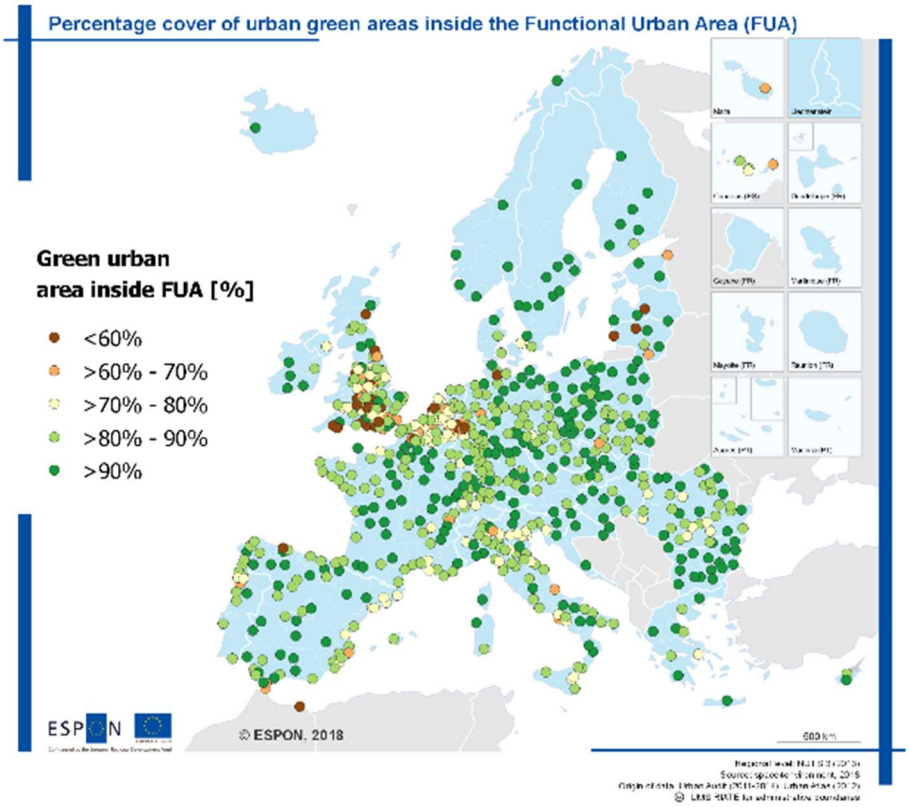
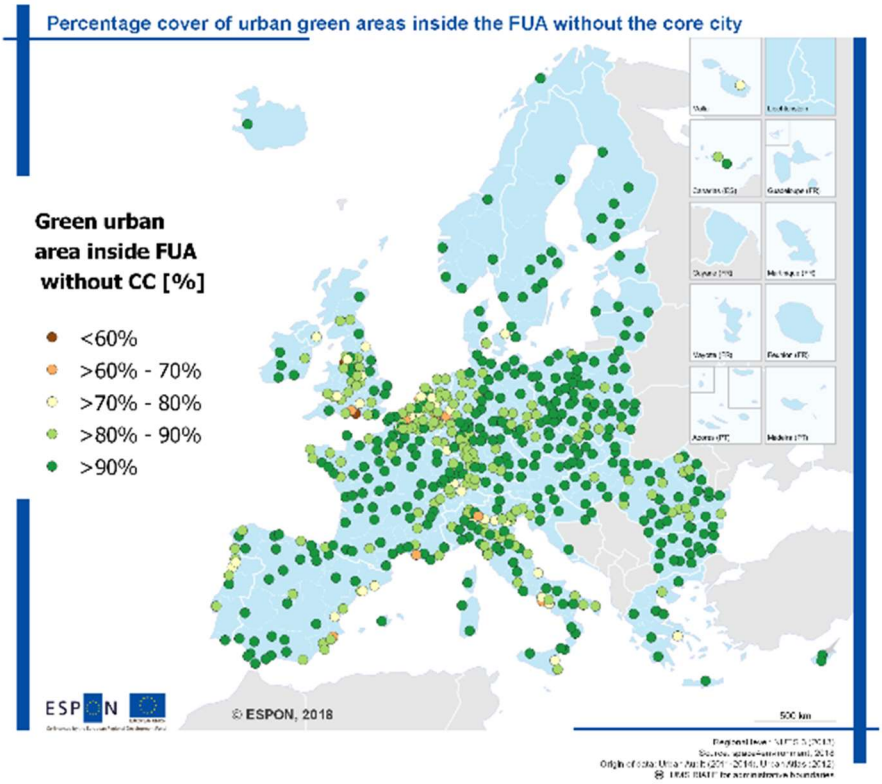


Figure 3 Spatial distribution of a functional GI network at landscape level for single policy frameworks and for multiple policy frameworks. The maps cover the region of the case study "Euroregion Nouvelle Aquitaine, Euskadi, Navarre".

Annex I-D: Additional overview maps



Map 1 Percentage cover of urban green areas inside the Functional Urban Area (FUA).



Map 2 Percentage cover of urban green areas inside the FUA without the core city

Annex I-E: List of core cities and FUAs including parameter values

Table 3: List of core cities with parameter values: share of GUA within the core city, share of N2K sites within the core city; changes in [%]); and categories.

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
AT001C1	Wien	AT130	414.85	53.75	13.34	-0.36	stable
AT002C1	Graz	AT221	127.43	55.90	0.00	-0.49	stable
AT003C1	Linz	AT312	96.05	52.61	6.96	-0.26	stable
AT004C1	Salzburg	AT323	65.61	52.60	0.08	0	stable
AT005C1	Innsbruck	AT332	104.83	80.17	47.56	-0.26	stable
AT006C1	Klagenfurt	AT211	120.15	73.95	0.62		
BE001C1	Bruxelles / Brussel	BE100	162.47	34.49	14.11	-0.42	stable
BE002C1	Antwerpen	BE211	203.92	39.00	8.78	-0.82	slight decrease
BE003C1	Gent	BE234	157.85	45.80	0.39	0.05	stable
BE004C1	Charleroi	BE322	102.97	33.74	0.02	-1.04	slight decrease
BE005C1	Liège	BE332	178.52	46.66	2.17	-0.43	stable
BE006C1	Brugge	BE251	139.19	62.02	15.90	-0.69	slight decrease
BE007C1	Namur	BE352	176.13	80.72	3.66	-0.17	stable
BE008C1	Leuven	BE242	57.62	56.75	12.14		
BE009C1	Mons	BE323	147.79	73.32	7.99		
BE010C1	Kortrijk	BE254	80.84	62.43	0.00		
BE011C1	Oostende	BE255	38.08	45.69	3.34		
BG001C1	Sofia	BG411	450.02	62.33	13.05	-0.64	slight decrease
BG002C1	Plovdiv	BG421	101.89	55.99	6.97	-1.11	slight decrease
BG003C1	Varna	BG331	154.00	59.25	32.35	-0.58	slight decrease
BG004C1	Burgas	BG341	255.37	83.02	43.36	-0.78	slight decrease
BG005C1	Pleven	BG314	85.11	77.59	8.65		
BG006C1	Ruse	BG323	129.65	78.05	2.73	-0.29	stable
BG007C1	Vidin	BG311	63.35	76.97	6.37	-0.99	slight decrease
BG008C1	Stara Zagora	BG344	85.15	74.27	0.03	-0.27	stable
BG009C1	Sliven	BG342	194.13	86.74	41.54		
BG010C1	Dobrich	BG332	109.02	81.60	0.61		
BG011C1	Shumen	BG333	136.07	85.75	21.24		
BG012C1	Pernik	BG414	85.40	69.48	2.61	-0.63	slight decrease
BG013C1	Yambol	BG343	90.67	81.45	20.11		
BG014C1	Haskovo	BG422	96.01	84.53	5.49		
BG015C1	Pazardzhik	BG423	37.50	68.34	19.74		
BG016C1	Blagoevgrad	BG413	28.82	66.88	0.04		
BG017C1	Veliko Tarnovo	BG321	30.19	69.92	39.99		
BG018C1	Vratsa	BG313	148.45	89.84	27.87		
CH001C1	Zürich	CH040	88.40	48.05			
CH002C1	Genève	CH013	15.99	33.25			
CH003C1	Basel	CH031	23.96	22.92			
CH004C1	Bern	CH021	51.79	64.35			
CH005C1	Lausanne	CH011	41.48	71.03			
CH006C1	Winterthur	CH040	68.03	73.65			
CH007C1	St. Gallen	CH055	39.57	70.49			
CH008C1	Luzern	CH061	29.47	63.10			
CH009C2	Lugano	CH070	76.65	78.41			
CH010C1	Biel/Bienne	CH021	21.16	60.26			
CY001C1	Lefkosia	CY000	205.86	59.82	0.00	-1.19	slight decrease
CY501C1	Lemesos	CY000	211.87	70.17	0.48		
CZ001C1	Praha	CZ010	496.34	56.06	1.80	-1.07	slight decrease
CZ002C1	Brno	CZ064	230.21	64.25	5.33	-0.71	slight decrease
CZ003C1	Ostrava	CZ080	214.18	56.81	6.84	-0.31	stable
CZ004C1	Plzeň	CZ032	137.65	67.87	0.16	-0.71	slight decrease
CZ005C1	Ústí nad Labem	CZ042	93.97	71.73	0.00	-0.84	slight decrease
CZ006C1	Olomouc	CZ071	103.34	70.69	7.50	-0.43	stable
CZ007C1	Liberec	CZ051	106.06	69.75	0.00	-0.58	slight decrease
CZ008C1	České Budějovice	CZ031	55.61	59.04	13.55	-0.97	slight decrease
CZ009C1	Hradec Králové	CZ052	105.70	71.10	4.18	-0.67	slight decrease
CZ010C1	Pardubice	CZ053	82.66	67.03	0.42	-1	slight decrease
CZ011C1	Zlín	CZ072	118.89	80.37	0.00	-0.46	stable
CZ012C1	Kladno	CZ020	36.97	57.61	1.46	-1.53	slight decrease
CZ013C1	Karlovy Vary	CZ041	59.10	76.58	7.00	-0.17	stable
CZ014C1	Jihlava	CZ063	87.87	81.58	2.67	-1.12	slight decrease

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
CZ015C1	Havířov	CZ080	32.07	56.52	0.32	0.24	stable
CZ016C1	Most	CZ042	86.98	72.41	3.32		
CZ017C1	Karviná	CZ080	57.53	69.80	4.21	-0.97	slight decrease
CZ018C2	Chomutov-Jirkov	CZ042	46.37	67.04	15.15		
DE001C1	Berlin	DE300	891.85	46.19	7.01	-0.21	stable
DE002C1	Hamburg	DE600	753.16	50.63	9.26	-0.03	stable
DE003C1	München	DE212	311.28	38.24	4.34	-0.21	stable
DE004C1	Köln	DEA23	406.68	51.51	6.42	-0.42	stable
DE005C1	Frankfurt am Main	DE712	248.32	52.15	5.02	-0.97	slight decrease
DE006C1	Essen	DEA13	210.60	45.71	0.81	0	stable
DE007C1	Stuttgart	DE111	209.95	55.56	11.01	-0.07	stable
DE008C1	Leipzig	DED51	298.75	58.61	11.37	-0.71	slight decrease
DE009C1	Dresden	DED21	328.01	62.56	7.55	-0.27	stable
DE010C1	Dortmund	DEA52	279.80	49.43	0.00	-0.2	stable
DE011C1	Düsseldorf	DEA11	217.75	51.54	4.03	-0.39	stable
DE012C1	Bremen	DE501	325.40	53.21	23.12	-0.66	slight decrease
DE013C1	Hannover	DE929	204.09	48.37	4.25	-0.67	slight decrease
DE014C1	Nürnberg	DE254	184.09	47.06	13.62	-0.11	stable
DE015C1	Bochum	DEA51	144.63	40.84	0.00	-0.09	stable
DE017C1	Bielefeld	DEA41	259.10	63.63	3.63	-0.79	slight decrease
DE018C1	Halle an der Saale	DEE02	135.77	59.83	15.50	-0.59	slight decrease
DE019C1	Magdeburg	DEE03	200.59	67.19	12.11	-0.7	slight decrease
DE020C1	Wiesbaden	DE714	203.82	69.69	20.55	-0.17	stable
DE021C1	Göttingen	DE915	116.75	74.91	18.97	-0.18	stable
DE022C1	Mülheim a.d.Ruhr	DEA16	91.25	53.53	1.51	0	stable
DE023C1	Moers	DEA1F	68.38	54.88	0.05	0.14	stable
DE025C1	Darmstadt	DE711	123.35	72.27	23.48	-0.15	stable
DE026C1	Trier	DEB21	116.13	73.67	4.98	-0.2	stable
DE027C1	Freiburg im Breisgau	DE131	154.32	74.87	23.76	-0.39	stable
DE028C1	Regensburg	DE232	79.68	50.59	2.81	-0.76	slight decrease
DE029C1	Frankfurt (Oder)	DE403	147.82	83.39	8.87	-0.45	stable
DE030C1	Weimar	DEG05	84.42	77.59	21.57	-0.44	stable
DE031C1	Schwerin	DE804	129.93	77.98	31.82	-0.42	stable
DE032C1	Erfurt	DEG01	271.04	76.50	17.46	-0.5	stable
DE033C1	Augsburg	DE271	146.46	63.71	15.54	-0.09	stable
DE034C1	Bonn	DEA22	141.86	55.70	21.47	-0.05	stable
DE035C1	Karlsruhe	DE122	174.08	62.05	25.47	-0.21	stable
DE036C1	Mönchengladbach	DEA15	170.94	57.91	0.58	-0.37	stable
DE037C1	Mainz	DEB35	97.66	58.31	8.37	-0.24	stable
DE039C1	Kiel	DEF02	112.26	52.21	1.11	-0.19	stable
DE040C1	Saarbrücken	DEC01	168.88	68.90	17.78	-0.26	stable
DE041C1	Potsdam	DE404	187.34	77.16	10.94	-0.32	stable
DE042C1	Koblenz	DEB11	106.02	67.76	16.32	-0.36	stable
DE043C1	Rostock	DE803	169.09	70.37	20.86		
DE044C1	Kaiserslautern	DEB32	140.49	79.31	4.07		
DE045C1	Iserlohn	DEA58	125.33	78.73	0.03		
DE046C1	Esslingen am Neckar	DE113	46.64	62.67	1.50	-0.08	stable
DE047C1	Hanau	DE719	77.14	66.67	10.28	-0.36	stable
DE048C1	Wilhelmshaven	DE945	107.54	66.17	5.92		
DE049C1	Ludwigsburg	DE115	43.11	58.57	1.62	-0.57	slight decrease
DE050C1	Tübingen	DE142	107.93	84.57	49.44		
DE051C1	Villingen-Schwenningen	DE136	165.05	85.04	49.76		
DE052C1	Flensburg	DEF01	49.22	51.20	4.57		
DE053C1	Marburg	DE724	124.40	84.92	7.51		
DE054C1	Konstanz	DE138	54.06	76.23	52.55		
DE055C1	Neumünster	DEF04	71.44	57.36	3.60		
DE056C1	Brandenburg an der Havel	DE401	229.36	85.25	29.55		
DE057C1	Gießen	DE721	72.81	67.82	7.63		
DE058C1	Lüneburg	DE935	71.09	67.80	6.16		
DE059C1	Bayreuth	DE242	66.99	71.04	2.55		
DE060C1	Celle	DE931	176.41	79.54	5.91		
DE061C1	Aschaffenburg	DE261	61.98	68.37	7.67		
DE062C1	Bamberg	DE241	54.95	60.82	10.34		
DE063C1	Plauen	DED44	101.55	81.85	4.21		
DE064C1	Neubrandenburg	DE802	85.72	77.77	41.99		

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
DE065C1	Fulda	DE732	103.69	77.49	3.48		
DE066C1	Kempten (Allgäu)	DE273	63.21	72.57	0.00		
DE067C1	Landshut	DE221	66.15	73.75	7.35		
DE068C1	Sindelfingen	DE112	50.75	68.41	9.71	-0.89	slight decrease
DE069C1	Rosenheim	DE213	36.43	62.83	4.58		
DE070C1	Frankenthal (Pfalz)	DEB31	43.78	70.35	0.41		
DE071C1	Stralsund	DE805	39.39	59.21	2.93		
DE072C1	Friedrichshafen	DE147	70.11	73.49	2.67		
DE073C1	Offenburg	DE134	77.86	76.08	20.93		
DE074C1	Görlitz	DED2D	67.49	75.43	8.44		
DE075C1	Sankt Augustin	DEA2C	34.26	52.08	4.01	0.05	stable
DE076C1	Neu-Ulm	DE279	80.89	77.75	6.02		
DE077C1	Schweinfurt	DE262	35.46	55.78	13.29		
DE078C1	Greifswald	DE801	50.99	71.58	19.01		
DE079C1	Wetzlar	DE722	76.08	75.21	3.67		
DE080C1	Speyer	DEB38	42.84	63.00	31.04		
DE081C1	Passau	DE222	70.28	76.55	7.57		
DE082C1	Dessau-Roßlau	DEE01	246.26	85.80	21.87		
DE501C1	Duisburg	DEA12	232.83	49.80	6.16	-0.06	stable
DE502C1	Mannheim	DE126	145.19	51.25	11.87		
DE503C1	Gelsenkirchen	DEA32	105.45	42.27	0.00	-0.06	stable
DE504C1	Münster	DEA33	303.52	75.60	5.69		
DE505C1	Chemnitz	DED41	221.38	70.95	0.59		
DE506C1	Braunschweig	DE911	192.31	65.01	7.36		
DE507C1	Aachen	DEA2D	164.00	68.77	1.02		
DE508C1	Krefeld	DEA14	136.79	58.15	2.86		
DE509C1	Oberhausen	DEA17	77.43	38.19	5.35	0.01	stable
DE510C1	Lübeck	DEF03	211.87	71.49	10.41		
DE511C1	Hagen	DEA53	160.77	68.34	1.09	-0.15	stable
DE513C1	Kassel	DE731	104.54	56.45	21.09		
DE514C1	Hamm	DEA54	227.65	71.00	4.14	-0.17	stable
DE515C1	Herne	DEA55	51.32	32.73	0.00	-0.01	stable
DE516C1	Solingen	DEA19	89.41	60.85	4.46		
DE517C1	Osnabrück	DE944	120.17	58.46	0.60		
DE518C1	Ludwigshafen am Rhein	DEB34	77.86	49.56	0.92		
DE519C1	Leverkusen	DEA24	78.87	50.59	0.13	-0.17	stable
DE520C1	Oldenburg (Oldenburg)	DE943	103.68	50.28	5.10		
DE521C1	Neuss	DEA1D	98.69	58.97	2.37	-0.76	slight decrease
DE522C1	Heidelberg	DE125	109.26	75.55	21.24		
DE523C1	Paderborn	DEA47	179.74	68.04	5.40		
DE524C1	Würzburg	DE263	87.78	64.77	7.32		
DE525C1	Recklinghausen	DEA36	66.52	52.94	0.19	-0.3	stable
DE526C1	Wolfsburg	DE913	204.88	77.27	18.03		
DE527C1	Bremerhaven	DE502	77.20	56.55	12.26		
DE528C1	Bottrop	DEA31	99.72	61.88	4.26	0.08	stable
DE529C1	Heilbronn	DE117	100.53	71.48	10.43		
DE530C1	Remscheid	DEA18	74.07	65.38	2.14		
DE531C1	Offenbach am Main	DE713	45.32	59.99	0.78	-0.48	stable
DE532C1	Ulm	DE144	119.39	72.27	4.97		
DE533C1	Pforzheim	DE129	98.46	78.36	13.89		
DE534C1	Ingolstadt	DE211	133.55	69.75	14.01		
DE535C1	Gera	DEG02	152.25	83.15	5.59		
DE536C1	Salzgitter	DE912	224.92	78.35	3.11		
DE537C1	Reutlingen	DE141	86.15	69.39	17.93		
DE538C1	Fürth	DE253	63.31	61.42	7.16	-0.2	stable
DE539C1	Cottbus	DE402	165.14	62.28	16.74		
DE540C1	Siegen	DEA5A	115.03	72.93	0.53		
DE541C1	Bergisch Gladbach	DEA2B	83.28	65.15	13.07	-0.14	stable
DE542C1	Hildesheim	DE925	93.05	71.00	10.85		
DE543C1	Witten	DEA56	72.92	59.70	0.00	-0.07	stable
DE544C1	Zwickau	DED45	103.84	65.43	1.17		
DE545C1	Erlangen	DE252	77.99	64.85	5.89	-0.73	slight decrease
DE546C1	Wuppertal	DEA1A	168.48	55.90	0.78	-0.36	stable
DE547C1	Jena	DEG03	114.86	80.00	44.52		
DK001C1	København	DK011	90.77	26.91	3.87	-0.42	stable
DK002C1	Århus	DK042	472.45	74.20	1.74	-0.43	stable

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DK003C1	Odense	DK031	305.12	71.29	0.95	-0.64	slight decrease
DK004C2	Aalborg	DK050	1141.30	87.92	9.50	-0.08	stable
EE001C1	Tallinn	EE001	159.47	45.37	6.91	-1.05	slight decrease
EE002C1	Tartu	EE008	38.89	36.79	2.44	-3.16	strong decrease
EE003C1	Narva	EE007	68.95	69.47	0.20		
EL001C1	Athina	EL300	38.95	14.73	0.00	-0.03	stable
EL002C1	Thessaloniki	EL412	18.32	11.67	0.00	0.04	stable
EL003C1	Pátra	EL127	126.35	79.97	35.09	-1.01	slight decrease
EL004C1	Irakleio	EL431	108.81	79.25	0.96	-0.11	stable
EL005C1	Larisa	EL253	122.62	74.95	14.70	-0.25	stable
EL006C1	Volos	EL254	26.81	51.90	0.00	-0.07	stable
EL007C1	Ioannina	EL221	48.40	68.58	100.00	-0.46	stable
EL008C1	Kavala	EL411	111.98	88.57	0.00	-0.5	stable
EL009C1	Kalamata	EL134	254.56	93.40	33.86	-0.35	stable
ES001C1	Madrid	ES300	604.99	56.86	35.52	-2.03	strong decrease
ES002C1	Barcelona	ES511	98.18	29.33	16.64	-0.35	stable
ES003C1	Valencia	ES523	134.65	62.79	41.88	-0.11	stable
ES004C1	Sevilla	ES618	141.36	52.09	1.07	-1.23	slight decrease
ES005C1	Zaragoza	ES243	973.64	86.25	26.79	-0.76	slight decrease
ES006C1	Málaga	ES617	395.61	80.57	0.00	-2.58	strong decrease
ES007C1	Murcia	ES620	886.04	88.42	22.32	-0.15	stable
ES008C1	Las Palmas	ES705	100.54	62.17	13.26	-0.98	slight decrease
ES009C1	Valladolid	ES418	197.62	76.83	0.19	-1.24	slight decrease
ES010C1	Palma de Mallorca	ES532	208.49	69.74	8.69	-1.38	slight decrease
ES011C1	Santiago de Compostela	ES111	219.99	85.62	0.00	-0.79	slight decrease
ES012C1	Vitoria/Gasteiz	ES211	276.80	83.57	7.61	-0.62	slight decrease
ES013C1	Oviedo	ES120	186.63	83.31	0.98	-0.7	slight decrease
ES014C1	Pamplona/Iruña	ES220	25.24	36.78	0.00	-7.78	strong decrease
ES015C1	Santander	ES130	34.71	43.09	0.00	-1.78	slight decrease
ES016C1	Toledo	ES425	231.91	87.39	0.06	-1.3	slight decrease
ES017C1	Badajoz	ES431	1470.24	94.44	11.88	-1.02	slight decrease
ES018C1	Logroño	ES230	79.56	73.86	1.45	-2.41	strong decrease
ES019C1	Bilbao	ES213	41.33	61.10	0.00	-1.38	slight decrease
ES020C1	Córdoba	ES613	1255.22	94.11	15.29	-0.35	stable
ES021C1	Alicante/Alacant	ES521	200.87	71.96	5.21	-0.14	stable
ES022C1	Vigo	ES114	108.96	58.41	3.52	-0.37	stable
ES023C1	Gijón	ES120	181.63	76.86	0.46	-0.77	slight decrease
ES024C1	L'Hospitalet de Llobregat	ES511	13.63	10.53	0.00	-0.21	stable
ES025C1	Santa Cruz de Tenerife	ES709	150.57	83.13	54.93	-0.44	stable
ES026C1	A Coruña	ES111	37.73	44.06	0.00		
ES027C1	Barakaldo	ES213	29.42	75.86	0.00	-1.02	slight decrease
ES028C1	Reus	ES514	52.98	66.37	0.00		
ES029C1	Telde	ES705	102.42	76.08	5.27	-0.92	slight decrease
ES030C1	Parla	ES300	24.96	60.65	0.00	-6.85	strong decrease
ES031C1	Lugo	ES112	329.75	89.90	0.63		
ES032C1	San Fernando	ES612	30.62	73.75	34.54		
ES033C1	Girona	ES512	38.88	70.93	48.07		
ES034C1	Cáceres	ES432	1750.28	97.83	66.59		
ES035C1	Torrevieja	ES521	71.43	73.43	50.86		
ES036C1	Pozuelo de Alarcón	ES300	43.10	61.13	0.00	-3.16	strong decrease
ES037C1	Puerto de Santa María, El	ES612	159.36	84.98	11.76		
ES038C1	Coslada	ES300	12.03	26.43	1.09	-0.07	stable
ES039C1	Avilés	ES120	26.80	56.40	2.09		
ES040C1	Talavera de la Reina	ES425	185.86	90.43	7.13		
ES041C1	Palencia	ES414	94.91	88.25	0.03		
ES042C1	Sant Boi de Llobregat	ES511	22.12	59.53	1.27	-0.29	stable
ES043C1	Ferrol	ES111	82.62	83.98	17.36		
ES044C1	Pontevedra	ES114	118.24	86.84	0.00		
ES045C1	Ceuta	ES630	19.78	62.17	28.86		
ES046C1	Gandia	ES523	60.87	83.66	27.98		
ES047C1	Rozas de Madrid, Las	ES300	58.32	68.01	46.76	-1.93	slight decrease
ES048C1	Guadalajara	ES424	235.54	93.52	0.16		

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ES049C1	Sant Cugat del Vallès	ES511	48.23	73.98	39.07	-0.25	stable
ES050C1	Manresa	ES511	41.65	76.91	0.00		
ES051C1	Getxo	ES213	11.88	62.07	0.00	-0.23	stable
ES052C1	Rubí	ES511	32.22	58.79	0.00	-0.32	stable
ES053C1	Ciudad Real	ES422	285.00	93.23	20.48		
ES054C1	Benidorm	ES521	38.53	69.99	17.06		
ES055C1	Melilla	ES640	13.87	46.08	4.60		
ES056C1	Viladecans	ES511	20.08	62.29	16.85	-0.3	stable
ES057C1	Ponferrada	ES413	283.16	93.49	17.65		
ES058C1	San Sebastián de los Reyes	ES300	59.27	72.60	19.28	-0.08	stable
ES059C1	Zamora	ES419	149.25	91.07	2.31		
ES060C1	Fuengirola	ES617	10.40	42.11	0.00		
ES061C1	Cerdanyola del Vallès	ES511	30.86	69.22	45.39	-1.22	slight decrease
ES062C1	Sanlúcar de Barrameda	ES612	170.90	89.74	22.49		
ES063C1	Vilanova i la Geltrú	ES511	33.87	66.52	17.63	-1.24	slight decrease
ES064C1	Prat de Llobregat, El	ES511	31.54	37.13	12.69	-1.75	slight decrease
ES065C1	Línea de la Concepción, La	ES612	19.27	62.78	0.00		
ES066C1	Cornellà de Llobregat	ES511	6.80	18.72	0.00	0.33	stable
ES067C1	Majadahonda	ES300	38.52	72.16	32.30	-2.37	strong decrease
ES068C1	Torremolinos	ES617	19.50	62.12	0.00	-2.53	strong decrease
ES069C1	Castelldefels	ES511	12.79	56.01	14.59	-5.16	strong decrease
ES070C1	Irun	ES212	41.74	81.16	31.11		
ES071C1	Granollers	ES511	14.94	49.79	3.06	-0.42	stable
ES072C1	Arrecife	ES708	22.72	65.33	0.17		
ES073C1	Elda	ES521	45.82	82.22	0.00		
ES074C1	Santa Lucía de Tirajana	ES705	61.54	79.50	9.37		
ES075C1	Mollet del Vallès	ES511	10.80	55.47	2.76	-0.41	stable
ES501C1	Granada	ES614	88.04	73.64	0.00		
ES503C1	Badalona	ES511	20.95	42.12	18.27	0.09	stable
ES504C1	Móstoles	ES300	44.96	63.37	13.12	-1.52	slight decrease
ES505C1	Elche/Elx	ES521	326.17	85.38	5.87		
ES506C1	Cartagena	ES620	558.08	87.23	29.04		
ES507C1	Sabadell	ES511	37.53	51.64	0.00	-1.98	slight decrease
ES508C1	Jerez de la Frontera	ES612	1188.10	95.05	16.75		
ES509C1	Fuenlabrada	ES300	39.19	52.44	0.00	-3.21	strong decrease
ES510C1	San Sebastián/Donostia	ES212	60.90	71.22	3.58		
ES511C1	Alcalá de Henares	ES300	88.02	66.73	28.82	-2.79	strong decrease
ES512C1	Terrassa	ES511	70.30	67.28	10.75	-0.79	slight decrease
ES513C1	Leganés	ES300	43.23	54.83	0.00	-2.35	strong decrease
ES514C1	Almería	ES611	296.31	79.78	50.63		
ES515C1	Burgos	ES412	107.11	70.10	0.00		
ES516C1	Salamanca	ES415	39.38	59.75	0.00		
ES517C1	Alcorcón	ES300	33.61	55.52	0.00	-4.15	strong decrease
ES518C1	Getafe	ES300	78.70	57.39	31.45	-7.64	strong decrease
ES519C1	Albacete	ES421	1125.54	95.61	0.00		
ES520C1	Castellón de la Plana/Castelló de la Plana	ES522	108.74	76.01	0.28		
ES521C1	Huelva	ES615	151.35	85.73	25.48		
ES522C1	Cádiz	ES612	12.27	43.87	28.75		
ES523C1	León	ES413	39.03	58.66	0.00		
ES524C1	San Cristóbal de la Laguna	ES709	102.07	68.16	17.46	-1.11	slight decrease
ES525C1	Tarragona	ES514	55.04	68.06	1.74		
ES526C1	Santa Coloma de Gramenet	ES511	7.10	44.91	0.24	-0.62	slight decrease
ES527C1	Jaén	ES616	424.31	94.76	0.01		
ES528C1	Lleida	ES513	212.08	87.51	7.14		
ES529C1	Ourense	ES113	84.55	79.48	0.00		
ES530C1	Mataró	ES511	22.31	56.14	19.01	0.3	stable
ES531C1	Dos Hermanas	ES618	160.48	76.89	2.26	-3.21	strong decrease
ES532C1	Algeciras	ES612	85.82	79.54	48.17		
ES533C1	Marbella	ES617	116.87	81.41	7.68		
ES534C1	Torrejón de Ardoz	ES300	32.37	35.35	4.77	-3.84	strong decrease

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ES535C1	Alcobendas	ES300	45.23	53.49	11.00	-1.38	slight decrease
FI001C2	Helsinki / Helsingfors	FI1B1	210.50	56.14	2.13	-2.67	strong decrease
FI002C1	Tampere / Tammefors	FI197	689.54	89.75	0.12	-0.53	slight decrease
FI003C1	Turku / Åbo	FI1C1	248.44	74.38	4.96	-1.25	slight decrease
FI004C2	Oulu / Uleåborg	FI1D6	1445.58	94.58	4.72	-2.05	strong decrease
FI005C1	Espoo / Esbo	FI1B1	327.25	79.85	7.45	-4.25	strong decrease
FI006C1	Vantaa / Vanda	FI1B1	240.28	71.15	2.21	-4.81	strong decrease
FI007C1	Lahti / Lahtis	FI1C3	154.46	79.42	1.75		
FI008C1	Kuopio	FI1D2	2319.03	97.65	4.38		
FI009C1	Jyväskylä	FI193	1466.35	95.71	1.24		
FR001C1	Paris	FR101	105.25	25.02	0.00	-0.08	stable
FR003C2	Lyon	FR716	519.99	44.71	3.73	-0.95	slight decrease
FR004C2	Toulouse	FR623	461.18	47.39	2.27	-2.28	strong decrease
FR006C2	Strasbourg	FR421	315.86	65.44	12.78	-0.62	slight decrease
FR007C1	Bordeaux	FR612	550.43	52.00	9.83	-1.35	slight decrease
FR008C1	Nantes	FR511	535.01	63.53	13.09	-0.62	slight decrease
FR009C1	Lille	FR301	612.47	56.80	0.00	-0.53	slight decrease
FR010C1	Montpellier	FR813	438.62	70.63	13.46	-0.04	stable
FR011C1	Saint-Etienne	FR715	570.68	78.06	3.86	-0.46	stable
FR012C1	Le Havre	FR232	199.69	58.49	1.81	-0.8	slight decrease
FR013C2	Rennes	FR523	613.66	72.43	0.12	-1.65	slight decrease
FR014C2	Amiens	FR223	313.21	82.36	2.40	-0.59	slight decrease
FR016C1	Nancy	FR411	143.11	56.54	1.80	0.02	stable
FR017C2	Metz	FR413	277.18	74.80	2.09	-0.6	slight decrease
FR018C1	Reims	FR213	87.98	43.61	0.60	-2.62	strong decrease
FR019C1	Orléans	FR246	336.10	66.62	8.86	-0.49	stable
FR020C2	Dijon	FR261	219.94	65.64	3.60	-1.06	slight decrease
FR021C2	Poitiers	FR534	253.02	74.76	8.78	-0.75	slight decrease
FR022C2	Clermont-Ferrand	FR724	302.75	67.50	5.90	-1.53	slight decrease
FR023C2	Caen	FR251	185.59	58.22	0.00	-0.65	slight decrease
FR024C2	Limoges	FR633	475.19	80.70	0.00	-0.32	stable
FR025C1	Besançon	FR431	434.01	81.34	7.66	-0.29	stable
FR026C2	Grenoble	FR714	311.79	70.87	0.23	-0.4	stable
FR027C1	Ajaccio	FR831	270.45	87.47	5.93	-0.59	slight decrease
FR028C1	Saint Denis	FR940	287.57		0.00		
FR030C1	Fort-de-France	FR920	175.74		0.00		
FR032C2	Toulon	FR825	371.51	62.30	24.63	-1.27	slight decrease
FR034C2	Valenciennes	FR301	262.88	74.70	9.73		
FR035C2	Tours	FR244	340.03	69.66	3.68	-0.07	stable
FR036C2	Angers	FR512	518.77	80.78	12.04		
FR037C1	Brest	FR522	218.36	66.40	1.11		
FR038C2	Le Mans	FR514	157.78	63.36	0.00		
FR039C2	Avignon	FR826	239.45	71.59	13.01		
FR040C2	Mulhouse	FR422	314.44	72.02	13.58		
FR042C1	Dunkerque	FR301	249.68	68.14	2.54		
FR043C2	Perpignan	FR815	624.50	83.14	17.23		
FR044C2	Nimes	FR812	688.15	87.01	21.90		
FR045C2	Pau	FR615	182.89	69.51	5.55		
FR046C2	Bayonne	FR615	84.67	47.00	7.23		
FR047C2	Annemasse	FR718	77.95	67.77	7.17		
FR048C1	Annecy	FR718	125.20	69.15	0.03		
FR049C2	Lorient	FR524	472.14	82.10	3.81		
FR050C2	Montbelliard	FR431	179.88	69.49	0.79		
FR051C2	Troyes	FR212	109.41	60.28	0.12		
FR052C2	Saint-Nazaire	FR511	317.46	81.98	49.78		
FR053C1	La Rochelle	FR532	210.81	71.29	4.13		
FR056C1	Angoulème	FR531	170.56	73.55	11.60		
FR057C2	Boulogne-sur-mer	FR302	205.87	83.56	6.95		
FR058C2	Chambery	FR717	262.86	85.61	1.11		
FR059C2	Chalon-sur-Saône	FR263	448.18	87.30	4.81		
FR060C2	Chartres	FR242	417.34	89.62	0.06		
FR061C2	Niort	FR533	544.07	88.69	31.60		
FR062C1	Calais	FR302	97.40	67.26	2.51		
FR063C2	Béziers	FR813	250.57	82.23	7.16		
FR064C2	Arras	FR302	170.67	78.19	0.00		

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FR065C2	Bourges	FR241	355.30	85.35	2.11		
FR066C1	Saint-Brieuc	FR521	249.76	73.94	1.36		
FR067C2	Quimper	FR522	289.40	81.28	0.00		
FR068C2	Vannes	FR524	522.15	87.23	7.76		
FR069C1	Cherbourg	FR252	68.23	60.27	0.00		
FR073C2	Tarbes	FR626	116.94	71.76	0.87		
FR074C2	Compiègne	FR222	199.68	88.06	60.65		
FR076C2	Belfort	FR434	175.52	80.64	1.36		
FR077C1	Roanne	FR715	96.98	65.23	7.18		
FR079C2	Saint-Quentin	FR221	158.59	85.13	0.26		
FR082C2	Beauvais	FR222	307.25	89.04	2.90		
FR084C1	Creil	FR222	34.07	49.94	0.52		
FR086C2	Evreux	FR231	292.21	87.74	0.65		
FR090C2	Châteauroux	FR243	464.50	90.45	1.05		
FR093C2	Brive-la-Gaillarde	FR631	324.20	87.25	0.25		
FR096C2	Albi	FR627	211.56	80.78	0.00		
FR099C1	Fréjus	FR825	195.71	80.46	45.41		
FR104C2	Châlons-en-Champagne	FR213	200.68	85.66	0.00		
FR201C1	Aubagne	FR824	246.09	87.95	10.83	-4.29	strong decrease
FR202C1	Aix-en-Provence	FR824	1293.29	82.32	33.33	-0.32	stable
FR203C1	Marseille	FR824	605.05	65.47	37.24	-0.23	stable
FR205C2	Nice	FR823	459.13	75.68	20.57	2.31	increase
FR206C1	CA de Sophia-Antipolis	FR823	269.74	85.00	38.28	-7.6	strong decrease
FR207C1	Lens - Liévin	FR302	239.69	63.43	0.00	-0.79	slight decrease
FR208C1	Hénin - Carvin	FR302	112.28	57.81	0.00		
FR209C2	Douai	FR301	235.66	76.29	0.90		
FR210C1	Marne la Vallée	FR102	38.32	54.36	0.00	-0.65	slight decrease
FR211C1	Versailles	FR103	97.75	62.30	0.00	-0.32	stable
FR212C1	CC de la Boucle de la Seine	FR103	38.88	24.01	0.00	-0.54	slight decrease
FR213C1	Sénart en Essonne	FR104	28.93	75.81	0.00	-1.25	slight decrease
FR214C1	Valence	FR713	236.27	75.48	0.00		
FR215C2	Rouen	FR232	663.49	76.58	5.78	-1.19	slight decrease
FR216C1	CA Marne et Chantereine	FR102	30.64	45.08	2.35	0.1	stable
FR217C1	CA des deux Rives de la Seine	FR103	46.02	65.89	0.00	-0.84	slight decrease
FR218C1	CC des Coteaux de la Seine	FR103	14.11	48.43	0.00	0.08	stable
FR219C1	CA Europ' Essonne	FR104	55.60	40.74	0.00	-0.5	stable
FR220C1	CA Brie Francilienne	FR102	27.40	56.75	0.00	-0.98	slight decrease
FR221C1	CA les Portes de l'Essonne	FR104	16.94	9.24	0.00	-0.04	stable
FR222C1	CA Val et Forêt	FR108	27.22	43.97	0.00	-0.07	stable
FR223C1	CC de l'Ouest de la Plaine de France	FR108	29.86	67.21	0.00	-0.09	stable
FR224C1	CA le Parisis	FR108	39.26	40.78	0.00	-1.38	slight decrease
FR304C1	Melun	FR102	97.98	64.29	6.13	-0.13	stable
FR305C1	Meaux	FR102	145.26	79.83	3.41	-0.15	stable
FR306C1	Mantes en Yvelines	FR103	113.82	77.37	22.24	-0.22	stable
FR308C1	Evry	FR104	43.47	43.03	0.73	-0.74	slight decrease
FR309C1	CA du Plateau de Saclay	FR104	71.26	60.21	0.00	-0.54	slight decrease
FR310C1	CA de Seine Essonne	FR104	46.94	63.48	0.00	-1.39	slight decrease
FR311C1	CA du Val d'Irge	FR104	54.33	32.82	0.00	-0.93	slight decrease
FR312C1	CA du Val d'Yerres	FR104	30.80	42.34	0.00	-0.39	stable
FR313C1	CA Sénart - Val de Seine	FR104	36.13	55.65	0.00	0.22	stable
FR322C1	CA Val de France	FR108	24.01	34.54	0.06	-1.66	slight decrease
FR323C1	CA de la Vallée de Montmorency	FR108	25.14	29.13	0.00	-0.78	slight decrease
FR324C1	Martigues	FR824	107.32	74.11	8.56		
FR501C1	Argenteuil - Bezons	FR108	21.56	17.13	0.00	0.02	stable
FR504C1	Cergy-Pontoise	FR108	83.20	50.10	0.00	-1.25	slight decrease
FR505C1	Charleville-Mézières	FR211	95.54	78.68	11.21		
FR506C1	Colmar	FR422	175.04	79.15	15.82		
FR512C1	CA des Lacs de l'Essonne	FR104	11.20	27.03	0.00	-1.05	slight decrease

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
FR518C1	Saint-Quentin en Yvelines	FR103	69.35	54.09	12.87	-0.64	slight decrease
HR001C1	Zagreb	HR041	641.29	77.87	0.00		
HR002C1	Rijeka	HR031	43.35		0.00		
HR003C1	Slavonski Brod	HR04A	54.29	68.93	0.00		
HR004C1	Osijek	HR04B	174.71	82.67	0.00		
HR005C1	Split	HR035	79.65	73.93	0.00		
HU001C1	Budapest	HU101	525.27	38.66	6.27	-0.37	stable
HU002C1	Miskolc	HU311	236.60	79.64	44.70	-0.21	stable
HU003C1	Nyíregyháza	HU323	274.57	76.73	2.44	-0.37	stable
HU004C1	Pécs	HU231	162.72	69.15	19.86	-0.87	slight decrease
HU005C1	Debrecen	HU321	461.67	82.46	8.10	-0.18	stable
HU006C1	Szeged	HU333	281.02	80.88	10.30	-0.62	slight decrease
HU007C1	Győr	HU221	174.60	72.33	17.47	-1.32	slight decrease
HU008C1	Kecskemét	HU331	321.45	77.20	2.82	-1.06	slight decrease
HU009C1	Székesfehérvár	HU211	170.89	77.52	3.48	-0.36	stable
HU010C1	Szombathely	HU222	97.51	74.01	0.00		
IE001C1	Dublin	IE021	117.68	24.49	2.66	0.2	stable
IE002C1	Cork	IE025	39.62	24.68	0.19	0.15	stable
IE003C1	Limerick	IE023	19.48	31.56	7.64	0.42	stable
IE004C1	Galway	IE013	50.72	55.64	8.15	-0.49	stable
IE005C1	Waterford	IE024	41.66	60.06	8.47	-0.21	stable
IS001C1	Reykjavík	IS001	1043.77	95.84			
IT001C1	Roma	ITI43	1285.97	68.39	7.86	-0.76	slight decrease
IT002C1	Milano	ITC4C	181.82	34.02	0.00	0.19	stable
IT003C1	Napoli	ITF33	118.38	29.13	2.65	-0.36	stable
IT004C1	Torino	ITC11	130.08	38.62	2.89	-0.18	stable
IT005C1	Palermo	ITG12	160.12	62.08	27.68	-0.94	slight decrease
IT006C1	Genova	ITC33	239.90	74.85	24.50	-0.33	stable
IT007C1	Firenze	ITI14	102.32	53.94	0.17	-0.22	stable
IT008C1	Bari	ITF47	116.20	52.51	0.00	-1.31	slight decrease
IT009C1	Bologna	ITH55	140.85	58.10	4.96	-1.13	slight decrease
IT010C1	Catania	ITG17	181.67	66.10	11.06	-1.49	slight decrease
IT011C1	Venezia	ITH35	159.38	59.38	8.77	-0.65	slight decrease
IT012C1	Verona	ITH31	198.96	66.28	4.57	-1.09	slight decrease
IT013C1	Cremona	ITC4A	70.54	70.40	1.20	-0.82	slight decrease
IT014C1	Trento	ITH20	157.90	80.75	6.28	-0.56	slight decrease
IT015C1	Trieste	ITH44	84.81	65.54	32.98	-0.03	stable
IT016C1	Perugia	ITI21	449.02	86.15	4.51	-0.89	slight decrease
IT017C1	Ancona	ITI32	124.61	80.33	9.53	-0.09	stable
IT019C1	Pescara	ITF13	34.03	37.99	0.00	-0.85	slight decrease
IT020C1	Campobasso	ITF22	55.85	71.27	3.60	-0.25	stable
IT021C1	Caserta	ITF31	53.73	70.85	7.92	-0.43	stable
IT022C1	Taranto	ITF43	253.00	76.93	8.05	-0.76	slight decrease
IT023C1	Potenza	ITF51	174.16	85.74	0.85	-0.38	stable
IT024C1	Catanzaro	ITF63	111.69	81.51	0.00	-1.71	slight decrease
IT025C1	Reggio di Calabria	ITF65	236.99	83.61	8.24	-0.26	stable
IT026C1	Sassari	ITG25	547.07	90.90	2.32	-0.36	stable
IT027C1	Cagliari	ITG27	83.76	68.55	36.41	-1.58	slight decrease
IT028C1	Padova	ITH36	93.00	47.38	0.08	-0.82	slight decrease
IT029C1	Brescia	ITC47	90.39	50.17	0.00	-0.55	slight decrease
IT030C1	Modena	ITH54	183.24	70.97	0.43	-1.01	slight decrease
IT031C1	Foggia	ITF46	505.90	89.91	2.17	-0.88	slight decrease
IT032C1	Salerno	ITF35	59.50	67.62	0.04	-0.36	stable
IT033C1	Piacenza	ITH51	118.32	76.49	13.37		
IT034C1	Bolzano	ITH10	52.29	73.94	0.00		
IT035C1	Udine	ITH42	57.06	54.09	0.00		
IT036C1	La Spezia	ITC34	51.45	70.27	22.82		
IT037C1	Lecce	ITF45	237.56	87.86	8.33		
IT038C1	Barletta	ITF48	148.13	88.31	2.55		
IT039C1	Pesaro	ITI31	126.63	80.96	20.09		
IT040C1	Como	ITC42	37.13	68.09	17.22		
IT041C1	Pisa	ITI17	185.32	77.58	34.54		
IT042C1	Treviso	ITH34	55.53	62.50	4.65		
IT043C1	Varese	ITC41	54.89	79.53	27.78		
IT044C1	Busto Arsizio	ITC41	30.68	45.01	0.00		

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IT045C1	Asti	ITC17	151.42	85.02	13.97		
IT046C1	Pavia	ITC48	63.30	78.65	18.65		
IT047C1	Massa	ITI11	93.91	78.20	32.60		
IT048C1	Cosenza	ITF61	37.53	76.82	0.00		
IT049C1	Carrara	ITI11	70.96	66.49	10.17		
IT050C1	Benevento	ITF32	130.19	83.12	0.00		
IT051C1	Sanremo	ITC31	55.98	77.20	29.91		
IT052C1	Savona	ITC32	65.30	87.05	7.06		
IT053C1	Vigevano	ITC48	81.43	81.16	22.15		
IT054C1	Matera	ITF52	388.46	94.34	21.10		
IT055C1	Viareggio	ITI12	32.39	58.15	23.06		
IT056C1	Acireale	ITG17	39.98	77.57	5.84		
IT057C1	Avellino	ITF34	30.40	71.64	0.00		
IT058C1	Pordenone	ITH41	38.17	65.14	0.00		
IT059C1	Biella	ITC13	46.72	79.53	0.05		
IT060C1	Lecco	ITC43	45.17	83.48	14.45		
IT501C1	Messina	ITG13	211.41	82.73	70.44		
IT502C1	Prato	ITI15	97.32	64.00	20.26		
IT503C1	Parma	ITH52	260.74	78.83	1.75		
IT504C1	Livorno	ITI16	104.05	72.89	1.90		
IT505C1	Reggio nell'Emilia	ITH53	230.75	82.33	1.20		
IT506C1	Ravenna	ITH57	653.31	88.94	12.80		
IT507C1	Ferrara	ITH56	405.04	89.12	2.85		
IT508C1	Rimini	ITH59	135.37	72.87	0.62		
IT509C1	Siracusa	ITG19	206.27	82.41	4.46		
IT510C1	Monza	ITC4D	33.11	44.94	0.00	-0.32	stable
IT511C1	Bergamo	ITC46	40.19	51.85	1.07		
IT512C1	Forlì	ITH58	228.04	82.60	3.04		
IT513C1	Latina	ITI44	276.98	82.60	4.40		
IT514C1	Vicenza	ITH32	80.56	65.18	0.63		
IT515C1	Terni	ITI22	212.12	89.32	20.54		
IT516C1	Novara	ITC15	103.13	78.17	0.00		
IT517C1	Giugliano in Campania	ITF33	94.27	69.09	4.50	-2.85	strong decrease
LT001C1	Vilnius	LT00A	400.58	66.69	1.73	-0.45	stable
LT002C1	Kaunas	LT002	156.98	48.53	7.21	-0.78	slight decrease
LT003C1	Panevėžys	LT005	50.18	48.17	0.00	-0.66	slight decrease
LT004C1	Alytus	LT001	39.49	62.75	9.56		
LT501C1	Klaipėda	LT003	88.25	59.14	2.74		
LT502C1	Šiauliai	LT006	81.13	55.55	18.75		
LU001C1	Luxembourg	LU000	51.74	55.64	14.46	-0.45	stable
LV001C1	Rīga	LV006	304.16	57.10	6.05	-0.69	slight decrease
LV002C1	Liepāja	LV003	61.01	63.96	22.64	-0.33	stable
LV003C1	Jelgava	LV009	60.55	68.17	4.53		
LV501C1	Daugavpils	LV005	72.38	64.05	0.01		
MT001C1	Valletta	MT001	50.23	32.17	1.87	-0.71	slight decrease
NL001C1	's-Gravenhage	NL332	85.14	35.12	8.19	0.37	stable
NL002C1	Amsterdam	NL326	194.98	47.60	0.22	-1.17	slight decrease
NL003C1	Rotterdam	NL339	274.64	40.06	0.70	-1.01	slight decrease
NL004C1	Utrecht	NL310	99.30	44.06	0.00	-0.24	stable
NL005C1	Eindhoven	NL414	88.86	36.28	0.03	-2.08	strong decrease
NL006C1	Tilburg	NL412	119.19	56.03	4.98	-1.94	slight decrease
NL007C1	Groningen	NL113	83.72	53.62	0.01	-2.49	strong decrease
NL008C1	Enschede	NL213	142.74	68.79	1.17	-0.65	slight decrease
NL009C1	Arnhem	NL226	101.54	63.96	49.59	-0.77	slight decrease
NL010C1	Heerlen	NL423	45.48	45.57	7.65	-1.67	slight decrease
NL011C1	Almere	NL230	148.47	67.45	2.66	-2.67	strong decrease
NL012C1	Breda	NL411	129.16	60.81	0.85	-0.77	slight decrease
NL013C1	Nijmegen	NL226	57.74	39.52	5.24	-3.57	strong decrease
NL014C1	Apeldoorn	NL221	341.15	83.32	60.49	-0.51	slight decrease
NL015C1	Leeuwarden	NL121	84.05	65.44	3.67	-1.63	slight decrease
NL016C1	Sittard-Geleen	NL423	80.70	56.23	0.09		
NL017C1	Delft	NL333	24.05	39.64	0.00	-1.15	slight decrease
NL018C1	Hilversum	NL327	46.47	70.80	3.73		
NL019C1	Amstelveen	NL326	44.04	60.35	0.00	-1.18	slight decrease
NL020C1	Roosendaal	NL411	107.27	74.88	3.92		
NL021C1	Spijkenisse	NL339	30.24	56.23	4.00	-0.58	slight decrease

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NL022C1	Leidschendam-Voorburg	NL332	35.71	64.19	0.00	-0.17	stable
NL023C1	Purmerend	NL326	24.58	43.98	0.00	-0.89	slight decrease
NL024C1	Vlaardingen	NL339	26.65	53.36	0.00	-0.74	slight decrease
NL025C1	Velsen	NL323	53.07	65.07	18.77	-0.34	stable
NL026C1	Alphen aan den Rijn	NL338	57.59	74.53	0.10		
NL027C1	Capelle aan den IJssel	NL339	15.42	27.34	0.00	0.66	increase
NL028C1	Bergen op Zoom	NL411	93.14	78.97	27.88		
NL029C1	Katwijk	NL337	26.03	47.85	17.82		
NL030C1	Gouda	NL338	18.09	39.67	0.01		
NL031C1	Hoorn	NL321	20.96	29.69	0.06	-2.69	strong decrease
NL032C1	Middelburg	NL342	53.03	74.78	6.36		
NL501C1	Haarlem	NL324	32.07	38.16	0.38		
NL502C1	Zaanstad	NL325	83.09	64.17	14.06		
NL503C1	's-Hertogenbosch	NL413	91.25	63.97	4.46		
NL504C1	Amersfoort	NL310	63.80	50.77	0.00		
NL505C1	Maastricht	NL423	60.08	54.36	4.15		
NL506C1	Dordrecht	NL33A	99.43	74.65	32.58		
NL507C1	Leiden	NL337	23.14	32.46	0.00		
NL508C1	Haarlemmermeer	NL326	185.26	60.35	0.00		
NL509C1	Zoetermeer	NL332	37.06	48.01	0.00	-0.67	slight decrease
NL511C1	Zwolle	NL211	119.30	73.74	8.47		
NL512C1	Ede	NL221	318.73	80.14	56.14		
NL513C1	Deventer	NL212	134.42	80.01	3.52		
NL514C1	Alkmaar	NL322	31.21	43.01	0.00		
NL515C1	Venlo	NL421	128.99	66.43	7.87		
NL516C1	Helmond	NL414	54.61	54.98	0.00	-2.03	strong decrease
NL517C1	Hengelo	NL213	61.77	58.51	0.01	-1.06	slight decrease
NL518C1	Schiedam	NL339	19.88	37.07	0.00	-2.41	strong decrease
NL519C1	Almelo	NL213	69.42	64.77	0.00		
NL520C1	Lelystad	NL230	253.20	87.00	21.95		
NO001C1	Oslo	NO011	453.98	84.28			
NO002C1	Bergen	NO051	464.67	86.66			
NO003C1	Trondheim	NO061	342.19	88.95			
NO004C1	Stavanger	NO043	70.83	63.24			
NO005C1	Kristiansand	NO042	274.19	90.35			
NO006C1	Tromsø	NO072	2515.86	98.87			
PL001C1	Warszawa	PL127	517.23	48.19	5.27	-1.07	slight decrease
PL002C1	Łódź	PL113	293.27	56.01	0.00	-0.53	slight decrease
PL003C1	Kraków	PL213	326.80	56.82	1.11	-0.87	slight decrease
PL004C1	Wrocław	PL514	292.82	61.56	7.01	-1.55	slight decrease
PL005C1	Poznań	PL415	261.85	57.10	1.26	-0.49	stable
PL006C1	Gdańsk	PL633	261.69	64.70	2.67	-3.01	strong decrease
PL007C1	Szczecin	PL424	300.53	74.64	38.47	-0.85	slight decrease
PL008C1	Bydgoszcz	PL613	175.98	64.69	5.84	-1.9	slight decrease
PL009C1	Lublin	PL314	147.45	59.61	0.04	-2.63	strong decrease
PL010C1	Katowice	PL22A	164.59	63.64	0.00	-0.23	stable
PL011C1	Białystok	PL343	102.12	51.07	0.00	-2.14	strong decrease
PL012C1	Kielce	PL331	109.65	61.58	9.33	-1.48	slight decrease
PL013C1	Toruń	PL613	115.71	61.07	13.30	-1.81	slight decrease
PL014C1	Olsztyn	PL622	88.33	67.70	0.00	-0.97	slight decrease
PL015C1	Rzeszów	PL325	116.35	58.23	1.01	-0.95	slight decrease
PL016C1	Opole	PL522	96.55	67.61	0.00	-1.12	slight decrease
PL017C1	Gorzów Wielkopolski	PL431	85.72	68.09	4.68	-2.41	strong decrease
PL018C1	Zielona Góra	PL432	58.34	61.55	0.00	-1.15	slight decrease
PL019C1	Jelenia Góra	PL515	109.23	80.48	24.95	-0.38	stable
PL020C1	Nowy Sącz	PL215	57.57	58.08	2.21	-1.21	slight decrease
PL021C1	Suwałki	PL345	65.50	74.14	5.93	-1.76	slight decrease
PL022C1	Konin	PL414	82.20	72.95	15.71	-0.62	slight decrease
PL023C1	Żory	PL227	64.64	74.16	0.00	-2.04	strong decrease
PL024C1	Częstochowa	PL224	159.72	59.12	0.44	-0.44	stable
PL025C1	Radom	PL128	111.80	57.59	1.17	-1.08	slight decrease
PL026C1	Płock	PL121	88.05	64.44	6.55	-1.88	slight decrease
PL027C1	Kalisz	PL416	69.41	64.95	0.04	-0.6	slight decrease
PL028C1	Koszalin	PL422	98.35	78.74	7.54	-1.23	slight decrease
PL029C1	Słupsk	PL631	43.15	63.31	4.90		

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PL030C1	Jastrzębie-Zdrój	PL227	85.34	70.78	0.00	-0.81	slight decrease
PL031C1	Siedlce	PL122	31.86	49.87	2.72		
PL032C1	Piotrków Trybunalski	PL115	67.24	70.95	0.00		
PL033C1	Lubin	PL516	40.76	72.08	0.00		
PL034C1	Piła	PL411	102.68	79.36	37.03		
PL035C1	Inowrocław	PL615	30.41	55.95	0.00		
PL036C1	Ostrowiec Świętokrzyski	PL331	46.43	61.84	0.62		
PL037C1	Gniezno	PL414	40.59	62.74	0.00		
PL038C1	Stargard Szczeciński	PL423	48.08	63.80	0.00	-2.19	strong decrease
PL039C1	Ostrów Wielkopolski	PL416	41.91	48.18	0.00	-1.72	slight decrease
PL040C1	Przemyśl	PL324	46.18	72.61	4.07		
PL041C1	Zamość	PL312	30.34	56.97	7.96		
PL042C1	Chełm	PL312	35.27	50.83	0.00		
PL043C1	Pabianice	PL114	32.99	59.35	0.00	-0.54	slight decrease
PL044C1	Głogów	PL516	35.11	59.24	3.56		
PL045C1	Stalowa Wola	PL326	82.52	84.10	5.84		
PL046C1	Tomaszów Mazowiecki	PL115	41.30	58.17	2.52		
PL047C1	Łomża	PL344	32.67	64.02	23.27		
PL048C1	Leszno	PL417	31.86	54.10	0.00		
PL049C1	Świdnica	PL517	21.76	49.39	0.00		
PL050C1	Zgierz	PL114	42.32	63.35	0.07	-0.15	stable
PL051C1	Tczew	PL635	22.38	53.73	5.97		
PL052C1	Ełk	PL623	21.05	56.31	0.00		
PL501C1	Gdynia	PL633	135.13	68.41	0.89	-0.72	slight decrease
PL502C1	Sosnowiec	PL22B	91.06	53.12	0.01	-0.54	slight decrease
PL503C1	Gliwice	PL229	133.87	64.16	0.00	-1.14	slight decrease
PL504C1	Zabrze	PL229	80.40	60.92	0.00	-1.39	slight decrease
PL505C1	Bytom	PL228	69.45	59.61	12.16	-3.35	strong decrease
PL506C1	Bielsko-Biała	PL225	124.51	68.49	19.97		
PL507C1	Ruda Śląska	PL22A	77.72	61.22	0.00	-0.92	slight decrease
PL508C1	Rybnik	PL227	148.36	68.18	0.00	-0.58	slight decrease
PL509C1	Tychy	PL22C	81.85	69.27	0.00	-0.65	slight decrease
PL511C1	Wałbrzych	PL517	84.71	76.11	11.70		
PL512C1	Elbląg	PL621	79.81	74.81	1.36		
PL513C1	Włocławek	PL615	84.31	71.87	16.07		
PL514C1	Tarnów	PL217	72.38	57.06	0.27		
PL515C1	Chorzów	PL22A	33.24	54.18	0.00	-0.17	stable
PL516C1	Legnica	PL516	56.30	62.06	0.00		
PL517C1	Grudziądz	PL614	57.77	67.15	6.28		
PT001C1	Lisboa	PT171	84.92	25.07	0.00	-1.23	slight decrease
PT002C1	Porto	PT114	41.42	21.23	0.00	-1.39	slight decrease
PT003C1	Braga	PT112	183.40	70.07	0.00	-1.25	slight decrease
PT004C1	Funchal	PT300	76.01		17.54		
PT005C1	Coimbra	PT162	319.39	82.13	0.85	-1.23	slight decrease
PT006C1	Setúbal	PT172	170.24	77.79	55.00	-0.85	slight decrease
PT007C1	Ponta Delgada	PT200	233.08		0.00		
PT008C1	Aveiro	PT161	197.57	80.15	17.04	-1.4	slight decrease
PT009C1	Faro	PT150	201.84	86.34	19.92	3.32	increase
PT010C1	Seixal	PT172	92.15	48.90	12.70	-3.22	strong decrease
PT011C1	Amadora	PT171	23.77	30.33	0.00	-3.34	strong decrease
PT012C1	Almada	PT172	70.18	48.30	0.06	-1.08	slight decrease
PT013C1	Odivelas	PT171	26.35	34.98	0.00	-1.43	slight decrease
PT014C1	Viseu	PT165	507.09	91.68	0.10		
PT015C1	Valongo	PT114	75.11	69.28	14.54	-2.69	strong decrease
PT016C1	Viana do Castelo	PT111	319.01	88.88	14.78		
PT017C1	Paredes	PT115	156.76	78.95	6.89	-3.33	strong decrease
PT018C1	Barreiro	PT172	31.55	49.26	0.00	-2.66	strong decrease
PT019C1	Póvoa de Varzim	PT114	82.20	72.61	0.00		
PT501C1	Sintra	PT171	319.14	73.25	13.66	-1.64	slight decrease
PT502C1	Vila Nova de Gaia	PT114	168.46	51.58	0.00	-2.45	strong decrease
PT503C1	Matosinhos	PT114	62.42	39.43	0.00	-2.25	strong decrease
PT504C1	Gondomar	PT114	131.86	71.88	2.90	-2	slight decrease
PT505C1	Guimarães	PT113	241.05	77.95	0.00		
PT508C1	Vila Franca de Xira	PT171	292.66	86.65	29.99	-1.3	slight decrease
RO001C1	Bucureşti	RO321	239.58	31.99	0.00	-1.42	slight decrease

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
RO002C1	Cluj-Napoca	RO113	179.29	73.94	10.92	-1.8	slight decrease
RO003C1	Timişoara	RO424	129.24	61.99	2.74	-0.9	slight decrease
RO004C1	Craiova	RO411	81.29	48.43	3.04	-1.11	slight decrease
RO005C1	Brăila	RO221	45.04	41.57	2.00	-1.62	slight decrease
RO006C1	Oradea	RO111	112.70	61.39	1.68	-2.63	strong decrease
RO007C1	Bacău	RO211	43.17	42.27	4.86	-1.63	slight decrease
RO008C1	Arad	RO421	252.53	80.19	6.80	-1.68	slight decrease
RO009C1	Sibiu	RO126	118.68	76.83	0.81	-0.52	slight decrease
RO010C1	Târgu Mureş	RO125	49.28	59.57	11.09	-1.47	slight decrease
RO011C1	Piatra Neamţ	RO214	76.92	80.74	27.85	-0.69	slight decrease
RO012C1	Călăraşi	RO312	132.83	86.62	19.75	-0.49	stable
RO013C1	Giurgiu	RO314	52.99	71.54	1.57	-0.38	stable
RO014C1	Alba Iulia	RO121	102.55	83.00	10.48	-1.12	slight decrease
RO015C1	Focşani	RO226	47.32	73.33	0.00		
RO016C1	Târgu Jiu	RO412	103.90	81.28	0.00		
RO017C1	Tulcea	RO225	199.52	92.45	32.90		
RO018C1	Târgovişte	RO313	54.58	72.24	0.00		
RO019C1	Slatina	RO414	47.72	69.68	2.51		
RO020C1	Bârlad	RO216	14.81	36.32	11.36		
RO021C1	Roman	RO214	29.46	64.76	10.75		
RO022C1	Bistriţa	RO112	146.15	89.05	0.38		
RO501C1	Constanţa	RO223	126.07	62.42	14.48		
RO502C1	Iaşi	RO213	93.65	58.71	0.01		
RO503C1	Galaţi	RO224	245.85	80.84	63.86		
RO504C1	Braşov	RO122	153.45	75.81	4.37		
RO505C1	Ploieşti	RO316	58.23	40.52	0.00		
RO506C1	Piteşti	RO311	40.96	56.69	3.32		
RO507C1	Baia Mare	RO114	230.94	90.55	17.55		
RO508C1	Buzău	RO222	73.54	73.59	1.54		
RO509C1	Satu Mare	RO115	150.17	85.35	7.89		
RO510C1	Botoşani	RO212	41.39	70.32	0.00		
RO511C1	Râmnicu Vâlcea	RO415	88.16	76.22	6.95		
RO512C1	Suceava	RO215	51.56	70.40	0.70		
RO513C1	Drobeta-Turnu Severin	RO413	69.58	78.98	51.84		
SE001C1	Stockholm	SE110	209.98	64.62	0.65	-0.47	stable
SE002C1	Göteborg	SE232	455.99	78.26	8.50	-0.42	stable
SE003C1	Malmö	SE224	158.51	65.63	1.24	-1.3	slight decrease
SE004C1	Jönköping	SE211	1937.39	96.30	22.56	-0.13	stable
SE005C1	Umeå	SE331	2396.28	96.90	3.73	-0.27	stable
SE006C1	Uppsala	SE121	2248.18	96.06	2.14	-0.08	stable
SE007C1	Linköping	SE123	1578.17	94.91	4.02	-0.18	stable
SE008C1	Örebro	SE124	1631.16	95.65	1.46	-0.12	stable
SE501C1	Västerås	SE125	1141.70		4.98		
SE502C1	Norrköping	SE123	1603.97	95.85	1.88		
SE503C1	Helsingborg	SE224	347.15	87.76	0.37		
SE504C1	Lund	SE224	442.76	91.21	13.56	-0.45	stable
SE505C1	Borås	SE232	973.50	95.56	0.10		
SI001C1	Ljubljana	SI021	275.05	74.16	13.57	-0.25	stable
SI002C1	Maribor	SI012	147.49	79.05	8.97	-0.02	stable
SK001C1	Bratislava	SK010	367.51	71.46	22.15	-0.74	slight decrease
SK002C1	Košice	SK042	243.79	75.18	15.06	-0.59	slight decrease
SK003C1	Banská Bystrica	SK032	103.30	80.96	5.17	-1.18	slight decrease
SK004C1	Nitra	SK023	100.44	73.86	7.88	-2.35	strong decrease
SK005C1	Prešov	SK041	70.44	72.41	0.06	-0.78	slight decrease
SK006C1	Žilina	SK031	80.04	72.71	0.00	-0.57	slight decrease
SK007C1	Trnava	SK021	71.54	75.78	3.07	-0.8	slight decrease
SK008C1	Trenčín	SK022	82.01	79.67	0.33	-0.65	slight decrease
UK002C1	Birmingham	UKG31	268.05	26.34	0.00	-0.09	stable
UK003C1	Leeds	UKE42	552.23	66.28	0.41	0	stable
UK004C1	Glasgow	UKM34	175.31	35.60	0.00	-0.08	stable
UK005C1	Bradford	UKE41	366.71	70.48	12.20	-0.15	stable
UK006C1	Liverpool	UKD72	111.93	25.93	0.00	-0.13	stable
UK007C1	Edinburgh	UKM25	263.55	62.44	0.00	-0.4	stable
UK008C1	Manchester	UKD31	115.70	25.02	0.00	0	stable
UK009C1	Cardiff	UKL22	140.98	50.30	0.90	0.15	stable
UK010C1	Sheffield	UKE32	368.26	72.47	24.70	-0.17	stable

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
UK011C1	Bristol	UKK11	110.65	30.47	0.72	0.01	stable
UK012C1	Belfast	UKN01	114.88	44.02	0.11	0.1	stable
UK013C1	Newcastle upon Tyne	UKC22	114.53	50.58	0.00	-0.43	stable
UK014C1	Leicester	UKF21	73.40	29.69	0.00	-0.41	stable
UK015C1	Derry	UKN04	387.43	88.16	0.39	-0.06	stable
UK016C1	Aberdeen	UKM50	187.01	66.20	0.44	-0.4	stable
UK017C1	Cambridge	UKH12	40.70	41.16	0.00	-2.85	strong decrease
UK018C1	Exeter	UKK43	47.21	44.93	1.58	0.23	stable
UK019C1	Lincoln	UKF30	35.65	40.08	0.00	-0.68	slight decrease
UK020C1	Gravesham	UKJ42	99.08	74.64	2.07	-1.68	slight decrease
UK021C1	Stevenage	UKH23	25.95	32.27	0.00	-0.45	stable
UK022C1	Wrexham	UKL23	504.02	87.68	11.37	0.03	stable
UK023C1	Portsmouth	UKJ31	40.65	29.05	3.10	-0.4	stable
UK024C1	Worcester	UKG12	33.31	34.41	0.00	-0.25	stable
UK025C1	Coventry	UKG33	98.64	38.33	0.00	-0.22	stable
UK026C1	Kingston-upon-Hull	UKE11	71.76	22.66	0.08	-0.37	stable
UK027C1	Stoke-on-trent	UKG23	93.45	39.63	0.00	0.02	stable
UK028C1	Wolverhampton	UKG39	69.53	18.49	0.00	-0.16	stable
UK029C1	Nottingham	UKF14	74.65	28.46	0.00	-0.2	stable
UK030C1	Wirral	UKD74	157.30	52.61	1.62	-0.1	stable
UK031C1	Bath and North East Somerset	UKK12	351.34	85.22	1.74	-0.13	stable
UK032C1	Thurrock	UKH32	163.65	65.79	0.06	-3.25	strong decrease
UK033C1	Guildford	UKJ23	271.07	83.14	7.28	-0.12	stable
UK034C1	Thanet	UKJ42	103.52	67.74	0.51		
UK035C1	Nuneaton and Bedworth	UKG13	79.04	61.74	0.03	0	stable
UK036C1	Fareham	UKJ33	74.66	60.30	3.60	-0.32	stable
UK038C1	Waveney	UKH14	371.69	89.93	1.87		
UK040C1	Tunbridge Wells	UKJ42	331.28	89.56	0.00	-0.08	stable
UK041C1	Ashford	UKJ42	580.56	93.23	0.17		
UK043C1	East Staffordshire	UKG24	390.36	88.65	0.00		
UK044C1	Darlington	UKC13	197.63	84.48	0.00		
UK045C1	Worthing	UKJ24	32.47	39.79	0.00		
UK046C1	Mansfield	UKF15	76.78	65.90	0.00		
UK047C1	Chesterfield	UKF12	66.07	57.89	0.00	-0.54	slight decrease
UK050C1	Burnley	UKD43	110.78	81.99	12.03		
UK051C1	Great Yarmouth	UKH13	179.49	84.71	8.17		
UK052C1	Woking	UKJ23	63.66	65.00	3.21	-0.27	stable
UK053C1	Hartlepool	UKC11	94.43	69.24	2.20		
UK054C1	Cannock Chase	UKG24	78.97	67.43	4.47		
UK055C1	Eastbourne	UKJ22	44.18	62.23	0.00		
UK056C1	Hastings	UKJ22	29.75	63.51	4.58		
UK057C1	Hyndburn	UKD43	73.08	73.23	0.00		
UK059C1	Redditch	UKG12	54.30	66.26	0.00		
UK060C1	Tamworth	UKG24	30.86	40.68	0.00	-0.15	stable
UK061C1	Harlow	UKH33	30.53	57.23	0.00	-0.44	stable
UK062C1	Halton	UKD71	79.27	49.04	1.22	0.12	stable
UK101C1	City of London	UKI11	2.90	1.55	0.00	0	stable
UK102C1	Barking and Dagenham	UKI21	36.25	23.35	0.00	-0.99	slight decrease
UK103C1	Barnet	UKI23	86.83	36.38	0.00	-0.28	stable
UK104C1	Bexley	UKI21	60.71	29.93	0.00	-0.83	slight decrease
UK105C1	Brent	UKI23	43.28	16.72	0.00	-2.76	strong decrease
UK106C1	Bromley	UKI22	150.10	54.10	0.00	-0.07	stable
UK107C1	Camden	UKI11	21.83	21.79	0.00	-0.44	stable
UK108C1	Croydon	UKI22	86.58	33.26	0.00	0.03	stable
UK109C1	Ealing	UKI23	55.52	22.56	0.00	-0.12	stable
UK110C1	Enfield	UKI21	82.18	47.82	0.00	-0.24	stable
UK111C1	Greenwich	UKI21	47.42	27.41	0.00	-0.53	slight decrease
UK112C1	Hackney	UKI12	19.05	18.04	0.00	-2.26	strong decrease
UK113C1	Hammersmith and Fulham	UKI11	16.39	15.30	0.00	-0.03	stable
UK114C1	Haringey	UKI12	29.60	23.60	0.08	-0.77	slight decrease
UK115C1	Harrow	UKI23	50.51	34.21	0.00	-2.07	strong decrease
UK116C1	Havering	UKI21	112.38	57.13	0.00	-1.09	slight decrease
UK117C1	Hillingdon	UKI23	115.81	42.06	0.00	-1.66	slight decrease

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
UK118C1	Hounslow	UKI23	56.23	34.74	0.32	-0.14	stable
UK119C1	Islington	UKI12	14.84	7.40	0.00	-2.57	strong decrease
UK120C1	Kensington and Chelsea	UKI11	12.16	12.79	0.00	-0.27	stable
UK121C1	Kingston upon Thames	UKI22	37.23	32.48	0.09	0.07	stable
UK122C1	Lambeth	UKI12	26.83	9.73	0.00	0.05	stable
UK123C1	Lewisham	UKI12	35.24	14.74	0.00	-0.05	stable
UK124C1	Merton	UKI22	37.64	29.71	6.49	-0.01	stable
UK125C1	Newham	UKI12	36.47	18.38	0.00	-1.18	slight decrease
UK126C1	Redbridge	UKI21	56.46	41.33	0.70	-0.29	stable
UK127C1	Richmond upon Thames	UKI23	58.09	51.63	14.62	0.04	stable
UK128C1	Southwark	UKI12	28.82	17.75	0.00	-0.65	slight decrease
UK129C1	Sutton	UKI22	43.88	25.41	0.00	-0.6	slight decrease
UK130C1	Tower Hamlets	UKI12	19.89	15.91	0.00	-0.08	stable
UK131C1	Waltham Forest	UKI21	38.88	35.59	12.26	-0.42	stable
UK132C1	Wandsworth	UKI11	34.29	21.35	2.89	0	stable
UK133C1	Westminster	UKI11	21.46	24.03	0.00	-0.9	slight decrease
UK501C1	Kirklees	UKE44	408.85	73.92	11.83	-0.03	stable
UK502C1	North Lanarkshire	UKM36	472.37	76.39	1.43	0.04	stable
UK503C1	Wakefield	UKE45	338.87	69.25	0.04	-0.45	stable
UK504C1	Dudley	UKG36	97.97	26.52	0.17	-0.05	stable
UK505C1	Wigan	UKD32	188.27	59.63	0.50	0.02	stable
UK506C1	Doncaster	UKE31	568.82	82.92	4.58		
UK507C1	Stockport	UKD31	126.16	47.26	0.00	-0.14	stable
UK508C1	Sefton	UKD73	153.33	56.40	12.94	-0.02	stable
UK509C1	Sandwell	UKG37	85.63	22.16	0.00	0.07	stable
UK510C1	Sunderland	UKC23	138.81	50.91	0.00		
UK511C1	Bolton	UKD32	139.87	55.79	0.00	-0.12	stable
UK512C1	Walsall	UKG38	104.05	39.63	0.00	-0.06	stable
UK513C1	Medway	UKJ41	192.61	65.72	10.37	-0.17	stable
UK514C1	Rotherham	UKE31	286.73	75.36	0.00	-0.09	stable
UK515C1	Brighton and Hove	UKJ21	82.96	58.21	0.77		
UK516C1	Plymouth	UKK41	80.73	32.88	0.06		
UK517C1	Swansea	UKL18	380.71	81.60	10.42		
UK518C1	Derby	UKF11	78.07	28.20	0.00		
UK519C1	Barnsley	UKE31	329.36	79.60	5.96	-0.34	stable
UK520C1	Southampton	UKJ32	50.21	25.62	0.41		
UK521C1	Oldham	UKD32	142.44	68.72	19.03	-0.01	stable
UK522C1	Salford	UKD31	97.25	46.61	0.00	-0.04	stable
UK523C1	Tameside	UKD31	103.34	56.14	1.02	0.17	stable
UK524C1	Trafford	UKD31	106.08	46.84	0.00	0	stable
UK525C1	Milton Keynes	UKJ12	308.85	79.24	0.00		
UK526C1	Rochdale	UKD32	158.25	69.08	7.31	-0.22	stable
UK527C1	Solihull	UKG32	178.50	66.71	0.00	-0.06	stable
UK528C1	Northampton	UKF24	80.81	43.05	0.90		
UK529C1	North Tyneside	UKC22	82.51	45.35	0.00	-0.11	stable
UK530C1	Gateshead	UKC22	143.78	63.54	0.00	-0.12	stable
UK531C1	Warrington	UKD61	181.20	67.79	0.50		
UK532C1	Luton	UKH21	43.40	19.10	0.00		
UK533C1	York	UKE21	272.10	80.58	2.65		
UK534C1	Bury	UKD32	99.57	60.01	0.00	0.13	stable
UK535C1	Swindon	UKK14	230.23	76.08	0.00		
UK536C1	Stockton-on-Tees	UKC11	205.41	65.99	1.19		
UK537C1	St. Helens	UKD71	136.50	66.18	0.00	-0.11	stable
UK538C1	Basildon	UKH33	110.45	60.83	0.00	-0.82	slight decrease
UK539C1	Bournemouth	UKK21	47.28	31.30	1.35		
UK540C1	Wycombe	UKJ13	324.78	89.58	1.04		
UK541C1	Southend-on-Sea	UKH31	41.84	26.11	0.16	-0.44	stable
UK542C1	Telford and Wrekin	UKG21	290.53	80.05	0.00		
UK543C1	North East Lincolnshire	UKE13	192.03	72.97	0.02		
UK544C1	Chelmsford	UKH33	342.61	85.16	0.26	-0.22	stable
UK545C1	Peterborough	UKH11	343.53	84.35	0.97		
UK546C1	Colchester	UKH33	333.97	86.29	3.66		
UK547C1	South Tyneside	UKC22	64.66	46.54	0.06	-0.18	stable
UK548C1	Basingstoke and Deane	UKJ33	634.17	91.17	0.00		
UK549C1	Bedford	UKH24	476.61	90.52	0.00		

CC code	CC name	NUTS3 code	CC area	GUA inside CC	N2K inside CC	Change in percent	Change category
UK550C1	Dundee City	UKM21	60.10		0.02		
UK551C1	Falkirk	UKM26	297.98	81.49	0.58		
UK552C1	Reading	UKJ11	40.43	34.14	0.00		
UK553C1	Blackpool	UKD42	34.96	23.01	0.00		
UK554C1	Maidstone	UKJ42	393.28	84.86	0.34	-0.11	stable
UK555C1	Poole	UKK21	67.75	45.54	9.27		
UK556C1	Dacorum	UKH23	212.59	81.08	2.10	-0.12	stable
UK557C1	Blackburn with Darwen	UKD41	137.17	77.79	0.00		
UK558C1	Newport	UKL21	191.74	73.59	1.00		
UK559C1	Middlesbrough	UKC12	54.08	44.38	0.00		
UK560C1	Oxford	UKJ14	45.66	46.34	3.84		
UK561C1	Torbay	UKK42	63.20	54.26	0.59		
UK562C1	Preston	UKD43	142.74	76.17	0.00		
UK563C1	St Albans	UKH23	161.30	74.64	0.00	-0.02	stable
UK564C1	Warwick	UKG13	283.10	84.67	0.00	-0.09	stable
UK565C1	Newcastle-under-Lyme	UKG24	211.08	82.03	0.00	-0.16	stable
UK566C1	Norwich	UKH13	40.54	30.28	0.69		
UK567C1	Slough	UKJ11	32.60	27.92	0.00	-5.33	strong decrease
UK568C2	Cheshire West and Chester	UKD63	537.58	85.07	2.96		
UK569C1	Ipswich	UKH14	39.53	33.42	0.00		
UK571C1	Cheltenham	UKK13	46.64	48.63	0.00		
UK572C1	Gloucester	UKK13	40.87	33.50	0.00		
UK573C1	Bracknell Forest	UKJ11	109.39	71.37	15.27	-0.15	stable
UK574C1	Lisburn	UKN02	446.47	84.65	1.06	-0.38	stable
UK575C1	Carlisle	UKD12	1041.37	94.79	10.43		
UK576C1	Crawley	UKJ24	44.99	37.26	0.00		

Table 4 List of core cities with parameter values: share of GUA within the entire FUA; share of GUA within the FUA without the core city; share of N2K sites within the FUA (representing hubs within the urban and peri-urban space); share of GUA within the FUA without the core city (representing the peri-urban space alone; all values in [%]); and Ratio of GUA comparing the share of GUA inside the core city with the share of GUA inside the entire FUA (unitless ratio value).

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
AT001L2	Wien	9205.26	8786.14	90.01	91.78	27.69	27.11	0.60
AT002L2	Graz	3073.44	2945.44	90.15	91.63	0.59	0.64	0.62
AT003L2	Linz	3521.88	3423.47	90.32	91.69	6.31	6.14	0.58
AT004L2	Salzburg	1428.39	1361.09	90.32	92.14	6.26	6.27	0.58
AT005L2	Innsbruck	1892.90	1785.26	94.99	95.85	19.32	16.68	0.84
AT006L1	Klagenfurt	2376.63	2256.48	94.81	95.92	0.57	0.52	0.78
BE001L2	Bruxelles / Brussel	3265.70	3103.22	79.92	82.30	5.71	5.09	0.43
BE002L2	Antwerpen	1190.56	986.35	68.88	75.06	17.66	16.18	0.57
BE003L2	Gent	1018.53	860.68	70.80	75.55	2.31	2.35	0.65
BE004L2	Charleroi	1097.19	994.22	80.27	85.09	3.87	3.97	0.42
BE005L2	Liège	1414.36	1235.85	80.33	85.19	4.51	4.51	0.58
BE006L2	Brugge	563.33	424.11	78.18	83.72	19.31	15.43	0.79
BE007L2	Namur	840.66	664.53	89.46	91.78	4.68	4.02	0.90
BE008L1	Leuven	451.38	393.76	84.91	89.03	12.92	11.57	0.67
BE009L1	Mons	392.79	245.00	79.69	83.53	8.80	5.96	0.92
BE010L1	Kortrijk	223.12	142.28	65.11	66.63	0.31	0.32	0.96
BE011L1	Oostende	205.86	167.79	78.20	85.58	3.95	3.36	0.58
BG001L2	Sofia	5716.91	5181.48	91.20	94.06	24.98	23.91	0.68
BG002L2	Plovdiv	2772.88	2670.04	92.50	93.90	20.75	20.56	0.61
BG003L2	Varna	2039.39	1884.35	92.92	95.67	56.21	53.86	0.64
BG004L2	Burgas	2948.14	2690.18	94.99	96.15	31.20	27.63	0.87
BG005L1	Pleven	1791.61	1706.49	94.53	95.38	15.77	15.39	0.82
BG006L2	Ruse	1339.50	1209.85	94.04	95.75	18.78	18.55	0.83
BG007L2	Vidin	622.86	557.59	92.44	94.18	9.75	9.17	0.83
BG008L2	Stara Zagora	1320.67	1235.52	94.68	96.09	3.85	3.94	0.78
BG009L1	Sliven	1366.64	1172.51	95.28	96.69	38.37	32.48	0.91
BG010L1	Plovdiv	1403.94	1294.92	95.84	97.04	22.80	22.79	0.85

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
BG011L1	Shumen	945.15	809.08	95.15	96.74	18.59	15.60	0.90
BG013L1	Yambol	1309.57	1218.90	95.48	96.52	12.60	11.28	0.85
BG014L1	Haskovo	739.67	643.66	95.15	96.73	14.89	14.36	0.89
BG015L1	Pazardzhik	636.84	599.34	91.89	93.37	13.23	12.10	0.74
BG016L1	Blagoevgrad	1354.85	1326.04	97.30	97.96	35.85	35.84	0.69
BG017L1	Veliko Tarnovo	885.10	854.90	95.90	96.82	6.10	5.00	0.73
BG018L1	Vratsa	706.07	557.62	95.58	97.11	20.35	14.50	0.94
CH001L1	Zürich	1089.98	1001.58	76.59	79.11			0.63
CH002L1	Genève	479.11	463.12	84.00	85.75			0.40
CH003L1	Basel	480.55	456.83	81.75	80.47			0.28
CH004L1	Bern	482.79	431.00	85.17	87.67			0.76
CH005L1	Lausanne	315.43	261.46	81.48	82.60			0.87
CH006L1	Winterthur	150.92	82.89	80.60	86.32			0.91
CH007L1	St. Gallen	174.66	135.09	82.42	85.91			0.86
CH008L1	Luzern	199.87	170.40	77.93	80.49			0.81
CH009L1	Lugano	222.48	105.00	81.29	82.72			0.96
CH010L1	Biel/Bienne	90.80	69.64	77.84	83.16			0.77
CY001L1	Lefkosia	2712.36	2506.50	88.78	94.01	20.96	21.05	0.67
CY501L1	Lemesos	1391.18	1179.30	91.29	95.48	19.28	19.23	0.77
CZ001L1	Praha	6979.79	6446.48	87.35	89.93	4.90	4.85	0.64
CZ002L1	Brno	3298.72	3068.51	89.77	91.68	3.70	3.37	0.72
CZ003L1	Ostrava	3878.19	3574.41	85.81	88.07	18.45	18.08	0.66
CZ004L1	Plzeň	3103.13	2965.48	91.86	92.98	1.50	1.55	0.74
CZ005L1	Ústí nad Labem	873.77	779.80	84.31	85.83	24.99	24.93	0.85
CZ006L1	Olomouc	1618.03	1514.70	91.43	92.85	26.57	26.17	0.77
CZ007L1	Liberec	1327.30	1221.24	89.40	91.11	10.01	10.02	0.78
CZ008L1	České Budějovice	1625.39	1569.77	92.19	93.36	10.93	10.53	0.64
CZ009L1	Hradec Králové	875.70	769.99	89.17	91.65	4.50	4.07	0.80
CZ010L1	Pardubice	889.29	806.64	88.57	90.78	3.31	3.37	0.76
CZ011L1	Zlín	1029.80	910.92	90.93	92.31	8.31	8.37	0.88
CZ013L1	Karlovy Vary	1628.06	1568.96	94.77	95.45	35.92	35.78	0.81
CZ014L1	Jihlava	1180.08	1092.21	94.06	95.07	0.62	0.54	0.87
CZ016L1	Most	467.20	380.22	85.90	88.98	20.41	19.70	0.84
CZ018L1	Chomutov	935.58	889.21	89.35	90.51	33.89	33.18	0.75
DE001L1	Berlin	17483.92	16404.72	88.52	90.95	21.75	21.35	0.52
DE002L1	Hamburg	7342.61	6586.68	83.89	87.69	12.24	11.69	0.60
DE003L1	München	5499.36	5188.07	84.60	87.38	7.61	7.53	0.45
DE004L1	Köln	1626.15	1057.32	67.33	74.84	3.94	1.76	0.77
DE005L1	Frankfurt am Main	4302.99	3932.22	83.05	85.59	12.84	12.58	0.63
DE007L1	Stuttgart	3654.23	3303.79	81.26	83.65	18.17	17.52	0.68
DE008L2	Leipzig	3978.75	3673.56	86.86	89.16	18.25	17.59	0.67
DE009L2	Dresden	5835.28	5500.93	87.65	89.14	19.06	18.90	0.71
DE011L1	Düsseldorf	1202.43	885.99	65.69	69.91	2.91	2.05	0.78
DE012L1	Bremen	5894.86	5569.46	87.60	89.61	8.56	7.36	0.61
DE013L1	Hannover	2973.18	2766.58	83.47	86.05	7.18	6.94	0.58
DE014L1	Nürnberg	2934.18	2602.72	85.31	89.19	17.38	16.30	0.55
DE017L0	Bielefeld	259.10		63.63		3.63		1.00
DE018L1	Halle an der Saale	1576.11	1440.35	85.13	87.51	6.53	5.30	0.70
DE019L2	Magdeburg	4168.05	3963.74	90.06	91.22	10.52	10.01	0.75
DE020L1	Wiesbaden	1015.80	811.98	86.63	90.88	14.36	10.36	0.80
DE021L1	Göttingen	2388.66	2271.91	91.80	92.66	14.00	13.19	0.82
DE025L1	Darmstadt	781.51	658.15	82.81	84.79	15.40	11.75	0.87
DE026L1	Trier	1210.69	1094.56	88.59	90.17	11.06	10.78	0.83
DE027L1	Freiburg im Breisgau	2211.34	2055.50	90.21	91.37	24.74	23.31	0.83
DE028L1	Regensburg	2538.20	2456.22	90.47	91.76	6.19	6.28	0.56
DE029L0	Frankfurt (Oder)	147.82		83.39		8.87		1.00
DE030L1	Weimar	888.80	804.38	90.69	92.07	22.97	20.90	0.86
DE031L1	Schwerin	4898.31	4768.37	93.65	94.08	28.29	27.44	0.83
DE032L1	Erfurt	2856.72	2585.68	90.27	91.75	20.80	19.20	0.85
DE033L1	Augsburg	1997.77	1851.31		88.53	3.12	2.06	
DE034L1	Bonn	1293.80	1117.68	77.80	81.41	11.22	9.14	0.72
DE035L1	Karlsruhe	1258.41	1084.33	81.48	84.60	25.50	22.31	0.76

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
DE036L0	Mönchengladbach	170.94		57.91		0.58		1.00
DE037L1	Mainz	703.20	605.54	82.43	86.32	18.18	16.99	0.71
DE038L1	Ruhrgebiet	4440.06	2546.77	66.87	77.22	5.73	4.90	0.68
DE039L1	Kiel	3364.59	3250.39	89.60	90.85	8.69	8.90	0.58
DE040L1	Saarbrücken	1537.62	1368.74	76.40	77.33	12.18	10.76	0.90
DE042L1	Koblenz	922.48	813.70	83.53	85.54	21.09	19.29	0.81
DE043L2	Rostock	3598.04	3428.31	94.36	95.54	24.60	23.68	0.75
DE044L1	Kaiserslautern	1354.00	1213.51	90.87	92.33	8.82	8.46	0.87
DE045L1	Iserlohn	1060.53	935.24	86.72	87.78	2.43	2.55	0.91
DE048L1	Wilhelmshaven	727.92	620.37	85.25	88.56	11.64	11.18	0.78
DE050L1	Tübingen	519.63	411.70	88.25	89.21	30.51	20.52	0.96
DE051L1	Villingen-Schwenningen	1025.98	860.90	91.80	93.12	51.55	43.52	0.93
DE052L1	Flensburg	2040.52	1991.14	90.71	91.69	7.80	8.19	0.56
DE053L1	Marburg	1262.08	1137.68	92.01	92.79	19.27	18.80	0.92
DE054L1	Konstanz	817.77	763.71	88.23	89.08	18.19	15.03	0.86
DE055L0	Neumünster	71.44		57.70		3.60		0.99
DE056L0	Brandenburg an der Havel	229.36		85.25		29.55		1.00
DE057L1	Gießen	855.38	782.57	88.59	90.52	19.25	18.82	0.77
DE058L1	Lüneburg	1327.26	1255.87	92.96	94.39	21.79	21.57	0.73
DE059L1	Bayreuth	1998.65	1931.85	94.51	95.33	3.20	3.32	0.75
DE060L1	Celle	1550.12	1373.54	90.77	92.21	14.08	13.52	0.88
DE061L1	Aschaffenburg	1476.18	1414.20	90.84	91.83	10.21	10.08	0.75
DE062L1	Bamberg	1221.96	1167.11	92.35	93.83	9.99	9.67	0.66
DE063L1	Plauen	1412.33	1310.78	92.31	93.12	8.93	9.06	0.89
DE064L1	Neubrandenburg	5839.03	5753.31	96.53	96.81	35.48	34.82	0.81
DE065L1	Fulda	1382.10	1278.42	91.75	92.91	28.47	28.38	0.84
DE066L1	Kempten (Allgäu)	1591.71	1528.50	93.32	94.23	23.65	23.80	0.78
DE067L1	Landshut	1413.62	1347.39	91.67	92.55	1.61	1.37	0.80
DE069L1	Rosenheim	1477.07	1440.64	90.71	91.42	9.19	9.32	0.69
DE071L1	Stralsund	3152.30	3112.91	95.19	95.65	33.07	33.70	0.62
DE072L1	Friedrichshafen	665.46	595.36	87.73	89.40	5.64	6.09	0.84
DE073L1	Offenburg	1859.29	1781.77	90.61	91.24	17.30	16.81	0.84
DE074L1	Görlitz	2111.18	2043.69	88.08	88.50	22.17	22.06	0.86
DE077L1	Schweinfurt	2014.66	1979.33	91.43	92.07	16.97	16.85	0.61
DE078L1	Greifswald	3449.43	3398.44	94.75	95.09	24.94	24.90	0.76
DE079L1	Wetzlar	1065.16	989.08	89.73	90.85	31.50	31.47	0.84
DE081L1	Passau	1600.37	1530.09	90.11	90.74	3.96	3.93	0.85
DE082L0	Dessau-Roßlau	246.26		85.80		21.87		1.00
DE083L1	Braunschweig-Salzgitter-Wolfsburg	4128.18	3505.76	88.96	91.64	7.40	6.08	0.73
DE084L1	Mannheim-Ludwigshafen	2044.83	1735.17	83.71	88.80	21.71	20.32	0.84
DE504L1	Münster	1416.04	1112.76	86.43	89.31	4.42	3.28	0.87
DE505L0	Chemnitz	221.38		70.95		0.59		1.00
DE507L1	Aachen	707.50	543.50	79.20	82.35	5.29	5.42	0.87
DE508L0	Krefeld	136.79		58.21		2.86		1.00
DE510L1	Lübeck	1598.28	1386.16	88.75	91.53	8.65	8.04	0.81
DE513L1	Kassel	1399.67	1295.12	88.33	90.91	9.71	8.33	0.64
DE516L0	Solingen	89.41		60.85		4.46		1.00
DE517L1	Osnabrück	2241.56	2121.40	88.31	90.01	3.58	3.78	0.66
DE520L1	Oldenburg (Oldenburg)	1898.48	1794.81	88.16	90.35	2.34	2.16	0.57
DE522L1	Heidelberg	1169.85	1060.55	84.88	85.84	18.27	16.47	0.89
DE523L1	Paderborn	1247.38	1067.64	87.00	90.19	15.95	15.21	0.78
DE524L2	Würzburg	3060.68	2972.90	92.09	92.90	20.28	20.22	0.70
DE527L1	Bremerhaven	2137.38	2060.73	91.92	93.24	6.25	6.15	0.62
DE529L1	Heilbronn	1199.50	1098.97	87.35	88.80	9.59	9.01	0.82
DE530L0	Remscheid	74.07		65.38		2.14		1.00
DE532L1	Ulm	1992.40	1792.12	89.86	91.58	7.82	7.48	0.87
DE533L1	Pforzheim	671.62	573.16	88.08	89.76	17.18	15.55	0.89
DE534L1	Ingolstadt	2847.97	2714.45	90.57	91.59	5.13	4.68	0.77
DE535L1	Gera	998.69	846.44	91.49	92.99	5.96	5.19	0.91
DE537L1	Reutlingen	1092.29	1006.40	91.06	92.91	24.12	22.84	0.76

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
DE539L1	Cottbus	1821.85	1656.71	85.10	87.37	24.99	23.54	0.73
DE540L2	Siegen	1775.45	1660.42	90.39	91.60	17.76	17.96	0.81
DE542L1	Hildesheim	1207.71	1114.43	89.85	91.42	5.00	4.30	0.79
DE544L1	Zwickau	949.56	845.73	86.57	89.16	3.03	3.13	0.76
DE546L0	Wuppertal	168.48		55.90		0.78		1.00
DE547L2	Jena	930.37	815.52	92.04	93.73	15.83	10.33	0.87
DK001L2	København	2800.47	2694.63	75.15	76.73	10.50	10.81	0.36
DK002L2	Århus	5928.29	4052.06	88.88	90.59	5.62	5.71	0.83
DK003L1	Odense	3497.96	3177.53	88.09	89.71	5.89	6.41	0.81
DK004L2	Aalborg	7942.51	5009.41	91.14	91.86	10.37	9.51	0.96
EE001L1	Tallinn	4339.75	4180.27	93.15	95.01	17.06	16.94	0.49
EE002L1	Tartu	2994.89	2956.00	95.08	95.85	17.55	17.53	0.39
EE003L0	Narva	68.95		69.47		0.20		1.00
EL001L1	Athina	3029.70	2990.75	77.23	78.10	11.85	11.89	0.19
EL002L1	Thessaloniki	254.66	1393.77	85.77	86.82	27.95	27.98	0.14
EL003L1	Patra	947.49	381.15	89.90	93.20	28.50	19.77	0.89
EL004L1	Irakleio	604.40	495.59	91.03	93.62	13.61	13.56	0.87
EL005L1	Larisa	1509.94	1433.07	92.65	94.17	54.06	52.91	0.81
EL006L1	Volos	1822.53	277.48	87.71	91.27	31.33	31.30	0.59
EL007L1	Ioannina	407.00	1277.92	93.46	94.41	34.95	31.28	0.73
EL008L1	Kavala	480.41	239.32	93.02	95.19	0.00	0.00	0.95
EL009L1	Kalamata	820.38	187.22	94.28	95.50	19.51	0.00	0.99
ES001L2	Madrid	6825.35	5576.04	83.97	89.74	36.83	32.01	0.68
ES002L2	Barcelona	2434.47	1900.23	74.07	80.25	24.84	21.58	0.40
ES003L2	Valencia	1040.36	905.70	77.03	79.49	12.67	7.26	0.82
ES004L2	Sevilla	3401.28	3099.45	89.70	92.08	5.79	5.65	0.58
ES005L2	Zaragoza	2761.58	1787.94	92.35	95.67	33.50	24.07	0.93
ES006L2	Málaga	1521.17	1106.07	88.94	92.46	5.28	5.34	0.91
ES007L2	Murcia	1198.86	312.82	87.03	83.10	17.35	0.88	1.02
ES008L2	Las Palmas	751.92	548.96	85.02	91.10	30.78	29.60	0.73
ES009L2	Valladolid	1156.57	958.96	88.73	91.18	3.67	3.95	0.87
ES010L2	Palma de Mallorca	2017.16	1808.59	89.67	92.00	15.53	14.83	0.78
ES011L2	Santiago de Compostela	1263.09	1043.10	91.81	93.16	0.19	0.38	0.93
ES012L2	Vitoria/Gasteiz	1597.89	1317.10	93.63	95.74	20.96	20.18	0.89
ES013L2	Oviedo	933.90	747.28	90.55	92.36	2.71	2.59	0.92
ES014L2	Pamplona/Iruña	1267.89	1242.64	93.11	94.25	18.48	18.52	0.39
ES015L2	Santander	682.76	648.05	83.65	85.99	1.36	2.26	0.52
ES016L2	Toledo	934.89	702.72	92.32	93.95	3.21	3.21	0.95
ES017L2	Badajoz	2188.71	718.47	95.20	96.75	11.65	3.70	0.99
ES018L2	Logroño	461.41	381.85	89.07	92.24	3.53	3.37	0.83
ES019L2	Bilbao	1480.73	1398.10	90.22	91.62	7.34	7.44	0.68
ES020L2	Córdoba	1869.07	613.85	94.74	96.02	21.79	11.53	0.99
ES021L2	Alicante/Alacant	354.00	153.13	70.61	69.20	5.34	2.44	1.02
ES022L2	Vigo	1345.40	1236.44	85.44	87.95	2.63	2.49	0.68
ES023L2	Gijón	524.69	343.06	87.35	93.55	2.02	2.49	0.88
ES025L2	Santa Cruz de Tenerife	612.42	359.78	82.24	85.95	36.51	20.23	1.01
ES026L2	Coruña (A)	746.91	709.18	87.54	89.86	1.41	1.61	0.50
ES028L1	Reus	115.44	62.45	77.32	86.60	0.00	0.00	0.86
ES031L0	Lugo	329.75		89.90		0.63		1.00
ES033L0	Girona	38.88		70.93		48.07		1.00
ES034L0	Cáceres	1750.28		97.83		66.59		1.00
ES035L0	Torrevieja	71.43		73.50		50.86		1.00
ES037L0	Puerto de Santa María, El	159.36		84.98		11.76		1.00
ES039L0	Avilés	26.80		56.40		2.09		1.00
ES040L0	Talavera de la Reina	185.86		90.43		7.13		1.00
ES041L0	Palencia	94.91		88.25		0.03		1.00
ES043L0	Ferrol	82.62		82.70		17.36		1.02
ES044L0	Pontevedra	118.24		86.84		0.00		1.00
ES045L0	Ceuta	19.78		62.17		28.86		1.00
ES046L0	Gandia	60.87		83.54		27.98		1.00
ES048L0	Guadalajara	235.54		93.52		0.16		1.00
ES050L0	Manresa	41.65		76.91		0.00		1.00

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
ES053L0	Ciudad Real	285.00		93.23		20.48		1.00
ES054L0	Benidorm	38.53		69.99		17.06		1.00
ES055L0	Melilla	13.87		46.08		4.60		1.00
ES057L0	Ponferrada	283.16		93.49		17.65		1.00
ES059L0	Zamora	149.25		91.07		2.31		1.00
ES062L0	Sanlúcar de Barrameda	170.90		89.75		22.49		1.00
ES065L0	Línea de la Concepción, La	19.27		62.78		0.00		1.00
ES070L0	Irun	41.74		81.16		31.11		1.00
ES072L0	Arrecife	22.72		64.87		0.17		1.01
ES073L0	Elda	45.82		82.22		0.00		1.00
ES074L0	Santa Lucía de Tirajana	61.54		79.49		9.37		1.00
ES501L1	Granada	1497.10	1409.05	92.43	93.61	32.45	32.44	0.80
ES505L1	Elche/Elx	384.72	58.55	85.71	87.57	10.98	6.09	1.00
ES506L1	Cartagena	582.87	24.79	86.69	87.36	28.12	0.32	1.01
ES508L1	Jerez de la Frontera	1258.10	69.99	95.12	96.36	15.97	0.14	1.00
ES510L1	Donostia-San Sebastián	330.99	270.09	86.28	89.67	20.21	19.88	0.83
ES514L1	Almería	400.45	104.15	81.20	85.57	44.72	7.26	0.98
ES515L1	Burgos	1493.50	1386.39	95.56	97.52	0.76	0.90	0.73
ES516L1	Salamanca	464.09	416.98	90.44	93.33	0.00	0.00	0.66
ES519L1	Albacete	2451.33	1325.78	96.60	97.44	1.89	1.89	0.99
ES520L1	Castellón de la Plana/Castelló de la Plana	320.12	211.38	83.75	88.52	5.74	5.65	0.91
ES521L1	Huelva	966.36	815.02	93.75	95.23	8.55	5.73	0.91
ES522L1	Cádiz	238.90	196.01	86.89	91.64	20.98	15.68	0.85
ES523L1	León	1190.06	1151.03	93.52	94.70	3.99	4.03	0.63
ES525L1	Tarragona	208.96	153.92	74.83	78.44	1.46	1.13	0.91
ES527L1	Jaén	999.01	574.70	96.19	97.25	0.15	0.15	0.99
ES528L1	Lleida	706.40	494.32	91.41	93.09	5.56	3.51	0.96
ES529L1	Ourense	651.50	566.95	91.16	92.91	1.93	1.92	0.87
ES532L1	Algeciras	417.13	331.31	92.96	96.44	70.32	60.42	0.86
ES533L1	Marbella	686.91	559.63	91.38	94.38	34.75	33.57	0.46
FI001L2	Helsinki	3821.67	3042.92	87.89	92.33	4.68	3.83	0.64
FI002L2	Tampere	4958.79	4269.25	95.22	96.10	1.69	1.70	0.94
FI003L2	Turku	2471.94	2223.28	91.56	93.48	2.95	2.54	0.81
FI004L2	Oulu	4771.00	3323.41	95.91	96.47	6.05	4.79	0.99
FI007L1	Lahti	3073.97	2919.51	95.77	96.64	1.48	1.41	0.83
FI008L1	Kuopio	7331.19	5012.16	97.77	97.83	3.45	2.08	1.00
FI009L1	Jyväskylä	9037.38	7571.02	97.50	97.85	2.89	2.71	0.98
FR001L1	Paris	12097.67	10724.43	81.86	85.56	4.31	4.00	0.31
FR003L2	Lyon	3669.79	3148.91	79.69	85.46	12.01	11.52	0.56
FR004L2	Toulouse	5245.98	4784.25	85.44	89.10	1.43	1.31	0.55
FR006L2	Strasbourg	2037.90	1720.99	86.59	90.47	9.58	7.72	0.76
FR007L2	Bordeaux	5543.08	4992.28	87.63	91.56	6.40	5.62	0.59
FR008L2	Nantes	3165.16	2630.15	85.37	89.82	10.61	8.41	0.74
FR009L2	Lille	1443.09	830.55	74.96	88.64	2.19	2.19	0.76
FR010L2	Montpellier	2234.77	1796.08	88.95	93.42	40.10	38.10	0.79
FR011L2	Saint-Etienne	1810.43	1239.75	87.37	91.65	14.99	13.77	0.89
FR012L2	Le Havre	754.53	554.58	80.47	88.72	5.40	5.00	0.73
FR013L2	Rennes	3820.00	3206.00	87.44	90.31	0.77	0.76	0.83
FR014L2	Amiens	2447.26	2133.70	94.00	95.71	1.38	1.13	0.88
FR016L2	Nancy	2834.45	2690.75	91.91	93.79	3.46	3.39	0.62
FR017L2	Metz	1768.25	1490.35	89.65	92.41	8.32	8.03	0.83
FR018L2	Reims	2430.86	2342.02	92.62	94.46	1.62	1.62	0.47
FR019L2	Orléans	2921.35	2584.72	90.95	94.11	31.24	30.26	0.73
FR020L2	Dijon	3858.66	3638.48	94.15	95.88	22.78	22.58	0.70
FR021L2	Poitiers	2504.42	2250.95	91.54	93.43	10.59	9.71	0.82
FR022L2	Clermont-Ferrand	2662.91	2359.75	90.05	92.94	11.57	10.95	0.75
FR023L2	Caen	2249.81	2064.05	88.84	91.56	1.50	1.65	0.66
FR024L2	Limoges	3177.73	2702.42	92.61	94.71	1.38	1.45	0.87
FR025L2	Besançon	2389.93	1955.70	92.45	94.92	13.32	11.92	0.88
FR026L2	Grenoble	2660.54	2348.27	91.07	93.75	8.14	8.13	0.78

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
FR027L2	Ajaccio	1455.52	1184.55	95.61	97.49	5.79	4.75	0.91
FR028L1	Saint Denis	287.57				0.00		
FR030L1	Fort-de-France	175.74				0.00		
FR032L2	Toulon	1047.98	676.40	81.00	91.22	21.56	12.82	0.77
FR034L2	Valenciennes	785.29	522.41	82.93	87.07	11.70	8.44	0.90
FR035L2	Tours	2850.84	2510.50	90.13	92.90	10.79	10.38	0.77
FR036L2	Angers	2312.36	1793.59	90.06	92.75	7.29	4.60	0.90
FR037L2	Brest	1306.97	1088.61	84.92	88.62	3.54	3.77	0.78
FR038L2	Le Mans	2241.38	2083.59	90.28	92.31	4.07	4.08	0.70
FR039L1	Avignon	870.07	630.62	80.49	83.87	9.36	5.78	0.89
FR040L2	Mulhouse	1297.99	983.56	86.42	91.03	19.96	16.67	0.83
FR042L2	Dunkerque	894.80	645.12	85.04	91.58	1.13	0.42	0.80
FR043L2	Perpignan	1818.48	1193.97	89.87	93.39	13.01	7.17	0.93
FR044L2	Nimes	1505.50	817.35	90.35	93.16	21.63	11.63	0.96
FR045L2	Pau	2017.81	1834.91	91.34	93.51	7.71	8.20	0.76
FR046L2	Bayonne	1022.75	938.09	87.27	90.91	22.61	24.15	0.54
FR047L0	Annemasse	77.95		67.77		7.17		1.00
FR048L2	Annecy	1191.30	1066.11	91.24	93.84	9.30	9.35	0.76
FR049L2	Lorient	1110.09	637.95	88.87	93.87	4.18	3.38	0.92
FR050L2	Montbelliard	1231.08	1051.20	91.15	94.86	2.61	2.48	0.76
FR051L2	Troyes	2609.74	2500.33	95.31	96.85	8.33	8.32	0.63
FR052L2	Saint-Nazaire	1056.19	738.63	87.95	90.52	26.64	12.40	0.93
FR053L2	La Rochelle	1103.72	892.91	90.04	94.47	15.73	15.20	0.79
FR056L2	Angoulème	2143.38	1972.81	93.25	94.96	8.89	8.09	0.79
FR057L2	Boulogne-sur-mer	678.70	472.83	89.49	92.11	4.59	2.67	0.93
FR058L2	Chambery	1017.66	754.78	90.93	92.81	10.02	9.81	0.94
FR059L2	Chalon-sur-Saône	1562.80	1114.62	93.02	95.31	7.88	6.50	0.94
FR060L2	Chartres	1614.17	1196.83	94.99	96.86	7.83	7.81	0.94
FR061L2	Niort	1799.16	1255.09	92.69	94.43	33.72	24.22	0.96
FR062L2	Calais	493.18	395.78	88.31	93.68	1.71	1.45	0.76
FR063L2	Béziers	849.43	598.86	89.85	93.04	16.04	13.92	0.92
FR064L2	Arras	1075.07	904.05	92.50	95.20	0.00	0.00	0.85
FR065L2	Bourges	2503.42	2148.12	94.60	96.14	2.34	2.16	0.90
FR066L2	Saint-Brieuc	1145.50	895.74	85.91	89.25	0.74	0.50	0.86
FR067L2	Quimper	1197.03	907.63	87.09	88.95	1.33	1.41	0.93
FR068L2	Vannes	1187.13	664.98	90.43	92.94	6.13	3.21	0.96
FR069L2	Cherbourg	894.97	826.74	90.90	93.43	2.64	2.80	0.66
FR073L2	Tarbes	1042.54	925.60	91.93	94.48	0.60	0.57	0.78
FR074L2	Compiègne	988.05	788.38	92.92	94.15	24.72	12.49	0.95
FR076L2	Belfort	656.48	480.95	90.72	94.39	13.64	13.39	0.89
FR077L2	Roanne	1233.62	1136.64	90.63	92.80	4.55	4.02	0.72
FR079L2	Saint-Quentin	993.29	834.70	94.07	95.77	0.04	0.00	0.90
FR082L2	Beauvais	1312.15	1004.90	94.35	95.98	1.63	1.03	0.94
FR084L2	Creil	297.33	263.26	84.37	88.83	5.23	5.18	0.59
FR086L2	Evreux	1265.16	972.94	94.61	96.68	1.03	0.92	0.93
FR090L2	Châteauroux	2611.11	2146.61	95.49	96.58	9.85	9.72	0.95
FR093L2	Brive-la-Gaillarde	1325.39	1001.19	92.86	94.67	0.83	0.79	0.94
FR096L2	Albi	1339.76	1128.20	92.92	95.19	0.40	0.40	0.87
FR099L2	Fréjus	439.14	243.43	85.56	89.65	40.18	19.97	0.94
FR104L2	Châlons-en-Champagne	1526.47	1325.75	95.01	96.42	1.36	1.36	0.90
FR203L2	Marseille	4235.38	2090.96	86.14	94.27	27.26	11.14	1.02
FR205L2	Nice	3096.77	2367.90	93.32	97.78	30.96	24.58	0.81
FR207L2	Lens - Liévin	252.65	12.95	64.37	80.31	0.00	0.00	0.99
FR208L1	Hénin - Carvin	115.23	2.92	58.78	93.14	0.00	0.00	0.98
FR209L2	Douai	451.72	216.05	80.57	85.24	2.11	1.65	0.95
FR214L1	Valence	909.58	673.31	86.01	89.70	1.74	1.78	0.88
FR215L2	Rouen	2871.29	2207.70	90.14	94.21	2.60	1.32	0.85
FR304L1	Melun	449.68	351.70	87.67	94.19	10.98	9.73	0.73
FR324L1	Martigues	195.94	88.62	72.19	69.85	11.17	6.46	1.03
FR505L1	Charleville-Mézières	1353.48	1257.94	95.13	96.40	22.49	21.67	0.83
FR506L1	Colmar	1018.96	843.92	90.97	93.42	21.56	18.82	0.87
HR001L2	Grad Zagreb	3902.28	3260.61	91.69	94.40	0.02	0.01	0.85

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
HR002L2	Rijeka	911.32	821.62	92.12	93.86	0.03	0.02	
HR003L2	Slavonski Brod	873.90	819.60	94.88	96.60	0.00	0.00	0.73
HR004L2	Osijek	1345.27	1190.22	94.59	96.34	0.00	0.00	0.87
HR005L2	Split	3111.72	3030.41	95.65	96.23	0.00	0.00	0.77
HU001L2	Budapest	6393.14	5867.85	82.95	87.43	17.91	17.42	0.47
HU002L2	Miskolc	1645.76	1409.09	90.82	92.70	25.12	18.75	0.88
HU003L2	Nyíregyháza	1682.65	1408.00	89.28	91.72	4.93	4.53	0.86
HU004L2	Pécs	1857.65	1694.93	92.43	94.78	15.54	13.84	0.75
HU005L2	Debrecen	2017.30	1555.54	90.32	92.65	14.62	12.82	0.91
HU006L2	Szeged	1609.26	1328.22	90.12	92.08	17.60	15.83	0.90
HU007L2	Gyõr	2047.38	1871.75	91.65	93.45	14.28	12.88	0.79
HU008L2	Kecskemét	1820.27	1498.82	91.13	94.12	15.86	15.35	0.85
HU009L2	Székesfehérvár	3012.22	2841.33	93.03	93.96	17.74	17.57	0.83
HU010L1	Szombathely	1343.26	1245.74	94.00	95.57	9.66	9.74	0.79
IE001L1	Dublin	6990.66	6872.98	88.50	89.95	6.43	6.57	0.28
IE002L1	Cork	3268.02	3228.05	90.61	91.41	1.82	2.55	0.27
IE003L1	Limerick	1565.05	1545.57	92.25	93.02	8.11	8.25	0.34
IE004L1	Galway	2239.09	2188.37	93.30	94.18	23.03	22.96	0.60
IE005L1	Waterford	947.11	905.46	90.79	92.21	4.10	3.91	0.66
IS001L1	Reykjavík	12872.07	11828.30	99.13	99.42			0.97
IT001L2	Roma	5744.48	4458.51	83.96	88.46	16.36	14.60	0.81
IT002L2	Milano	2637.61	2422.46	70.55	73.65	3.17	3.18	0.48
IT003L2	Napoli	1552.27	1339.30	63.11	65.68	14.64	14.22	0.46
IT004L2	Torino	1781.49	1650.77	80.46	83.75	8.32	8.11	0.48
IT005L2	Palermo	1366.83	1205.49	88.16	91.86	22.26	19.05	0.70
IT006L2	Genova	1114.70	874.54	90.97	95.49	24.63	19.36	0.82
IT007L2	Firenze	1737.84	1635.33	89.34	91.63	8.07	8.06	0.60
IT008L2	Bari	755.39	638.87	82.66	88.14	3.71	3.70	0.64
IT009L1	Bologna	2038.59	1894.54	87.38	89.55	11.88	11.54	0.66
IT010L2	Catania	609.03	427.36	72.90	75.79	5.27	1.98	0.91
IT011L2	Venezia	639.47	480.09	75.50	80.91	9.22	7.57	0.79
IT012L2	Verona	774.65	575.52	74.70	77.61	3.25	2.15	0.89
IT013L2	Cremona	563.22	492.68	87.53	89.99	3.23	3.04	0.80
IT014L2	Trento	939.15	780.10	91.05	93.11	2.60	1.60	0.89
IT015L1	Trieste	211.86	127.06	77.94	86.21	45.78	32.55	0.84
IT016L2	Perugia	1145.25	696.07	89.33	91.38	12.69	10.95	0.96
IT017L2	Ancona	328.52	203.71	81.62	82.41	5.17	1.60	0.98
IT019L2	Pescara	160.54	126.51	64.17	71.30	0.00	0.00	0.59
IT020L2	Campobasso	806.44	750.45	92.17	93.73	11.52	11.32	0.77
IT021L2	Caserta	93.20	39.47	73.45	76.98	7.26	2.65	0.96
IT022L2	Taranto	1052.13	798.49	85.30	87.86	15.68	13.81	0.90
IT023L2	Potenza	1379.78	1204.93	93.53	94.65	3.73	3.62	0.92
IT024L2	Catanzaro	883.38	771.00	92.97	94.69	6.48	6.52	0.88
IT025L2	Reggio di Calabria	455.88	218.63	87.70	92.15	21.22	17.00	0.95
IT026L2	Sassari	1699.30	1151.42	93.12	94.18	5.71	5.19	0.98
IT027L1	Cagliari	1668.26	1583.65	90.09	91.21	24.58	22.83	0.76
IT028L2	Padova	545.76	452.76	70.94	75.78	7.04	7.02	0.67
IT029L2	Brescia	590.58	500.03	72.95	77.06	0.02	0.01	0.69
IT030L2	Modena	551.19	367.61	78.78	82.67	1.14	1.05	0.90
IT031L2	Foggia	968.59	462.49	92.98	96.33	7.16	6.04	0.97
IT032L2	Salerno	274.48	214.95	76.62	79.11	18.93	18.99	0.88
IT033L1	Piacenza	730.30	611.98	89.22	91.69	8.41	6.26	0.86
IT034L1	Bolzano	1067.34	1015.05	95.96	97.10	4.96	4.95	0.77
IT035L1	Udine	672.94	615.88	86.21	89.24	0.76	0.78	0.63
IT036L1	La Spezia	506.25	454.79	89.73	91.94	15.19	13.15	0.78
IT037L1	Lecce	577.33	339.77	88.02	88.14	4.73	1.48	1.00
IT038L1	Barletta	148.13		88.31		2.55		1.00
IT039L1	Pesaro	254.05	127.42	85.80	90.61	16.40	6.41	0.94
IT040L1	Como	219.49	182.35	87.27	91.17	4.51	1.63	0.78
IT041L1	Pisa	448.46	263.13	84.57	89.50	25.31	11.04	0.92
IT042L1	Treviso	240.69	185.16	76.49	80.69	3.06	2.19	0.82
IT043L1	Varese	224.75	169.86	86.22	88.38	22.51	15.75	0.92

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
IT044L1	Busto Arsizio	37.90	7.21	45.46	47.38	0.00	0.00	0.99
IT045L1	Asti	514.99	363.57	91.30	93.91	5.66	1.57	0.93
IT046L1	Pavia	362.99	299.69	89.69	92.02	13.54	10.26	0.88
IT047L1	Massa	110.65	16.75	79.05	83.83	30.27	2.66	0.99
IT048L1	Cosenza	1138.57	1101.00	94.91	95.53	16.56	16.55	0.81
IT049L1	Carrara	84.83	13.86	69.50	84.91	8.91	0.40	0.96
IT050L1	Benevento	413.12	282.93	89.36	92.24	6.61	6.60	0.93
IT051L1	Sanremo	188.93	132.95	87.62	92.19	27.60	18.74	0.88
IT052L1	Savona	283.53	218.22	91.81	93.30	9.16	7.51	0.95
IT053L1	Vigevano	221.02	139.60	87.85	91.74	15.88	7.70	0.92
IT054L1	Matera	779.07	390.61	96.22	98.09	13.02	2.52	0.98
IT055L1	Viareggio	186.17	153.77	83.08	88.34	17.46	13.46	0.70
IT056L1	Acireale	39.98		77.57		5.84		1.00
IT057L1	Avellino	322.86	292.47	88.38	90.12	19.23	19.22	0.81
IT058L1	Pordenone	278.46	240.29	86.02	89.33	9.76	9.75	0.76
IT059L1	Biella	437.32	390.60	91.25	92.65	15.09	15.07	0.87
IT060L1	Lecco	288.11	242.95	91.36	92.82	21.46	19.17	0.91
IT501L2	Messina	336.03	124.63	86.39	92.59	61.02	16.73	0.96
IT502L2	Prato	409.59	312.25	85.32	91.97	21.84	17.08	0.75
IT503L2	Parma	1076.64	815.89	87.39	90.12	9.31	8.95	0.90
IT504L2	Livorno	254.51	150.46	83.09	90.15	1.34	0.56	0.88
IT505L2	Reggio nell'Emilia	588.49	357.73	87.57	90.98	4.39	3.93	0.94
IT506L2	Ravenna	699.54	46.23	88.81	86.96	12.09	0.15	1.00
IT507L2	Ferrara	914.64	509.97	91.30	93.04	2.33	1.06	0.98
IT508L2	Rimini	304.34	168.97	79.57	84.94	2.35	2.08	0.92
IT509L2	Siracusa	260.47	54.21	83.18	86.10	3.59	0.06	0.99
IT511L2	Bergamo	181.21	141.02	64.62	68.26	3.38	3.15	0.80
IT512L2	Forlì	557.93	329.89	88.62	92.78	4.17	2.97	0.93
IT513L2	Latina	621.97	344.99	87.83	92.03	18.96	17.01	0.94
IT514L2	Vicenza	372.43	291.87	78.56	82.30	14.56	14.84	0.83
IT515L2	Terni	1023.65	811.53	94.30	95.60	16.89	12.63	0.95
IT516L2	Novara	571.40	468.27	89.08	91.48	6.58	6.58	0.88
LT001L1	Vilnius	4246.62	3846.04	91.95	94.58	3.26	3.22	0.73
LT002L1	Kaunas	1620.67	1463.69	88.54	92.83	11.22	10.53	0.55
LT003L1	Panevėžys	2228.07	2173.69	94.49	95.55	14.89	14.91	0.51
LT004L0	Alytus	39.49		62.75		9.56		1.00
LT501L0	Klaipėda	88.25		58.93		2.74		1.00
LT502L0	Šiauliai	81.13		55.55		18.75		1.00
LU001L1	Luxembourg	2595.77	2544.03	89.15	89.83	17.85	17.73	0.62
LV001L0	Rīga	304.16		57.10		6.05		1.00
LV002L1	Liepāja	3652.39	3591.37	97.16	97.72	7.75	7.41	0.66
LV003L1	Jelgava	1664.71	1604.15	95.34	96.37	4.79	4.62	0.72
LV501L1	Daugavpils	2595.97	2523.58	95.31	96.24	21.38	21.41	0.67
MT001L1	Valletta	246.70	196.48	66.75	75.61	11.83	12.68	0.48
NL001L2	s' Gravenhage	275.41	117.50	54.41	67.44	10.34	7.83	0.65
NL002L2	Amsterdam	2914.54	1874.82	78.41	86.20	10.66	7.81	0.61
NL003L2	Rotterdam	1517.85	1151.02	73.45	83.61	10.48	18.67	0.55
NL004L2	Utrecht	627.85	528.55	72.67	78.04	3.57	3.53	0.61
NL005L2	Eindhoven	1200.56	1057.09	76.84	81.38	8.01	8.04	0.47
NL006L2	Tilburg	323.06	203.87	74.88	85.89	8.66	6.81	0.75
NL007L2	Groningen	1851.73	1768.01	86.85	88.43	4.59	5.85	0.62
NL008L2	Enschede	849.98	645.47	81.35	86.31	5.16	5.00	0.85
NL009L2	Arnhem	559.13	457.58	76.44	79.21	35.66	26.65	0.84
NL010L2	Heerlen	199.53	154.05	76.55	85.70	7.26	5.82	0.60
NL012L2	Breda	481.04	351.72	76.83	82.71	7.35	7.12	0.79
NL013L2	Nijmegen	355.94	298.20	73.82	80.47	6.87	6.03	0.54
NL014L2	Apeldoorn	710.13	368.98	84.99	86.53	43.27	14.18	0.98
NL015L2	Leeuwarden	1040.51	956.46	88.33	90.34	4.85	4.56	0.74
NL016L1	Sittard-Geleen	148.66	67.96	61.77	68.35	0.73	1.09	0.91
NL017L1	Delft	73.49	49.44	65.45	78.01	0.00	0.00	0.61
NL018L1	Hilversum	122.80	76.33	83.42	91.10	40.88	39.37	0.85
NL020L1	Roosendaal	246.97	139.71	79.09	82.32	1.70	0.00	0.95

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
NL026L1	Alphen aan den Rijn	57.59		74.53		0.10		1.00
NL028L1	Bergen op Zoom	256.41	163.27	87.24	91.95	16.92	10.01	0.91
NL029L1	Katwijk	26.03		47.85		17.82		1.00
NL030L1	Gouda	74.62	56.53	80.83	94.01	0.00	0.00	0.49
NL032L1	Middelburg	227.28	174.24	81.11	83.04	9.27	8.00	0.92
NL503L2	s-Hertogenbosch	379.63	288.38	77.45	81.72	8.01	6.94	0.83
NL504L2	Amersfoort	135.84	72.04	66.28	80.01	7.74	7.69	0.77
NL505L1	Maastricht	203.11	143.03	75.52	84.42	7.45	6.55	0.72
NL506L2	Dordrecht	110.19	10.76	71.45	41.83	29.40	0.00	1.04
NL507L2	Leiden	57.39	34.26	58.23	75.63	0.00	0.00	0.56
NL511L2	Zwolle	492.12	372.82	84.64	88.13	19.29	17.24	0.87
NL512L1	Ede	318.73		80.14		56.14		1.00
NL513L2	Deventer	252.82	118.40	84.87	90.39	6.83	4.79	0.94
NL514L2	Alkmaar	196.72	165.51	76.11	82.35	22.93	22.99	0.57
NL515L2	Venlo	511.44	382.45	79.55	83.97	4.28	2.27	0.84
NL519L2	Almelo	420.33	350.91	83.69	87.43	6.29	6.36	0.77
NO001L1	Oslo	7427.73	5387.98	95.05	95.42			0.89
NO002L1	Bergen	3357.38	2408.38	95.66	97.40			0.91
NO003L1	Trondheim	6700.74	2211.59	96.76	97.98			0.92
NO004L1	Stavanger	2807.40	1411.68	93.00	94.62			0.68
NO005L1	Kristiansand	3076.56	2266.66	97.08	98.07			0.93
NO006L1	Tromsø	3602.71	1086.85	99.28	99.41			1.00
PL001L2	Warszawa	8614.64	8097.41	86.33	88.76	10.80	10.49	0.56
PL002L2	Łódź	1695.25	1358.38	82.62	88.97	0.21	0.22	0.68
PL003L2	Kraków	3757.26	3429.53	84.25	86.86	4.58	4.51	0.67
PL004L2	Wrocław	2648.10	2355.28	88.22	91.53	8.52	7.74	0.70
PL005L2	Poznań	3092.01	2828.53	87.97	90.82	12.61	12.51	0.65
PL006L2	Gdańsk	2629.74	2230.49	86.63	90.33	6.58	6.29	0.75
PL007L2	Szczecin	1128.91	828.39	88.48	93.51	36.24	26.02	0.84
PL008L2	Bydgoszcz	2100.60	1924.62	91.48	93.93	5.45	4.96	0.71
PL009L2	Lublin	3222.17	3070.14	89.56	90.97	0.80	0.80	0.67
PL010L2	Katowice	3945.35	3212.69	80.59	84.89	2.05	1.84	0.79
PL011L2	Białystok	2236.35	2133.17	91.47	93.40	34.83	34.82	0.56
PL012L2	Kielce	2243.29	2132.63	90.32	91.80	21.69	21.30	0.68
PL013L2	Toruń	1588.56	1471.38	90.91	93.24	4.50	3.56	0.67
PL014L2	Olsztyn	2023.57	1934.15	94.33	95.60	21.06	21.08	0.72
PL015L2	Rzeszów	2291.83	2174.00	85.88	87.35	7.17	7.20	0.68
PL016L2	Opole	1765.62	1668.35	92.24	93.66	7.95	7.99	0.73
PL017L2	Gorzów Wielkopolski	975.17	889.45	92.49	94.84	27.77	27.34	0.74
PL018L2	Zielona Góra	1694.86	1635.05	94.25	95.41	11.49	11.53	0.65
PL019L2	Jelenia Góra	834.31	724.35	91.85	93.56	40.05	36.78	0.88
PL020L2	Nowy Sącz	1303.90	1245.73	89.22	90.66	28.97	29.03	0.65
PL021L2	Suwałki	721.36	654.25	93.45	95.37	32.93	32.39	0.79
PL022L2	Konin	1182.11	1098.26	91.65	93.06	23.23	22.13	0.80
PL024L2	Częstochowa	1937.69	1776.21	88.38	91.00	2.32	2.28	0.67
PL025L2	Radom	680.49	568.69	85.37	90.83	5.40	5.20	0.67
PL026L2	Płock	1710.86	1620.13	91.75	93.23	4.03	3.71	0.70
PL027L2	Kalisz	1490.71	1421.30	90.95	92.22	0.87	0.86	0.71
PL028L2	Koszalin	1296.20	1195.73	94.54	95.83	16.57	16.04	0.83
PL029L1	Słupsk	2345.69	2302.54	97.24	97.87	19.77	19.82	0.65
PL030L1	Jastrzębie-Zdrój	294.91	144.86	76.74	81.38	0.05	0.03	0.97
PL031L1	Siedlce	1262.74	1230.88	94.55	95.70	14.68	14.62	0.53
PL032L1	Piotrków Trybunalski	1170.38	1102.74	94.52	95.96	2.79	2.81	0.75
PL033L1	Lubin	933.28	892.52	95.39	96.46	7.94	7.93	0.76
PL034L1	Piła	520.78	418.10	93.52	97.17	37.66	30.38	0.85
PL035L1	Inowrocław	202.07	171.66	86.79	92.25	0.00	0.00	0.64
PL036L1	Ostrowiec Świętokrzyski	616.80	570.37	93.29	95.85	8.77	8.98	0.66
PL037L1	Gniezno	667.10	626.51	93.87	95.89	1.76	1.77	0.67
PL038L1	Stargard Szczeciński	366.97	318.89	91.74	95.95	8.18	8.22	0.70
PL039L1	Ostrów Wielkopolski	846.97	805.06	90.77	93.03	28.62	28.61	0.53
PL040L1	Przemyśl	849.18	803.01	95.18	96.47	40.10	40.03	0.76
PL041L1	Zamość	1127.65	1097.31	95.18	96.24	12.26	12.10	0.60

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
PL042L1	Chełm	466.14	430.87	93.18	96.65	8.78	8.78	0.55
PL043L1	Pabianice	331.01	296.75	87.62	90.75	0.87	0.91	0.68
PL044L1	Głogów	641.71	606.61	94.92	96.98	5.71	5.50	0.62
PL045L1	Stalowa Wola	1904.04	1821.53	95.94	96.47	44.77	44.54	0.88
PL046L1	Tomaszów Mazowiecki	191.12	149.82	86.66	94.51	3.49	2.96	0.67
PL047L1	Łomża	559.90	527.23	94.16	96.02	25.66	24.30	0.68
PL048L1	Leszno	775.83	743.97	93.71	95.40	16.29	16.28	0.58
PL049L1	Świdnica	480.13	458.38	92.90	94.97	5.76	5.75	0.53
PL051L1	Tczew	270.79	248.35	91.11	94.48	6.97	6.45	0.59
PL052L1	Ełk	400.22	379.17	95.22	97.38	2.36	2.36	0.59
PL506L2	Bielsko-Biała	734.19	609.68	87.78	91.72	25.91	22.54	0.78
PL508L1	Rybnik	148.36		68.19		0.00		1.00
PL511L2	Wałbrzych	514.91	430.20	92.17	95.53	53.39	51.53	0.83
PL512L2	Elbląg	964.53	884.72	94.80	96.60	9.99	10.00	0.79
PL513L2	Włocławek	1224.22	1141.27	93.86	95.50	5.25	4.15	0.77
PL514L2	Tarnów	1255.49	1183.11	89.86	91.86	1.99	2.09	0.64
PL516L2	Legnica	564.13	507.84	92.57	95.95	3.28	3.28	0.67
PL517L2	Grudziądz	549.76	491.99	90.74	93.51	7.15	6.50	0.74
PT001L2	Lisboa	3900.85	2959.36	81.46	86.16	13.58	10.16	0.31
PT002L2	Porto	952.48	316.40	66.76	77.32	2.92	0.24	0.32
PT003L1	Braga	494.03	310.44	81.10	87.60	3.22	3.22	0.86
PT004L2	Funchal	339.58				15.82	12.52	
PT005L2	Coimbra	1628.68	1308.88	89.99	91.91	4.55	4.38	0.91
PT006L0	Setúbal	170.24				55.00		
PT007L1	Ponta Delgada	536.88				2.37	2.39	
PT008L2	Aveiro	429.92	232.29	82.11	83.79	15.56	10.61	0.98
PT009L1	Faro	486.06	283.84	89.17	91.15	29.15	24.42	0.97
PT014L0	Viseu	507.09				0.10		
PT016L0	Viana do Castelo	319.01		88.88		14.78		1.00
PT019L0	Póvoa de Varzim	82.20				0.00		
PT505L1	Guimarães	265.74	24.69	78.03	78.67	0.00	0.00	1.00
RO001L1	Bucureşti	1093.02	826.01	71.13	82.33	3.53	3.52	0.45
RO002L1	Cluj-Napoca	591.66	412.37	87.32	93.14	15.02	11.69	0.85
RO003L1	Timişoara	237.41	108.16	71.08	81.94	4.23	2.73	0.87
RO004L1	Craiova	344.39	263.11	81.51	91.73	12.39	11.74	0.59
RO005L1	Brăila	235.49	190.44	85.16	95.47	20.84	20.49	0.49
RO006L1	Oradea	203.68	90.99	74.16	89.97	6.00	5.25	0.83
RO007L1	Bacău	221.22	178.04	81.16	90.59	14.65	13.71	0.52
RO008L1	Arad	516.51	263.97	86.29	92.12	3.32	0.00	0.93
RO009L1	Sibiu	563.46	442.07	91.95	95.94	31.87	31.69	0.84
RO010L1	Târgu Mureş	137.66	88.38	77.33	87.24	4.22	0.26	0.77
RO011L1	Piatra Neamţ	149.65	72.73	82.85	85.08	23.50	9.18	0.97
RO012L1	Călăraşi	244.33	110.58	90.92	95.69	11.76	1.02	0.95
RO013L1	Giurgiu	110.53	55.50	84.50	96.63	22.55	21.77	0.85
RO014L1	Alba Iulia	258.84	153.26	87.43	89.97	5.72	1.58	0.95
RO015L1	Focşani	271.82	224.49	89.20	92.54	3.81	3.82	0.82
RO016L1	Târgu Jiu	244.93	141.03	88.02	93.82	3.48	3.49	0.92
RO017L1	Tulcea	409.71	210.19	95.17	97.76	48.69	32.70	0.97
RO018L1	Târgovişte	202.32	147.74	84.78	89.41	0.28	0.28	0.85
RO019L1	Slatina	71.06	23.34	76.90	91.65	9.91	8.20	0.91
RO020L1	Bârlad	263.06	248.26	92.88	96.25	29.76	29.22	0.39
RO021L1	Roman	144.58	115.12	82.07	87.06	13.46	11.27	0.79
RO022L1	Bistriţa	426.18	280.03	94.72	97.67	19.29	19.27	0.94
RO501L1	Constanta	570.92	444.85	82.67	88.42	11.60	8.47	0.76
RO502L1	Iasi	798.91	705.26	90.53	94.76	16.73	16.86	0.65
RO503L1	Galati	410.83	164.98	85.12	91.50	40.56	2.38	0.95
RO504L1	Brasov	985.49	832.04	92.03	95.02	19.24	18.60	0.82
RO505L1	Ploiesti	343.73	285.49	78.72	86.51	1.52	1.49	0.51
RO506L1	Pitesti	246.20	160.31	78.84	84.50	2.32	1.74	0.72
RO507L1	Baia Mare	524.28	293.34	92.68	94.35	8.98	1.27	0.98
RO508L1	Buzau	378.17	223.25	89.00	94.08	3.89	3.59	0.83
RO509L1	Satu Mare	728.76	359.66	93.29	96.61	5.97	4.28	0.91

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
RO510L1	Botosani	372.49	260.62	92.10	95.56	3.78	3.80	0.76
RO511L1	Ramnicu Valcea	291.91	140.96	87.57	94.67	4.40	2.32	0.87
RO512L1	Suceava	398.36	137.07	83.81	88.85	14.68	14.60	0.84
RO513L1	Drobeta-Turnu Severin	328.23	215.33	90.63	94.40	33.35	22.30	0.87
SE001L1	Stockholm	7093.12	6862.39	93.57	94.37	2.24	2.57	0.69
SE002L1	Göteborg	4254.65	3793.75	92.39	94.09	4.32	3.61	0.85
SE003L1	Malmö	1852.73	1247.89	89.09	91.50	4.31	1.16	0.74
SE004L1	Jönköping	3471.68	1534.29	94.62	96.87	17.50	4.92	1.02
SE005L1	Umeå	9791.11	7390.34	98.20	98.61	6.89	6.40	0.99
SE006L1	Uppsala	6870.92	4619.00	97.13	97.64	4.14	3.53	0.99
SE007L1	Linköping	4231.71	2653.54	96.28	97.09	2.23	0.78	0.99
SE008L1	Örebro	3687.78	2056.61	96.32	96.85	1.19	0.59	0.99
SE501L1	Västerås	2904.79	1763.09	96.78	97.58	4.25	2.54	
SE502L1	Norrköping	3054.99	1415.89	96.81	97.91	2.45	1.63	0.99
SE503L1	Helsingborg	1133.06	785.91	91.27	92.84	1.58	1.60	0.96
SE505L1	Borås	973.50		95.56		0.10		1.00
SI001L1	Ljubljana	2555.81	2280.77	90.94	92.96	21.60	20.17	0.82
SI002L1	Maribor	2169.92	2022.43	91.61	92.53	27.42	26.84	0.86
SK001L1	Bratislava	2051.52	1684.01	88.14	91.78	35.79	31.82	0.81
SK002L1	Košice	1776.81	1533.02	91.47	94.06	50.31	48.18	0.82
SK003L1	Banská Bystrica	809.41	706.11	94.31	96.26	36.48	35.83	0.86
SK004L1	Nitra	870.51	770.07	89.53	91.57	7.83	6.93	0.83
SK005L1	Prešov	934.08	863.64	91.83	93.41	19.03	19.01	0.79
SK006L1	Žilina	815.02	734.99	91.09	93.09	42.12	42.13	0.80
SK007L1	Trnava	741.13	669.59	90.54	92.12	33.32	33.01	0.84
SK008L1	Trenčín	674.98	592.97	91.47	93.10	3.61	3.57	0.87
UK001L2	London	8024.12	5400.73	73.05	84.03	1.54	1.59	1.02
UK002L2	West Midlands urban area	2075.21	1239.62	65.56	85.38	0.03	0.03	0.40
UK003L1	Leeds	1493.72	602.61	76.31	89.47	0.56	0.42	0.87
UK004L1	Glasgow	3373.50	2725.82	84.29	88.81	3.62	3.46	0.42
UK005L0	Bradford	366.71		70.48		12.20		1.00
UK006L2	Liverpool	724.91	86.55	51.95	56.45	3.22	0.00	0.50
UK007L1	Edinburgh	1728.32	1464.78	86.05	90.18	0.49	0.55	0.73
UK008L2	Manchester	1817.54	540.62	66.09	92.93	13.55	11.32	0.38
UK009L1	Cardiff	1174.30	1033.38	79.31	83.14	0.33	0.25	0.63
UK010L2	Sheffield	930.86	275.87	78.01	88.16	11.46	1.67	0.93
UK011L2	Bristol	983.57	872.92	75.68	81.41	0.76	0.84	0.40
UK012L1	Belfast	960.31	398.95	75.93	75.35	0.52	0.16	0.58
UK013L2	Newcastle upon Tyne	5437.45	5031.13	93.18	96.38	6.84	6.98	0.54
UK014L1	Leicester	1397.41	1323.24	83.20	86.16	0.00	0.00	0.36
UK015L0	Derry	387.43		88.16		0.39		1.00
UK016L1	Aberdeen	6514.33	6327.32	95.15	96.01	12.97	13.13	0.70
UK017L1	Cambridge	942.70	901.46	89.42	91.60	0.05	0.07	0.46
UK018L2	Exeter	1776.30	1729.10	90.64	91.89	0.96	0.96	0.50
UK019L2	Lincoln	958.61	922.90	90.43	92.37	0.00	0.00	0.44
UK021L0	Stevenage	25.95		32.41		0.00		1.00
UK022L0	Wrexham	504.02		87.68		11.37		1.00
UK023L1	Portsmouth	196.41	81.11	47.38	44.32	2.84	1.44	0.61
UK024L0	Worcester	33.31		34.41		0.00		1.00
UK025L2	Coventry	531.56	353.88	74.37	87.24	0.00	0.00	0.52
UK026L1	Kingston upon Hull	2484.22	2411.37	90.31	92.27	0.82	0.96	0.25
UK027L1	Stoke-on-Trent	880.80	575.79	83.85	91.68	3.80	3.83	0.47
UK029L1	Nottingham	903.75	829.10	74.60	78.75	0.00	0.00	0.38
UK031L0	Bath and North East Somerset	351.34		85.22		1.74		1.00
UK033L0	Guildford	271.07		83.14		7.28		1.00
UK034L0	Thanet	103.52		67.74		0.51		1.00
UK038L0	Waveney	371.69		89.93		1.87		1.00
UK040L0	Tunbridge Wells	331.28		89.57		0.00		1.00
UK041L0	Ashford	580.56		93.23		0.17		1.00
UK043L0	East Staffordshire	390.36		88.65		0.00		1.00

FUA code	FUA name	FUA area	FUA area without CC	GUA inside FUA	GUA inside FUA without CC	N2K inside FUA	N2K inside FUA without CC	Ratio GUA CC/FUA
UK044L0	Darlington	197.63		84.48		0.00		1.00
UK045L0	Worthing	32.47		39.79		0.00		1.00
UK046L0	Mansfield	76.78		65.90		0.00		1.00
UK047L0	Chesterfield	66.07		57.89		0.00		1.00
UK050L1	Burnley	280.27	169.48	85.98	88.59	10.32	5.54	0.95
UK051L0	Great Yarmouth	179.49		84.71		8.17		1.00
UK053L0	Hartlepool	94.43		69.40		2.20		1.00
UK054L0	Cannock Chase	78.97		67.44		4.47		1.00
UK055L0	Eastbourne	44.18		62.23		0.00		1.00
UK056L1	Hastings	541.95	512.09	92.24	93.91	3.19	2.99	0.69
UK059L0	Redditch	54.30		66.26		0.00		1.00
UK501L0	Kirklees	408.85		73.92		11.83		1.00
UK506L0	Doncaster	568.82		82.92		4.58		1.00
UK510L0	Sunderland	138.81		50.91		0.00		1.00
UK513L0	Medway	192.61		66.34		10.37		0.99
UK515L1	Brighton and Hove	418.72	335.76	81.82	87.77	0.58	0.45	0.71
UK516L0	Plymouth	80.73		33.02		0.06		1.00
UK517L1	Swansea	824.07	443.36	83.06	84.31	5.00	0.19	0.98
UK518L1	Derby	416.47	338.41	77.01	88.27	0.00	0.01	0.37
UK519L0	Barnsley	329.36		79.60		5.96		1.00
UK520L1	Southampton	130.42	80.21	49.68	64.46	1.60	1.61	0.52
UK525L0	Milton Keynes	308.85		79.24		0.00		1.00
UK528L0	Northampton	80.81		43.05		0.90		1.00
UK531L0	Warrington	181.20		67.80		0.50		1.00
UK532L0	Luton	43.40		19.10		0.00		1.00
UK533L0	York	272.10		80.58		2.65		1.00
UK535L0	Swindon	230.23		76.08		0.00		1.00
UK539L1	Bournemouth	927.70	809.81	83.13	89.30	11.18	11.11	0.38
UK540L0	Wycombe	324.78		89.58		1.04		1.00
UK542L0	Telford and Wrekin	290.53		80.05		0.00		1.00
UK543L0	North East Lincolnshire	192.03		72.97		0.02		1.00
UK545L0	Peterborough	343.53		84.35		0.97		1.00
UK546L0	Colchester	333.97		86.29		3.66		1.00
UK548L0	Basingstoke and Deane	634.17		91.17		0.00		1.00
UK549L0	Bedford	476.61		90.52		0.00		1.00
UK550L0	Dundee City	60.10		48.32		0.02		
UK551L0	Falkirk	297.98		81.49		0.58		1.00
UK552L0	Reading	219.55	179.10	66.92	74.31	0.00		0.51
UK553L1	Blackpool	484.48	449.52	80.76	85.26	5.10	5.99	0.28
UK554L0	Maidstone	393.28		84.86		0.34		1.00
UK556L0	Dacorum	212.59		81.09		2.10		1.00
UK557L1	Blackburn with Darwen	795.14	584.90	90.55	95.70	8.39	8.39	0.81
UK558L1	Newport	318.04	126.23	75.52	78.55	0.60		0.97
UK559L1	Middlesbrough	504.65	245.17	69.25	77.46	5.03	4.64	0.95
UK560L0	Oxford	45.66		46.34		3.84		1.00
UK561L0	Torbay	63.20		54.35		0.59		1.00
UK562L1	Preston	459.35	316.61	77.74	78.44	0.78	0.78	0.98
UK564L0	Warwick	283.10		84.68		0.00		1.00
UK566L1	Norwich	1502.05	1461.51	91.15	92.84	2.30	2.33	0.33
UK568L1	Cheshire West and Chester	1357.26	818.99	85.16	85.22	2.85	1.90	1.00
UK569L1	Ipswich	935.45	895.92	90.18	92.74	7.54	7.88	0.37
UK571L1	Cheltenham	461.88	415.24	86.03	90.23	0.30	0.31	0.57
UK572L0	Gloucester	40.87		33.50		0.00		1.00
UK573L0	Bracknell Forest	109.39		71.38		15.27		1.00
UK575L0	Carlisle	1041.37		94.80		10.43		1.00
UK576L0	Crawley	44.99		37.31		0.00		1.00

Annex I-F: Data sources, difficulties and backup solutions

To map and assess the distribution of potential GI, two sources of geographical datasets were utilised: (i) land use and land cover data; and (ii) ES. These two sets of data were used to assess two of the key underlying principles of a GI network, as defined by the EC (2013) and similarly stressed by others (e.g. Mell 2017) – *connectivity* and *multifunctionality*.

Land use and land cover data are the foundation of a potential GI network assessment and mapping (Hoctor et al. 2000, Carr et al. 2002, Weber 2004, Weber et al. 2006) and are used to identify the two primary components of a GI network, i.e. hubs and links (Benedict and McMahon 2002), and to evaluate their connectivity. Data on ES is used to measure GI multifunctionality, which represents the ability of the GI elements (i.e. hubs and links) to simultaneously provide multiple benefits in the same spatial area (Mell, 2017). Annex I-A provides the list of datasets that were identified and collected for mapping potential GI elements and the related ES, at both the regional and city levels in Europe. Supplementary datasets were collected to cover a larger number of ESPON Member States (MS), to perform a time-series analysis of potential GI geographical distribution over the "past 10 years" at the city level, and to estimate additional benefits from the GI network (other than biodiversity related).

For the GRETA project, eight ES indicators were selected to measure the ability of potential GI elements to provide multiple functions in the same spatial area. Selected indicators were collected from the list proposed in the framework of the Mapping and Assessment of Ecosystems and their Services (MAES), and published by Maes, Fabrega et al. (2015): Gross Nutrient Balance (GNB), Habitat Quality index (HQi), Net Ecosystem Productivity (NEP), Relative Pollination (RP), Soil Erosion Control (SEC), Water Purification (WP), Water Retention Index (WRI) and Recreation Potential (RecPot). The selection was based on the capacity of each ES to support the achievement of some objectives defined in the context of the three selected policy sectors. Biodiversity, Climate Change and Disaster Risk Reduction, and Water Management. The description and rationale for including specific ES in the analysis of the functional performance of potential GI within each policy sector is presented in Annex I-B

From the list of identified datasets (see Annex I-A and I-B,) it is notable that most of the available layers only cover the EU-28 countries. The datasets often exclude Iceland, Liechtenstein, Norway and Switzerland, as well as EU Candidate Countries and other countries of the Balkans. Moreover, most geographic layers are related to a single date (around the year 2012) or multiple dates that do not comprise present time, i.e. 2017.

Issues regarding spatial coverage

The Natura 2000 (N2K) network stems from the Birds and Habitats Directives and, accordingly, only the EU-28 MS have designated these areas. To mitigate the limited geographical coverage of GI 'hubs', the sites of the Emerald Network officially designated for Switzerland and six West Balkan countries (i.e. Macedonia, Montenegro, Serbia, Albania, Bosnia and Herzegovina, and Kosovo) were included. It was decided not to include protected areas designated at the national level in order to avoid biasing the distribution of GI across Europe due to differences in the national policies designating such sites.

ES maps from Maes, Fabrega et al. (2015) act as a EU reference for measuring Target 2 in the Biodiversity Strategy 2020 (EC, 2011). Therefore, the geographical extent of the Maes, Fabrega et al.'s (2015) assessment is also the EU-28 countries. Given that most of these ES maps are derived through modelling approaches (Maes, Fabrega et al., 2015), maps of the same ES that are produced by different institutions may have large biases and are recommended not to be used together (Schulp et al 2014). Therefore, to avoid dissimilarities in the final results that are due to different input data characteristics, it was decided to perform a multifunctionality analysis of GI network only for EU-28 countries. Moreover, this provides consistency to the results and avoids mismatches with the outcomes from other EU level projects that base their analysis on the standard ES maps of Maes, Fabrega et al. (2015).

At the city level, the Urban Atlas is the main source of information for the indicators informing about GI. The Urban Atlas is a EU product that in its first version in 2006 mapped cities in the EU-27 territory. In the newest Urban Atlas (reference year 2012), EU-28 and the four European Free Trade Association (EFTA) countries Iceland, Norway, Switzerland and Liechtenstein, i.e. the entire ESPON space, are covered. Consequently, 32 countries can be analysed for the reference year 2012 whereas cities from 27 (EU-27) will be assessed regarding changes.

Issues regarding spatial resolution

The spatial resolution of the CLC map (100x100m) used for mapping the 'links' between 'hubs' of the GI network is too coarse for detecting small artificial landscape elements that act as barriers between natural and semi-natural patches, namely roads. To mitigate this problem, it was decided to include OSM and HRL data (20x20m) in the process of spatial analysis to better determine hotspots of landscape fragmentation and remove these areas from the potential GI network at landscape level. The CLC map is also to coarse to detect small woody features that can be used as links of the potential GI network, such as hedgerows within agricultural fields. Therefore, such landscape elements, which are smaller than the MMU, were not included in the spatial analyses performed in the framework of GRETA. For the future, the Copernicus HRL Small Woody Features might already be available and be used for improving the delineation of such GI elements.

At the city level, MAES ES maps (Maes, Fabrega et al. 2015) do not provide useful information, as the spatial resolution is too coarse. Therefore, the approach to mapping GI in cities has been set in a more pragmatic way: whatever is 'green' (and 'blue' in this case) will be part of the urban GI network. Rather than targeting ES for biodiversity conservation (and potential restoration) alone, urban GI should enhance ecological, but also social and economic benefits to the urban populations within the limits of city areas (Mattijssen et al., 2017). Since almost all 'green' (and 'blue') elements serve a certain function, it is important to map all of them.

Issues regarding time-series analysis

Based on the preliminary analysis of N2K and Emerald Networks, LU/LC datasets and ES maps, it was decided to use 2010 as the reference year for assessing GI in European regions. Performing an analysis of changes on the geographical distribution of GI over the past 10 years (i.e. 2010-2017) was not possible given that there are no standard and consistent LU/LC and ES data that provide coverage for

the whole ESPON space after 2012. Similarly, there is also no ES data available at EU level for the year of 2000 thereby making it difficult to perform a time-series analysis between 2000-2010. Moreover, in 2000 the number of countries covered by N2K sites is only 15, thus limiting the LU/LC assessment of a GI network. The main issue is that the 'hubs' to establish transboundary connections are missing and this would also modify the integrated structure of the network across countries and bias the time-series analysis at the regional level.

On the other hand, regarding city level, a change analysis of GI can be performed between 2006 and 2012. The technical characteristics of the Urban Atlas product is consistent across those years, but the change analysis needs to consider that the number of FUAs and cities increased substantially between 2006 and 2012 due to a reduction in the inclusion threshold for population from 100 000 to 500 000 inhabitants. Moreover, since the spatial coverage of the Urban Atlas is different between 2006 (EU-27) and 2012 (entire ESPON space), it means that the EU candidate countries and the other countries in south-eastern Europe cannot be taken into consideration in the change analysis.

Issues regarding multifunctional analyses

The primary objective of the N2K and Emerald Network protected sites is the conservation of endangered biodiversity, including rare habitats, species and genetic diversity. Still, those protected areas are able to support many policy objectives beyond biodiversity, such as climate change mitigation and adaptation, water quality and provision, food provision, jobs and livelihoods, cost savings, science and education, social cohesion and identity (EC, 2013b). Indeed, the improved ecosystems' health and conservation status of N2K and Emerald Network is known to improve the resilience of the functioning of the ecosystems – i.e. their ability to withstand pressures (e.g. climate change, pollution). This is expected to improve ES provision (with improved ecosystem health/connectivity) or reduce the loss of service provision, in light of climate change or other pressures that risk degrading the ecosystem health (Maes et al., 2012). A study by Gantioler et al. (2010) shows that conservation measures deliver changes to ES that also benefit individuals, society and the economy. These include enhanced cultural ES that attract tourists, provide a critically important service of storing carbon, reveal essential synergies of biodiversity with climate mitigation and adaption, offer potential significant cost savings and reduction of damage from extreme weather events, as well as water quality and water regulation benefits via working with natural capital. Therefore, it is realistic to consider that N2K and Emerald Network sites can be used as potential GI 'hubs' supporting the multiple objectives of policies beyond biodiversity.

Regarding the eight MAES ES indicators (Maes, Fabrega et al. 2015) used in this project, they describe only the potential supply side of ecosystem services and do not take into consideration the state or the condition of the ecosystems. The European Environment Agency (EEA) is still preparing an assessment of ecosystem condition at European level, which should be published by the end of 2019 (Maes et al. 2018). Therefore, although the assessment of ecosystem condition at EU level will be a key element to understand the link between ecosystems status and the provision of multiple ecosystem services, it is not yet considered in this project. Finally, the ES indicators are only based on data and models. For their production, the authors (i.e. Maes, Fabrega et al. 2015) did not consult stakeholders who often can contribute valuable, expert-based knowledge at higher spatial scales.

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Annex II: Ecological, social, cultural and economic benefits and demand for Green Infrastructure in Europe

Annex II-A: Detailed description of the socio-ecological system of GI in Europe

Introduction

It is now the right time to bring forward social and cultural perspectives, connecting the supply and demand for ES, in order to build the foundations for an integrated understanding of the system that will inform better decisions (van den Belt and Blake, 2014). A transition towards nature-based solutions entails changes in manifold socio-ecological systems. These changes, however, involve complex processes that are characterised by multiple and interacting feedbacks, non-linear dynamics, and cause and effect relationships; in many instances these relations may not be evident.

Modelling methods provide a key tool to support decision makers in the conservation of ES. A model is a simplification of reality, a quantitative or qualitative description of key components of a system and of relationships between these components. When modelling is jointly developed with stakeholders, it is possible to identify potential conflicts (Angelstam et al., 2013). This co-creation process is also crucial to build a common understanding among all involved actors.

We aimed to describe the **main elements and relations** of socio-ecological systems that facilitate the **implementation of GI**. To do so, we have used Causal Loop Diagrams (CLDs) that are qualitative models useful to foster knowledge exchange and to highlight key aspects of dynamic systems. These diagrams are depicted through arrows representing cause–effect relationships between variables. A positive link "+" indicates that two variables change in the same direction (e.g. when variable A increases, variable B increases too). When two variables are directly link with a negative link "-", this indicates that both variables change in the opposite direction (e.g. when variable A increases, variable B decreases). Like this, CLDs may be used to develop dynamic hypotheses about the propagation of an impact within the system (Lopes and Videira, 2017).

Methodology

1 Defining the GI socio-ecological system

First, the system variables need to be identified. This was done in two steps: a literature review and a collaborative process to include stakeholders' perceptions.

1a Literature Review

The goal of this step is the identification of key factors in the system, their linkages and their relative social, ecological and economic importance and dependencies in the implementation of GI. The review of enabling factors, benefits and negative impacts is needed to characterise the whole socio-ecological system that provides the context for the implementation of GI. Therefore, two complementary reviews were carried out using Scopus. Due to the extensive body of literature on GI, the search was limited to those studies focused on different implementation aspects of GI. The first search was based on the term "green infrastructure" linked to "benefit", "impact", "advantage", "positive", or "compensation". The second search was also based on term "green infrastructure" but now linked to "conflict", "barrier", "challenge", "constraint", "drawback", "disadvantage", or "negative impact". Using a snowball approach,

relevant literature referenced in the reviewed papers was also added. Overall, 85 papers were obtained in this step and reviewed.

Figure 4 summarises the most frequent keywords in GI research in relation to conflicts, negative impacts, trade-offs or disservices.

From this literature review we have identified a number of potential key factors that can be grouped by motivation, potential pressures, enabling factors, and available tools (see Table 5).

MOTIVATION	POTENTIAL PRESSURES	ENABLING FACTORS	TOOLS
Air purification	Conflicts of land uses	Public awareness	Implemented strategies
Area attractiveness	Environmental deterioration	Long-term political vision and commitment	Availability of information base on existing GI elements
Biodiversity conservation		Available funding resources	Regulation of land use
Climate regulation			Dedicated spatial plan
Quality of life			Market instruments
			Land purchase
			Projects on GI creation or restoration
			Participatory decision-making process
			Capacity building and technical assistance

Table 5 Groupings of key system factors identified through literature review.

The first list of identified factors should also consider the negative consequences of GI implementation.

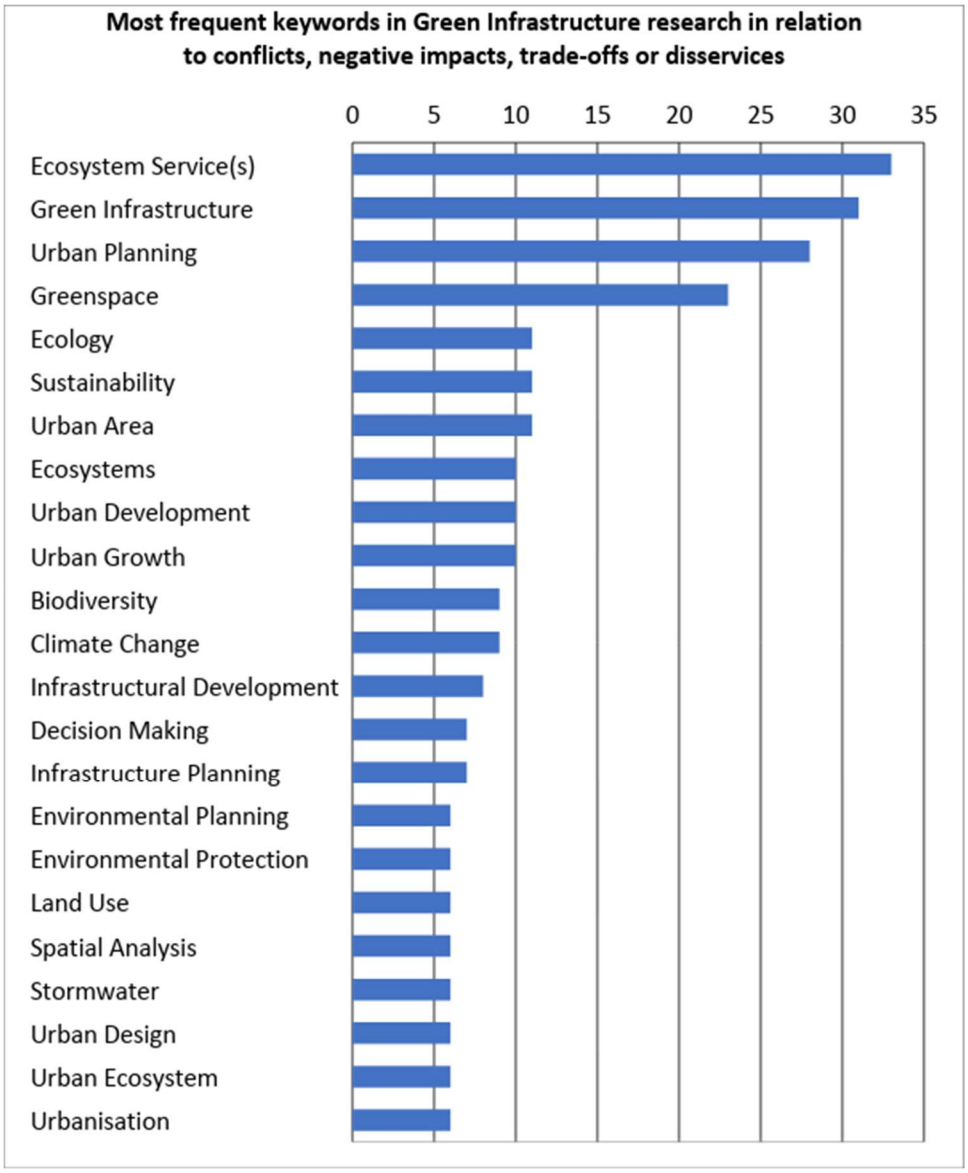


Figure 4 Most frequent keywords in Green Infrastructure research in relation to conflicts, negative impacts, trade-offs or disservices

1b Collaborative identification of system variables

We were highly interested on the **key factors that support European cities and regions** in making full use of their GI potential. To gather knowledge from a **wide multidisciplinary perspective,** we invited stakeholders from different backgrounds, which included decision-makers, academia, practitioners and civil society. Table 6 details the invited participants from across the ESPON space.

Country (Number of invited stakeholders)									
Austria	5	Denmark	2	Ireland	1	Montenegro	1	Spain	21
Belgium	6	Estonia	2	Italy	25	Norway	6	Sweden	10
Bosnia and Herzegovina	1	Finland	1	Latvia	1	Poland	4	Switzerland	1
Bulgaria	3	France	7	Liechtenstein	1	Portugal	8	The Netherlands	7
Canada	1	Germany	25	Lithuania	2	Romania	2	UK	49
Croatia	1	Greece	2	Luxemburg	1	Serbia	4	USA	6
Cyprus	1	Hungary	10	Malta	1	Slovakia	2		
Czech Republic	1	Iceland	1	Monaco	1	Slovenia	3	Total	226

Table 6 Number of invited stakeholders by country across the ESPON space.

We prepared an online questionnaire with 9 open answers which allowed respondents to provide their insights without restrictions (see Table 7)

1. How would you define Green Infrastructure?
2. What is your main expertise in relation to Green Infrastructure?
3. Thinking about the implementation of Green Infrastructure, what are the main challenges or barriers to overcome during the implementation process?
4. What in your opinion would be a desirable result / outcome from the implementation of Green Infrastructure? Please consider short, medium and long term time frames.
5. What are the unintended consequences that might occur as a result of implementing Green Infrastructure?
6. Can you give examples of uncertainties linked to Green Infrastructure?
6. What indicators can be used to evaluate the impact of Green Infrastructure projects on territorial development?
7. Who should take the lead during the implementation process?
8. Which approach will be best for effective implementation process?
9. What specific planning instruments you find more useful to implement Green Infrastructure?

Table 7 Questions included in online questionnaire to stakeholders about GI

We received 17 responses from a variety of countries, from which 9 respondents work for a government (at different levels), 7 for a research institution, and only 1 for an NGO (see Table 8).

Country							
Belgium	3	Italy	3	Portugal	1	UK	1
Germany	1	Norway	1	Sweden	1	USA	1
Hungary	1	Not specified	3	Slovenia	1		
						TOTAL	17

Table 8 Summary of responses by kind of respondent

There was a general agreement among respondents that GI is made of a variety of **green features** (natural and semi-natural areas), independent of their legal status, that are connected and can form an **ecological network,** which provides benefits to citizens resulting in different **ecosystem services** in **both rural and urban settings**. The network should be **strategically planned**, designed and managed to favour **multifunctionality** of land, therefore GI (i) supports native species and **protects biodiversity;** (ii) maintains natural ecological processes improving long-term **ecological resilience**; (iii) sustains water, air and other **natural resources;** and (iv) contributes to healthier societies and increases the **quality of life** of citizens. This multifunctional character of GI often provides cost-effective alternatives to traditional 'grey' infrastructure.

The most cited challenge in the process of implementation of GI is the **missing of a strategic vision** (both by politicians and planners) that results in the disconnectedness between strategic planning, implementation and maintenance. There is also a lack of common goals and integrated planning. On the other way round, it is needed to integrating GI objectives into other policies at different spatial scales and administrative boundaries.

Moreover, there is an insufficient knowledge of the cost-benefit ratio employing nature-based solutions (NBS) compared to the use of traditional techniques and a need of practical guidelines due to the paucity of **long-term experiences**.

Financial incentives are scare and when funding opportunities are available they are mostly focused on the conservation of green areas, rather than a functional approach aiming to preserve certain ES such as improving ecological resilience or increasing public health outcomes.

GI practises require space, not always abundant in urban areas and in intensely developing regions in general. The reduced number of placement options may jeopardise the implementation process. GI may therefore add pressure and increase **land use competition**.

It is also crucial to ensure the full life cycle of GI is covered including the ongoing **cost of maintenance** and clarify whose responsibility is.

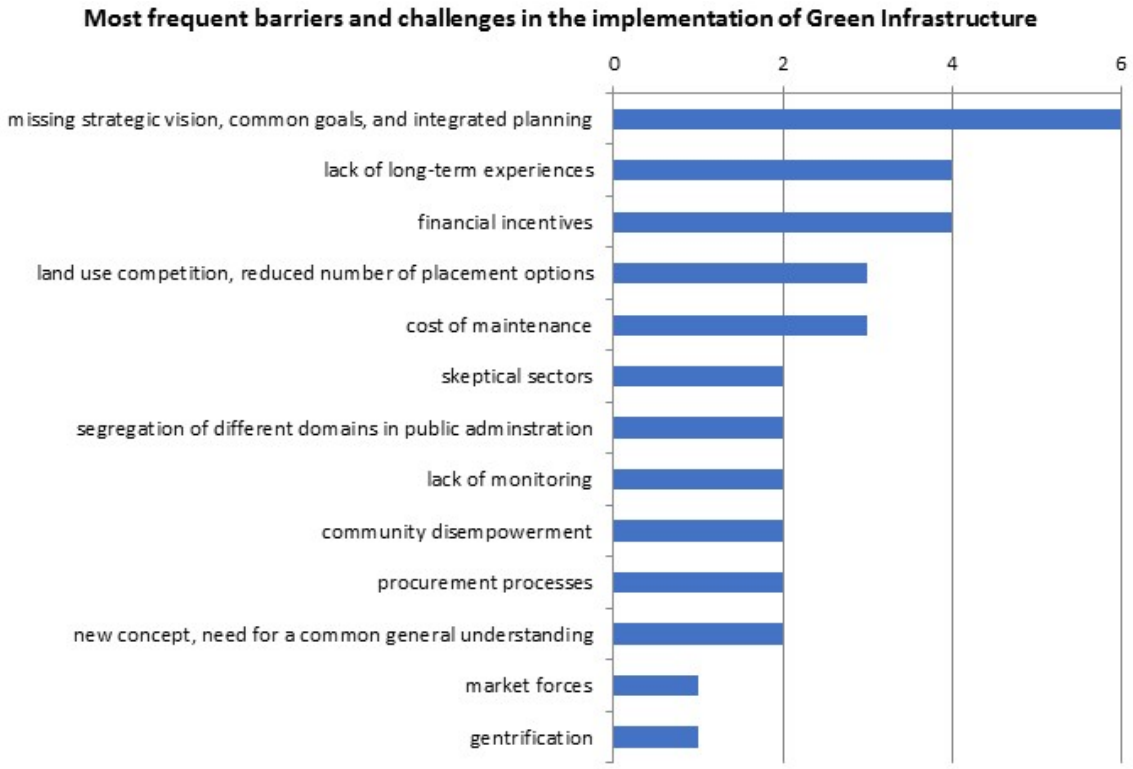


Figure 5 Most frequent barriers and challenges in the implementation of Green Infrastructures as identified through stakeholder input

Respondents also highlighted the negative (in red) and positive (in green) unintended consequences of the deployment of GI practices (see Table 9).

Unintended consequences
Gentrification
Invasive alien species
Increase need of maintenance
Risk of vandalism
Increase fragmentation of certain habitats
Competition for land
Competition for funding and policy power among key organisations for development of urban and rural areas
Leakage and displacement of environmental issues
Homogenisation of habitats
New job opportunities
Neighbourhood cohesion
New income possibilities for farmers
New coalitions and networks
Strengthening grassroots' initiatives
Paradigm shifts among decision makers
Increase in the demand for NBS
Impulse to NBS economy
Awareness raised among inhabitants at local, national and European level
Better dispersal of ecosystem engineers (like pollinators)
Support to climate by creating carbon sinks
Enhance safety by lowering flooding risk through increasing water storage
Increase well-being of people

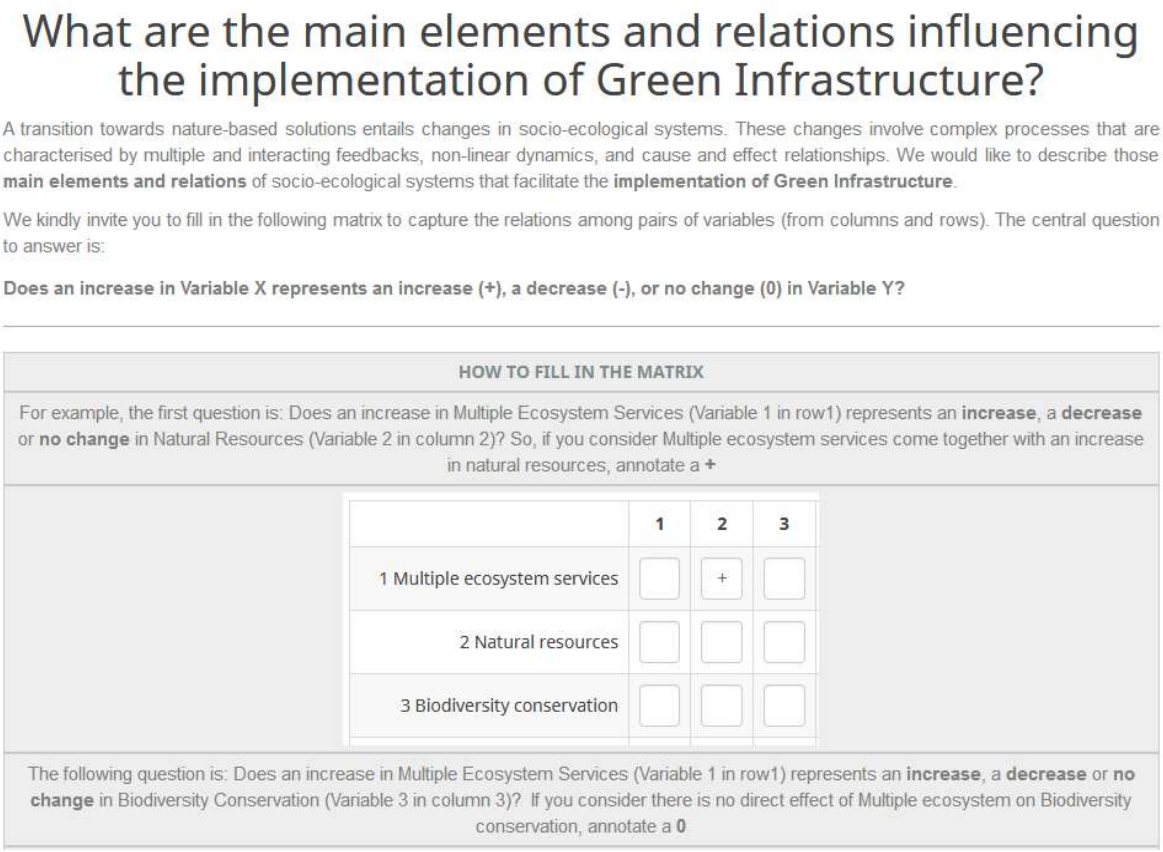
Cleaner air
Cost-saving in the long term
Multifunctionality of green spaces

Table 9 Negative (in red) and positive (in green) unintended consequences of the deployment of GI practices

Although there is no agreement in who should lead the process of implementation, respondents did agree that it may depend on the policy or project targets, where the project is being developed and who is promoting it (whether a regional or national government, local municipalities, or the private sector). Additionally, it was accepted among the respondents that this should be a co-led process, in which local authorities are the main stakeholders, but communities of interest and communities of practice are vital if GI is to be scaled out. Ideally, interdisciplinary teams guided by professionals used to integrate knowledge from different domains. There was, however, complete agreement on applying hybrid approaches (a combination of bottom-up and top-down) as the best option for effective implementation process.

After this process, we selected 18 key factors and prepared a second online questionnaire in order to gather different insights on **dynamic relations** from a variety of stakeholders**.** The aim of this questionnaire was to incorporate knowledge on **the strength of causal links among pairs of elements within the socio-ecological systems (see** Figure 6**).** We invited a selection of people who has complementary expertise in the implementation of nature-based solutions and GI in particular.

Figure 6 Questionnaire focusing on elements influencing implementation of green infrastructure



What are the main elements and relations influencing the implementation of Green Infrastructure?

A transition towards nature-based solutions entails changes in socio-ecological systems. These changes involve complex processes that are characterised by multiple and interacting feedbacks, non-linear dynamics, and cause and effect relationships. We would like to describe those **main elements and relations** of socio-ecological systems that facilitate the **implementation of Green Infrastructure**.

We kindly invite you to fill in the following matrix to capture the relations among pairs of variables (from columns and rows). The central question to answer is:

Does an increase in Variable X represents an increase (+), a decrease (-), or no change (0) in Variable Y?

HOW TO FILL IN THE MATRIX

For example, the first question is: Does an increase in Multiple Ecosystem Services (Variable 1 in row1) represents an **increase**, a **decrease** or **no change** in Natural Resources (Variable 2 in column 2)? So, if you consider Multiple ecosystem services come together with an increase in natural resources, annotate a **+**

	1	2	3
1 Multiple ecosystem services		+	
2 Natural resources			
3 Biodiversity conservation			

The following question is: Does an increase in Multiple Ecosystem Services (Variable 1 in row1) represents an **increase**, a **decrease** or **no change** in Biodiversity Conservation (Variable 3 in column 3)? If you consider there is no direct effect of Multiple ecosystem on Biodiversity conservation, annotate a **0**

	1	2	3
1 Multiple ecosystem services		+	0
2 Natural resources			
3 Biodiversity conservation			

Once you have filled in the first row, you can follow with the next variable: Does an increase in Natural Resources (Variable 2 in row2) represents an **increase**, a **decrease** or **no change** in Multiple ecosystem services (Variable 1 in column1)? Here, if you consider Natural Resources come together with a decrease in multiple ecosystem services, annotate a **–**

	1	2	3
1 Multiple ecosystem services		+	0
2 Natural resources	-		
3 Biodiversity conservation			

THE CAUSAL-EFFECT MATRIX

Does an increase in Variable X represents an increase, a decrease, or no change in Variable Y?

Please, complete matrix annotating the effect of the **variable X** (left-side column) for each **variable Y** on the right columns (**+** for an increase, **-** for a decrease, and **0** when there is no direct relation among variables)

Leave in blank the relation on the diagonal among variable1/variable1, variable2/variable2, variable3/variable3 and so on.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Multiple ecosystem services																		
2 Natural resources																		
3 Biodiversity conservation																		
4 Ecosystems well-functioning																		
5 Green Infrastructure																		
6 Quality of life																		
7 Gentrification																		
8 Dispersal of invasive species																		
9 New job opportunities																		

10 Land use competition (conflicts of uses)																			
11 Increased maintenance costs (short term)																			
12 Public awareness																			
13 Available funding																			
14 Financial incentives (grants and subsidies and indirect)																			
15 Spatial planning																			
16 Existing regulations (policies and laws)																			
17 Political commitment																			
18 Knowledge-base (information, guidelines)																			

With this consultation process, we received 10 full responses that showed an overall 80% of agreement among respondents' described links between variables.We used this insight to start building the causal loop diagrams.

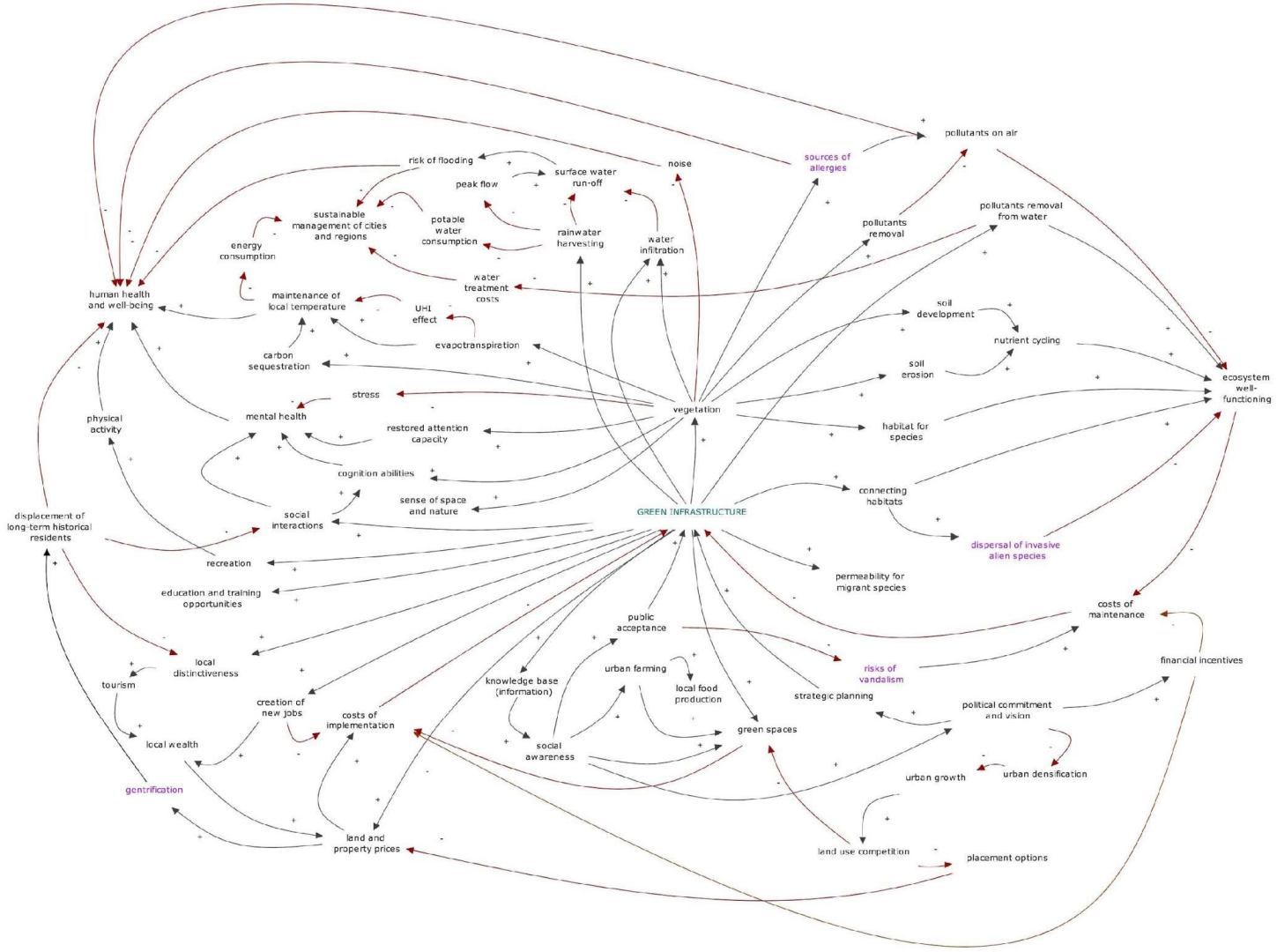


Figure 7 Causal loop diagram representing the socio-ecological system for gi in Europe

Cross-Impact Matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	AS
1	GREEN INFRASTRUCTURE		1				1	1					1				1											1	1		1		1		1						1		1		1							1														14
2	connecting habitats			1	1																																																																2
3	dispersal of invasive alien species				1																																																															1
4	ecosystem well- functioning																											1																																									1
5	habitat for species				1																																																																1
6	permeability for migrant species																																																																				0
7	pollutants removal from water				1																																																																			2
8	sources of allergies									1																																																																	2
9	pollutants on air				1																																																																									2
10	noise																		

2 Analysing the CLD

The socio-ecological system for the implementation of Green Infrastructure is defined here by 61 variables using a CLD, which summarises the mental models of a range of stakeholders and describes the variables and causal links. Using CLDs we can also identify the most critical pieces of the system.

The variables can be arranged in to five thematic groups, including:

- Ecosystem functioning;
- Ecosystem services derived from GI;
- Physical and psychological health and well-being;
- Economic aspects;
- Planning opportunities.

The first theme relates to the **ecosystem functioning** and it is described by variables like vegetation, soil development, soil erosion, and nutrient cycling. This group also relates to the amount of habitats for species, the increased connectivity of habitats and the negative impact that could result from the dispersal of invasive alien species. All of them have a strong influence on the functioning of ecosystems. Finally, GI can also be linked to the increased permeability and mobility for migrant species.

The second theme is related to the **ES** derived from GI. Most of variables, though not all of them, are mainly dependent on the amount and quality of vegetation. The difference between vegetation and GI is that GI implies planning and management practices, while vegetation is related to the presence of plants. Here we have services like the removal of pollutants from both water and air, the attenuation of noise, the increased capacity for water infiltration and the opportunity for rainwater harvesting, which in turn reduces the amount of surface water run-off. On the other hand, the increased evapotranspiration and carbon sequestration capacity helps to maintain local temperature. These services are important for local climate change adaptation and mitigation.

The third theme explains the benefits from GI in relation to physical and psychological human **health and well-being**. Again, vegetation plays a key role in this group, which is mainly described by direct benefits like reduced stress, restored attention capacity, increased cognition abilities, and favouring social interactions. All of them result in improved mental health and increased physical activity, which can conclude in better human health and well-being. On the other hand, one has to consider the increased sources of allergies directly derived from the amount and type of vegetation.

The fourth theme relates to **economic aspects**. GI may increase the local distinctiveness and create new jobs, which in turn, improves the local wealth. However, some drawbacks can appear like increased land and property values, gentrification and the displacement of historical residents. Here, three variables are crucial for the implementation of GI; one is the cost of implementation, the second is the cost of maintenance, and the third is the availability of financial incentives which will have effects on implementation and maintenance.

The fifth theme is associated with **planning opportunities**. This is the most intricate group, where a major number of indirect links appear. It is formed by the production of knowledge derived from previous

experiences and existing research, which will increase social awareness and public acceptance, and in turn decrease undesired risks. This theme is also related to the political commitment and strategic and common vision necessary to enable strategic planning. Here there is a leverage point derived by urban densification, which encourages urban growth, increasing land use competition and reducing the placement options.

Those variables that present a higher active sum (AS) in the cross-impact matrix are the ones that have a higher impact on the system and, therefore, provide more information on where to act (Lopes and Videira, 2016). These key factors can be used as indicators to monitor the performance of management actions. In this case, the first indicator is the amount of GI elements. This is followed by the presence of vegetation that can be distinguished among types, and it could be interesting to consider indicators for GI quality. Another good indicator could be the amount of rainwater retained, which also gives an indication on the sustainable management of cities and regions. Then there are some other variables that are harder to define as indicators like social awareness, here it is not so clear which formulas can be used to monitor performance. The same applies to the displacement of long-term historical residents, and even more with political commitment and vision that are more conceptual elements and difficult (though not impossible!) to quantify.

Alternatively, those variables that present a higher passive sum (PS) are the ones that are more influenced by the system, so they are more impacted by changes making them good indicators to monitor changes in the system. Here we have human health and well-being, ecosystem "well-functioning", GI costs of implementation, mental health, green spaces, and sustainable management of cities and regions. The challenge is now to propose indicators that are easy to quantify to monitor progress.

A total of 22 feedback loops appear in the system in relation to GI. When two or more variables are connected in a closed cycle, we have a feedback loop, which can be classified as Reinforcing (R) when it propagates the initial change in one of the variables, or Balancing (B) if the loop counteracts the initial impact. The shorter loops (where less variables are involved) the faster is propagated the effect. Therefore, we focus on describing and analysing the implications of these shorter loops in relation to GI.

The first one is defined by the creation of new jobs, which in turn reduces the costs of implementation as more professionals are available that know how to put into practice GI approaches, and with less costs there is an increase in the number of GI elements finally implemented as costs in this case do not represent a burden.

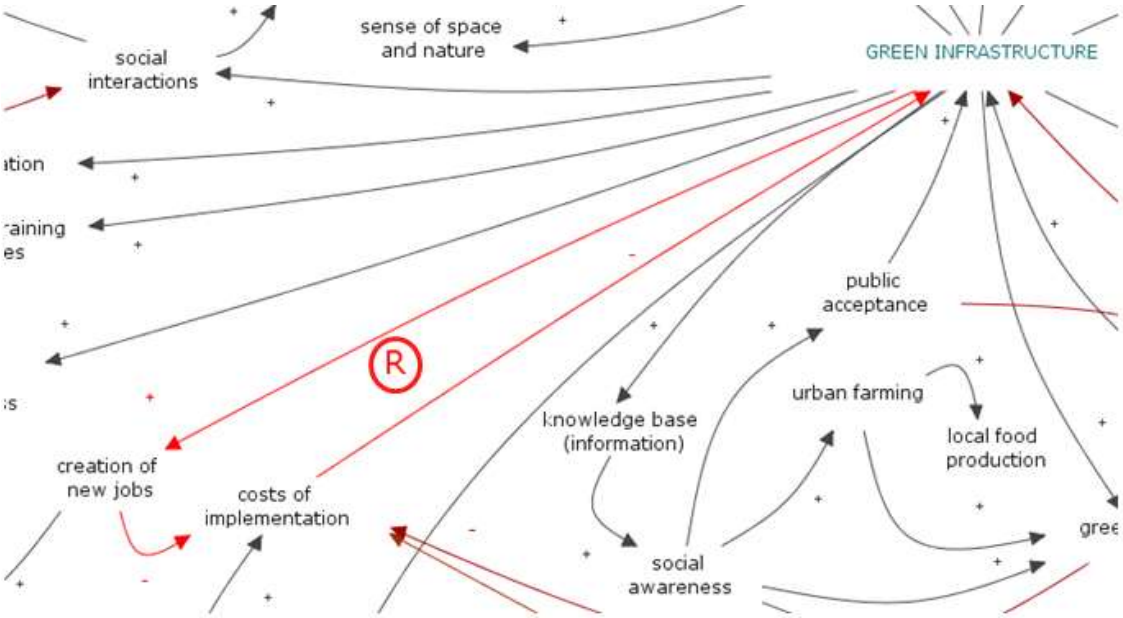


Figure 8 Creation of new jobs and impact on GI implementation costs.

A second reinforcing loop is derived by the availability of green spaces, with a higher number of them, the costs of implementation are reduced, so the number of GI elements increases.

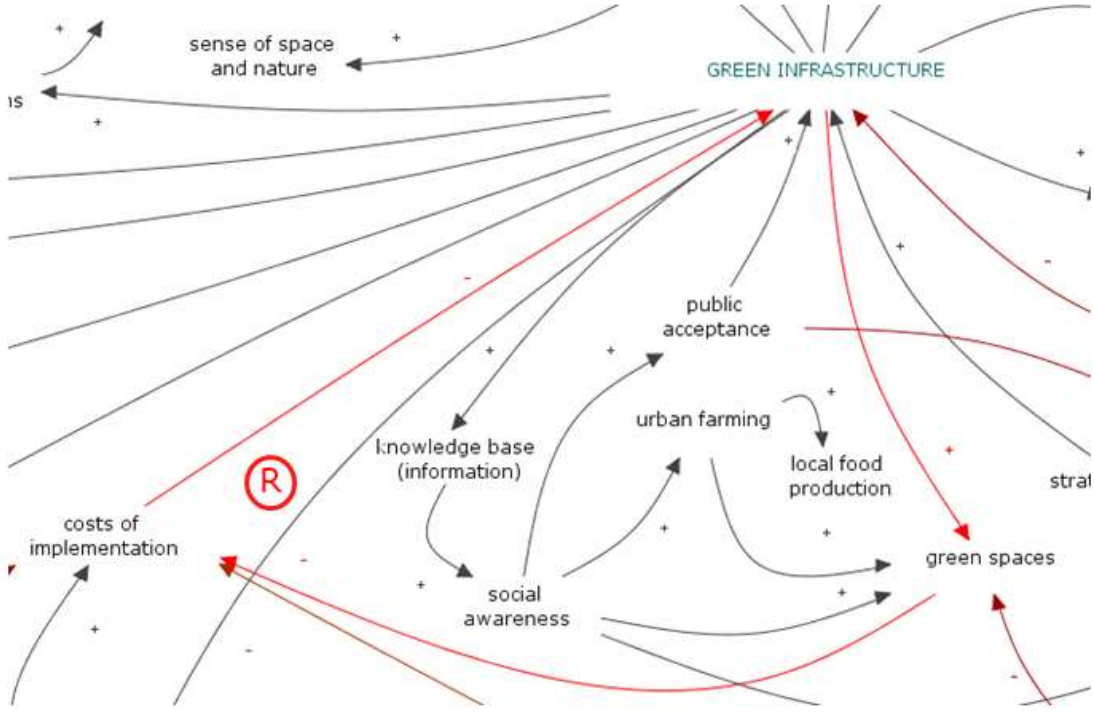


Figure 9 Zoom- in to reinforcing loop derived by the availability of green spaces

Finally, the balancing loop illustrates how an increase in GI leads to an increase in land and property values, which in turn increases the costs of implementation as the acquisition of new land to develop GI projects is more expensive. Consequently, the deployment of GI elements is reduced.

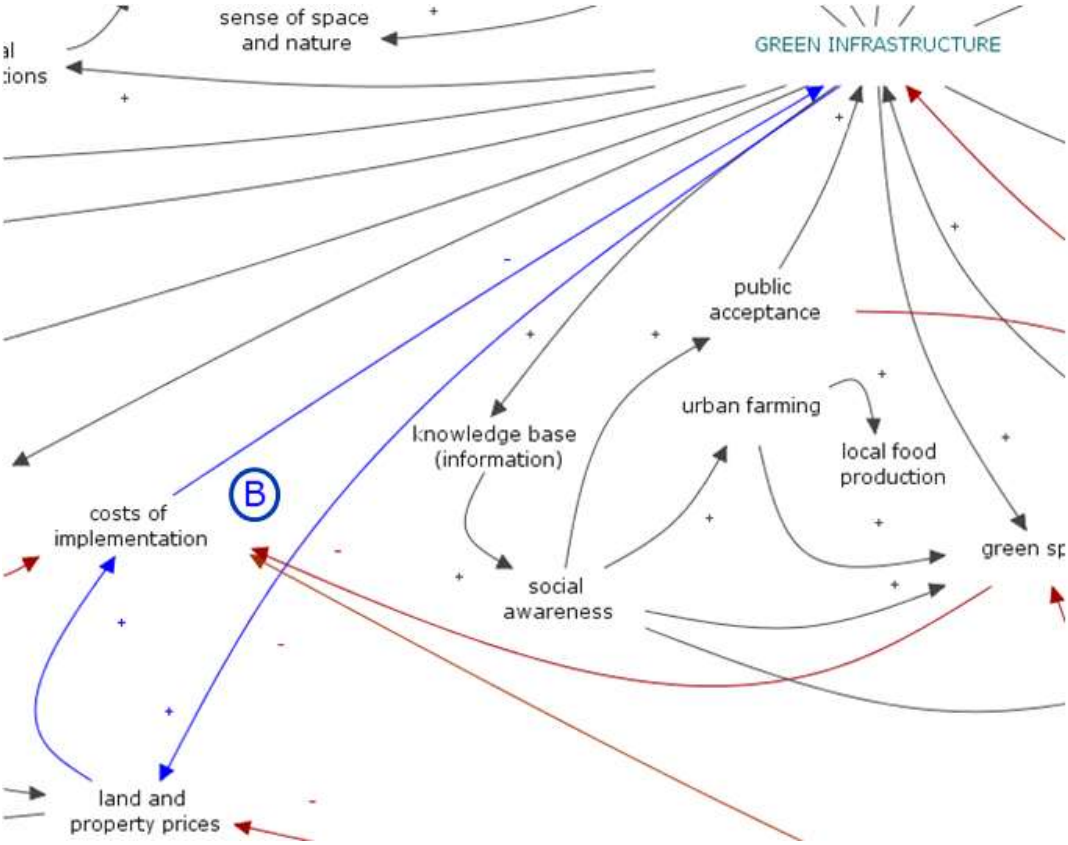


Figure 10 Balancing loop illustrating increase of GI impacting land and property values.

Insight Matrices

An Insight Matrix is used to illustrate the strength of the relationships between a selection factors against a target factor. It makes it possible to ask questions such as *What are the strongest drivers of one factor? What trend has a positive/negative effect on a selected target factor?*

The x-axis describes **the strength of the total effect of a given factor**, for both positive or negative impacts. Like this, the further a factor is to the right, the stronger the positive effect. On the opposite side, the further it is to the left, the stronger the negative effect. Closer to the centre are the weaker factors.

The y-axis describes **how the impact of a given factor evolves over time.** The higher a factor is on the y-axis, the more positive feedbacks are involved, which reinforce positive impacts or counteract negative ones. The opposite occurs when lower down a factor is, as more negative feedbacks are implied.

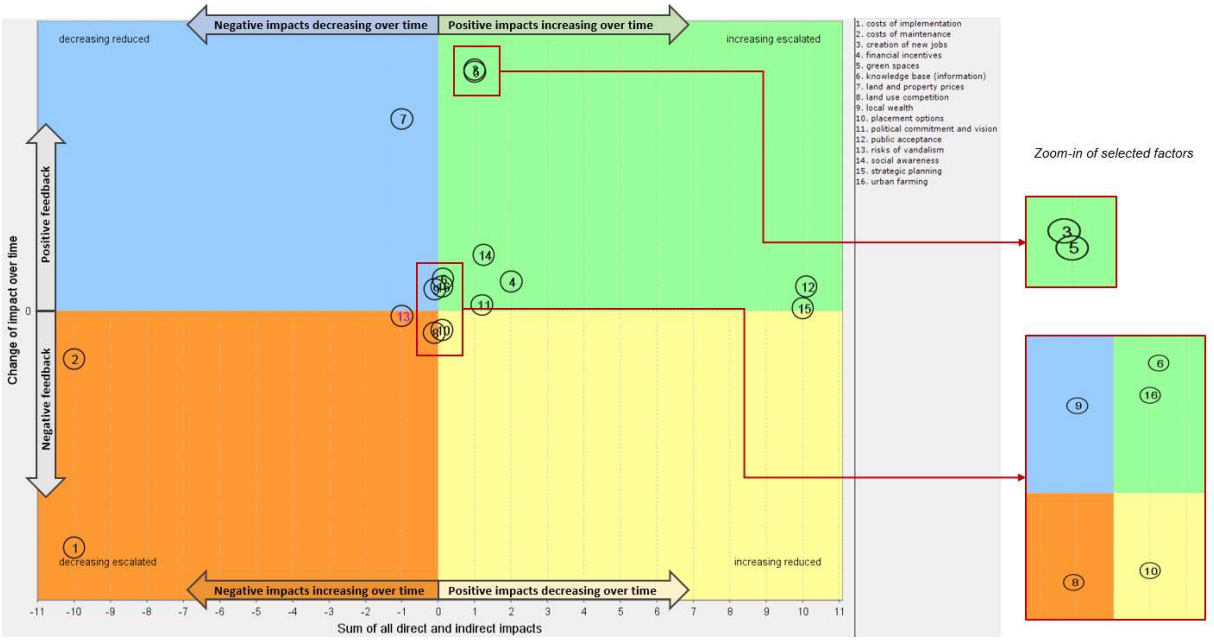


Figure 11 Insight Matrix of the main enabling factors for the implementation of Green Infrastructure

Note that only those factors from socio-economic aspects and planning opportunities that had an impact >= 0.1 were considered in this analysis

The following 4 combinations are possible:

- Green quadrant - A positive x-value and a positive y-value represents a positive effect that is getting more and more positive over time due to positive feedbacks.
- Blue quadrant - A negative x-value and a positive y-value occurs when a negative effect is lessened by positive feedbacks, so the impact is decreasing over time.
- Yellow quadrant - A positive x-value and a negative y-value means that a positive effect is getting smaller over time due to negative feedbacks.
- Orange quadrant - A negative x-value and a negative y-value is for a negative effect that is getting even more negative over time due to the negative feedbacks.

Therefore, when analysing the main enabling factors for the implementation of GI we will first have a look to those factors in the green quadrant, which will represent the positive effects that will keep increasing their impact over time. Here we can find public acceptance and strategic planning as those with a major impact in the short term. These are followed with a lower overall impact by the existence of financial incentives, social awareness and a strong political commitment and vision for future. We should also pay special attention to the creation of new jobs and the amount of green spaces which will increase their impact in the long term. The number of placement options has a relatively low positive impact, but this will be even weaker in the long run. On the other side, the limiting factors for the implementation of GI will be the costs of implementation and the costs of maintenance. Though the cost of implementation will have an increasing negative impact during the lifetime of the GI project and not only at the begining. The risk of vandalism is also negatively impacting in the implementation and will not significantly change

over time. Finally, land and property prices will also represent an unfavourable impact, though this will be relatively weak and will be reduced over time.

Figures 12 to 14 show the set of matrices resulting from the anlysis in relation to GI contribution to maintenance of local temperature (Figure 12), to flood risk reduction (Figure 13) and water treatment costs (Figure 14)

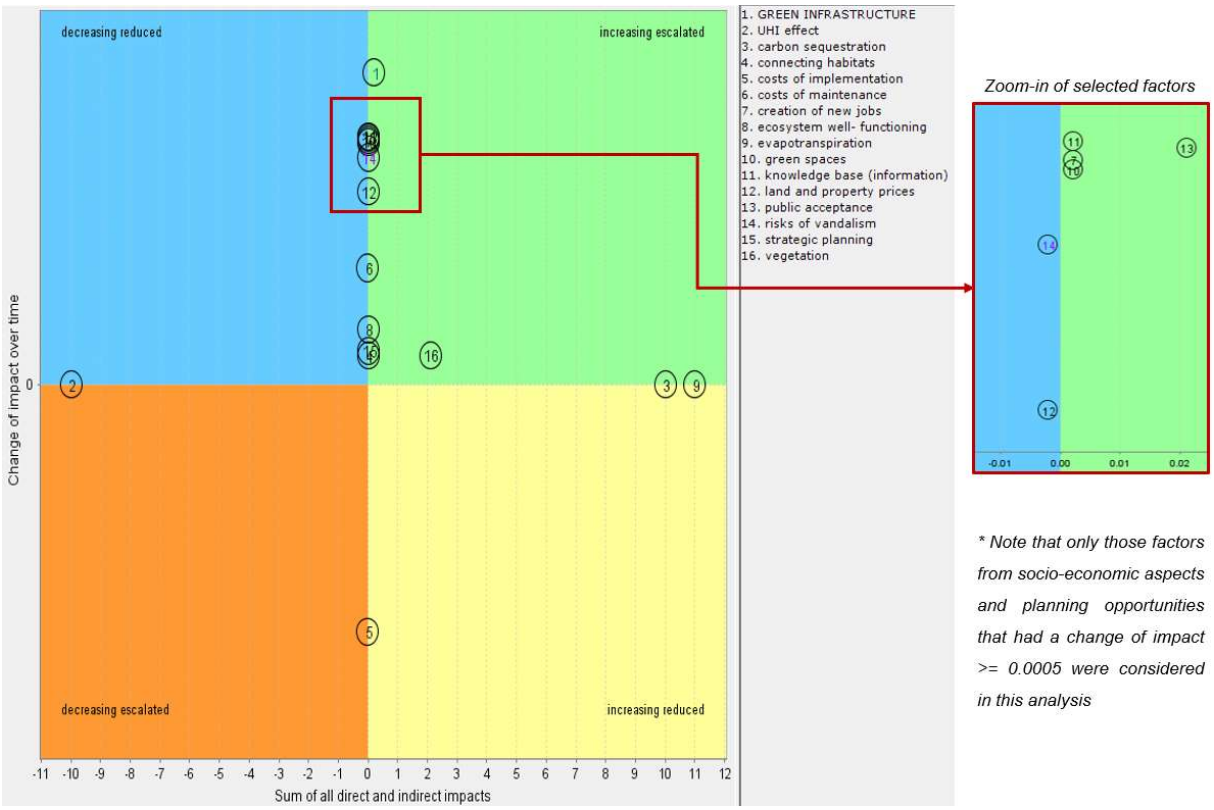


Figure 12 Insight Matrix of main driving factors for the Maintenance of local temperature

The main driving factors affecting the maintenance of local temperature are evapotranspiration and carbon sequestration, followed by the amount of vegetation. Here also, we can highlight the capacity of GI to positively impact local temperature and though this impact is weaker than the inherent capacity directly derived from vegetation, its impact will increase over time. On the other side, it should be considered the UHI effect will have a direct negative impact performed by the UHI effect.

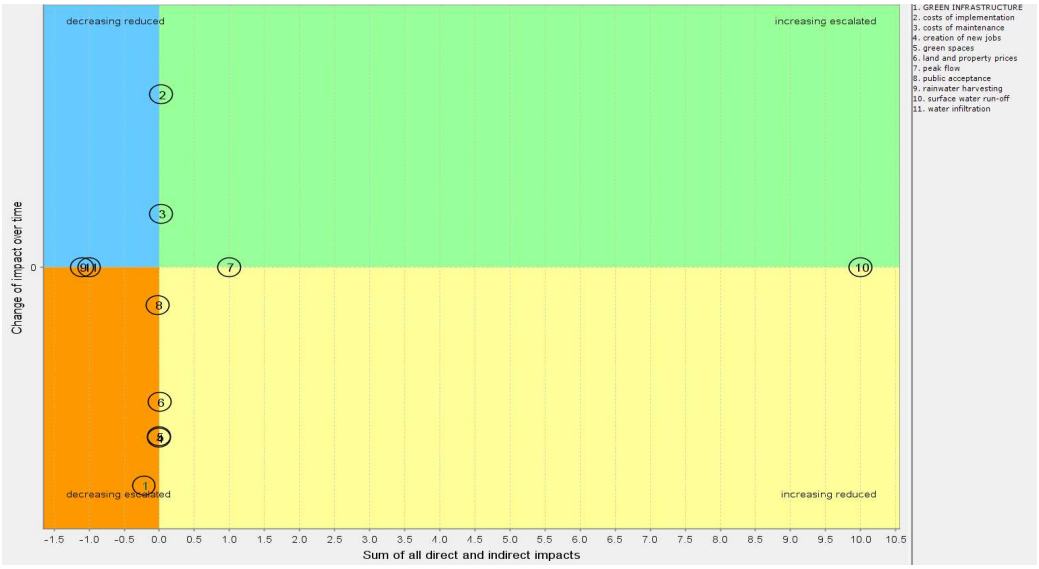


Figure 13 Insight Matrix of main driving factors for the Risk of flooding

In relation to the risk of flooding, we can highlight that the risk of flooding will be favoured by the amount of surface water run-off, which will be stable along time. This will be followed by peak flow, though this impact will be relative lower. On the other side, the possibility to harvest rainwater and the capacity for water infiltration will reduce the risk of flooding, being both factors steady over time. Here, GI will have a weaker effect, though it will be increasing over time.

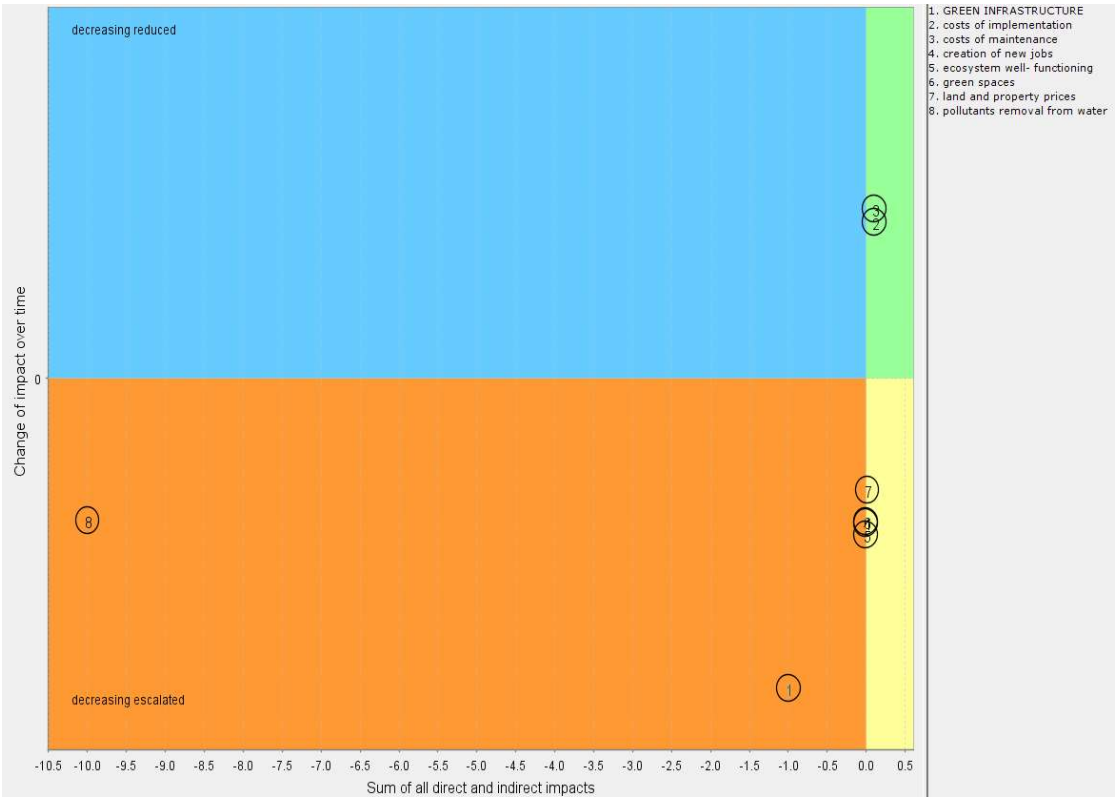


Figure 14 Insight Matrix of main driving factors for Water treatment costs

In the case of water treatment costs, main driving factors are the amount of pollutants removal will decrease the total impact and direc and indirect capacity of GI to reduce these costs. Moreover, this impact will increase over time.

Annex II-B: Methodology for analysis of synergies and trade-offs

The methodological approach used to analyse synergies and trade-offs follows closely the one described by Jopke et al. (2015). Graphical and correlation analyses were performed to investigate and characterise interactions among ecosystem services (ES). Data sources were the values of ecosystem services per NUTS region (see in Annex I detailed description of datasets - item 7, Maps of ecosystem services – MAES working group report published in 2015).). For graphical analysis we used bagplots (Rousseeuw et al., 1999). The bagplot is a bivariate version of the boxplot (Tukey, 1975) consisting of a point marking the highest half-space depth, which is labeled the depth median (Tukey, 1977); see Chakraborty and Chaudhuri (2006) for the statistical definition of half-space depth, surrounded by a region (bag) displaying the location of 50% of the data points (see Figure 14). The bag is surrounded by a further area called a loop. The boundary of the loop is calculated, as recommended by Rousseeuw et al. (1999), by bloating the bag by a factor of three. All data points outside the loop are outliers. Similar to univariate boxplots, the bivariate bagplots can also be visually interpreted. Important features for general explanation of the data distribution are: the position of depth median, dispersion of values (bag area), correlation (bag direction), distribution asymmetry (bag shape) and outliers (Rousseeuw et al., 1999).

The depth median is taken as a reference point in order to separate the bagplot into four quadrants (see Figure 14). The positive/positive space (i.e., both ecosystem services perform well relative to the depth median) is in the upper right of the depth median and the negative/negative one in the lower left, respectively. If the bagplot is oriented from lower left to upper right and thus covering the negative/negative and positive/positive space we assume a synergetic relationship between the two ES. In contrast, a trade-off between ES A and B is expected when the bagplot is oriented along the positive/negative and negative/positive space. If all four spaces are equally covered a neutral relationship is assumed.

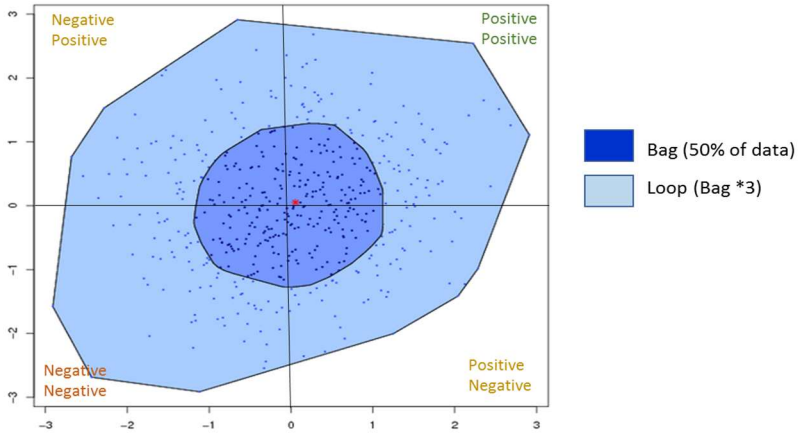
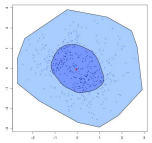
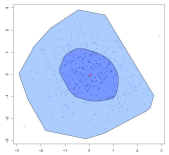
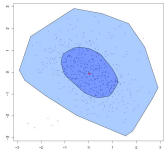
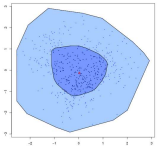
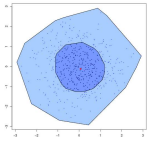
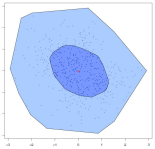
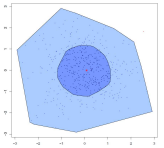
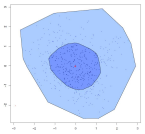
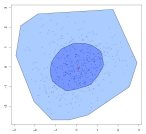
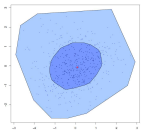
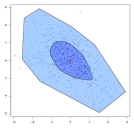
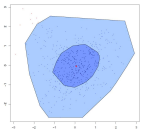
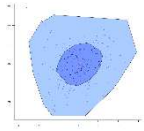
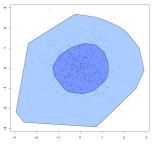
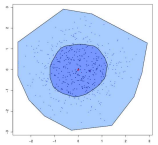
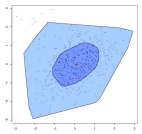
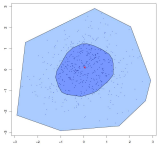
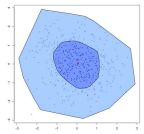
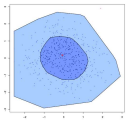
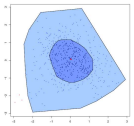
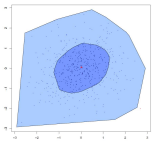
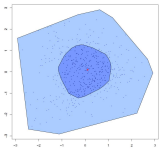


*Figure 15 B*agplot presenting the distribution of NUTS regions on the space defined by the relationship between habitat quality (x axis) and net ecosystem productivity (y axis). The graph displays the location of the depth median (red dot) and the bag that contains 50% of the data. All points outside the loop are considered outliers. The four quadrants defined by the depth median (red dot) depict the different type of combinations between the two ecosystem services. There is a synergy between both ES (r=0.33

Table 10 provides an overview of all ecosystem services interactions. For each pair of ES the correlation coefficient is provided and the bagplot as well.

TGross nutrient balance							
	-0.13	-0.13	-0.34	0.01	0.01	-0.23	0.05
Soil Erosion Control						
	-0.16	0.12	0.14	-0.43	0.07	0.23
Recreation potential						
	0.10	-0.01	0.34	0.12	-0.20	
Water retention						
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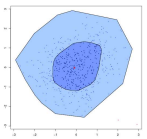
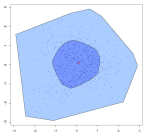
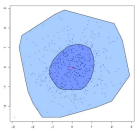
Water purification						
	0.20	0.02	0.20			

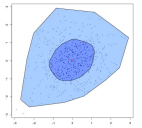
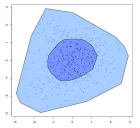
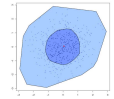
Relative pollination		
	0,24	0.23
Net ecosystem productivity		
	0.33	
	Habitat quality	

Table 10 Synergies and trade-offs of ES- Correlations and bivariate plots of pairs of ecosystem services

A detailed description of the synergies and trade-offs within each policy objective follows.

All the combinations between the three ecosystem services supporting **biodiversity** show a synergy. Moreover, these synergies are the highest ones observed among all policies. The highest synergy (r = 0.33) occurs between habitat quality and net ecosystem productivity. This covariance has long been studied and several authors highlight that higher productivity is mainly linked to plant biodiversity (Liang et al., 2016). Synergy between habitat quality and relative pollination was also expected since both ecosystem services are strongly linked (certain habitat quality is required to provide good conditions for pollination). It should be noted that even though positive correlations have been observed, the values are relatively low (below r=0.5) which implies that there is a strong variability. These results show that planning GI for biodiversity has the potential to have a multiplying factor by improving several ecosystem services at the same time. The bivariate plots among ecosystem services, illustrated below (Figures 15, 16, and 17) are a useful tool to identify how a specific NUTS region behaves. It helps to identify if a NUTS region already has a strong synergy (within the dark blue area) and if the values of the ecosystem services are on the lower or higher correlation. Therefore, it could be used to identify where potential weakness are, which indicates areas for improvement. This more detailed analysis at regional level will be used for the case studies.

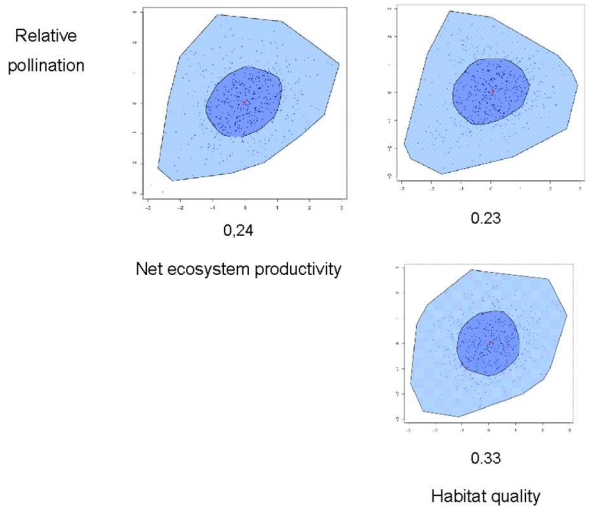


Figure 16 Correlations and bivariate plots of pairs of ecosystem services supporting biodiversity. Plots show the distribution of NUTS regions: dark blue includes NUTS regions with stronger synergies; light blue includes those regions where synergies are weaker. All pairs of ecosystems show synergy.

Synergies and trade-offs of ES supporting climate change and climate risk reduction

The pairwise comparison of the three ecosystem services related to Climate Change and Disaster Risk Reduction, reflects that there are two trade-offs (gross nutrient balance-water retention and gross nutrient balance-net ecosystem productivity, negative correlation), and one synergy (water retention-net ecosystem productivity).

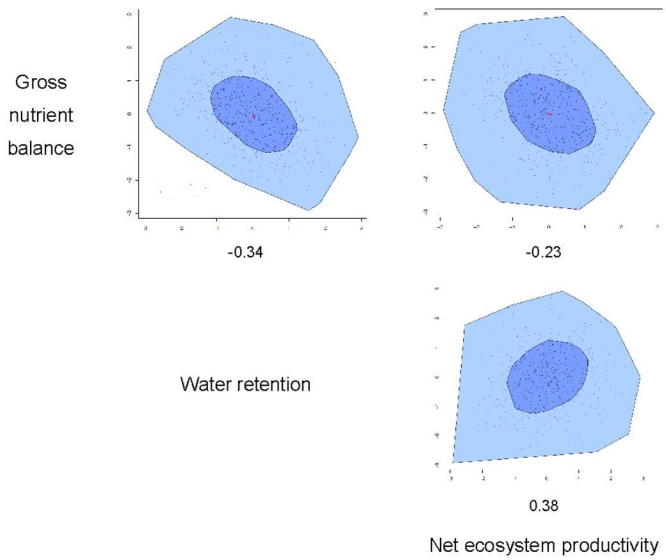


Figure 17 Correlations and bivariate plots of pairs of ecosystem services supporting climate change and risk-reduction. Plots show the distribution of NUTS regions: dark blue includes NUTS regions with stronger synergies; light blue includes those regions where synergies are weaker. Gross nutrient balance show trade-off with both water retention and net ecosystem productivity. On the other hand, there is a synergy between water retention and net ecosystem productivity.

To understand these trade-offs, it is important to recall the gross nutrient balance: this ecosystem service refers to the capability to process and keep nitrogen within the system, limiting nitrogenous emissions. These emissions are very often linked to livestock production and the application of manure fertilizer. However, since the ecosystem services are analysed within the GI network, and most agricultural areas are excluded in its delineation, this is not an important factor explaining regional differences on nitrogenous emissions. Therefore, the explanation comes from a combination of other factors: nitrogen deposition and characteristics of the soil-vegetation system (type of ecosystem, structure, composition, etc.). It has been described that changes in forest composition in response to land use activities and global change may have implications for regional budgets of greenhouse gases (Ambus, P, 2006). Specifically, increased nitrification in response to accelerated nitrogen inputs predicted for forest ecosystems in Europe may thus lead to increased greenhouse gas emissions from forests (Pilegaard, K., 2016). Different patterns have also been described for coniferous (highest emissions) and deciduous forest. In conclusion, deposition, forest type and soil characteristics determine to a large extent nitrogenous emission (Kitzler, B., 2006). Consequently, the gross nutrient balance has a local component (vegetation type and soil) and an exogenous component (nitrogen deposition).

The trade-off between gross nutrient balance and water retention service should therefore be considered in the European context. This trade-off emerges from a combination of several processes: water retention, net ecosystem productivity and nitrogen deposition pattern. The higher net ecosystem productivity at higher emission level (low values for ecosystem service) may reflect a fertilizer effect of nitrogen deposition.

Finally, there is a synergy between water retention and net ecosystem productivity. Water retention is linked to a combination of soil properties that provide favourable conditions for ecosystem productivity.

This combination of interactions, dominated by trade-offs, may explain the fact that most regions are monofunctional for climate change and disaster-risk reduction as described in Section 1.1.2. of the Interim (main) Report.

The analysis of ES linked to climate change shows the complexity of the system when external factors, like nitrogen deposition, interact between each other- Therefore, good regional and local knowledge is required to overcome the issues linked to gross nutrient balance. However, nitrogen deposition is a factor of uncertainty that could not be directly managed at regional and local level (mitigation measures could be taken).

Synergies and trade-offs of ES supporting water management (Water Framework Directive)

Ecosystem services supporting water management are those with lower correlations. Therefore, the type or relationship is either a weak synergy or neutral (no influence). Our findings are in line with the conceptual approach developed by Kandziora et al. (2013) where no trade-offs were found between regulating services, and the same neutral relationship between water purification and water retention were observed. Soil erosion control has a weak synergy with both water purification and water retention. Jopke et al. (2015) have also observed similar patterns analysing other regulating services across European regions.

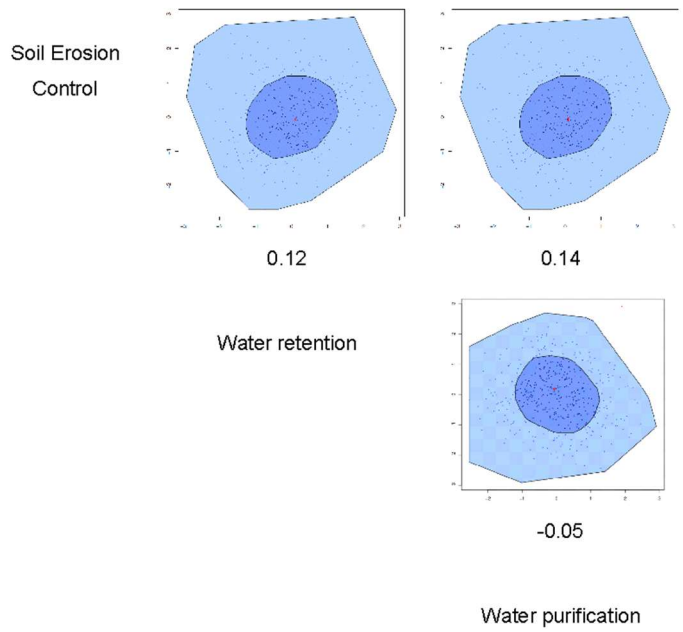
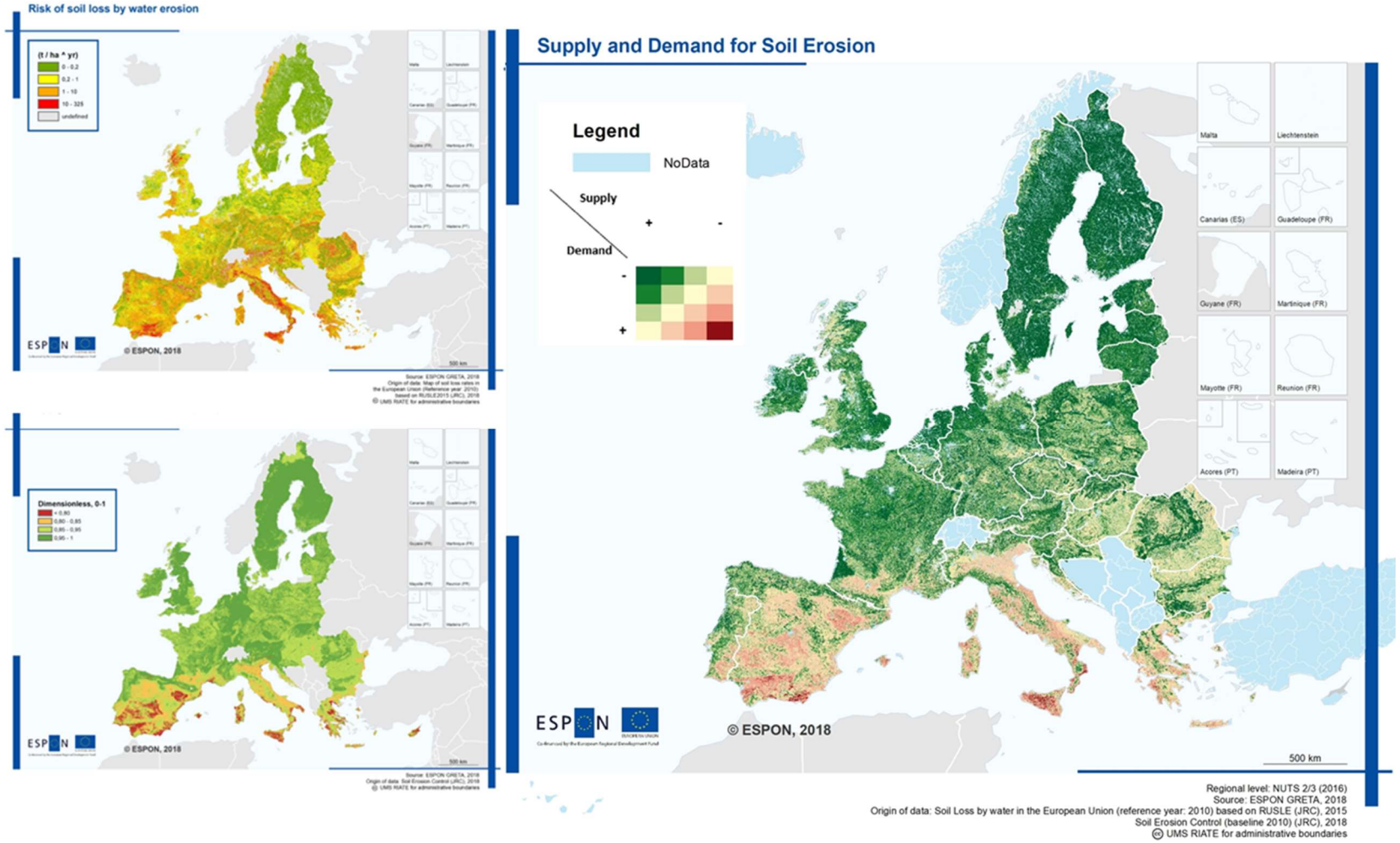
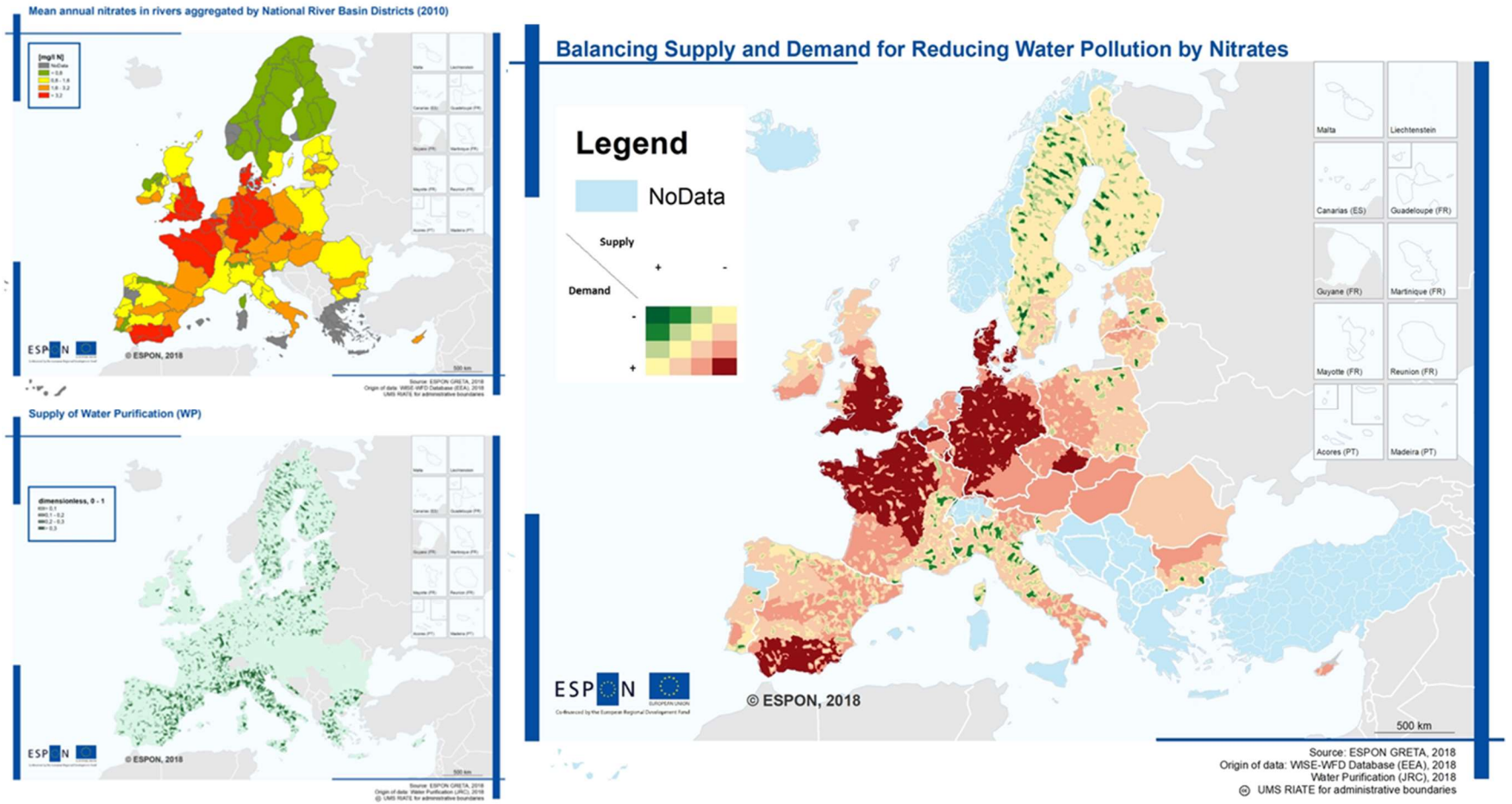


Figure 18 Correlations and bivariate plots of pairs of ecosystem services Water Framework Directive. Plots show the distribution of NUTS regions: dark blue includes NUTS regions with stronger synergies; light blue includes those regions where synergies are weaker. Weak synergies are observed in: soil erosion control-water retention, soil erosion control-water purification. Relationship between water purification and water retention is neutral.

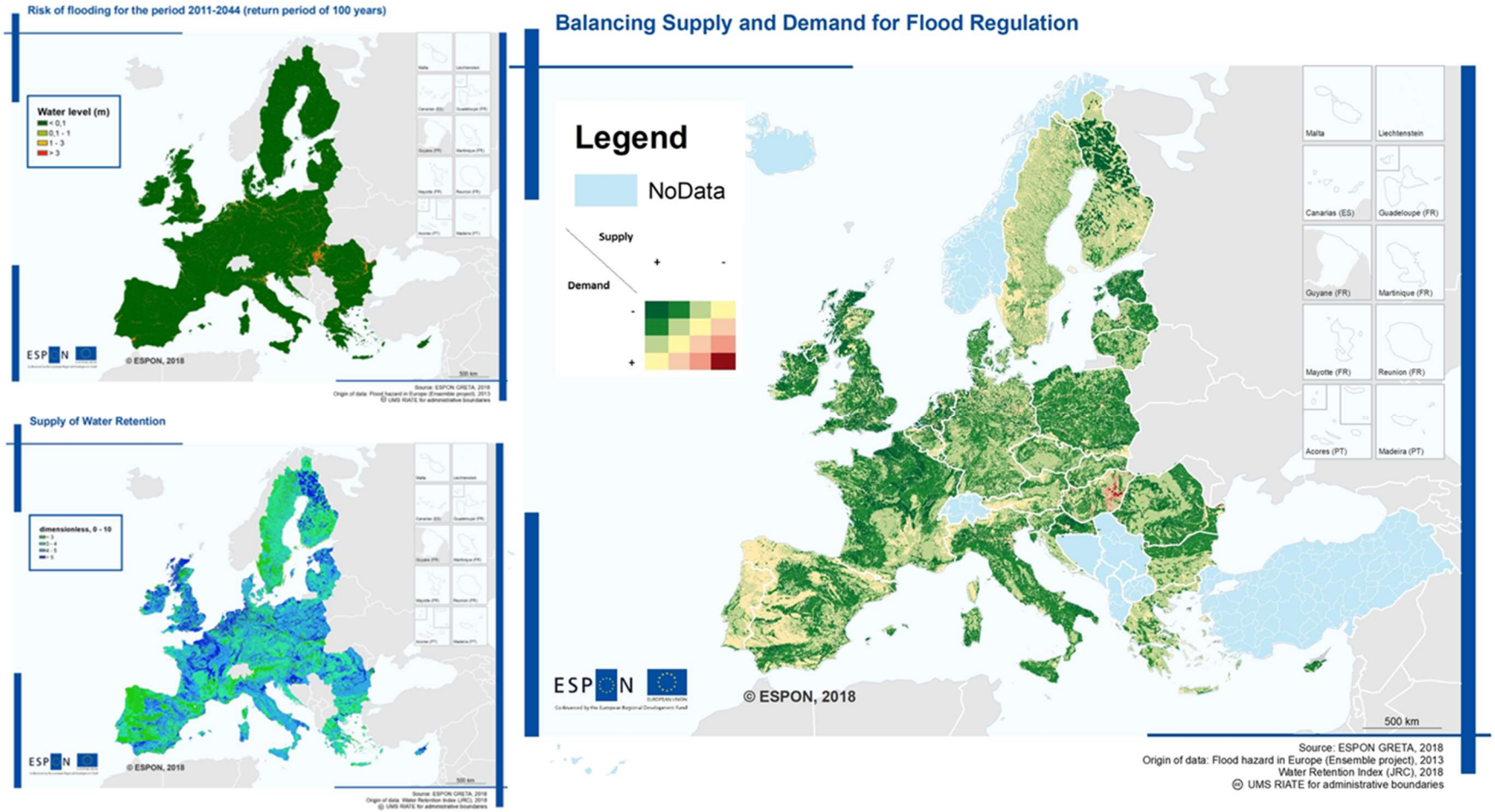
Annex II-C: Analysis of Supply and Demand for ES



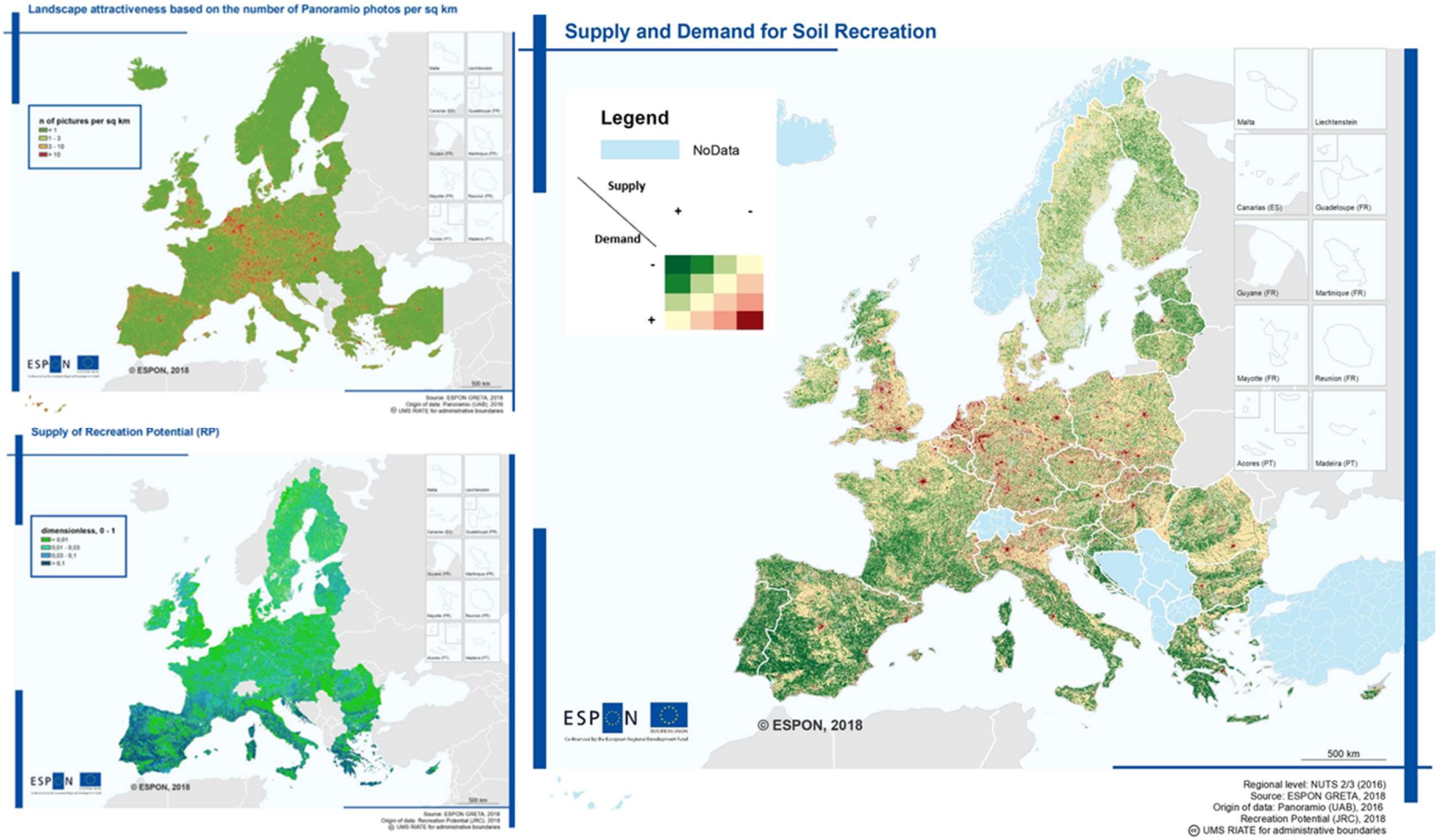
Map 3 Balancing supply and demand for reducing Soil Erosion



Map 4 Balancing supply and demand for reducing Water Pollution by Nitrates

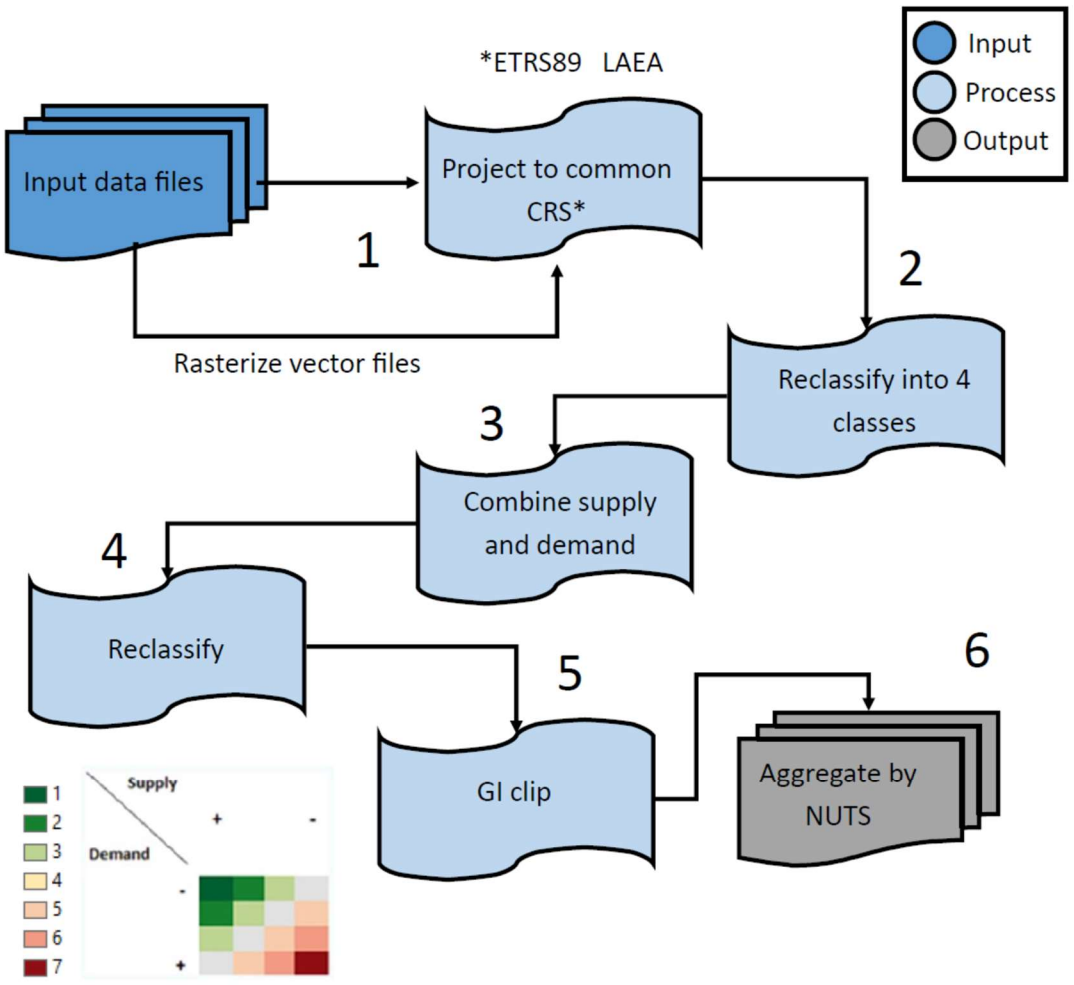


Map 5 Balancing supply and demand for Flood Regulation

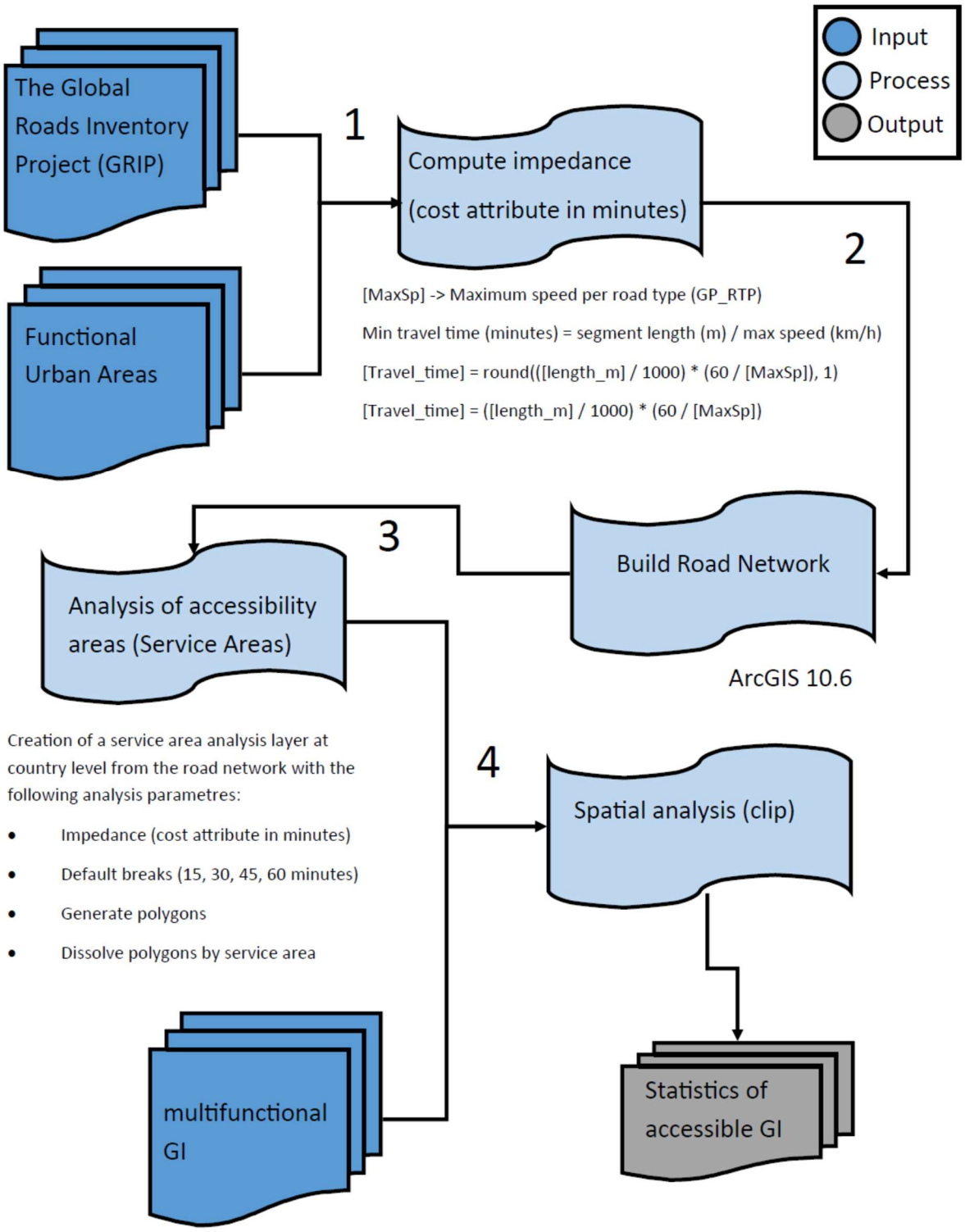


Map 6 Balancing supply and demand for Recreation

Work -flow for spply and demand mapping



Annex II-D: Accesibility mapping



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Annex III: Economic methods and financial mechanisms

Annex III-A: Main Economic Valuation Methods Considered in GRETA

The main valuation methods considered in GRETA include:

Replacement costs, where the costs of providing an equivalent service, would the GI not provide it, is used to measure the value of the benefits it provides. For example, one might use the costs of building and maintaining a dyke for flood risk protection as an estimate of the value of the flood risk mitigation service provided by the GI.

Cost avoided, where the costs of the damages the GI contributes to avoid are used as a value of the benefits it provides. One example could be to estimate the costs of potential floods on housing, would the GI not be in place, and use these costs to value the flood risk mitigation service provided by the GI.

Hedonic pricing, where the extra price individuals are willing to pay to buy a property close to the GI is used as an indicator of the benefits the GI provides to the neighbouring community.

Travel Costs, where the costs of travel and time individuals are willing to spend to visit the GI are used to measure the value of the recreational services it provides.

Contingent valuation, where surveys are used to collect individuals' stated willingness to pay to see the GI project implemented. These willingness-to-pay values are used as a measure of the benefits individuals (would) receive from the GI.

Discrete Choice Experiments (or choice modelling), which are similar to contingent valuation surveys, but where individuals state their preference and willingness to pay amongst multiple alternative scenarios of potential GI designs.

Benefit transfer, where values estimated for other similar sites are used to value the benefits provided by the GI of interest.

Annex III-B: Meta analysis on Economic Methods

Sourcing articles and selection

a. Search keywords, combinations and search engines

Based on the working definition of Green Infrastructure (GI) being used in the GRETA project and key valuation methods, the keywords used for searching the literature included.

Keywords used for literature search for the economic valuation of GI meta-analysis

Keywords to capture definition of Green Infrastructure	Keywords to capture economic valuation methods
"Green Infrastructure"	Valuation
"Green wall"	"Willingness to pay"
"Green park"	"Choice experiment"
"Green roof"	"Contingent valuation"
"Green network"	Hedonic
"Green space"	"Travel cost"
"Urban natural area"	
"Urban green area"	
"Urban park"	

The keywords initially included "Value" which in combination with "green infrastructure" led to 1,693 results. We therefore dropped the keyword "Value" as it was too broad and encompassed very different definition of "values" (e.g. monetary, ethical). Similarly, "benefits" was initially included in the keywords but appeared to be too broad and leading to very heterogeneous papers. Since the main economic valuation methods are included as keywords, we believe the current list of keywords is comprehensive.

All combinations of one (1) GI definition keyword with one (1) valuation method keyword were entered into Sciencedirect search engine (e.g. "Green infrastructure" AND "willingness to pay" gave 143 references). Additionally, the Environmental Valuation Reference Inventory (EVRI, www.evri.ca) database of empirical studies on the economic value of environmental assets and human health effects was searched using the following search criteria: "Europe" & "journal article" and "primary data collection" in combination with the GI definition keywords (Table 11, first column). This initial search led to the identification of 1,251 papers,. References were downloaded in a reference management software (Mendeley[11]) and were then screened through the following selection process.

b. Selection of relevant papers

At each stage of the selection process the following criteria were used to determine whether an identified article would be included in the next stage: (i) provide an economic valuation; (ii) focus on GI as defined by the working definition of GI used in GRETA; (iii) valued through the use of a stated preference method (contingent valuation or choice experiment), a revealed preference

[11] The used of Mendeley helped manage duplicates as it automatically detects them in the reference list.

method (travel costs and hedonic pricing), a cost avoided or a replacement costs method – papers based on benefit transfer were excluded;, (iv) focused on GI located in Europe.

Selection stage 1: with the selection criteria in mind, a first selection of papers was done based on titles and keywords reported by authors.

Selection stage 2: based on the remaining articles, a second selection of papers was done based on abstracts.

After these 2 selection stages, the number of relevant references dropped down to 119 papers which will undergo a full text review for data extraction against the selection criteria (listed below).

Data extraction and analysis

a. Data extraction

In this part of the work we extracted and recorded from each paper the data necessary for the meta-analysis in a standardised table. In addition to recording data on the publication (authors, journal, year of publication, paper ID), typical variables necessary for the meta-analysis include: value/marginal WTP (and currency); year of valuation; location; rural, urban or peri-urban; ecosystem service(s) to which the value refers; ecosystem service(s) provided by the GI (if not all valued); type of GI; method used for valuation; area covered by the GI; protection status of the GI; sample size (for stated and revealed preference methods only); data collection approach (for stated and revealed preference methods only); payment mechanism (stated preferences only). The data was complemented by the population density at the NUTS2 level found on Eurostat.

The final number of references included in the meta-analysis dropped down during the data extraction stage due to the selection criteria not being met or data required for the meta-analysis exercise appears not to be available in the paper. The reasons for non-inclusion were registered and are:

- Different definitions of “value”: no monetary value is actually provided in the paper
- The GI under study does not match GRETA’s definition of GI (e.g. green roofs, green walls)
- Several papers are published on the same database: to avoid double counting only 1 of these papers is included

The number of papers finally selected are, presented by method:
- hedonic pricing: 16 papers
- stated preferences (contingent valuation and discrete choice experiments): 20 papers
- other methods: 8 papers

b. Data analysis

The meta-analysis method is applicable on papers using methods with compatible theoretical frameworks, therefore we analysed separately the hedonic pricing papers from the stated preferences papers. The papers using other approaches were too few and too heterogeneous for a meta-analysis based on these. We first looked at the general descriptive statistics of the papers included in the 2 databases (one for hedonic pricing papers, one for stated preferences papers) and then ran regressions on the 2 databases.

In particular, regarding the meta-analysis of stated preferences studies, two methods are used in the literature: the contingent valuation method and the Discrete Choice Experiment (DCE) method. The DCE method enables one to estimate WTP measurements for large numbers of simulated alternative GI scenarios, therefore 1 paper provides 144 observations in the meta-analysis (Liekens et al. 2013). Table 11 details the average WTP with and without these observations in order to illustrate how many results might be driven by this single paper.

Variable	n	Mean	Std. Dev.	Min	Max
Mean WTP (annual in 2017 Euros) all papers	203	166.51	84.81	2.48	516.74
Mean WTP (annual in 2017 Euros) all papers except Liekens et al., 2013	59	80.85	108.92	2.48	516.74

Table 11 Descriptive statistics of annual WTP in the meta-analysis of stated preferences studies

A regression analysis was carried out to gain a better understanding of the drivers behind the average value given to GI. The aim was to explain which characteristics of GI influence the mean annual WTP (in 2017 Euros) measured in the original papers. In order to account for the use of multiple observations from each original study, a weighted regression was used.

Results – Tables

Hedonic pricing:

Table 12: List of papers included in the meta-analysis on hedonic pricing

	Authors	Journal	Year	Number of observations
1	Tyrvainen	Landscape and Urban Planning	1997	3
2	Liebelt et al	European Planning studies	2018	9
3	Nilsson	Landscape and Urban Planning	2014	3
4	Schlapfer et al	Landscape and Urban Planning	2015	4
5	Herath et al	Ann Reg Sci	2015	8
6	Tyrvainen and Miettinen	JEEM	2000	5
7	Melichar and Kaprova	Landscape and Urban Planning	2013	2
8	Votsis	Ecological Economics	2017	7
9	Franco and Macdonald	Regional Science and Urban Economics	2017	4
10	Zygmunt and Gluszak	Forest Policy and Economics	2015	3
11	Panduro and Veie	Landscape and Urban Planning	2013	24
12	Czembrowski et al	Ecological Economics	2016	4
13	Czembrowski et al	Urban Forest and Urban Greening	2016	2
TOTAL				**78**

Table 13: Different measures of GI impact on property value

Measure of GI impact on property prices	Number of observations
Absolute price variation (/m2) when distance increases in meters	13
% variation in price when distance increases in meters	52
Absolute price variation (/m2) when distance increases by 1 %	7
% variation in price when distance increases by 1 %	15
Total	**78**

Table 14: Countries where the case studies included in the meta-analysis on hedonic pricing are located

Country	Freq.	Percent
Austria	8	10.26
Czech Republic	2	2.56
Denmark	24	30.77
Finland	15	19.23
Germany	9	11.54
Poland	9	11.54
Portugal	4	5.13
Sweden	3	3.85
Switzerland	4	5.13
Total	**78**	**100**

Table 15: Types of GI valued in the papers included in the meta-analysis on hedonic pricing

Type of GI	Freq.	Percent
coastline	1	1.28
lake	8	10.26
landscape biodiversity	1	1.28
urban forest	16	20.51
urban green areas	12	15.38
urban parks	34	43.59
watercourse	6	7.69
Total	**78**	**100**

Stated preferences

Table 16: List of papers included in the meta-analysis on stated preferences

	Authors	Journal	Year	Number of observations
1	Baarsma	ERE	2003	1
2	Bernath; Roschewitz	Journal of Environmental Management	2008	1
3	Bishop	Journal of Environmental Planning and Management	1992	4
4	Caula; Hvenegaard; Marty	Urban Forestry and Urban Greening	2009	2
5	Chen et al	Environmental Management	2014	2
6	del Saz Salazar and Menendez	Land Use Policy	2007	1
7	Giergiczny and Kronenberg	Ambio	2014	6
8	Hanley and Knight	Journal of Environmental Planning and Management	1992	1
9	Lanz and Provins	Environmental and Resource Economics	2013	10
10	Latinopoulos et al	Land Use Policy	2016	2
11	Inge et al	Land Use Policy	2013	144
12	Marella and Raga	Waste management	2014	1
13	Mell et al	Urban Forestry and Urban Greening	2013	5
14	Mell et al	Urban Forestry and Urban Greening	2016	2
15	Polizzi et al	Ecosystem Services	2015	2
16	Reynaud et al	Ecosystem Services	2017	3
17	Sarvilinna et al	Environmental Management	2017	1
18	de Saz-Salazar and Raussell-Koster	Landscape and Urban Planning	2008	1

1			200	
9	Tyrvainen	Journal of Environmental Management	1	12
2			201	
0	Vecchiato and Tempesta	Forest Policy and Economics	3	2
TOTAL				**203**

Table 17: Countries where the case studies included in the meta-analysis on stated preferences are located

Country	Freq.
Belgium	2
Finland	3
France	1
Greece	1
Italy	3
Netherlands	1
Poland	1
Spain	2
Switzerland	1
UK	5
Total	**20**

Table 18: Types of GI valued in the papers included in the meta-analysis on stated preferences

Type of GI	Freq.
forest	6
lake	3
landscape biodiversity	1
park	6
street trees	2
urban green areas	2
watercourse	4
Total	**24**

Note: Some papers value several types of GI (hence the number of observations is higher than the number of papers)

Table 19: Regression analysis showing the influence of GIs' characteristics on average WTP

Y = mean annual WTP (euros 2017)	Coef.	Robust Standard Errors	t	P>t	[95% Confidence Interval]	
GI type (ref.: other type)						
landscape biodiversity	24.39	33.00	0.74	0.474	-47.51	96.29
park	-22.52	28.51	-0.79	0.445	-84.63	39.60
lake or river	-7.33	36.76	-0.2	0.845	-87.43	72.76
forest	**74.81**	**33.22**	**2.25**	**0.044**	**2.44**	**147.19**
Ecosystem services valued (ref. other)						
Biodiversity	**23.26**	**1.03**	**22.51**	**0.000**	**21.00**	**25.51**

Flood control	**41.74**	**19.31**	**2.16**	**0.052**	**-0.33**	**83.81**
Recreation	**38.19**	**2.28**	**16.78**	**0.000**	**33.23**	**43.14**
Duration of payment (years)	**-2.74**	**0.91**	**-3**	**0.011**	**-4.74**	**-0.75**
Payment for an indefinite period of time	**332.48**	**87.60**	**3.8**	**0.003**	**141.61**	**523.35**
Population density in NUTS2 region (inhab/km^2)	-0.05	0.04	-1.13	0.282	-0.13	0.04
Size GI (hectares)	0.02	0.01	1.26	0.231	-0.01	0.05
Presence of water structure	48.41	29.40	1.65	0.126	-15.65	112.47
Sample size (number of observations)	**0.06**	**0.02**	**3.5**	**0.004**	**0.02**	**0.09**
Hypothetical GI (ref.: existing GI)	26.17	30.63	0.85	0.410	-40.56	92.91
Constant	-56.36	43.02	-1.31	0.215	-150.10	37.38

Note: the regression analysis was implemented with weighting by number of observations from a same paper (n=5811, R2=0.8820). Standard errors are estimated clustered by paper.

Annex III-C: Results from online consultation on economic valuation methods

Method

Consultation A was based on an online questionnaire circulated to technical experts and policy / decision makers within each of the GRETA project case studies. The questionnaire included 20 questions structured in two main parts. The first part aims at assessing the current use and awareness of valuation methods by respondents while the second part aims at identifying their perceived barriers and interest of using such methods. We used a mix of open ended and closed-ended questions to combine comparable results as well as qualitative material, and provide respondents with the possibility to comment on their responses.

Access to Consultation A https://survey.tecnalia.com/limesurvey/index.php/214247?lang=en

Results

Table 20: Number of respondents by case study

Country	Case study	Number of responses
Romania	Alba Iulia Municipality	1
UK	Central Scotland Green Network (CSGN)	1
Ireland	Dún Laoghaire-Rathdown	2
France-Spain	Euroregion Aquitania- Euskadi-Navarra	5
Denmark-Sweden	Greater Copenhagen	4
Malta	Malta	2
Netherlands	Randstad	6
ºEstonia - Latvia	Southern Estonia/ Northern Latvia	2
Slovakia	Trnava Region	3
Finland	Urban Parks in Finland	1
Spain	Valencia Metropolitan Area	1
Grand Total		**28**

Table 21: Awareness and use of economic valuation methods (number of respondents)

	Replacement costs	Cost avoided	Hedonic pricing	Travel Costs	Contingent valuation	Discrete Choice Experiments	Benefit transfer
Heard of but not used	21	19	14	17	15	15	18
Heard of and used	6	7	9	4	7	4	4
Not heard of	1	2	5	7	6	9	6
Total	**28**	**28**	**28**	**28**	**28**	**28**	**28**

Table 22: reasons for not using economic valuation methods (number of respondents out of 14 respondents who have never used any of the methods but are aware of there existence)

	Too costly	**Too time-consuming**	**Not responsive enough for project/policy timelines**	**Lack of necessary skills in my institution**	**Not suitable to my objectives**	**Lack of data**	**Not convinced by this method (reliability)**
Yes	1	4	2	6	2	5	4
No	13	10	12	8	12	9	10

Annex III-D: Financing of Green Infrastructure in Europe

The responses to the questionnaire distributed for the elaboration of the National Fact Sheets also provided valuable information on the financing of GI in Europe (the result in this annex is based on answers to the questions 8-10 in the National fact sheet survey. The method for this survey, and the full questionnaire is included in Annex IV). Financial measures are important for preserving and restoring green and blue areas and enhancing their quality. Twenty out of 41 respondents stated that European funds contributed to developing policy for and implementation of GI in their respective member state[12]. Nine respondents stated this was not the case, and 12 did not know if European funds were used in this regard. The respondents were also asked to rank the importance of different funding sources for implementing green infrastructure measures from a list of seven European funds (see Figure 19).

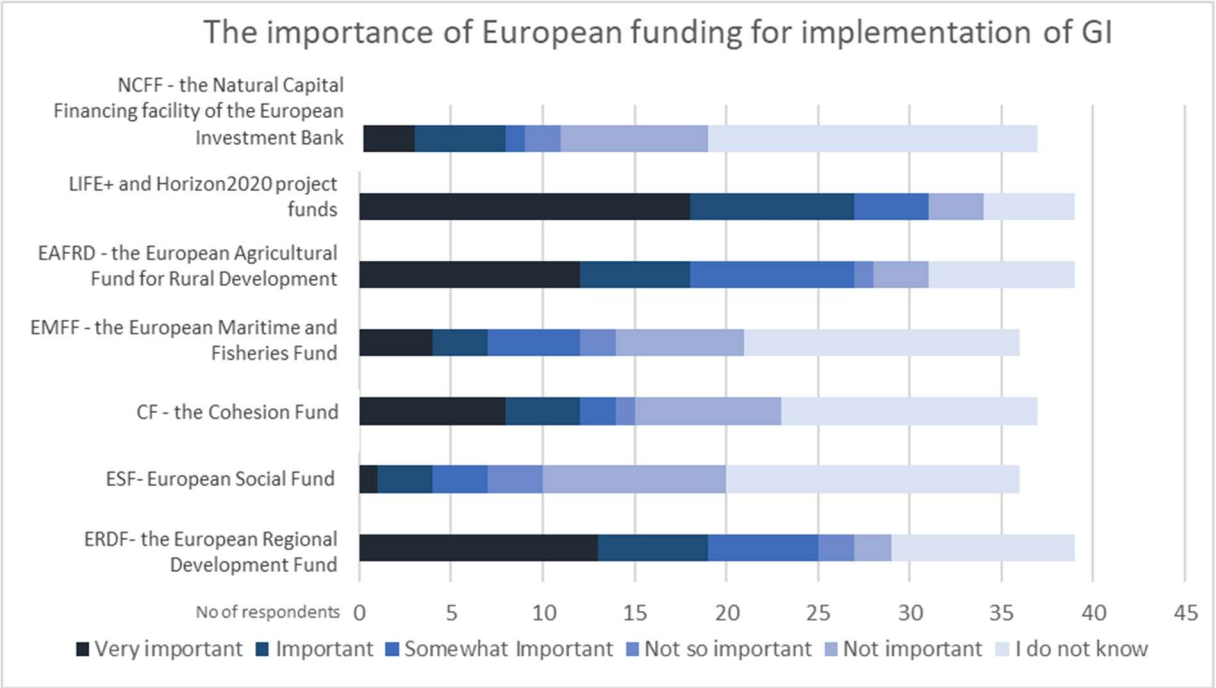

Figure 19 The importance of European funding for implementation of green infrastructure in 32 ESPON countries (e.g. EU28 + 4 EES-countries)

All funds included in the questionnaire were considered important to a certain degree. The three funds that were perceived as *very important* for implementing GI in Europe by most respondents are: LIFE+ and Horizon 2020-project funds (18 of 40 respondents), The European Regional Development Fund (ERDF; 13 of 40 respondents) and The European Agricultural Fund for Rural Development (EAFRD; 12 of 40 respondents). It can be noted that many respondents did not know if funding originated from the European Union or not. In addition,

[12] Included in the survey was accept the EU-28 member states, also the 4 ESPON and EES-states whom do not have access to the European funding included in the questionnaire (eg. Iceland, Norway, Lichtenstein and Switzerland)

some commented that other funds were used, especially national funding and co-funding from different sources depending on the primary aim of the green infrastructure in question.

In comments to the survey it was stated that subsidies, investments and tax reliefs are used for different land management incentives, for ‘greening’ agriculture, for establishing and managing nature trails and nature reserves, for renewing urban parks and building green roofs.

Annex IV: Governance, policy and planning contexts for GI implementation in Europe

Annex IV-A: Method and approach for assessing GI policy

The previous research and grey literature

To enable the integration of previous research, the international search data base Scopus Elsevier was utilised. Scopus is one of the largest abstracts and citation databases of peer-reviewed literature, and includes outputs in the fields of science, technology, medicine, social sciences, and arts and humanities. The search criteria were set up to find published peer-reviewed journal articles with the most recent research concerning policy for green infrastructure in Europe. The search terms used were “green” AND “infrastructure” AND “policy” AND “Europe”, and they were searched in title, abstract and key words. To find the most recent research the search was limited to articles published after 2006 and before 2018 (eg. 2007-2017). The search was done on 2017-12-14 and 63 documents were found. After reviewing the search results (i.e. reading the abstracts) 19 journal articles and other types of documents (eg. conference papers) were considered non-relevant for the topic of policy for green infrastructure in Europe (focusing on topics such as road infrastructure, freight logistics and discursive articles on environmental law). These were excluded and the literature review then consisted of 44 journal articles. While reviewing the 44 journal articles, additional relevant research and grey literature were identified and included in the review (this is referred to as snowball sampling). This for instance included green infrastructure fact sheets for ten European countries (EC, 2015), MAES-factsheets from the project called ESMERALDA (EC, 2016), as well as ongoing work on the Biodiversity Information System for Europe’s national review (BISE) (EC, DG Environment - Directorate B and the European Environment Agency, 2018) .

The Questionnaire

The questionnaire was developed through an iterative process with feedback received from: all research partners, the Inception report review, and the EGTC-representatives that are related to the GRETA-project. The initial questions were formulated based on insights from previous research on the topic of green infrastructure. After several rounds of discussions around the themes that should be included and the formulations of the questions, an online platform was chosen as a tool to circulate the questions to possible respondents. The online platform surveymonkey was utilised for the survey. A cover letter was drafted within which the link to the questionnaire was included.

Following this, the factsheet survey was deployed via the ESPON Monitoring Committee and ESPON national contact points. The targeted stakeholders either answered the questionnaire directly or sent the questionnaire to other relevant stakeholders within their country. Relevant stakeholders were experts in spatial planning, nature conservation, environmental management and those working in public administration at the national level and/or other institutional levels. Initially, there was a lack of responses from certain countries. For these countries, the initial 44 journal articles from the SCOPUS search results were analysed to

identify researchers and academics who have published research on the topic of green infrastructure in these countries to respond to the questionnaire.

Most contact was made via e-mail, and most respondent's chose to answer via the online questionnaire. However, some chose to answer via e-mail directly, or gave additional information via e-mail and/or telephone. Reminders were sent out every other week until at least one response from each of the ESPON-countries had been received.

The respondents are primary advisors, experts or officials in public administration on national, regional or municipal levels (34 respondents). They are primarily working within fields of spatial planning or environmental resource management. For some of the countries, respondents from public administration did not provide answers and therefore the respondent(s) are academics (12 respondents) or private consultants (1 respondent). For some countries, both respondents within public administration and research have answered the survey (3 countries; Belgium, Romania and Slovenia). The questionnaire was open to respondents from January 22nd, 2018. Initially the plan was to close the survey by the end of March 2018; however, as not all responses had been received from all ESPON-countries, it remained open until May 10th, 2018. In total 43 answers have been received via the online platform and 4 answers were received via e-mail correspondence.

To complement the answers from the survey, the following steps were performed to write national policy factsheets: 1) reading the sample of academic literature for facts about the country in question; 2) reading grey literature reports and home pages for facts for the country in question, these for instance included green infrastructure fact sheets, mapping and assessing ecosystem services, and biodiversity information systems for Europe, green infrastructure homepages for all EU countries (EC, 2015; EC, 2016; EC, DG Environment - Directorate B and the European Environment Agency, 2018); 3) reading specific national homepages on green infrastructure and georeferenced information; 4) including the references in the fact sheets to any statement that had another source other than the respondent to the questionnaire.

Shortcomings, room for improvements and solutions

As the topic of green infrastructure is cross-sectoral and spans several institutional levels it has been challenging to find stakeholders that could answer all the questions in the questionnaire. To solve this, stakeholders were encouraged to answer at least some parts of it, and to forward the questionnaire to others if they were not able to answer all or parts of it. Therefore, it cannot be said with certainty how many stakeholders were requested to answer the survey. It is however possible to state how many and who have answered. It should be noted that some respondents answered the questionnaire together with colleagues, and the impression from our e-mail correspondence is that this could be the case for several countries.

As is often the case with questionnaires, the answers to the survey from respondents in the same country were in some instances completely varied. This was even noted for questions

where the only alternatives were Yes/No/I don't know. This complicates the analysis and interpretation of the policy contexts, as the respondents have different perceptions. The presentation of the results has taken this into account, by making this clear in the national policy factsheet text. It is also worth noting that respondents' understanding and perceptions of the term GI could affect their responses. Depending upon how familiar the respondents were with the term GI, it is possible that some view GI as being more broadly linked with different policy sectors and strategies like energy, climate change adaptation or disaster prevention. Many countries have policies related to GI embedded within different sectoral strategies but the term GI is not necessarily directly used. For this reason, it is possible that there are more policy sectors or strategies linked with plans that support GI development than those identified by the respondents or the literature review.

Adding to this risk is the use of English in the questionnaire, which could increase the risk of non-native English speakers not fully comprehending the questions. A language adapted questionnaire might have been more suitable, but was not possible to execute within all the ESPON-countries due to time and resource constraints.

One respondent commented that more opportunities to answer 'yes' or 'no' questions would have provided an opportunity to gather further insight from respondents. For all of the yes/no questions, the questionnaire included the option "I do not know", but the respondent expressed that it is not always a proper alternative. We could have included other neutral options, such as "other" and a blank space for further information. At the same time, and more commonly, even though the length of the questionnaire was balanced to get a good response rate, some questions where respondents were asked to fill in more elaborated answers in text form were left empty. In general, respondents spent 47 minutes to finalise the online questionnaire

National Fact Sheets Survey

[1] Included in the survey were the EU-28 member states, also the 4 ESPON and EES-states whom do not have access to the European funding (eg. Iceland, Norway, Lichtenstein and Switzerland).

Survey ESPON GRETA- Green Infrastructure: Enhancing biodiversity and ecosystem services for territorial development, GI policy in Europe

The ESPON-funded project GRETA aims to develop a comprehensive knowledge base for enhancing green infrastructure to benefit territorial development in different European regions and cities.

With this survey we are collecting information to improve the knowledge base regarding GI.

The survey should only take about 15 minutes to complete. Information will be incorporated into a set of National Fact Sheets, one for each of the ESPON countries. Any personal information shared with us will be anonymised.

Feel free to share the survey with other experts as well.

Thank you for helping us balance the green, blue and grey infrastructures in Europe!

* 1. Questions for the national fact sheets and Green Infrastructure (GI) policies

Personal information:

Name

Country

Email Address

2. Background information about you

Title:

Affiliation:

3. Questions regarding policies in relation to Green Infrastructure (GI)

Does your country adopt and implement the following pan European policies?

	Yes	No	I don't know
Natura 2000	○	○	○

GI (Green Infrastructure) strategy	◯	◯	◯

~~European policies that are applied and have a direct relation to GI policy and/or planning.~~

4. Has your country developed specific GI policies, strategies, or similar?

Yes	No	I don't know

Answer

If yes, please provide name of policy, strategy, or framework (Description of key areas of focus, website or other information)

5. Based on your expertise, are GI principles included in your country's legislation, policy and/or strategy for:

	Yes	No	I don't know
Land use and spatial development plans	◯	◯	◯
Transportation	◯	◯	◯
Water management	◯	◯	◯
Agriculture, Forestry and Fisheries	◯	◯	◯
Climate Change mitigation And adaptation	◯	◯	◯
Environmental protection	◯	◯	◯
Disaster prevention	◯	◯	◯
Finance	◯	◯	◯
Energy	◯	◯	◯
Cultural Heritage	◯	◯	◯
Health	◯	◯	◯
Social services	◯	◯	◯
Rural development	◯	◯	◯
Other sector	◯	◯	◯

6. Who in terms of actors and/or institutions have the main responsibility for GI **implementation*** in your country?

**With implementation we are referring to actions taken to further develop the multi functionality and connectivity of protected areas.*

Rank actors 1-7, where 1 main responsibility

	European policy and stakeholders	☐ N/A
	National policy and stakeholders	☐ N/A
	Regional policy and stakeholders	☐ N/A
	Municipal policy and stakeholders	☐ N/A
	Research	☐ N/A
	Non-governmental organisations	☐ N/A
	Business community	☐ N/A

7. What institutions/actors etc. have the main responsibility for developing GI ***policy** and **strategy** in your country?

**With policy and strategy we are referring to funding and activities such as the formulation of a national Green Infrastructure policy and GIS-mapping for green areas to be used for decision making.*

Rank actors 1-7, where 1 main responsibility

	European policy and stakeholders	☐ N/A
	National policy and stakeholders	☐ N/A
	Regional policy and stakeholders	☐ N/A
	Municipal policy and stakeholders	☐ N/A
	Research	☐ N/A
	Non-governmental organisations	☐ N/A
	Business community	☐ N/A

8. **Questions regarding financing GI**

Does your country receive European funds that contribute towards GI policy development and implementation?

	Yes	No	I don't know
Options	◯	◯	◯

9. Please rate the importance of the following European funding mechanism for contributing to the implementation of GI measures in your country

	Very Important	Important	Somewhat important	Not so important	Not important	I don't know
ERDF - the European Regional Development Fund	◯	◯	◯	◯	◯	◯
ESF - European Social Fund	◯	◯	◯	◯	◯	◯
CF - the Cohesion Fund	◯	◯	◯	◯	◯	◯
EMFF - the European Maritime and Fisheries Fund	◯	◯	◯	◯	◯	◯
EAFRD - the European Agricultural Fund for Rural Development	◯	◯	◯	◯	◯	◯
LIFE+ and Horizon2020 project funds	◯	◯	◯	◯	◯	◯
NCFF - the Natural Capital Financing Fund facilitated by the European Investment Bank (EIB)	◯	◯	◯	◯	◯	◯

Other relevant funds (Please identify)

10. **Questions regarding GI in spatial planning**

What kinds of instruments are integrated into spatial planning that consider the elements of GI?

Information tools that are applied as innovative ways of calculating GI requirements for new developments *(e.g. Biotope Area Factor / Green space factor etc.)*	
Financial incentives or subsidies	
Other	

11. On a national level, is information about where protected areas are located easily available (e.g. georeferenced data etc.)?

	Always	Often	Sometimes	Rarely	Never	I don't know
Options	◯	◯	◯	◯	◯	◯

Please provide some additional information e.g. webpage

12. On a national level, is information on environmental quality in protected areas easily available? (e.g. biodiversity rates, ecosystem services and/or other quality measures)

	Always	Often	Sometimes	Rarely	Never	I don't know
Options	◯	◯	◯	◯	◯	◯

Please provide some additional information e.g. webpage

13. Is the provided information used in decision making processes regarding spatial development on regional and local levels?

	Always	Often	Sometimes	Rarely	Never	I don't know
Options	◯	◯	◯	◯	◯	◯

Please provide some additional information e.g. webpage

14. **Questions regarding good practice examples of GI projects:**

We are interested in good practice examples of GI planning and managements at regional scales.*

**With good practice example we are referring to implementation of instruments and/or actions in a way that can be perceived to successfully increase connectivity and multi-functionality in green space.*

Can you please provide a good practice example of GI planning and management within your county?

15. Please provide the following information for the good practice example:

City & Region	
Area & Population	
Budget (amount and source of funding)	
Timespan	

16. How did the GI project emerge?

17. Which of the following functions does the good practice example address?

	Yes	No	I don't know
Protect biodiversity	◯	◯	◯
Preserve cultural heritage	◯	◯	◯
Mitigation and/or adaptation to climate change	◯	◯	◯
Ecosystem services incl. food production	◯	◯	◯
Promote health and well-being	◯	◯	◯
Recreational and amenity	◯	◯	◯
Enhancing green economy	◯	◯	◯
Urban attractiveness	◯	◯	◯
Social cohesion and inclusion	◯	◯	◯

18. **Lessons learned** and **recommendations** from your **good example:**

Which are the most important factors of success?

19. Which are the most challenging factors (or failures)?

20. What are the innovative approaches in the project?

21. What are the perceived or measured effects?

22. Finally, please share other considerations or thoughts on the issues of GI in your country:

Presentation of the results in National Policy Fact Sheets

The results from the questionnaire have been analysed according to the structure of the national fact sheet template, which includes five sections. The full questionnaire is included in Each content related question of the survey has been associated to a section of the fact sheet as follows :

1. Policy overview – Questions: 3, 8, 9
2. Governance and decision-making – Questions: 4, 6, 7
3. Key sectors – Question: 5
4. Tools and incentives – Questions: 10, 11, 12, 13
5. Challenges and opportunities – Question: 22.

According to this allocation, the results of the survey are transparently communicated in the fact sheets. Most of the questions required respondents to select an answer from a list of options, rankings or variables, as well as opportunities for further comments. The comment sections have been used to support the presentation of the results.

Common analysis of the GI policy situation

Based on the European-wide questionnaire described above, a draft common analysis of policy and planning for GI have been conducted. The focus of this analysis is on what GI is, existing national GI policies, integration of GI in policy sectors, and whether or not relevant georeferenced information is available and used in spatial planning.

References

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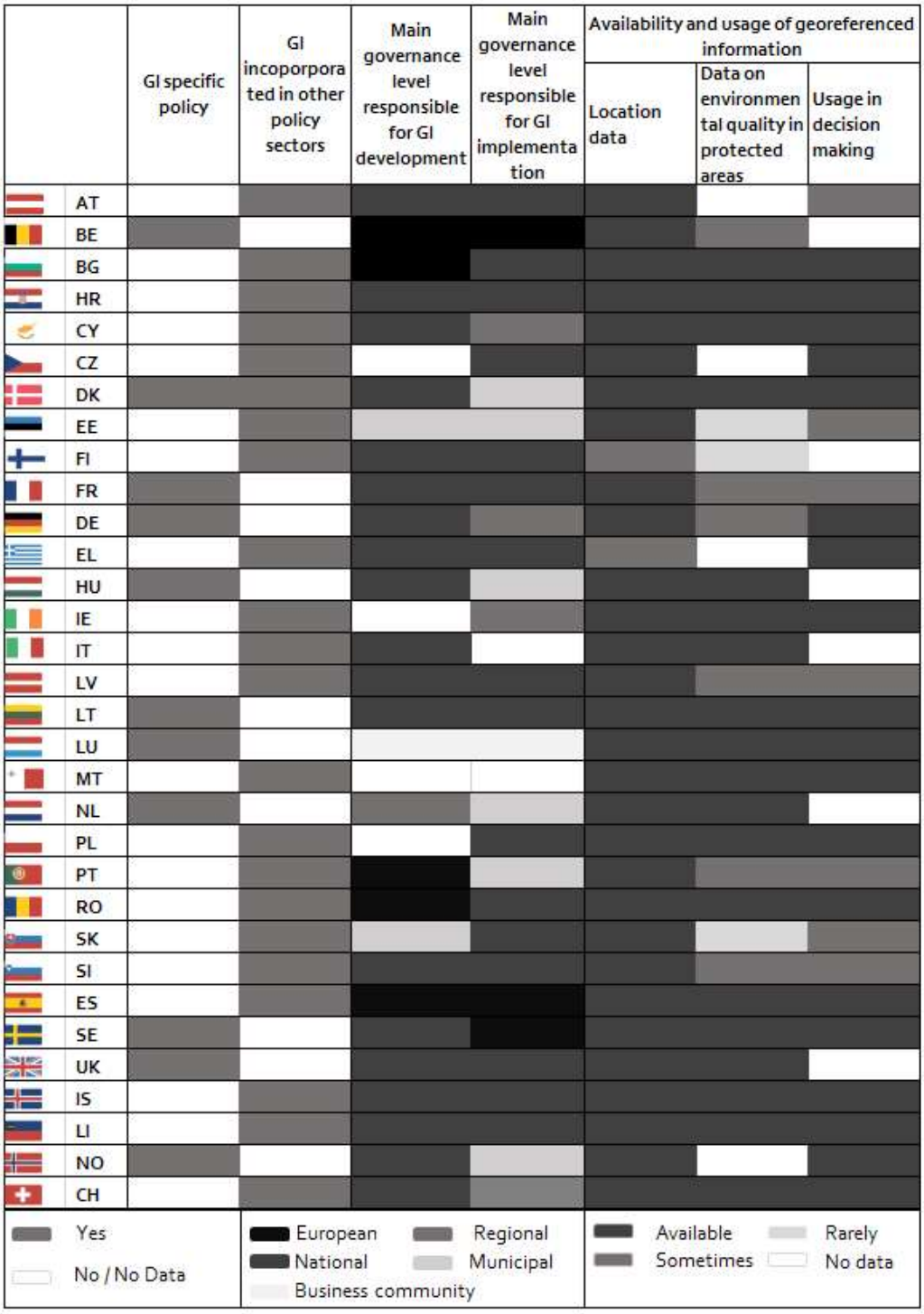
1.1 Annex IV-B: Results: National Policy Fact Sheets

Table 23 provides a summative overview of the results across all 32 ESPON countries. This is followed by each country's individual fact sheet in alphabetic order.

Table 23 Overview of results of the National Policy Fact sheets



1 Austria

Policy Overview

Based on the GRETA-survey results, it is not clear if Austria has a GI specific policy. Other studies, however, report that a national strategy focusing on biodiversity, the Austrian Biodiversity Strategy 2020+, is the strategic policy for GI in Austria (BISE, 2018). This strategy, which is in line with the European Bird and Habitat Directive (eg. the Natura 2000 network) and the EU Green Infrastructure strategy, was developed by the Ministry of Agriculture, Forestry, Environment and Water Management (BMFLUW) in 2014. The national strategy is divided into five areas of action, including actions to strengthen biotope connectivity (BMLFUW, 2014).

Other GI-related policy processes are also active in Austria, such as the EU-wide Mapping and Assessment of Ecosystems and their Services (MAES). For MAES in Austria, the Ministry of Agriculture, Forestry, Environment and Water Management have conducted work on development of biodiversity indicators. In turn, the Environment Agency Austria, conducted a nation wide mapping of ecosystems in 2014 (Klug and Weiss, 2015; MAES, 2015). Although most activities are implemented by official authorities and stakeholders at local or federal province levels, Klug and Weiss, (2015, p.6) report that the activities are funded by a variety of sources, including EU-support.

Governance and decision-making

In terms of *developing* GI policy and strategy, the main responsibility is on national policy and stakeholders, followed by the European policy level. Furthermore, based on the GRETA-survey results, researchers are considered to be third most important for developing GI policy and strategy in Austria. This is followed by municipal and then regional policy and stakeholders. Among the actors listed in the survey, the NGOs and the business community are not considered to have responsibility for developing GI-policy and strategy in Austria.

GRETA-survey results indicated that national policy and stakeholders have the main responsibility for *implementing* GI in Austria, followed by municipal policy and stakeholders. Based on the survey results, the policy and stakeholders at the European level and regional levels were considered to be the third and fourth most important, respectively, for implementing GI in Austria. Research, NGOs and the business community were not considered having responsibility for implementing green infrastructure.

Key Sectors

The respondent from Austria indicated that they considergreen infrastructure to be included within the policy sector of disaster protection. The building sector was also considered as relevant. According to the respondent, transportation and climate change mitigation and adaptation policy and legislation do not include GI-principles. For the other policy sectors listed in the questionnaire (land use and spatial development; water management; agriculture, forestry and fisheries; environmental protection; finance; energy; cultural heritage; health; social services; and rural development) the respondent didn't know if GI principles were included or not.

Tools and incentives

At the national level, information about where protected areas are located in Austria are considered as easily available. The information can be downloaded from an open data platform (Umweltbundesamt, 2018). This information, was, however, only stated to be used sometimes in spatial planning at regional and local levels by the respondent.

The Austrian Biodiversity Strategy 2020+ mentioned above includes different targets, tools and initiatives. For instance, specific measures on incorporating ecological infrastructure in spatial

planning, and considering functional connectivity and the habitat network when establishing compensation areas for large infrastructure projects (BISE, 2018; EC, 2017). Moreover, previous research on green roofs in cities in Europe acknowledges that a policy for official financial support for green roofs between 2003-2010 in the Austrian capital Vienna resulted in additional 16,000 m^2 of green roofing (Brudermann and Sangkakool, 2017).

Challenges and opportunities

One challenge for GI-implementation in Austria, as also indicated elsewhere, is that although georeferenced information on protected areas and their environmental qualities is provided at the national level, this information is not always used in decision making for spatial planning. This means that decisions on where to invest in socio-economic developments (e.g. building new housing, commercial areas or industries) in spatial planning is not always based onknowledge about the environment and/or this knowledge is not prioritised in decision making.

Meta data

Responses: 1 (Academic, University of Graz). The answers to the questionnaire were received March 21th 2018.

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2 Belgium

Policy Overview

Based on the GRETA-survey results, the strategy for the development of GI in Belgium is developed at the national level (i.e. the federal state level together with the regions and communities). Policy related to GI is made at the highly autonomous regional level. Belgium has two types of regions: language communities (i.e. the Flemish Community, the German-speaking Community and the French Community). The other type of region divides the country in the Brussels-Capital Region, the Flemish region and the Walloon region. The two types of regions are equally highly autonomous but have jurisdiction over different policy areas. The national biodiversity strategy has been approved by a commission with ministers from the federal government, the three communities and the three regions. The strategy was updated in 2013 and will last until 2020 and involved the production of an updated strategy plan in which European and global targets for improving biodiversity and the quality of ecosystems were operationalised (BNKVIBD, 2013). Although promising, the strategy does not include any concrete GI or ecological network policy recommendations (BISE, 2018).

Through the Bird and Habitats Directive, the European Natura 2000 policy is implemented in Belgium. Other European policy processes that influence Belgian GI policy are the Mapping and Assessing Ecosystem Services (MAES) initiative. Three out of five respondents indicated that the country receives European financial support for implementing GI development. All five respondents to the GRETA-questionnaire indicated that the LIFE+ and Horizon2020 project funds are very important funding mechanisms for implementing GI policy in Belgium. Examples of LIFE+ and Horizon2020 projects are Green4Grey and LIFE Belini. Four of the survey respondents marked the European Agricultural Fund for Rural Development (EAFRD) ranging from very important to somewhat important. One respondent replied that the ERDF (the European Regional Development Fund) is an important funding mechanism and two respondents replied that it has some importance in contributing to implementing GI measures.

Governance and decision-making

As mentioned in the above section, there is no GI policy development at the overarching level. This corresponds with the questionnaire results where the federal level is mostly regarded as having very low or no responsibility for *developing* and *implementing* GI policy.

The respondent for the Walloon region indicated they do not specifically *develop* GI strategies and policies. For the *implementation* of GI in the Walloon region the respondent considered, in descending order, of responsibility, the European policy, non-governmental stakeholders and regional policy to have the greatest responsibility. The responsibility for the *development* of GI policy was believed to lie primarily at the European level, followed by the regional and municipal Walloon authorities. The federal level, together with researchers and the business community, was considered to have the least responsibility for both the *implementation* and *development* of GI policy.

For the Flemish region the respondents indicated that GI-related policy is developed and implemented. All respondents indicated that the main responsibility for both *implementation* and *development* of GI lies at the regional level. Only one respondent replied that the municipal level has the main responsibility for *implementing* GI and ranked the regional government level second. The federal policy level is considered to have very little responsibility for *implementing* and *developing* GI policy, with one respondent declaring that there is no such activity at all at the federal government level.

For the Brussel-Capital Region there was no survey respondent, but in all three regions the Natura 2000 sites have special status. Thirty-eight sites in the Flemish Region, 240 sites in Walloon Region and three sites in the Brussel-Capital Region are marked as Special Areas of

Conservation (SAC). The responsibility for conservation measures and objectives lies at the regional level (BISE, 2018).

All three regions have developed a strategy or plan to strengthen and connect nature areas, including Natura 2000 areas (BISE, 2018). The Brussels-Capital Region has a strategy called *The Green Network* (Het Groene Netwerk/ Le Maillage Vert, 2014). The Flemish Region works with an ecological network called *Vlaams Ecologisch Netwerk* (*Flemish Ecological Network*) which indicates areas of high natural value for which GI policy must be developed at the local level (Instituut voor Natuur- en Bosonderzoek, n.d.). The law *Nature Decree* (*Natuurdecreet*) is the regional legislation for nature preservation. The Walloon Region works with the *Réseau Wallonie Nature* (*Walloon Nature Network*) which aims to improve biodiversity and connect nature areas using a catalogue in which the objectives and possible actions are stated (Service Public de Wallonie, 2015).

Key Sectors

The respondent from the Walloon Region indicated that GI principles are included in the following sectors*: land use and spatial development plans, transportation, water management, agriculture, forestry and fisheries, environmental protection and rural development*. GI principles are not included in finance, health and social services according to the questionnaire results.

Three out of four respondents from Flanders indicated that GI principles are included *in land use and spatial development plans and climate change mitigation and adaptation*. There was some inconsistency among various answers but according to some of them, GI principles are also included in water management; agriculture, forestry and fisheries; environmental protection; disaster prevention; energy; cultural heritage and rural development.

Although data about the Brussels-Capital Region is missing, it can be concluded that land use and spatial development planning is a sector where GI-principles are included. The region is highly urbanised, making struggles over land for different uses very likely.

Tools and incentives

The survey results indicated that information like georeferenced data about the location of protected areas is often available at the national level. The results also imply that data on the environmental quality in protected areas is sometimes easily available. Georeferenced data and data on the environmental quality is always delivered at the *regional level* through the *regional authorities* (BISE, 2018). Flanders, for example, has developed an online portal of the Flemish Region with geographical information on a multitude of sectors amongst which natural and environmental features like Natura2000 areas, bird habitats, nature reserves and vulnerable flora and fauna habitats are noted.

Incentives for implementing GI in spatial development at the regional and local level exist sometimes in the Walloon Region according to the respondent. Two Flemish respondents believe incentives for implementing GI in spatial development on regional and local level exists sometimes and two Flemish respondents believe it exists often.

One example of a Flemish GI incentive is the ECOPLAN Monitor (include reference here), an incentive that maps, monitors and evaluates ecosystems. Their ecosystem analysis can be used for improving environmental quality, land use efficiency and performing cost–benefit analysis in the process of spatial planning.

Challenges and opportunities

The main challenge for GI is the fragmentation of habitats and natural areas due to demand for land for other land uses, causing isolation of species and thus reducing biodiversity (National Focal Point, 2014).

The use of natural resources like wood, fish, arable land and ground water are both an opportunity for economic growth and a challenge regarding overexploitation and loss of biodiversity. The acknowledgement of nature as a source of well-being and a place for recreation for humans might contribute to raising awareness of the multifunctional importance of GI and the development of it (BNKVIBD, 2013).

A possible challenge ahead is also Belgium's regional and Federal state structure. This in addition to the fact that the physical expression of GI, with hubs and links, falls on the responsibilities of the regional authorities, but the ecosystem services in terms of health and social injustice is the responsibility of the Language Communities. Further collaborations between the regions and Federal state levels would be an opportunity for enhancing GI.

In turn, there are some general and region-specific issues concerning GI in Belgium. In the Brussels-Capital region the main challenge for developing and conserving GI is the recreation pressure on the areas. Because of the high population density and high usage of parks, nature reserves and other green areas, the environmental quality of the recreational areas is challenged.

Meta data

Responses: Five in total. (1: Advisor at the Walloon Fédération des Parcs naturels de Wallonie, 2: Researcher at the Flemish Institute for Technological Research (VITO), 3: Researcher at the Flemish regional government, 4: Advisor at the Flemish Land Agency (VLM), 5: Researcher at the Flemish Institute for Technological Research (VITO)**.**

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3 Bulgaria

Policy Overview

There are no specific national policies or strategies for green infrastructure (GI) in Bulgaria. Instead, GI-principles are stated to be included in national legislations, policies and governance measures. For example, according to Biodiversity Information System for Europe's national review (BISE, 2018), Bulgaria's main strategic development policy document is the National Development Programme Bulgaria 2020 (add reference here). This document does not refer to green infrastructure explicitly, but it states that, "*the preserved nature in Bulgaria and the unique biodiversity are prerequisite not only for the provision of a supportive and healthy environment, but also for the development of perspective environmental industries – sustainable forms of tourism, organic farming, protection of lands with high natural value and protected areas, traditional farming, herbs-gathering, etc.*"

GI in Bulgaria is also in compliance with other EU policy processes, such as the EU Strategy on Biodiversity (EC, 2011), the European Bird and Habitats Directive (eg. the Natura 2000 network), and the EU Strategy for Sustainable Development. The Bulgarian Biodiversity Act (BDA) was adopted in 2002 to meet the requirements of the EU Bird and Habitats Directive, and the National Prioritised Action Framework for NATURA 2000 (NPAF) provides guidance on funding needs and conservation priorities for protected sites.

According to MAES (2015), the process of mapping habitats and ecosystem services is still underway. The ESMERALDA national factsheet, published in 2015, states that support is needed in terms of establishing a policy and stakeholder network, as well as personnel with the necessary expertise to develop the mapping and assessment approaches.

Based on the GRETA-questionnaire, various EU funding sources are considered to be important for the implementation of GI-measures in Bulgaria. The ERDF - the European Regional Development Fund; LIFE+ and Horizon2020 project funds; and the NCFF - the Natural Capital Financing Fund were considered very important. The EMFF - the European Maritime and Fisheries Fund; and the EAFRD - the European Agricultural Fund for Rural Development were considered to be important. The CF - the Cohesion Fund - was considered to be somewhat important and the ESF - European Social Fund was considered to be not so important.

Governance and decision-making

Bulgarian GI-principles that are included in policies correspond to, and are largely driven by, overall strategic guidance provided by the European Union policy and stakeholders, which the survey respondent noted as having the most responsibility for *developing* GI policy and strategy. While there is no national GI strategy in Bulgaria, the European guidance has motivated a number of key policy directives at the national level that influence the development of GI. This corresponds to national policy and stakeholders being the second most important for developing GI policy and strategy in Bulgaria. The regional level is ranked third, but interestingly, research is ranked above the municipal scale as the fourth most important for

developing GI policy. This likely further reinforces the dominant role of the European and national scales for GI policy development. Among the actors listed in the survey, NGO's and the business community were considered as having the least responsibility for developing a GI-policy and strategy.

Policy and stakeholders at the national scale have the main responsibility for *implementing* GI in Bulgaria. Regions and municipalities follow national strategies, handbooks and guidance from the national policy levels. Based on the survey results, the policy and stakeholders on European level is considered to be fourth most important for implementing GI in Bulgaria, followed by NGO's, research and the business community.

Key Sectors

According to the survey response, GI was considered to be included within policy sectors of land use and spatial development; transportation; water management; agriculture, forestry and fisheries; climate change mitigation/adaptation; environmental protection; disaster prevention; energy; health; and rural development. It is likely that it is not explicitly referenced within policies for finance; cultural heritage and social services. However, BISE (2018) lists only nature, forestry and tourism and leisure as part of mainstreaming the GI policy in Bulgaria.

Tools and incentives

On a national level, it appears that GI information platforms are reasonably well-developed. Information about the location of protected areas is viewed as always easily available, and information about environmental quality of these areas in terms of biodiversity, ecosystem services and/or other quality measures are often available. The respondent mentioned that this information is always used in decision making processes regarding spatial development on regional and local levels. For example, national laws stipulate the minimum percentages of green space required for new developments. There are also standards in place for protecting public green areas in urban areas. Main environmental control instruments are environmental impacts assessments of plans, programmes and investment proposals.

According to the Bulgarian national Green Infrastructure Review produced by the Biodiversity Information System of Europe (BISE, 2018), European financing is a primary tool that facilitates GI development in the country. While the survey respondent noted that Cohesion Funds are "somewhat important" to supporting GI implementation, BISE mentions that in Bulgaria's National Prioritised Action Framework for NATURA 2000 (NPAF), the development of green infrastructure, green business and green tourism in the Natura 2000 network in Bulgaria has been identified as a priority for the programming period 2014-2020. Furthermore, financing for investments are mainly the operational programmes under the existing Structural and Cohesion Funds for the 2014 – 2020 period.

Challenges and opportunities

To the extent that Mapping and Assessment of Ecosystems and their Services (MAES) is viewed as a process of developing GI strategy in Europe, it can be used to assess the

development of coordinated GI within each member state. Therefore, a key challenge for Bulgaria is the fact that they lack the necessary expertise to develop the mapping techniques and stakeholder assessments to complete their MAES assessment (ESMERALDA, 2015). The MAES project could therefore provide an opportunity to focus efforts and develop additional GI-related expertise in a way that is aligned with the knowledge structure provided by the EU.

Meta data

Responses: 1 (Junior expert, Ministry of regional development and public works). The answers to the questionnaire were received March 15th 2018.

Additional references

BISE (2018) https://biodiversity.europa.eu/countries/gi/bulgaria, accessed 24 May 2018

MAES (2015) https://biodiversity.europa.eu/maes/maes_countries/bulgaria, accessed 24 May 2018

ESMERALDA (2015) http://catalogue.biodiversity.europa.eu/uploads/document/file/1302/Esmeralda_country_fact_sheet_Bulgaria.pdf, accessed 24 May 2018

4 Croatia

Policy Overview

In Croatia there is no specific national policy or strategy for green infrastructure (GI). Instead GI is included in different sectoral policies and strategies for physical planning, environmental and nature protection, water management, forest management, and agriculture. This is in line with the EU Green Infrastructure Strategy (2013, p.10), which states that GI is not necessary regarded as a policy sector on its own but rather should be included in already existing legislation, policies and governance measures.

GI in Croatia is also in compliance with other EU policy processes, such as the EU Strategy on Biodiversity (2011), the European Bird and Habitats Directive (eg. the Natura 2000 network), and the Charter of European Planning, adopted by ECTP-CEU (2013). In turn, the EU-wide Mapping and Assessment of Ecosystems and their Services (MAES) have focused on water management and on lowland river ecosystems and services (MAES, 2015). The Strategy and Action Plan for the Protection of Biological and Landscape Diversity of the Republic of Croatia, developed by the Ministry of Environmental and Nature Protection, and adopted in 2017, is the fundamental document for nature protection. In this strategy, GI-principles are included (Parliament of the Republic of Croatia, 2017).

Based on the GRETA-questionnaire, funding from the European Union is considered important for implementation of GI in Croatia. The ERDF - the European Regional Development Fund; the CF - the Cohesion Fund; the EMFF - the European Maritime and Fisheries Fund; EAFRD - the European Agricultural Fund for Rural Development were considered very important. The LIFE+ and Horizon2020 project funds were considered either very important or important. In turn, it is not clear if the ESF - European Social Fund; and the NCFF - the Natural Capital Financing is important for GI- implementation in Croatia. Other funds, not listed in the questionnaire, were mentioned as being important were the PHARE 2005, IPA 2007, IPA 2009.

Governance and decision-making

As GI in Croatia is already integrated in existing policy regime and sectors, one of the respondents states that no specific actors are perceived as having the *responsibility for developing* a GI-specific policy and strategy. Indications from another respondent is, however, that the main responsibility is located at national policy and stakeholders, followed by regional and municipal policy and stakeholders. Actors within research, NGOs and the business community were also considered to have or take on responsibility but not to the same extent as actors within public authorities. European policy and stakeholders, were not considered as having responsibility for developing GI policy and strategy in Croatia.

Regarding *implementation of GI* in Croatia, national policy and stakeholders have the main responsibility, followed by regional policy and stakeholders. Based on the survey results, the respondents from the national ministry level show somewhat differing views. The policy and stakeholders on European level and municipal levels were considered to be the third or fourth most important for implementing GI. One of the respondents stated that NGOs were considered

to take on more responsibility than research. Further, one of the respondents did not consider the business community as responsible for implementing GI in Croatia, while another did.

Key Sectors

In Croatia, green infrastructure was considered to be explicitly included within policy sectors of land use and spatial development; agriculture, forestry and fisheries; climate change mitigation/adaptation; and environmental protection. For the policy sectors finance; transportation; water management; disaster protection; energy; cultural heritage; health; social services; and rural development it is not clear if GI principles are included or not. The response on the GRETA-questionnaire is somewhat challenged by BISE (2018) that states that initiatives within the policy sectors of nature; agriculture; forestry; urban policy; spatial planning; water management; disaster risk reduction; marine and coastal policy; transport infrastructure; energy infrastructure; and tourism and leisure are part of mainstreaming GI in Croatia. For instance, visitor management in protected areas, in terms of building of information centers, educational trails and information panels, are acknowledged as important for ensuring that GI-principles are included in tourism and leisure.

Tools and incentives

On a national level in Croatia, information about where protected areas are located and the environmental quality of these areas are considered as always easily available. This information was stated to be used often in spatial planning at regional and local levels. The information can be found at four different web-portals (Bioportal, 2018; Croatian Environment and Nature Agency, 2018; Geoportal, 2018; Information system of spatial planning, 2018).

The Natura 2000-network is stated as an important planning tool for implementing GI in Croatia. Moreover, a green space factor is stated to be applied for new developments, but no financial incentives in terms of subsidies or sanctions are applied in relation to this type of planning measure. In the midterm evaluation for the EU Biodiversity Strategy (Ministry of Environmental and Nature Protection, 2014) it is acknowledged that a new type of investment has been developed in the Programme of Rural Development of the Republic of Croatia 2014-2020. As roughly one third of Croatian Natura 2000 network is agricultural land, a support for enhancing and maintaining good environmental quality of these lands has been developed. These so called ‘non-productive investments linked to the achievement of agri-environment-climate objectives’ can be applied for to finance habitat restorations such as meadows, pastures and ponds for livestock watering.

Challenges and opportunities

Regarding challenges for GI the respondents from Croatia expressed that there is a need for further improvement, especially stronger institutional support across different sectors. An opportunity ahead is to further integrate GI-principles. For this to be realised, spatial planning is viewed as the basic mechanism for enabling the implementation of different GI projects.

Furthermore, respondents were optimistic that spatial information is easily available for spatial planning at different institutional levels in Croatia. However, using four different platforms can possibly be a bit of hurdle for getting practitioners and planners to find and use the most accurate information.

Meta data

Responses: 3 (Senior expert advisor at Ministry of construction and physical planning, Senior Advisor at Croatian Institute for Spatial Development under the Ministry of construction and physical planning, Technical expert at Zadra Nova County Development Agency). The answers to the questionnaire were received between March 15th and April 5th 2018.

Additional references

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Parliament of the republic of Croatia (2017) The Nature Prtotection Strategy and Action Plan of the Republic of Croatia for the period 2017-2025 https://www.cbd.int/doc/world/hr/hr-nbsap-v3-en.pdf

5 Cyprus

Policy Overview

In Cyprus there is no specific national policy or strategy for green infrastructure (GI). GI-principles of preserving and enhancing green and blue areas are, however, stated to be included in policies for environmental protection. Several EU policy fields that have directives have impacts on how green areas are managed in spatial planning, in particular those related to Birds and Habitats, EIA/SEA, Water Directive Framework and SEVESO.

Three overarching GI related action plans; for climate change, for desertification and for biodiversity are in use in Cyprus. These action plans include GI-related measures; to conserve and restore habitats, to adapt to climate change, combat desertification and acknowledge biodiversity preservation issues (EC, 2017). This is somewhat in line with the EU Green Infrastructure Strategy (EC, 2013, p.10), which states that GI is not necessarily regarded as a policy sector on its own but rather it should be included in already existing legislations, policies and governance measures.

The work within the policy sectors of environmental protection and spatial planning in Cyprus is also in compliance with other EU policy processes, such as the EU Strategy on Biodiversity (2011), the European Bird and Habitats Directive (e.g. the Natura 2000 network). In relation to the latter, the implementation of Natura 2000-areas and their connectivity, has been a focus in Cyprus. Work on the EU-wide initiative on Mapping and Assessment of Ecosystems and their Services, to be done 2014-2020, has not yet started (BISE, 2018; MAES, 2018).

One of the respondents to the GRETA-questionnaire expressed that most of the government-controlled areas are covered by land use plans and that these plans have seen a great increase in protected area networks over the last 10-20 years, partly as a result of the above-mentioned EU-policies.

The respondents to the GRETA-questionnaire gave some contradictory messages regarding funding for GI. According to the respondents, Cyprus does not receive any EU-funds that are directly targeting GI development and implementation. At the same time, all the European funds listed in the survey were considered very important for implementation of GI in Cyprus. These are: the ERDF - the European Regional Development Fund; the CF - the Cohesion Fund; the EMFF - the European Maritime and Fisheries Fund; EAFRD - the European Agricultural Fund for Rural Development; The LIFE+ and Horizon2020 project funds, the ESF - European Social Fund; and the NCFF - the Natural Capital Financing. The respondent from the planning authority especially acknowledges the Structural funds and the Cohesion funds during the funding period 2014-2020 as important for GI in Cyprus (DGEPCD, 2018).

Governance and decision-making

In Cyprus the *responsibility for developing* a GI-specific policy and strategy is considered to be located at the national policy level. The respondent from the planning authority viewed municipal stakeholders and policy as second, and NGOs as third, most important for this

process. The respondent from the environmental authority instead considered the European policy levels being second most important, followed by the municipal institutional levels. The respondent from the environmental department did not consider the regional level as responsible for developing a strategy for GI, while the respondent from the planning department did. Both respondents considered actors within research and the business community to have responsibility for developing GI strategically in Cyprus.

Regarding *implementation of GI* in Cyprus, the respondent from the Department of Town Planning and Housing identified a multi-level governance structure; within which the regional and municipal stakeholders and policy have the main responsibility. This is followed by the national policy level. The business community and NGOs were considered to be fourth and fifth most important for GI implementation. European policy and research were also viewed as somewhat important. The respondent from the Department of Environment considered European policy and stakeholders to have the main responsibility, followed by the national and municipal policy and stakeholders. In addition, also based on the results from the GRETA-questionnaire, actors within research and NGOs were considered to be the fourth and fifth most important for implementing GI policies and strategies. Finally, actors within the business community were also considered as having some responsibility for implementing GI in Cyprus.

Key Sectors

The respondent from the Department of Environment stated that the key policy sector for GI in Cyprus is environmental protection.

The respondent from the Department of Town Planning and Housing also lists that the policy sectors of land use and spatial planning; transport; water management; climate change and adaptation; disaster prevention; energy; cultural heritage; and rural development are key to the implementation of GI in Cyprus. For the other policy sectors listed in the GRETA-questionnaire (agriculture, forestry and fisheries; finance; health; social services) it is not clear whether GI is explicitly included within them or not.

In addition, the Biodiversity Information System for Europe (BISE, 2018) lists initiatives within nature; forestry; urban policy; and marine and coastal policy as ways to mainstream GI in Cyprus.

Tools and incentives

Georeferenced information about the location of protected areas are considered as always easily available in Cyprus. Additionally, the environmental quality of these areas was considered as often available. The information of the 65 established Natura 2000-areas can be found at the webpage of the Department of Environment (2018). The respondent from the Department of Town Planning and Housing stated that this information is always used as a basis for the decision-making process regarding spatial planning. This is in line with the planning processes of plan preparation, plan approval, plan implementation and development of control procedures of the planning system.

The respondent from the national planning authority expressed that there is a new standard initiative in the Cypriot spatial planning system that proposes implementation of a mandatory concession of converting 10-15 % private land into “public green space” every time a new housing area, road, commercial or other development is permitted. To increase greens along grey infrastructure the planning authority also express that they have guidelines for planting trees along roads, reducing road surface and increasing pedestrian and cyclist space. Although in Greek, the guidelines can be translated to “Sustainable Infrastructure Guidelines for Local Road Networks”. The respondent stated that some improvements to this system are still necessary to avoid counterproductive scattering/fragmentation and achieve synergies through functioning networks of GI.

Other ongoing incentives by public authorities are for instance water management initiatives for enhanced water quality in the around 120 Cypriot fresh water bodies. To enhance the water quality in the blue infrastructure, minimizing nutrients leakages from agriculture and decreasing litter in the rivers are priority areas. Along most in-land waterways and seasonal streams ‘protection zones’ have been established. Furthermore, participating in the UN Oceans Conference in 2017, Cyprus made a number of commitments for the protection of the Mediterranean basin, including the continuation of efforts to eliminate all treated and untreated wastewater discharges in the sea, reducing therefore the risks of eutrophication and its negative effects. (Ministry of Foreign Affairs, 2017)

Challenges and opportunities

All published statutory Development Plans include a chapter which specifies policy for a network of open green areas, including regional and local parks, special habitats to remain undeveloped, other protected areas for nature, natural features, landscapes, linear parks, coastal areas, areas of scenic beauty, and linear watercourses (due to the dry climatic conditions these are mostly seasonal rivers that exist mostly as "green" belts with little or no water). The system is constantly improved through periodic review and amendment of Development Plans.

One challenge for preservation of green areas in Cyprus, is that the demand for land in Cyprus is quite high. It is however promising that the establishment of Natura-2000 and other national protected area designations exist. The practical management, in terms of human resources, and other resources, do however need further work (Nicosia Development Agency, 2012).

One of the respondents expressed that all GI related initiatives and practices from public authorities do not explicitly refer to green infrastructure and it is not easy to keep track of all GI-related initiatives that are taking place in Cyprus. This is related to the fact that practical implementation of GI in each country, and across the European space, is depending on cross-sectoral and collaborative work among a range of both public, private and civil society actors. Several existing spatial planning policies contain elements of GI that can be reorganized and presented in a more coherent way, fulfilling important objectives of protection of the environment and promotion of sustainability in Cyprus as well as harmonisation of the planning

system of Cyprus with European and international standards and practices. This challenge, which is not unique for Cyprus, makes it hard to keep track on incentives that are related to GI.

As stated in the introduction, the MAES (2018) and BISE (2018) reports that the work on the EU-wide initiative on Mapping and Assessment of Ecosystems and their Services (2014-2020), has not yet started in Cyprus. This form of mapping provides a good opportunity to create knowledge of which habitats and ecosystems are most important to protect and preserve.

Meta data

Responses: 2 (Environmental Officer at Department of Environment and Senior official at Department of Town Planning and Housing). The answers to the questionnaire were received between April 12th and April 18th, 2018.

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6 Czech Republic

Policy Overview

In Czech Republic, there is no specific national policy or strategy for green infrastructure (GI). This means that GI is not a distinct national policy area on its own. Instead, the respondent to the GRETA-questionnaire stated that GI-principles are included in national legislation, policies and governance measures in policy sectors such as biodiversity (Czech Nature Protection Agency, 2016), as well as climate change adaptation (Ministry of the Environment, 2016). This is in compliance with EU Green infrastructure strategy (2013), as this strategy is not a directive and therefore not enforced to be included as national law in the member states.

GI-policy in the Czech Republic is also in compliance with other EU policy processes, such as the EU Strategy on biodiversity (2011), the European Bird and habitat directive (e.g. the Natura 2000 network), and the EU-wide Mapping and Assessment of Ecosystems and their Services (MAES). According to MAES (2015) the process of mapping habitats and ecosystem services was finished in 2013. The national strategy for biodiversity conservation (adopted in 2016) is the main policy to maintain and enhance the environmental qualities of the mapped habitats. As described below, 'Territorial system of ecological stability' (TSES) is a parallel governance process that is well in tune with the MAES-process.

Governance and decision-making

The respondent for the GRETA-questionnaire acknowledged that as GI in the Czech Republic is to be integrated in already existing policy regime and sectors, no specific actor is perceived as having the responsibility for *developing GI policy and strategy*. Regarding *implementation* of GI, however, national policy and stakeholders have the main responsibility, followed by municipal policy and stakeholders, research and regional policy and stakeholders. Other actors listed in the questionnaire: European policy and stakeholders, , NGOs and the business community, were not considered as having responsibility for implementing GI in the Czech Republic.

Key Sectors

In the Czech Republic, GI is considered to be included within policy sectors of land use and spatial development; and climate change mitigation/adaptation. For instance, flood risk management policy, for which an operational program is running 2014-2020, includes investments in nature-based solutions (BISE, 2018). For the other policy sectors listed in the questionnaire - transportation; water management; agriculture, forestry and fisheries; environmental protection; disaster protection; finance; energy; cultural heritage; health; social services; and rural development – it is not clear whether GI is explicitly included within them or not. BISE (2018), however, considers initiatives within the policy sectors of nature; agriculture; forestry; urban policy; spatial planning; water management; disaster risk reduction; transport; and economy to be part of mainstream GI in the Czech republic's policy regime.

Tools and incentives

On the national level, information about where protected areas are located (in terms of georeferenced data) were stated to be always easily available at two different web platforms (Geoportal, 2018; State Administration of Surveying and Cadastre, 2018). The respondent did not know if the georeferenced data also included information on environmental quality of these areas. Furthermore, the georeferenced information on protected areas were stated to be always taken into account in the spatial planning and decision-making processes on regional and local levels.

An innovative incentive in the Czech Republics' planning and policy is the 'Territorial system of ecological stability' (TSES) (*in Czech: územní systém ekologické stabilty, ÚSES*). This incentive is mapping habitats and their connectivity in the whole country. It is prescribed in law that the TSES-network is to be used for decisions in spatial planning at all institutional levels in the Czech Republic (BISE, 2018; Ministry of the Environment, 2018).

Moreover, the respondent to the GRETA-questionnaire expresses that a green space factor is used, but not in all spatial plans for new developments.

Challenges and opportunities

According to MAES (2015) a challenge for the continued work on biodiversity-related issues for enhanced GI in the Czech Republic is to further highlight why protection of biodiversity is useful and beneficial outside "the biodiversity community". Public campaigns and education on the need to further preserve and enhance green infrastructure for ecologic, social and economic benefits are long term, but urgent, solutions to this challenge.

The above-mentioned adaptation of GI-related strategies, for biodiversity (in 2016) and climate change adaptation (in 2017) are opportunities for the work with GI implementation in the Czech Republic in the coming years. A concrete way is through the implementation of TSES. Furthering the implementation and continuous control of the TSES is an opportunity for governance of the green infrastructure.

Meta data

Responses: 1 (Senior Ministerial Counsellor at Ministry of Regional Development). The answers to the questionnaire were received February 3, 2018.

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7 Denmark

Policy Overview

In compliance with the EU Green Infrastructure Strategy (2013), Denmark is developing its national green infrastructure (GI) strategy during 2017-2020. On both national and municipal institutional levels, work is underway to establish a Green Map of whole of Denmark. This policy process, led by stakeholders at the Nature Agency under the Ministry of the Environment, is based on the European Bird and Habitats Directive (eg. the Natura 2000 network), and the Mapping and Assessment of Ecosystems and their Services (MAES). In turn, the implementation of the Water Framework Directive is promoting the importance of the blue infrastructure.

Based on the GRETA-questionnaire, some of the funding from the European Union is considered important for implementation of GI measures in Denmark. The EAFRD - the European Agricultural Fund for Rural Development; and LIFE+ and Horizon2020 project funds were considered very important. The ERDF - the European Regional Development Fund; and the EMFF - the European Maritime and Fisheries Fund were considered somewhat important. The ESF - European Social Fund; the CF - the Cohesion Fund; and the NCFF - the Natural Capital Financing were considered as not important.

Governance and decision-making

There is a clear multi-level governance perspective that structures GI policy development and implementation in Denmark. This corresponds to overall strategic guidance provided by the European Union on one hand and the strong role of municipalities as the main institutions responsible for planning and implementing GI related actions on the other hand. Due to the institutional governance system in Denmark, regional levels do not have a formal responsibility for GI policy development and implementation.

In terms of *developing* GI policy and strategy the main responsibility is on national policy and stakeholders, followed by municipalities who are involved in the work. Based on the survey results, the policy and stakeholders at European levels are considered to be third most important for developing GI policy and strategy in Denmark. This is followed by research and NGOs. Among the actors listed in the survey, the business community were considered as having the least responsibility for developing a GI-policy and strategy.

Municipalities have the main responsibility for *implementing* GI in Denmark. Followed by national policy and stakeholders. The municipalities, that also have the main responsibility for spatial planning, are obliged to follow national strategies, handbooks and guidance from the national policy levels. Based on the survey results, the policy and stakeholders at European levels are considered to be third most important for implementing GI in Denmark. For the implementation of GI in Denmark the business community is considered more important than research and NGOs.

Key Sectors

From the respondent to the GRETA-questionnaire for Denmark, GI was considered to be included within policy sectors of: land use and spatial development; water management; agriculture, forestry and fisheries; climate change mitigation/adaptation; environmental protection; energy; cultural heritage; and rural development. Moreover, it is not explicitly referenced within policies for: transportation; disaster prevention; finance; health and social services.

This answer is somewhat challenged by BISE (2018) as they state that initiatives within the policy sectors of agriculture; forestry; urban policy; spatial planning; water management; disaster risk reduction; marine and coastal policy; transport infrastructure; energy infrastructure; and tourism and leisure are mainstreaming GI in Denmark's policy regime. This for instance by including Environmental Impact Analyses (EIA) before any transport infrastructure is established.

Tools and incentives

At the national level, it appears that GI information platforms are quite well developed. Information about the location of protected areas is viewed as always easily available, and information about environmental quality of these areas in terms of biodiversity rates, ecosystem services and/or other quality measures are often available. A digital collection of maps, called the Green Map with several layers, was developed in 2017, based on the municipal spatial plans from 2013. The Green Map includes for instance a Biodiversity Map which is a new map layer providing detailed knowledge of where Denmark's Red List species and other endangered animals and plant species live. It also shows where habitats with the highest quality of nature are found. The digital collection is published by the Ministry of Environment and Food (2018). This information, stated to often be used in regional and local spatial planning, is compliant with the national guidance on how these institutional levels should work in planning (Miljostyrelsen, 2017). The Green Map will be continually developed, in line with municipal revisions of their spatial plans. For financing, besides the above mentioned EU-funds, official rural development funding is allocated to improve nature quality in Natura 2000 sites, which are an integrated part of the Green Map of Denmark.

Another digital platform for spatial information, used in spatial planning in Denmark, is a webportal with open access data from the Danish Business Authority (2018). This portal includes for instance administrative boarders, georeferenced information about geology, risks of flooding, and different types of intended and established nature protection areas.

Moreover, previous research has promotedthe capital Copenhagen as a good example when it comes to initiatives for GI. For instance, Brudermann and Sangkakool (2017) state that *"In the city of Copenhagen, Denmark, green roofs are required for all newly constructed roofs with a pitch of less than 30 degrees."* The green corridors in the climate friendly residential area Østerbro is highlighted by Faivre et al. (2017) as being a positive initiative for fulfilling the global Agenda 2030 and the SDGs.

Challenges and opportunities

The main opportunity ahead is the fact that the Green Map of Denmark is developed commonly by national and municipal levels. The challenge will be to gain local acceptance and commitment to the designation of areas that are included in the Green Map in the municipal spatial planning. In turn, sufficient funding for the implementation is required in order to establish and/or manage the areas. As the areas are multifunctional, funding can be related to a range of different policy sectors and projects, such as for nature, water, climate and recreational projects.

Another practical challenge relates to the conceptual perspective of GI. While GI needs to be seen as a "political" or communicative concept rather than a scientific one, in order to be operative, there needs to be improved practical understandings of how to acknowledge the GI components of various policies, strategies, plans and projects. Accounting for green infrastructure policy strategy and especially actions is thus challenging because many actors work with different elements of green infrastructure, but not always under GI explicitly.

Meta data

Responses: 2 (Senior consultant, Environmental Protection Agency and Senior Consultant, Danish Business Authority). The answers to the questionnaire were received between March 7th and March 9th 2018.

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8 Estonia

Policy Overview

In 1990 the Estonian Environmental Protection law was adopted under which Estonian environmental policy is developed. In the *Estonian Environmental Strategy up to 2030* the main long-term objectives and principles of the environmental policy are defined. Targets to be achieved on shorter term are defined in the *National Environmental Action Plan 2007-2013*. In this plan the targets concerning green infrastructure (GI) are included (Ministry of the Environment, 2007). In Estonia, GI policy is delivered through the spatial planning system and implemented through sectors like nature conservation, forestry, water management and others.

For developing and implementing GI, Estonia receives funds from several European funding mechanisms. LIFE+ and Horizon2020 project funds are considered important by the respondent to the GRETA-questionnaire. To a lesser extent the Natural Capital Financing facility of the European Investment Bank (NCFF), the European Agricultural Fund for Rural Development (EAFRD) and the European Regional Development Fund (ERDF) are important funds. Estonia adopts and implements European policies like Natura 2000 and Green Infrastructure Strategy. By early 2016, 17.9% of the Estonian national territory was covered by Natura 2000 (EU average 18.1%) consisting of a total of 568 sites.

Governance and decision-making

In the Planning Act, the main instrument for GI planning, Green Networks are defined and their requirements set. According to the act, each municipality and county must address and outline the Green Network in their municipal plans. Municipalities and counties must specify the boundaries, the environmental restrictions and conditions. According to the response to the GRETA-questionnaire the greatest responsibility for developing GI policy and strategy lies with the municipality then the national government and the government at the regional level. European policy and stakeholders are of moderate importance. Implementing GI policy in Estonia is mostly done by the municipality in association with businesses and NGO's. Here the respondent deemed European policy and stakeholders to be of very little relevance.

Key Sectors

The respondent to the GRETA-survey indicated a number of sectors where GI principles are included in policy-making. The sectors where this is the case are: land use and spatial development plans; transportation; water management; agriculture, forestry and fisheries; environmental protection; cultural heritage and rural development. It seems logical that these sectors consider GI when making policy because they deal with nature and the environment in their activities. The respondent indicated uncertainty about whether GI is represented when making legislation, policy or strategy for climate change mitigation/adaptation; disaster protection;eEnergy; finance; health and social services.

Tools and incentives

Although the nature agency has a fairly comprehensive website, also available in English (Environmental Agency, 2018), information about environmental quality is rarely available according to the respondent to the GRETA-survey. The website does however, provide English reports on the state of the environment and the forests and gives an overview of Estonian nature conservation. The reports seem to focus on national policy making and include for example reports on the economic aspects of the forest (i.e. distribution of the resource, sale of wood and the added value of foresting companies). Although BISE (2018) state that *"thematic spatial plans have been established for all counties and have also been brought into the general spatial plans at the municipal level in almost all municipalities"* the respondent to the GRETA-questionnaire says this information is used only sometimes in decisions making processes in relation to local and regional spatial development.

Challenges and opportunities

73% of the Estonian territory is considered green infrastructure. This is the highest percentage of GI among all the 27 investigated EU-countries (Liquete et al., 2015, pp. 275). The country has been developing its GI for a long time and the Estonian Natura 2000 sites have been highlighted by the European Commission as good practice. This is impressive given that the amount of hectares included in Natura 2000 areas, by early 2016, consisted of 17.9% of the total national territory, a little under the EU average of 18.1%.

Challenges to GI include the need to improve the cohesiveness of the ecological network and analyse the information flow between national and local government. Also, the integration of principles of conservation, biodiversity and ecological value across sectors is lacking. There is little coherence between nature conservation and other land use practices (Külvik et al., 2003). Estonia has been working on the green network for more than ten years and the GRETA-survey respondent indicated that they have quite some experience with GI planning and implementation.

Meta data

Responses: 1 (Academic at the Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences (EMU)). The answers to the questionnaire were received on February 23th 2018.

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9 Finland

Policy Overview

Finland has not a national green infrastructure (GI) policy or strategy of its own. In a report from the Ministry of the Environment it is stated that green infrastructure (GI) should be implemented within the framework of existing regulations and policies (Similä et al. 2017). This in compliance with the EU strategy on green infrastructure (2013, p.10), as the strategy express that GI-principles can be implemented by using the existing policy instruments more effectively and more systematically. In 2017 the Finnish Minister of the Environment proposed a voluntary basis process plan for implementing more holistic GI policy in Finland. This process plan could later indicate the potential need to create broader legislative framework for regional planning and for a national green infrastructure strategy. (Similä, et al. 2017)

Even so, currently there are numerous regulatory instruments and policy instruments within which GI-principles are included. These are for instance the Environmental Impact Assessment act, the Nature Conservation Act, Land Use and Building Act and natural resource management tools, like Ecosystem-based Natural Resources Planning (ENRP) and Landscape Ecological Planning (LEP) (Kettunen 2010 & Similä, et al. 2017). In addition, one of the five key national land use goals is directly linked to green infrastructure management. The goal of 'vital natural and cultural environment and sustainable use of natural resources' includes preservation of ecological core areas and links for biodiversity and conservation of sufficient recreational areas and the ecological network with solid natural areas. (Finnish government, 2017)

Further, based on the GRETA-questionnaire, LIFE+ and Horizon2020 project funds from the European Union were considered important for implementation of GI-measures in Finland.

Governance and decision-making

In terms of implementing and developing GI policy and strategy the main responsibility is on national policy and stakeholders, that follows the framework of European policy. General guidance for land use planning is based on the Land Use and Building Act, through which regional and municipal planning are directed by national land use guidelines. The land use and spatial planning policies at the local levels are guided by legally binding regional land-use plans. (Ministry of Environment, 2018).

The survey results about responsibilities to implement and develop GI policy and strategy in Finland are correspondent to this above mentioned administrative and multi-level governance structure. In addition, research followed by NGOs were considered to also have some role and responsibility.

Key Sectors

The survey results didn't provide information on how green infrastructure is included within different policy sectors in Finland. However, based on the desk based research, GI is included at least to the policy sector of environmental protection. Furthermore, BISE (2018) lists the policy sectors agriculture, forestry, urban policy, spatial planning, water management, disaster

risk reduction, marine and coastal policy and health related projects, plans and policy instruments as part of including GI into to the policy regime in Finland.

Tools and incentives

The respondent to the GRETA-questionnaire express that information about the location of protected areas, in terms of georeferenced data, is viewed as sometimes easily available. Finnish Environmental Institute provides this information on their web portal (SYKE, 2018). However, information about environmental quality of these areas in terms of biodiversity rates, ecosystem services and/or other quality measures are stated to be rarely available.

The Finnish approach of National Urban Parks provides an example how conservation work for urban green infrastructure can be integrated into spatial planning policy in a consistent way. The Finnish Ministry of Environment coordinates this national instrument. The parks are established to preserve the beauty of a cultural and natural landscape and to maintain the ecological corridors, biodiversity, cultural and natural heritage in urban areas. The nine existing Finnish National Urban parks are aiming to function as example areas for sustainable urban planning practices.

In Finland various spatial planning instruments to assess green areas' structural and potential connectivity are available. The most established instrument in practical planning is so called zonation which is directed to support decision-making in conservation and land-use planning. The tool reveals most valuable sites for expanding protected area networks. Other uses include conservation area network evaluation, targeting restoration measures and finding areas where the negative impacts of land-use on biodiversity may be minimized. (Administration of Forest in Finland, 2018) So far, this tool has been used in Forest Biodiversity Programme METSO, in many scientific articles and in regional assessments for ecological network. (Similä, et al. 2017) In addition, a green factor tool for Helsinki have been developed by the research project Climate-Proof city (2018).

Challenges and opportunities

For the ongoing work of GI in Finland, one fundamental challenge emerges from the respondent to the GRETA-questionnaire. The respondent expresses that currently there is no political willingness to develop a national GI strategy, or any other new large scale of nature conservation policies. Further, Similä, et al, 2017 states that in order to implement GI policy instruments in Finland it would require increased exchange of information and dialogue between authorities, strengthening the knowledge base, and development of the monitoring systems. Also, legislative changes would possibly be needed to ensure the efficient implementation. Financial instruments could also be developed because the current instruments have proven insufficient for activities such as restoration projects.

An opportunity that the respondent to the GRETA-questionnaire addresses, however, is that there is stronger interest to policies related to natural resource management in Finland than for GI-implementation. This calls for drawing on the multifunctional aspects of GI, acknowledging

that GI is broader than nature conservation, to further implement GI in Finland. Another opportunity, also indicated by previous research (Similä et al. 2017) is that the implementation of GI in Finland could be focused on enhancing and maintaining the environmental qualities in the non-built-up land and water areas. To maintain environmental and social qualities is especially important to acknowledge in countries such as Finland, which have large potential in the biobased economy, due to its large share of non-built-up land and waters. Without such environmental and social concerns, the economic development comes with risks of environmental degradation and conflicts over resource use.

Metadata

Responses: 1, Academic at University of Helsinki. The answers to the questionnaire were received March 19, 2018.

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10 France

Policy Overview

In France, a strategy for green infrastructure (GI) was adopted in 2010. In compliance with the EU GI strategy (2013), this green and blue frame (trame verte et bleue, TVB) is composed of cores and corridors of green and blue areas. The national strategy, is a biodiversity conservation tool which aims to maintain and strengthen the functionality of natural environments into planning and development projects. Further, the national strategy (TVB, 2018a) acknowledges that the French green and blue infrastructure does not exclude or replace but rather interacts with other environmental policies, such as policies for protected areas, Natura 2000, and national action plan for endangered species. In addition to environmental objectives such as biodiversity conservation, the green and blue frame also aim to achieve social and economic objectives by maintaining the services provided by biodiversity and maintained habitats. Such as, wood energy production, benefits for agriculture, improvement of water quality, flood regulation, improving the living environment and hosting recreational activities.

In addition to the European GI strategy (2013), the French green and blue frame is also a response to other European policy processes. For instance, the Pan-European Ecological Network, and the EU 2011-2020 Biodiversity Strategy, which the Mapping and Assessing Ecosystem and their services are a vital part of (MAES 2017). The first phase of the MAES in France, called EFESE for “Evaluation française des écosystèmes et des services écosystémiques”, was finished in 2016. The ongoing work, which will be synthesized in a report during 2018, includes reviews of the six ecosystem types in France (forest, wetlands, urban, agro-ecosystems, mountains and marine ecosystems) and studies on ecosystem services in relation to these ecosystems. (MAES, 2017). BISE (2018) acknowledge that a national biodiversity law was established in 2016.

The respondent to the GRETA-questionnaire considered that the European funds EAFRD - the European Agricultural Fund for Rural Development and LIFE+ and Horizon2020 project funds are very important for the implementation of GI in France.

Governance and decision-making

The national GI strategy has been established in the governance structure in France through national and regional committees. The multi-stakeholder committee on the national level reports back to the Minister for the Environment and the Minister for Urban Planning. The committees are appointed for three years, and include five types of stakeholders with ten representative members each. The types of stakeholders are elected officials; the government and its public bodies; socio-professional organisations, land owners and users; associations, organisations and foundations working towards biodiversity conservation, and managers of natural areas; and scientists, research organisations, organisations that support public policy,

and qualified experts. In turn, the multi-stakeholder regional committees are responsible for the work within regional territories (for more information see TVB, 2018b).

In line with the national strategy for GI, which is implemented through a clear multi-level governance structure, the respondent to the GRETA-questionnaire considers that the main responsibility for *developing* GI policy and strategy is on national policy and stakeholders, followed by regional and then municipal policy levels. The other actors listed in the survey, policy and stakeholders on European level, researchers, NGOs and business community are not considered as having responsibility for developing GI-policy and strategy in France. Further, also based on the GRETA-survey results, the same type of multilevel governance is visible for *implementing* GI in France, although for the implementation also NGOs are considered as having and taking responsibility.

Key Sectors

As the established committees for implementation of the French GI strategy report back to two ministers, for the Environment and for Urban planning, indicate that GI in France is considered to be broader than biodiversity and/or environmental protection. According to the survey response, Green infrastructure was considered to be included within policy sectors of land use and spatial development; transportation; water management; agriculture, forestry and fisheries; climate change mitigation/adaptation; environmental protection; disaster prevention; energy; social services and rural development. Initiatives in these policies can be seen as part of mainstreaming GI into the policy regime in France. It is, however, likely that it is not explicitly referenced within policies for finance; cultural heritage or health.

Tools and incentives

On a national level, information about where protected areas are located in terms of georeferenced data are stated to be always easily available. Interestingly though the respondent to the GRETA survey states that this georeferenced data does only sometimes include information on environmental quality, such as biodiversity rates, ecosystem services and other quality measures (INPN, 2018). By the respondent from the national level, the provided information on protected areas were considered to be used as basis for decisions in spatial planning on regional and local levels only sometimes (options ranging between always-often-sometimes-rarely-never or I don't know).

The respondent to the GRETA-questionnaire states that different models are applied for calculating GI requirements for new developments are in use in France, based usually on habitats and species. These models help incorporate biodiversity issues into territorial projects and planning. For instance, in compliance with the national GI-strategy, local level spatial planning is obliged to consider the regional plans for ecological coherence (so called SRCE) in urban planning (TVB, 2018). According to BISE (2018) these initiatives have been strengthened by the Biodiversity Law from 2016, as this law includes the principle of compensation of ecological damage, and no net loss of biodiversity. This as the law consolidates into law the

principle of applying the sequence “avoid, reduce, compensate” in relation to biodiversity and loss of habitats.

Moreover, as in line with the multilevel governance structure in the country and in the French GI strategy, the respondent to the GRETA-questionnaire express that regional and national governments finance most part of GI-related projects.

Challenges and opportunities

For the ongoing work of GI in France, two challenges emerge from the respondent to the GRETA-questionnaire. First, it is stated to be a bit of a challenge to find the right financing for a specific GI-project. Second, to measure the combined environmental, social and economic effects from such investments and incentives are considered to need further work.

Meta data

Responses: 1 (Senior expert at French Ministry of Ecology). The answers to the questionnaire were received April 4th, 2018.

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11 Germany

Policy Overview

The Federal Agency for Nature Conservation has recently published the Federal Green Infrastructure Concept (2017) which is the first explicitly Green Infrastructure (GI) related national initiative in Germany. This advising report proposes first suggestions for how GI could be implemented into spatial planning and considered under each planning related sector. The Green Infrastructure Concept can facilitate the incorporation of existing nature conservation and landscape management models into national planning. This is an important step to acknowledge and realise the benefits from enhanced GI, such as benefits in adaptation for climate change (e.g. flood prevention), biodiversity protection (connectivity of green space) and social benefits (e.g. recreational benefits of green and blue space, urban heat island effect experienced in cities).

Another national level plan where GI-elements have been embedded is the Federal Transport Infrastructure plan 2030 (FTIP 2030), published by the Federal Ministry of Transport and Digital Infrastructure in 2016. One of its overarching objectives is to limit the impact on nature and landscape by avoiding additional land take and additional losses of unfragmented areas in infrastructure planning. This objective is suggested to be achieved by creating e.g. new green bridges or corridors.

In addition to these plans there are many GI related legislative frameworks, initiatives and programs at the federal level in Germany. BISE (2018) lists the domains that can be relevant for GI strategy and its implementation.

According to the respondent to the GRETA-questionnaire, the European Regional Development funds (ERDF), the European Agricultural Funds for Rural Development (EAFRD) and LIFE+ and Horizon 2020 project funds from the European Union are considered as important for implementation of GI.

Governance and decision-making

Based on the GRETA questionnaire national policy followed by the regional policy have the main responsibility for *developing* the GI policy and strategy. Municipal policy followed by actors within research have been considered also relevant actors for *developing* GI policies and strategy. European policy and stakeholders were ranked as the fifth relevant body for developing GI policy. NGOs and business community were considered to have least responsibility.

Regional policy and stakeholders followed by municipal policy and stakeholders have been considered to have the highest responsibility on *implementing* the GI policy and strategy. Especially, the large cities, where is high need for and awareness of GI's social benefits, were considered forerunners in the implementation of GI strategies and show examples for other institutional levels of governance. The national policy and stakeholders followed by the actors within NGOs and research were considered to be third, fourth and fifth most important.

Business community and European policy and stakeholders were considered as having the least responsibility for developing a GI-policy and strategy.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; transportation; water management; climate change mitigation and adaptation; environmental protection and rural development. Agriculture, forestry and fisheries; finance; energy; health and social services were policy sectors that were not including GI-principles in Germany. It is unclear whether GI is included within sectors of disaster prevention or cultural heritage. In addition to these, BISE (2018) acknowledges urban development and energy infrastructure but also disaster prevention, forestry and agriculture as sectors where some of the GI elements have been incorporated.

Tools and incentives

On a national level in Germany, information on protected area's locations were considered as always easily available. This national-level georeferenced data sometimes includes information on environmental quality such as biodiversity rates, ecosystem services and other quality measures. Besides, the survey respondent states that each planning region in Germany has their own nature conservation institutes who provide more detailed information on land cover and ecosystem services to advise the local spatial planners. The Federal Agency for Nature Conservation provides the national level information on their web pages and map portals (BfN, 2018; BfN Natura 2000, 2018). Information on protected areas is considered always relevant in regional and local decision-making process. In addition, the above-mentioned information on green areas geographical distribution and qualities was stated to become more important part of the decision-making processes in spatial planning.

The Ecological Networks in Germany (Biotopverbund) was considered in GRETA-questionnaire as the backbone for further developing GI principles. This network is regulated in the Federal Nature Conservation act and it consists of many GI elements. One of its objectives is to improve the coherence of Natura-2000 areas but also to ensure the connectivity between its own core areas (BISE, 2018).

As mentioned the spatial planning on regional, e.g. federal, level in Germany plays a strong role in implementation of GI elements into spatial planning. There are especially many initiatives from large cities like the implementation of GI in the Ruhr area in North Rhine Westphalia, and Frankfurt's green belt plans (Andreucci, 2013). Another incentive that have been promoted in Germany is some cities' early support for green roofs (Brudermann and Sangkakool, 2017).

Challenges and opportunities

For the moment, there is still lack of national level decisions of implementing or explicitly incorporating the concept of GI into spatial planning. However, according to the respondent of the GRETA-questionnaire, the planning regions have high interest to utilise and implement the

multifunctional benefits of GI. The interest is especially high in urban and densely populated areas.

In addition, two more challenges emerge from the respondent to the GRETA-questionnaire: implementing GI-principles within other than transport or spatial planning sectors on federal level is still challenging. Also, more direct European financing tools for GI implementation is considered as an additional need because lack of good financing tools is a challenge.

Metadata

Responses: 1 (Advisor at Federal Agency for Nature Conservation). The answers to the questionnaire were received April 13, 2018.

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12 Greece

Policy Overview

In Greece there is not one single overarching national policy or strategy for green infrastructure (GI). This is in compliance with EU Green infrastructure strategy (2013), as this strategy is not a directive and therefore not enforced to be included as national law in the member states. Based on the GRETA-questionnaire, GI solutions and approaches are incorporated in the National Biodiversity Strategy and Action Plan (2014). The Action Plan sees the establishment and maintenance of natural GI as one specific target but it also acknowledges GI as a tool by its multifunctional benefits to achieve other specific targets of the strategy (2014-2018). By promoting, prioritising and evaluating GI the strategy aims to minimise the impacts of large infrastructure projects (e.g. avoid habitat fragmentation, create green bridges) and to ensure the compatibility of tourist activities with biodiversity conservation.

Also, the National Climate Change Adaptation Strategy (NCCAS) acknowledges the multifunctional benefits of GI. The use of GI is seen as a relevant adaptation policy, which would simultaneously have high impact on employment and growth (Ministry of Environment and Energy, 2016). The survey result from GRETA questionnaire also address the National Operational Programme “Environment-Sustainable Development 2007-2013” and the Law 4447/17 about spatial planning and sustainable development as GI related policies in Greece. In addition, the Life programme and its 228 projects that are co-financed in Greece are identified as GI related policy in the survey.

According to the GRETA-questionnaire, the European Regional Development fund (ERDF), Cohesion fund (CF) and LIFE+ and Horizon2020 project funds from the European Union are very important funds for implementation of GI in Greece. The European Social Fund (ESF), the European Maritime and Fisheries Fund (EMFF) and the Natural Capital Financing facility of the European Investment Bank (NCFF) were considered as important. The European Agricultural Fund for Rural Development (EAFRD) were considered as somewhat important.

Governance and decision-making

Based on the GRETA questionnaire, national policy and stakeholders followed by European policy and stakeholders have the main responsibility for *developing* the GI policy and strategy in Greece. The Ministry of Environment and Energy is the main body on national level, which is responsible for developing and implementing policy for the environment.

Regional and municipal policies were considered to have third and fourth highest responsibility for developing the GI policy. On this governance level the practical applications of various environmental measures (e.g. environmental impact assessments) are assured as part of the spatial planning process (BISE, 2018). Actors within the business community and NGOs were considered also to have relevant roles for developing GI policies in Greece but with lesser extent. Actors within research were considered to have and take on least responsibility.

As the role of the Ministry of the Environment and Energy reveals, the *implementation* of the GI policy and strategy is mainly a responsibility for national policy and stakeholders. In the implementing process regional policy is considered to have higher responsibility than European policy. Policy and stakeholders on municipal level are fourth most important. Actors within business community and actors within research are also considered to have relevance in the implementing process. NGO's responsibility was seen as the least.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; transportation; water management; agriculture, forestry and fisheries; environmental protection; disaster prevention; energy; cultural heritage and rural development. The other policy sectors included in the survey - climate change mitigation and adaptation; finance; health and social services - were not considered as including GI-related elements in Greece.

Tools and incentives

On the national level in Greece, georeferenced information on protected area's locations is considered as sometimes easily available. The available information on national level is about large-scale areas consisting of e.g. Natura 2000 or protected wetland areas. Smaller scale protected areas are usually available in Regional Plans or Master Plans for municipalities. From the GRETA survey it is not clear whether there is available information on the environmental quality of protected areas. Nevertheless, the available information is stated to be always used in spatial planning process on regional and local levels. This information is included in the first phase analysis of each regional and municipal spatial plan.

Other informative instruments for taking GI into account in spatial planning are planning tools for acquisition and management of public spaces. This for instance, the General Plan of Civil Protection (called as Xenocratis plan) which have a section about disaster prevention, planning of Special Protection Zones (PEP), of Urban Regeneration and the Strategy for Sustainable Development of Urban Zones (SVAA).

In addition to information tools there are also some Greek specific financial incentives to consider GI elements in spatial planning process. These are called the Zones of Special Incentives (ZEK) and Zones of Special Financial Support (ZEE).

Challenges and opportunities

The lack of finance is seen as a challenge for GI development in Greece. The respondent to the GRETA-survey also state that the traditional complex bureaucratic procedures, and inadequate information and training of the public authorities in GI issues are the main impediments of further development of GI in Greek local societies.

These challenges are addressed also for achieving the objectives of the Nature Directives. European Commission's country report states that Greece has the lack of awareness about Natura 2000 and its benefits, coupled with a lack of incentives for investments promoting those

benefits, as well as the poor capacity to support sustainable land management and integration with other policies and to enforce legal provision. (EC, 2017)

Metadata

Responses: 1 (Researcher, University of Thessaly). The answers to the questionnaire were received May 9, 2018.

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13 Hungary

Policy Overview

Over the last years Hungary has been active in the field of Green Infrastructure (GI). Policy for enhancing GI has been developed by the Ministry of Agriculture. Within the Ministry, it is the State Secretariat for Environmental Affairs holding responsiblity for developing the legislative frameworks, policies and initiatives concerning GI. GI has been addressed in a number of government programmes. Setting long term strategic objectives for environmental protection and development, the National Environmental Programme serves as a national framework through which GI related policymaking is executed (BISE, 2018). For the period 2015-2020, the National Nature Conservation Master Plan and the National Biodiversity Strategy have been adopted. These strategies are primarily concerned with GI — they aim at reducing the loss of biological diversity, halting the decline of ecosystem services and improving the conditions in the green infrastructure areas.

The results from the GRETA-survey showed that the EU Biodiversity Policy to 2020 is implemented in Hungarian GI-development. The EU Biodiversity Policy is aimed at reducing biodiversity loss and requires parallel action from the member states to be effective (EC, 2011). In the policy, six priority targets are outlined: enhance efforts to protect species and habitats; maintain and restore ecosystems and their services; anchor biodiversity goals in the most relevant EU policy areas (farming, forests and fisheries); combat invasive alien species; step up the EU contribution to averting global biodiversity loss. Hungary is part of the Natura 2000 network and has a multitude of Bird Directive Sites, Habitat Directive Sites and sites under both directives spread throughout the country. New Natura 2000 sites are being proposed and assessed as of end 2016 (EEA, 2017). The national programme of state nature conservation (financed by the European Regional Development Fund) contributes to the national implementation of the EU Biodiversity Strategy to 2020 into policy making. The aim of this project is strengthening conservation status and improving data and evaluation quality, supported by field surveys of 45 habitat types, 25 species, and the national survey of bird species nesting in Hungary. By the end of 2020 a map about ecosystems in Hungary will be developed and 13 selected ecosystem services will be evaluated as well.

In the survey the ERDF - the European Regional Development Fund, the CF - the Cohesion Fund, the EAFRD - the European Agricultural Fund for Rural Development and the LIFE and Horizon2020 project funds were deemed very important for the implementation of GI-measures in Hungary. To a lesser extent the EMFF - the European Maritime and Fisheries Fund was considered important.

Governance and decision-making

International biodiversity protection agreements and Hungary's role in them forms an explicit policy area in the National Biodiversity Strategy. The commitment to protect biodiversity and ecosystems started around 2003 when the National Ecological Network was established in

Hungary. International commitments, European agreements and preparations to join the European Union had a significant impact on the formation process of the Hungarian National Ecological Network (MoE, 2002). The network covers 36 % of Hungary's territory and consists of different nature areas for instance Natura 2000 areas, nature protected areas and ecological and green corridors. The network is used as a base for decision-making processes in spatial planning.

According to the response to the survey, developing GI policy and strategy is mainly a national and regional responsibility. An investigation into multifunctional floodplain management by Schindler et al. (2016) shows that the responsibility for developing the floodplain management policy, with implications for GI, is centralised but involves local and regional stakeholders (Schindler et al., 2016, p. 1372). The implementation of policy and strategy related to GI is mostly a municipal and regional affair. On a local level, municipalities have adopted green infrastructure as an intrinsic part of spatial planning and have rolled out green-network development programmes. EU funding from LIFE, as mentioned in the Policy Overview above, has supported a number of regional GI-projects targeting the restoration and revitalisation ecosystems (BISE, 2018) Funding from ERDF has also supported developing new indicators for GI assessment, and identifying conflict areas of GI and possible development directions.

Key Sectors

According to the GRETA-survey results the sectors where GI-principles are included in Hungarian legislation, policy and strategy are: Land use and spatial development planning; Transportation; Agriculture, Forestry and Fisheries; Environmental protection; Disaster protection; Energy; Cultural heritage; Rural development. A note on this is that the two respondents that filled in this survey question did not agree on a single sector where GI principles are taken into account. Based on these conflicting survey responses GI is most possibly not explicitly addressed in the policy sectors of Water management; Climate change mitigation/adaptation; Finance; Health; and Social services.

As established in the previous section GI principles are considered in making spatial development plans in terms of the National Ecological Network. In the agricultural sector efforts have been made to contribute to the National Ecological Network, and thus the GI, by regulating the use of agricultural land, paying farmers to farm in a way that is beneficial for the environment, restoring migration routes and develop natural water retention.

According to the study by Schindler et al. (2016), GI is included in disaster protection. Floodplains along Hungarian rivers are mainly used for agriculture, forestry and nature conservation. The floodplains are used for projects concerned with fighting against invasive species and hydrological rehabilitation. As a result, the biodiversity of the flora and fauna in the floodplains seems to have increased (Schindler et al., 2016, pp. 1371-1373).

Tools and incentives

Georeferenced information on nature conserved areas in Hungary is available online. An interactive map of the Nature Conservation Information System shows protected areas (Ministry of Agriculture, 2018). The tool can be consulted to: report pollution to the authorities; locate protected natural values; find areas for field trips, educational excursions or other nature oriented recreation (Ministry of Agriculture, 2018).

The results of the GRETA-survey show that information on environmental quality in protected areas is available. As example the websites of the national directorates and the state nature conservation are mentioned (Ministry of Agriculture, 2018).

Challenges and opportunities

In the survey responses nature conservation is considered a weaker sector compared to e.g. water management, transport and spatial planning, which have strong partisans. To acknowledge the importance of GI in these sectors can therefore be an opportunity to further preserve, restore and enhance green and blue areas in Hungary. According to one respondent, GI is considered to go beyond traditional nature conservation and can contribute to national and European intersectoral cooperation. However, the lack of exact spatial data is considered to inhibit the extensive development of GI policy.

From the research done by Schindler et al. (2016) and the Biodiversity Information System for Europe (BISE, 2018), the greatest challenge for GI development in Hungary is combining the roll-out of the National Ecological Network while at the same time ensuring adequate water retention systems for flood protection. In other words, to work with establishing a network for GI in terms of hectares that should be preserved as green and blue areas, while at the same time ensure environmental quality and disaster prevention. It has been suggested that, by developing eco-based natural solutions, the water retention need can contribute to the improvement of biodiversity and GI (BISE, 2018).

Meta data

Responses: 3 (Senior advisor Environmental Development at the Ministry of Agriculture, senior advisor Department of Strategy at the Ministry of Agriculture, Public administration advisor at the Ministry of Agriculture). Of the three respondents, one has filled out the complete survey, the other two skipped most questions or did not know the answer. The answers to the questionnaire were received between February 27th and March 26th of 2018.

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14 Iceland

Policy Overview

Iceland is not an EU-member, and therefore not forced to adapt to European policies and regulations, such as the European Bird and habitat directive, the accompanying Natura 2000 network, and the Mapping and Assessment of Ecosystems and their Services (MAES). Iceland is however a EES- and ESPON-member state.

According to the respondent to the GRETA-survey, strategies and policies for green infrastructure (GI) in Iceland is included in the National Planning Strategy and partly also in the National action plan for Climate Change.

Based in the Icelandic Planning Act, the latest version of the National planning strategy (2015-2026) have a long-term perspective and aims to ensure common interests and to support sustainable development and efficient planning at local spatial plans (Landsskipulagstefna, 2018). The National Action Plan for Climate Change (2010) corresponds to GI as it includes 'Afforestation and revegetation' and 'Restoration of wetlands' as two of ten cross-cutting actions to be done to reduce emissions (Ministry for the Environment and National resources, 2010, p.69, 80-81; Ministry for the Environment and National resources, 2018a).

As a non-EU-member state Iceland do not utilize European funding for implementation of GI.

Governance and decision-making

In terms of *developing* and *implementing* GI policy and strategy the main responsibility is on national policy and stakeholders, followed by municipal policy and stakeholders. Also based on the survey results, researchers and NGOs were considered to be third and fourth most important. Among the other actors listed in the survey, the business community were considered as having some responsibility.

Due to the governance system in Iceland, the policy and stakeholders on regional and European levels are not considered as having any formal responsibility for Green Infrastructure. Spatial planning on regional level is currently only done in collaboration between the 8 municipalities around the capital Reykjavik.

Key Sectors

The respondent to the GRETA-questionnaire from Iceland considered GI to be included within policy sectors of land use and spatial development; climate change mitigation/adaptation; environmental protection; and energy. It is likely GI is not explicitly referenced within policies for agriculture, forestry and fisheries; health; transportation; water management; disaster prevention; finance; cultural heritage; health; social services and rural development.

Tools and incentives

On a national level, georeferenced information about the location of protected areas is always easily available online at the homepage of The Environmental Agency of Iceland (Umhverfis Stofnun 2018).

The respondent to the GRETA-questionnaire also states that information on environmental quality in protected areas (e.g. biodiversity rates, ecosystem services and/or other quality measures) are always easily available. More specifically, the Icelandic Institute of Natural History (in Icelandic: *Náttúrufræðistofnun Íslands*) have maps over the 105 areas classified as the most important land and water habitats. The different categories of protection are numerous, including natural sites, national parks, nature reserves, protected areas with sustainable resource utilisation, country parks. Although the Environment Agency handles preparations for designating protected areas and their administration, the maps have been organized and worked by staff of the Icelandic Institute of Natural History and partners in 1999-2016 (Ministry for the Environment and National resources, 2018b; Náttúrufræðistofnun Íslands, 2018a; 2018b).

The respondent to the GRETA-questionnaire expresses that the above-mentioned information is always used in decision making processes regarding spatial development on local municipal levels.

Challenges and opportunities

The respondent to the GRETA-questionnaire did not express any specific challenges with the continuous GI-implementation in Iceland. Drawing from the empirics from Iceland, however, it is promising that a National Planning Strategy is in place. This could indeed enhance the connectivity of green areas beyond local municipal administrative boarders and territories, as planning at regional and/or national state level can have a wider spatial perspective. Such a development must however be balanced with the possibilities for the public to be engaged in the processes of spatial planning. As reported by researchers such as Slätmo (2017) spatial planning and land use governance within Europe builds on the subsidiarity principle. This means that decision making should be as close to citizens as possible with respect to the capacity to conduct it satisfactorily. The principle as such aims to ensure participation and acknowledgement of local contexts. However, on another scale of decision making, it is important to acknowledge that the sum of local decisions can be degrading for life supporting resources, such as green and blue - and for Iceland white - areas for biodiversity, climate change adaptation and mitigation, water and air regulations, and recreation.

It is worth noting that the respondent from Iceland indicates that the term of green infrastructure is used with a broader meaning than how it is described within the GRETA project, eg. that green infrastructure is related to the physical expression of green and blue areas and their connectivity. The answer from the respondent indicate that green infrastructure is somewhat also perceived as the infrastructure (or planning and policy efforts) provided by public

administration for a ‘green transition’, e.g. environmentally friendly societies. This as the respondent acknowledged public administrative tools for enhanced use of public transports as good practice examples for GI.

Meta data

Responses: 1 (Senior expert, at the National Planning Agency division of Strategy and Development). The answers to the questionnaire were received April 13th,2018.

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15 Ireland

Policy Overview

The Irish National Planning Framework 2040, published in 2018, considers GI as a national policy objective that states, “Integrated planning for GI and ecosystem services will be incorporated into the preparation of statutory land use plans.” The Department of Housing Planning and Local Government is behind this published framework. They are overseeing the national spatial planning policies and legislation. Other governmental body responsible for GI related policy is the Department for Environment, Community and Local Government. Theyhave implemented green infrastructure (GI) policy as part of its national framework “Our Sustainable Future” (2012). Also, the Irish Environmental Protection Agency (EPA), operating under the Department of Communications, Climate Action and Environment have shared knowledge about GI as a spatial planning concept and but also published guidance on how the GI approach could be disseminated among planning authorities (EPA,2016).

Furthermore, GI is also included in the National Spatial Strategy 2002-2020, mainly focusing on preventing urban sprawls. GI has also been promoted by Comhar Sustainable Development Council (SDC). For GI in Ireland, SDC put together national GI objectives and mapped GI with the aim to inform local planning authorities. In addition, GI is included at least to some extent in sectoral strategies like the Biodiversity Action Plan 2017-2024 and the National Landscape Strategy 2015-2025. (BISE, 2018)

Regarding funding for GI-projects and implementation, the respondent of the GRETA-questionnaire, considered that LIFE+ and Horizon2020 project funds from the European Union as somewhat important for implementation of GI in Ireland. Other EU-funds, such as the Cohesion Fund and the Natural Capital Financing facility of the European Investment Bank was not recognised important.

Governance and decision-making

Based on the questionnaire the regional level of policy makers and stakeholders have been seen the most relevant for both developing and implementing GI policies and strategy. For instance, Fingal County, Dublin city, Kilkenny County, Borough Councils and Wicklow county are considered as regions that considers GI in their plans or strategies (BISE, 2018). The second significant role were identified to be municipal policy and stakeholders.

The regional and local policy and stakeholders were the only actors considered as responsible for developing GI policy and strategy in Ireland. However, non-governmental organisations followed by European policy and research were identified as next responsible for implementation of GI (i.e. instruments considering multi functionality and connectivity of the protected areas). National policy and stakeholders were considered to have least responsibility and business community with no responsibility for GI-implementation.

Key Sectors

In Ireland, GI-principles are included within land use and spatial development plans and water management. However, the respondent to the GRETA-questionnaire states that the concept is not clearly embedded in the requirements for planning. For the other sectors listed in the survey, transport; agriculture, forestry and fisheries; climate change and adaptation; environmental protection; disaster prevention; finance, energy; cultural heritage; health; social services or rural development it is not clear whether GI is explicitly included within them or not. However, BISE (2018) lists additionally agriculture and forestry as policy sectors were initiatives and GI-principles are included in Ireland.

Tools and incentives

On a national level in Ireland, information about where protected areas are located and the environmental quality of these areas are considered as always easily available. The National Parks and Wildlife Service (NPWS) and EPA are providing these information in their webpages. The institute NPWS, part of the Heritage Division of the Department of Arts, Heritage, Regional,

Rural and Gaeltacht Affairs, designate and advise on the protection of habitats and species identified for nature conservation. NPWS also make the necessary arrangements for the implementation of National and EU legislation and policies for nature conservation and biodiversity (NPWS, 2018). The respondent to the GRETA- questionnaire states that the information provided by NPWS is always used in spatial planning processes on regional and local levels. However, not all counties consider GI in their local area plans or county development plans.

Challenges and opportunities

One challenge that can be drawn for GI-implementation in Ireland, as also indicated elsewhere, is that although georeferenced information on protected areas and their environmental qualities is provided in national levels, and considered to be use in decision making for spatial planning. The decisions on where to invest in socio-economic developments (e.g. build new housing, commercial areas or industries) is not always based on this information.

Despite there are many strategies or programmes that consider GI, there is no national actor or institutional body with the main responsible for GI in Ireland. This, together with the lack of visible funding and functional fragmentation in planning efforts might influence the use of GI-principles in spatial planning (BISE,2018). Even some local authorities and Irish Landscape Institute are promoting the GI, the big amount of disparate public authorities with no clear incentive to collaborate lead to challenges for GI development.

Moreover, the lack of incentives for how private landowners can consider GI in their land management is also a challenge that come forth as prominent from the empirics for Ireland.

Metadata

Responses: 1, Consultant at JBA Consulting Engineers and Scientists Ltd. The answers to the questionnaire were received March 1, 2018.

Additional references

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16 Italy

Policy Overview

In Italy the Ministry for the Environment, Land and Sea Protection with the help of Italian Botanical Society (SBI) is the main responsible body of developing national green infrastructure (GI) policy. The concept is acknowledged in the national biodiversity strategy 2011-2020 which considers GI elements. GI aspects were further elaborated as a tool for environmental action and the green economy in the national “La Natura dell’ Italia” conference 2013 (Italian Ministry of the Environment, 2013).

Another national level body in Italy important for the work with GI is the Italian Federation of Parks and Nature Reserves (FEDERPARCHI - IT). This organisation coordinates over 160 entities that manage national and regional parks, marine protected areas, regional and state-owned nature reserves. The main objectives of their activities are the implementation of the National Strategy of Biodiversity and the integration and coordination of Protected Areas with territorial policies (ESPON, 2017).

Enhancing green areas and their connectivity was considered as one step within the implementation of the European wide Mapping and assessing ecosystem services (MAES)-process in Italy. MAES aimed to define an ecological framework for GI development according to the land ecological network approach (ESMERALDA, 2015). In addition, the national law on the Development of Green Urban Areas, Natural Capital Committee’s report on the State of Natural Capital in Italy and Charter of Rome on Natural and Cultural Capital are also part of the GI related policy setting in Italy. Furthermore, there have been many regional or local projects that have worked with implementation of GI (BISE, 2018).

The respondent to the GRETA-questionnaire expressed that GI-development can be financed through several European funds, especially financing sources deriving from the Operational programmes under the existing Structural and Cohesion Funds for the 2014 – 2020 (Operational Programme Environment 2014 – 2020, Rural Development Programme 2014 – 2020, Operational Programme Human Recourses Development, Operational Programme Innovations and Competitiveness 2014-2020). Also, Financial Mechanism of the European Economic Area and LIFE+ and Horizon2020 were considered as relevant funding sources of GI development in Italy.

Governance and decision-making

Based on the GRETA-questionnaire the national policy and stakeholders are the most relevant for *developing* and *implementing* GI policies and strategies. Regional policy and stakeholders are stated to carry second significant role of the implementation process. An example is the regional ecological network of Lombardia which aims to enhance the biodiversity and habitat connectivity of the regional protected areas. (BISE, 2018) The third significant role on the multi-level governance structure was identified to the non-governmental organisations which work together as organised informal lobbyist network for environmental protection issues. The main

actors identified to this group were Legambiente, Italia Norsta, Fondazione Montagna Italia, WWF and Green Peace. These actors work both on national and regional level. Researchers and lastly the business community were considered to have some responsibility on GI development and implementation.

Key Sectors

The GRETA-survey results didn't provide explicit information on how Green infrastructure is included within different policy sectors in Italy. However, according to the respondent, the concept of GI has its effects on following policy sectors: biodiversity; spatial planning; urban policy; agriculture and forestry; tourism and leisure; transportation; energy; water and flood management; disaster risk reduction; climate change mitigation and adaptation and marine and coastal policies. Moreover, BISE (2018) lists the policy sectors of agriculture, urban policy, management and prevention of floods, disaster risk reduction as well as tourism and leisure as part of including GI into to the policy regime in Italy.

Tools and incentives

According to the respondent to the GRETA-questionnaire, implementing GI related policy tools in Italy has been done by setting up the SAPA areas (System of Italian Alpine Protected Areas) on a subnational level, and by implementing the Natura-2000 network on a national level.

Information about protected areas' locations and the environmental quality of these areas are stated to be available. The Ministry of Environment is providing these information on their webpages (MINAMBIENTE,2018). In addition, each protected area has got their own plan for which they produce relevant spatial information. It is, however, not clear how regularly this information is used in decision making processes of spatial development on regional and local governance levels.

In addition, BISE (2018), states that several regions have established Regional Ecological Networks as more or less prescriptive tools in land planning. Also, there are some different urban planning tools as well as some sector tools that the municipal authority can adopt for the regulation of urban and peri-urban green systems. Many of the GI-related projects around Italy have focused urban area, but there are also projects related to e.g. wetland restoration, ecological connectivity and sustainable energy. (BISE, 2018)

Challenges and opportunities

Based on the results from the GRETA questionnaire, GI in Italy could be developed by enhancing the involvement of local populations in the policy processes of protected areas. The respondent to the GRETA-questionnaire states: *"Considering that the NPAs [National Protected Area System] are the backbone of European and national ecological networks, GI play a major role in the agriculture, forestry, soil conservation and water sectors, underscoring those functions that have increased tree cover on land, which can prevent erosion and flooding, as well as the protection of water supplies."*

Further, encouraging and supporting pilot projects implementation, developing innovative tools and agreements and more efficient distribution of the financial instruments are identified as opportunities for GI development in Italy.

Metadata

Responses: 1 (Academician at University of Rome). The answers to the questionnaire were received February 26, 2018.

Additional references

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ESPON (2017) LinkPAs- Linking networks of protected areas to territorial development – Targeted Analysis, Interim Report

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Italian Ministry of the Environment (2013) http://www.minambiente.it/sites/default/files/archivio/allegati/natura_italia/natura_italia_documento_sintesi_finale_eng.pdf, accessed April 11, 2018

17 Latvia

Policy Overview

In Latvia there is not one single overarching national policy or strategy for green infrastructure (GI). This is in compliance with EU Green infrastructure strategy (2013), as this strategy is not a directive and therefore not enforced to be included as national law in the member states. Based on the GRETA-questionnaire, however, GI solutions and approaches are incorporated in land use governance, for instance in terms of improvements of agriculture land management and in the territorial planning of the municipalities.

On national level, Latvia's National Development Plan 2014-2020 and the Sustainable Development Strategy of Latvia 2030 have relations to GI-principles. They both include the objective of restoring and increasing of natural capital which includes sustainable management of the natural resources, protection of the diversity of the Latvian nature and enhancements of ecosystem services. Some GI-related objectives like increasing of forest coverage and amelioration of the agricultural land are also incorporated as measurable outcomes for the goals of the plans (BISE, 2018, Saeima of Latvia, 2012; Saeima of Latvia, 2010). The Ministry of the Environmental Protection and Regional Development is the main body on national level responsible for implementing policy for environment protection.

Latvia has carried out a Mapping and Assessment of Ecosystems and their Services (MAES) for its marine waters, internal marine waters, territorial waters and Exclusive Economic Zone (EEZ). It was performed in 2016 as one of the steps for implementation of the ecosystem based approach within development of the national Maritime Spatial Plan (MSP) (MAES, 2018).

According to the GRETA-questionnaire the European Agricultural Fund for Rural Development (EAFRD) and LIFE+ and Horizon2020 project funds from the European Union are important funds for implementation of GI in Latvia. Also, the Cohesion Fund (CF) and the European Regional Development Fund (ERDF) were considered as somewhat important funding sources.

Governance and decision-making

Based on the GRETA questionnaire, national policy followed by municipal policy have the main responsibility for *developing* and *implementing* the GI policy and strategy in Latvia. NGOs and actors within research were considered to have third and fourth most significant role on *developing* the GI policy and strategy. The business community were considered to have responsibility but to a lesser extent. European and regional policies and stakeholders were stated to have no role for developing GI policy in Latvia.

Business communities' role was considered to be more important on *implementing* the GI policy and strategy. Whereas NGO's role was considered with somewhat lower relevance. European policy was stated to have the least responsibility. Regional policy was not seen as relevant body for implementing the GI policy. This is likely to emphasize the municipalities strong role for both developing and implementing GI policy in Latvia.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; agriculture, forestry and fisheries; climate change mitigation and adaptation; environmental protection and rural development. Transportation; water management; disaster prevention; finance; energy; cultural heritage; health and social services were policy sectors that were not considered as having responsibility for developing GI-policy and strategy in Latvia. GI's and its principles broad representation under many policy sectors are visible for example through the measurable outcomes for the goals of National Development plan for 2014-2020 (Saeima of Latvia, 2012).

Tools and incentives

On a national level in Latvia, information on protected area's locations, other nature areas and land use are considered as always easily available. The environmental quality of these areas is considered to be sometimes easily available. This information, were stated to be used sometimes in spatial planning on regional and local levels. The spatial information and GIS data for e.g. protected areas, natural habitats or land use restrictions are provided on-line on the natural data management system OZOLS in Latvia (OZOLS, 2018).

Latvia has altogether 333 sites on Natura 2000 network. They also have a relatively high density of natural areas compared to many other EU Member States. Nevertheless, further efforts to increase the connectivity between habitats would be useful to establish protected areas as Green Infrastructure (EC, 2015).

The sustainable development strategy of Latvia until 2030 suggests the creation of market instruments as a possible solution to sustainable management of natural values and services. The strategy states that *"For the needs of restoration of the natural capital taxes for activities degrading natural capital should be increased."* (Saeima of Latvia, 2010, p.59). The strategy also presents a programme of eco-gifts, which encourages land owners to transform ecologically-sensitive areas into nature reserves (Saeima of Latvia, 2010, p. 59). The respondent to the GRETA-questionnaire express that this is implemented, for instance in the assessments of projects that should receive project funds. Projects that consider GI elements gets extra ranking points, which are profitable in the process for receiving state funds.

Challenges and opportunities

The GRETA survey results did not address any opportunities or challenges for GI related issues in Latvia. However, previous studies on GI in Latvia addressed that challenges relate to e.g. the lack of general strategic policy framework for Green Infrastructure development; lack of know-how and awareness (especially at the municipal level) and lack of public participation (EC, 2017).

Metadata

Responses: 1 (Advisor, at the Ministry of Environmental Protection and Regional Development of the Republic of Latvia, the department for Nature protection). The answers to the questionnaire were received April 27, 2018.

Additional references

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18 Liechtenstein

Policy Overview

According to the respondent to the GRETA-survey, there are many operative policies which have GI elements, but there is no overarching policy targeted specifically to GI. Liechtenstein is not an EU-member, and therefore not forced to adapt to European policies and regulations, such as the European Bird and habitat directive, the accompanying Natura 2000 network, and the Mapping and Assessment of Ecosystems and their Services (MAES). However, the fifth National Report on the Implementation of the UN Convention on Biological Diversity (CBD) by the Principal of Liechtenstein (2014) is the foundation for the National Biodiversity Strategy and its action plan. It lists many GI and biodiversity related objectives and acknowledges GI related issues like the enhancement of ecosystem services, habitat connectivity and designation of new nature protection areas. The National Biodiversity Strategy is published by the Office of the Environment, which is responsible for all matters relating to environmental protection, agriculture, forest and landscape in the Government of the Principality of Liechtenstein.

As a non-EU-member state Liechtenstein do not utilize European funding for implementation of GI. So, none of the funding mechanisms from European Union were considered important for implementation of GI in Liechtenstein. The survey result states that Liechtenstein uses subsidies for agriculture to enhance the environmental quality in agricultural lands. This is a GI related question, as intensive monoculture farming methods and the use of pesticides is degrading for biodiversity, as well as air, water and soil quality.

Governance and decision-making

Based on the GRETA questionnaire the responsibility for *developing* and *implementing* the GI policy and strategy lies foremost at the national governance level. Municipal policy followed by European policy were considered to have the second and the third most important role on developing and implementing GI policy. Actors within business community is considered the fourth and NGOs the fifth most important for *developing* the GI policy. For *implementing* the GI policy, the relevance of these two bodies of governance is seen the other way around. Actors within research are seen with the least importance for developing and implementing the GI policies in Liechtenstein. Due to the governance system in Liechtenstein, the policy and stakeholders on regional level are not considered as having any formal responsibility for Green Infrastructure.

Key Sectors

Based on the questionnaire, GI-principles are included within sectors of land use and spatial development plans, transportation; water management; agriculture, forestry and fisheries; climate change mitigation and adaptation; environmental protection; disaster prevention; energy; cultural heritage; health; social services and rural development. GI is not explicitly referenced within policies for finance.

Tools and incentives

On a national level, georeferenced information platforms for GI seems well developed. On a national level in Liechtenstein, information on protected area's locations and other nature areas as well as the information on environmental quality of these areas are considered as always easily available. The provided information is stated to be always used in spatial planning process on regional and local levels. The spatial information and GIS data for e.g. nature reserves, special forest areas or protected landscapes are provided online through a public geodata portal (Geodata portal, 2018).

The respondent to the GRETA-questionnaire states that there are also other information tools that include GI elements. However, these are mostly directed to agriculture, forestry and nature protection areas. There are also some GI related financial subsidies to certain ecological activities within agriculture. Also, municipalities are stated to get some subsidies for certain activities related to GI development.

Challenges and opportunities

A challenge for GI related policy development in Liechtenstein is the fact that there is no directly GI related policy in place. Nevertheless, there are many ongoing activities and some ongoing project plans that can facilitate the GI policy development.

Metadata

Responses: 1 (Advisor from Government of the Principality of Liechtenstein, Office of the Environment.) The answers to the questionnaire were received April 17, 2018.

Additional references

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19 Lithuania

Policy Overview

The Nature Frame is the Lithuanian policy that consists of Green Infrastructure (GI) principles. In this frame, green areas' multifunctionality are explicitly considered. The Nature Frame consist of a coherent network of the natural ecological compensation areas and Natura 2000 areas in Lithuania. This Lithuanian expression of GI include around 60 percent of the country's territory (BISE, 2018). The aim of the Nature Frame is to ensures the geo-ecological balance of the landscape, habitats and landscapes' connectivity as well as preservation of biodiversity and natural recreational resources of landscape (Republic of Lithuania, Law on Protected Areas, 2015). This system has been established under relevant laws on environmental protection and protected areas: the Law on Environmental Protection 1992, the Law on Protected Areas 1993 and the Master Plan of the Territory of the Republic of Lithuania. The Minister of Environment has approved the Regulations of the Nature Frame and it is applied in all governance levels of spatial planning.

In addition to the Nature Frame, the National Environment Protection Strategy (2015) and the National Landscape Management Plan (2015) are also relevant GI related plans on the national level (BISE, 2018). The former address four priority areas of environmental protection in Lithuania: Sustainable use of natural resources and waste management; Improvements of the quality of the environment; Maintenance of ecosystem stability; Mitigation of climate change and adaptation to environmental changes caused by the climate change (Seimas of the Republic of Lithuania, 2015). The latter plan provides national level information for sustainable landscape formation, protection and management process.

According to the respondent to the GRETA-questionnaire, the Cohesion fund (CF) and LIFE+ and Horizon 2020 project funds from the European Union are considered as very important for implementation of GI in Lithuania. The European Regional Development funds (ERDF) was as well seen as an important funding source.

Governance and decision-making

Based on the GRETA questionnaire the responsibility for *developing* and *implementing* the GI policy and strategy lies foremost at the national governance level. European policy followed by municipal policy were considered to have the second and the third most important role on developing and the implementing GI policy and strategy.

It was not clear from the GRETA-questionnaire, whether the actors at regional level, research, NGOs or business communities have responsibility regarding GI related governance or decision-making.

Key Sectors

Based on the questionnaire, GI-principles are included within sectors of land use and spatial development plans, transportation; water management; agriculture, forestry and fisheries;

climate change mitigation and adaptation; environmental protection; disaster prevention; finance; energy; health; social services and rural development. Cultural heritage was the only sector considered as not having GI-principles included. BISE (2018) fact sheet addresses also marine and coastal policy and tourism and leisure as sectors that include some legal and national guidance for GI-implementation.

Tools and incentives

On a national level in Lithuania, information on protected area's locations, other nature areas and land use are considered as always easily available. The information on environmental quality of these areas is considered to be often easily available. This kind of information is provided by the Environmental Protection Agency (EPA). This information, were stated to be used often in spatial planning on regional and local levels. The spatial information and GIS data for e.g. protected areas, natural habitats or land use restrictions are provided on the national Spatial Information Portal for Lithuania (Geo portal, 2018).

In addition to national information tools, there are many finalised and on-going GI related projects that facilitates the implementation of GI on national, regional, municipal and even on multinational levels (BISE, 2018).

Challenges and opportunities

The respondent to the GRETA survey did not address any specific opportunities or challenges for GI related issues in Lithuania. However, financial support and implementation of Nature Frame into municipalities' practical actions are stated as challenges by BISE (2018). Lithuania's opportunities for preserving green and blue areas with high quality in new land use developments are the already well-established Nature Frame.

Metadata

Responses: 1 (Advisor at the Ministry of Environment of Republic of Lithuania, Division of protected areas and landscape). The answers to the questionnaire were received April 27 2018.

Additional references

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20 Luxembourg

Policy Overview

The green infrastructure (GI) strategy in Luxembourg is part of the national plan for nature protection 2017-2021. This “Plan national concernant la protection de la nature 2017-2021” (PNPN2), was developed by the Ministry of Sustainable Development and Infrastructure in 2017. The department of the Environment have the administrative role on national level on implementation and coordination of this plan.

The main objectives of the GI strategy are to preserve biodiversity in Luxembourg by ensuring ecological connectivity of the Natura-2000 network and in other nature areas and to ensure the delivery of ecosystem services. Ensuring ecological connectivity and reduction of land use fragmentation is a very important action in Luxembourg, which is the most fragmented country in Europe. By incorporating the GI concept into urban and regional planning, the PNPN2 aims to further the multifunctional benefits of GI (The Ministry of Sustainable Development and Infrastructure, 2017).

Other programmes and projects that facilitate the implementation of GI in Luxembourg are The Lanscape Plan, Ecological valorisation of the Alzette’s upper Valley, LIFE grassland Luxembourg project and LIFE Orchis project (BISE, 2018).

In 2018 a new regional planning measure; the Sectoral Master Plan on Landscapes, which is formalized by a draft Grand-Ducal Regulation is under development. The Sectoral Master Plan has not yet been officially adopted, but the intention is to reserve land, firstly, for the establishment of green buffer zones between municipalities with the objective of stopping further urban sprawl and landscape fragmentation and, secondly, for the establishment of green corridors and links between protected areas. (The Ministry of Sustainable Development and Infrastructure, 2018)

According to the GRETA-questionnaire, LIFE+ and Horizon2020 project funds from the European Union is considered as very important for implementing GI in Luxembourg. The Natural Capital Financing Fund is also considered important. The European Agricultural Fund for Rural Development as somewhat important.

Governance and decision-making

The respondent to GRETA-questionnaire considered the business community the most relevant actor for developing and implementing GI policies and strategy. The European policy and non-governmental organisations are considered to have more responsibility on developing the GI policy and strategy than implementing them. Actors within research is seen as an important influential body and finally public authorities follows with lower responsibility. Actors within research followed by the European policy and stakeholders were considered to carry second and third important role on implementation of GI. NGOs followed by municipal, regional and national policies and stakeholders were considered to act with somewhat smaller role.

Key Sectors

GI principles are included variously among different sectors: land use and spatial development plans; transportation; water management; agriculture, forestry and fisheries; climate change mitigation and adaptation; environmental protection; disaster prevention; cultural heritage; health and rural development. However, it is unclear whether GI is included within finance, energy or social service policy sectors.

Climate adaptation and water management by promoting green infrastructure instead of grey infrastructure are emphasised in the national GI-strategy (PNPN2). Other key sectors in the PNPN2 are also urban planning and land use planning.

Tools and incentives

On a national level in Luxembourg, information on protected area's locations, other nature areas and land use are considered as always easily available. The environmental quality of these areas and the actual management plans for Natura-2000 network are considered to be often easily available. This information, were stated to be used often in spatial planning on regional and local levels. The ministry of Sustainable Development and Infrastructure is providing this information in two national web portals (Geo portal, 2018; Emwelt, 2018)

The information on areas with high environmental qualities is used in sectoral plans for landscapes. These plans seek to find the balance between socio-economic use and conservation of natural resources. The Landscape plan functions as a planning tool because it verifies that the planning zones (e.g. urban or green zones) cannot adverse the effect of each other's (BISE, 2018).

Moreover, the respondent to the GRETA-survey stated that national green and wildlife corridors are important tools for GI-implementation in Luxembourg.

Challenges and opportunities

The recently updated nature protection plan (PNPN2) is an opportunity for GI-implementation in Luxembourg. The plan is recognised in the lower governance levels since initiatives have started to emerge at regional and municipal scales to enhance green areas and their connectivity. According to the respondent of the GRETA-questionnaire the national policy makers have well acknowledged the benefits of nature-based solutions and their potential to offer cost-effective and long-term solutions to urban and rural planning.

Metadata

Responses: 1 (Advisor at Ministry of Sustainable Development and Infrastructure). The answers to the questionnaire were received March 6, 2018.

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21 Malta

Policy Overview

In Malta there is not one single overarching national policy or strategy for green infrastructure (GI). This is in compliance with the EU Green infrastructure strategy (2013), as this strategy is not a directive and therefore not enforced to be included as national law in the member states. The respondent to the GRETA-questionnaire express that several of Malta's policies explicitly address green infrastructure and connectivity, and that the government has introduced various policies to preserve Malta's biodiversity.

For instance, Malta's National Biodiversity Strategy and Action Plan 2012–2020 includes five policy goals with 20 action tasks that should be fulfilled by 2020. The strategy aims to integrate GI within spatial planning policies and it identifies GI as one of the main options for improving ecosystems and their services. The policy document is viewed as function as a driver to enhance Malta's biodiversity, as well as the 2020 global and EU targets for biodiversity.

Another GI-related policy document is the National Climate Change Adaptation Strategy (adopted in 2012). This document states the importance of conservation of habitats, ecosystems, and biodiversity preservation as core elements of climate change adaptation (action 17), and specify that Cost Benefit Analyses and Environment Impact Assessments should be used as tools to fulfill these tasks (Ministry for Resources and Rural Affairs, 2012, p.17).

In turn, also The Green Economy Action Plan (2015) was mentioned by the respondent as important for GI in Malta. This draft of an action plan sets out the Government's vision for the green economy in Malta, focusing particularly on achieving sustainable growth, the effective use of resources, ensuring ecosystem resilience and enhancing social equity. A range of Action Points, which aim at stimulating the transition towards a green economy is also included in the document (Ministry for sustainable development, the environment and climate change, 2015).

For spatial planning, the Planning authority in Malta have a Strategic Plan for the Environment and Development since 2015. This policy document is a tool to enhance greening of open spaces, developing ecological corridors and improving the quality of life in urban areas (The Planning Authority, 2018a)

Other GI-related policy processes in Malta is for instance the EU-wide initiative on Mapping and Assessment of Ecosystems and their Services (MAES), to be done 2014-2020. In 2015, a pilot study including a land use map and the mapping of a number of ecosystem services of the Maltese Islands was performed (MAES, 2017; Mallia and Balzan, 2015).

Regarding funding, the respondent to the GRETA-questionnaire do not specify any sources but state that all funding mechanisms are important for the implementation of GI in Malta.

Governance and decision-making

The respondent to the GRETA-questionnaire did not provide any answer to the questions on who in terms of actors and/or institutions that were considered as having responsibility for developing and implementing GI-policy and strategy in Malta.

Key Sectors

As mentioned in the introduction above, the respondent considered GI-principles to be included in various policies in Malta; for biodiversity, climate change adaptation, rural development and for green economy and growth. The answer did not provide any details on which specific policy sectors. However, the Biodiversity Information System in Europe (BISE, 2018) considers initiatives in the policy sectors Nature; Agriculture; Forestry; Spatial planning; Water management; Marine and coastal policy; Tourism; Climate change adaptation; Economy; and Transport as part of mainstreaming GI in Malta.

Tools and incentives

On a national level, information about where protected areas are located in Malta were considered as easily available. Reports and assessments can be found at the Environment and Resources Authority (ERA) webpage (2018a) and georeferenced information via the European Environment Agency platform (2018). Moreover, information on environmental quality in protected areas are available within adopted Natura 2000-areas that have management plans (Environment and Resources Authority (ERA) webpage, 2018b).

The respondent to the GRETA-questionnaire express that it is standard procedure to consult the maps provided by the Environment and Resources Authority (ERA) on all development proposals made to the Planning Authority. Furthermore, the planning authority has a geoportal which identifies all protected areas, that planners, architects and the general public could use to be aware of the context of potential development applications (The Planning Authority, 2018b).

The respondent to the GRETA- survey state that the network of Natura 2000-areas in Malta is the largest GI-network in Europe, which contributes to reduction of ecosystem fragmentation and loss of biodiversity. There are currently 35 Sites of Community Importance (SCIs) declared under the EC Habitats Directive and 21 Special Protection Areas (SPAs) declared under the EC Birds Directive – including terrestrial and marine sites. When considering land area, over 41km^2 (>13%) is covered by such sites, while the marine sites cover more than 3,450km^2 of Malta's marine environment. Some SCIs completely overlap with SPAs, while others partially overlap. This network is the spatial expression of the GI-policy implementation in Malta.

Challenges and opportunities

The fact that Malta have a large network of protected blue and green areas is an opportunity for preserving the environmental qualities and societal functions that these areas contains.

The respondent expresses a number of different challenges in the work ahead with GI. For financing GI, it is stated that an analysis of available funds is a necessary step, followed by technical assistance facilitating the use of the various available fund. In this work with finding the right funding solutions, structures to promote public-private partnerships to find additional finance are stated to be needed. Lack of awareness and public participation to gain broader buy-in for GI efforts are also mentioned as a challenge. (cf. EC, 2015)

A challenge that can be drawn for GI-implementation in Malta, as also indicated elsewhere, is that although georeferenced information on protected areas and their environmental qualities is provided in national levels, this information is only considered to be used sometimes in decision making for spatial planning. This means that decisions on where to invest in socio-economic developments (e.g. build new housing, commercial areas or industries) in spatial planning is not always based on the knowledge about environmental consideration and/or that this knowledge is not prioritized in decision making.

Meta data

Responses: 1 (Senior Manager at Ministry for European Affairs and Equality). The answers to the questionnaire were received February 3, 2018.

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22 Netherlands

Policy Overview

Dutch policy related to green infrastructure (GI) started in 1990 with the introduction of the *Ecologische Hoofdstructuur (EHS)*, the Main Ecological Structure — a network of existing and 'to be developed' nature areas. The network changed its name to *Natuurnetwerk Nederland (NNN)*, Nature Network of the Netherlands, in 2013 and the aim of the network is to halt the decline of biodiversity and shrinkage of nature areas. The NNN is the major GI related policy plan that focusses on developing and maintaining the Natura 2000 network in the Netherlands and is developed by the Ministry of Agriculture, Nature and Food Quality. Not all Natura 2000 areas are part of the NNN; the total area of the NNN comprises 695.000 hectares while the total amount of Natura 2000 areas in the Netherlands encompasses more than two million hectares, 83 % of which is open water (CBS, PBL, RIVM, WUR, 2017). Under the NNN, agricultural land in between and adjacent to nature areas is bought up by the government and set up as nature areas to create a coherent green network. At the introduction of GI development in 1990 the goal was to increase nature areas with 275.000 hectares to a total of 710.500 hectares of nature area by 2018 (CBS, PBL, RIVM, WUR, 2017).

The respondent to the Green Infrastructure survey confirmed that Natura 2000 policy is implemented in national nature protection and conservation policy. According to the questionnaire results, LIFE+ and Horizon2020 project funds are important EU-funds for GI development and implementation while the respondent was unsure about the significance of funds like the European Regional Development Fund (ERDF) and the Natural Capital Financing Fund (NCFF).

Governance and decision-making

The survey respondent indicated that GI policy *development* was, in descending order, the responsibility of government at the regional level, the municipal level and the national level. Responsibility for the *implementation* of GI policy lies foremost at the municipal level, then regional level and then the national level. The business community and non-governmental stakeholders were considered irrelevant for both matters, while EU stakeholders were considered to have some responsibility for the development of GI policy but none for the implementation of GI policy.

Since January 2017 the Ministry of Economic Affairs is obliged by the new Nature Protection Law (*Wet Natuurbescherming)* to develop strategic vision documents describing policy guidelines regarding nature protection and green infrastructure (WUR, 2017). The most recent vision is from 2014 and provides general guidelines for nature policy until 2025, not only regarding conservation and expansion of nature and GI, but also concerning the economic and societal assets of nature (EZ, 2014).

For the 162 Natura 2000 areas in the Netherlands, management plans are made by the municipal and regional authorities in collaboration with farmers and nature organisations. The

responsibility for the development and supervision of the NNN lies with the regional authorities (EZ, 2014).

Key Sectors

The results of the questionnaire showed that GI principles are included in the following sectors: land use and spatial development planning, water management; and agriculture, forestry and fisheries. GI principles have a strong limiting impact on spatial planning in the Netherlands. Areas with high nature value are observed in spatial plans and protected from development (WUR 2017). The impact of GI on agriculture, forestry and fisheries can be explained by the high percentage of open water in the Dutch Natura 2000 areas (83 %) and in the NNN. This includes coastal waters, inland seas and bays where there is high fishing activity. Water management is an important sector in the Netherlands; large parts of the country lie below sea level and there is much water around, both from rivers and the sea. Programmes like Room for the River (*Ruimte voor de rivier*) are developed to prevent flooding in a natural way, incorporating GI principles where it can (Wessels, 2016).

Tools and incentives

According to the survey, the Green Space Factor is an instrument integrated in spatial planning considering GI principles. The Green Space Factor is a tool to integrate climate change adaptation into spatial development and planning, but it is still in the project phase with 14 pilot cities throughout Europe (Kruuse, 2011). This project has led to plans to include nature, like storm water management ponds and parks, in areas that are zoned for urban development.

National georeferenced data and documents on the location and changes in the size of protected areas, i.e. the NNN and the Natura 2000 network, are always available online according to the questionnaire. The survey respondent indicated that information about the status of the national environmental quality is often available online, with new reports about the progress of restoring the biodiversity and ecosystem being published regularly. It was unknown if the information provided was used in local and regional planning for spatial development.

Challenges and opportunities

From the questionnaire, no challenges or opportunities emerged. It is a fact however, that 27.000 hectares of Natura 2000 areas in the Netherlands are not part of the protected NNN. These are mostly agricultural areas with a narrower protection status meaning that limited economic activity is allowed if the core natural qualities of the area are maintained and protected. The use of these areas will not be further regulated, since they are not part of the NNN. This is limiting the possibilities for improving the geographical expression of GI in Netherlands (CBS, PBL, RIVM, WUR,2017). Development and conservation of the GI in the Netherlands tends to clash with economic activities like agriculture. The government tries to harmonise the two sectors e.g. by allowing restricted livestock in nature areas and lowering the amount of nitrogen deposition in the soil.

Meta data

Responses: 1 (An employee at the PBL Netherlands Environmental Assessment Agency, Department of Spatial Planning and Quality of Local Environments). The answers to the questionnaire were received on April 18th, 2018.

Additional References

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23 Norway

Policy Overview

Norway is not an EU-member country, and therefore not forced to adapt to European policies and regulations, such as the European Bird and habitat directive, the accompanying Natura 2000 network, and the Mapping and Assessment of Ecosystems and their Services (MAES). According to the respondent to the GRETA-survey, however, strategies and policies for green infrastructure (GI) have been in place in Norway since the early 1990s.

In 1994, the national Norwegian Environment Agency (*in Norwegian: Direktoratet for naturforvaltning*) developed the first guidelines for how to integrate green structures in spatial planning. During the 2000s and 2010s the concept of green infrastructure was developed in Norway. In Norweigan it is called 'blågrönstruktur' or 'blågrön infrastruktur', translated into blue-green structure or blue-green infrastructure. The development of the concept for spatial planning have over time meant that areas included in the blue-green infrastructure shall be more multifunctional, and to a lesser degree have pure recreational and/or outdoor recreation purposes (Direktoratet for naturforvaltning, 2003; Zinko et al. 2018, p.12).

As a non-EU-member state Norway do not utilize European funding for implementation of GI. The respondent to the GRETA-questionnaire, however, acknowledge that there might be cross-border cooperations and ongoing LIFE+ and Horizon 2020 projects related to green infrastructure in the country.

Governance and decision-making

There is a clear multilevel governance perspective that structures GI policy development and implementation in Norway. This corresponds to the strong role of municipalities as the main institutions responsible for planning, and implementing GI related actions. Due to the institutional governance system in Norway, state level authorities can interfere with local decisions if it concerns areas and/or resources of certain values for the nation state; such as soils for food production, culture heritage and/or biodiversity.

In terms of *developing* GI policy and strategy the main responsibility is on national policy and stakeholders, followed by regional and municipalities who are involved in the work. Also based on the survey results, researchers and NGOs are considered to be fourth and fifth most important for developing GI policy and strategy in Norway. Among the other actors listed in the survey, the policy and stakeholders on European levels and the business community were considered as having the least responsibility for developing a GI-policy and strategy.

Municipalities have the main responsibility for *implementing* GI in Norway. Followed by regional and national policy and stakeholders. The municipalities, that also have the main responsibility for spatial planning, are obliged to follow national strategies, handbooks and guidance from the national policy level. Based on the survey results, actors within the business community are considered to be fourth most important for implementing GI in Norway. Further, actors within NGOs and research are also considered as having or taking on responsibility for implementing

GI. Among the actors listed in the survey, the policy and stakeholders on European levels were considered least important.

Key Sectors

The respondent to the GRETA-questionnaire from Norway considered GI to be included within policy sectors of land use and spatial development; transportation; water management; agriculture, forestry and fisheries; climate change mitigation/adaptation; environmental protection; disaster prevention; cultural heritage; health; social services; and rural development. However,it is likely GI is not explicitly referenced within policies for finance; and energy.

Tools and incentives

On a national level, georeferenced information platforms for GI are well developed. Information about the location of protected areas is always easily available at online platforms provided by an institute of Bioeconomy research under the Ministry of Agriculture and Food (NIBIO, 2018) and by the Norwegian Environment Agency (Naturbase, 2018).

Naturbase is a digital platform that provides georeferenced information and knowledge on nature and outdoor recreation areas in Norway. This including the 17.1 % of the land area being in different types of zoning for nature protection.

In 2015, a nature index over the status and the development trends of biodiversity in the big land and water based ecosystems in Norway was published. This work has involved 158 national experts, and the results from the 310 indicators measured in the index can be found at the homepage of Norwegian Environment Agency (2015).

Another important source of knowledge for biodiversity is the Artdatabanken (2018). This digital platform for red listed species, invasive species and ecological risk evaluations, builds on observations from both public actors and private persons.

In addition, knowledge on cultural heritage is digitally available at the online platform Askeladden (2018). This database includes over 115 000 culture heritage objects and sites, and is continuously updated. Objects and sites older than 1537 is automatically protected in Norweigan law. (Slätmo and Stenseke, 2013)

Since the first state level guidelines for GI in 1994, the policies have been updated several times. The operative version (the third) is focusing on management of public land. Another recent development in the policy regime for GI in Norway is that ‘Green structure’ became a zoning category for regional and municipal spatial plans in the latest amendment of the Plan and building act.

A more ‘rural’ zoning category for non-build up land, e.g. agriculture, nature, outdoor recreation and reindeer husbandry have, however, been in place in Norwegian planning legislation since the 1980s (*called LNF(R) in Norwegian*). This zoning category aims to preserve these land uses from being changed to build up land, and preventing seeing the areas outside urban cities and towns as ‘areas ready for urban development’. (Slätmo, 2014, p.172-173)

For new bigger developments, such as roads and railroads, impact analyses are obliged as basis for decisions on placement and location to decrease the harm. The road authority commends impact analysis to been done both for impacts possible to measure in monetary terms, using cost-benefit analysis, and non-monetary costs, on a scale from 1 to 9. (Statens vegvesen, 2018)

The available information and guidelines is stated to be always used on decision making processes for spatial planning at regional and local levels by the respondent to GRETA - questionnaire. Moreover, some municipalities are using Blue Green Area Factor, and some municipalities have been using a tool called the Green Poster suggested in the two first GI-handbooks.

Previous research has lifted several good practice example initiatives for GI in Norway. For instance, Zinko et al. (2018) report on Grorudalen in the outskirts of the capital Oslo, and Ilabekken in Trondheim.

Challenges and opportunities

The respondent to the GRETA-questionnaire express that the main challenge for continuous GI-implementation in Norway is that Norwegian municipalities need a new push. It is acknowledged that there was a GI "wave" in the 1990s due do a big state lead project headed by the Ministry of environment called Miljøbyprosjektet. This imply the importance of anchoring the work at the highest institutional and political levels, and combine this with funding and competence in order for change to take place.

Meta data

Responses: 1 (Researcher at the School of Landscape Architecture, NMBU). The answers to the questionnaire were received February 20th, 2018.

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24 Poland

Policy Overview

In Poland there is no direct national policy or strategy for green infrastructure (GI). Instead, it is included into various national strategies such as the National Spatial Development Concept 2030 (NSDC2030) and the National Urban Policy. This is following the EU strategy on green infrastructure (2013, p.10), as the strategy express that GI-principles can be implemented by using the existing policy instruments. The NSDC2030 is the most important national strategic document that address the spatial planning management in Poland (Ministry of Regional Development, 2012).

The NSDC is a midterm national development strategy where GI elements have been mainly included by the fourth objective: *"To develop spatial structures supporting the achievement and preservation of Poland's high-quality natural environment and landscape.*" The concept of GI is embedded into Polish ecological network 2030 which consists of Natura 2000-network together with other diverse types of protected areas. (Ministry of Regional Development, 2012)

According to the GRETA-questionnaire, the European Regional Development funds (ERDF), the European Social funds (ESF) and the European Agricultural Funds for Rural Development (EAFRD) from the European Union are considered as very important for implementation of GI. Also, the LIFE+ and Horizon2020 project funds are considered as somewhat important.

Governance and decision-making

It is not clear from the GRETA questionnaire which actors would be important for *developing* the GI policy and strategy. However, national policy and stakeholders have been considered the most relevant actors for *implementing* GI policies and strategy. Regional policy followed by the European policy were considered to have second and third significant role on implementation of GI. Actors within research followed by actors within NGOs is also important. Business community and municipal policy and stakeholders were considered to have least responsibility.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; transportation; water management; agriculture, forestry and fisheries; climate change mitigation and adaptation; environmental protection and disaster prevention. However, it is unclear whether GI is included within finance; energy; cultural heritage; health; social service or rural development sectors.

In addition, BISE (2018) fact sheet describes GI principles that are included to urban policy; economy; health and education, sport and culture sectors.

Tools and incentives

On a national level in Poland, information on protected area's locations and the environmental quality of these areas were considered as always easily available. This information, were stated

to be always used in spatial planning process on regional and local levels. The General Directorate of Environmental Protection is providing these information on their web portal (2018). These GIS-tools have been considered as informative and innovative tools that are applied to calculate GI requirements for new developments.

The Polish Ecological Network, defined in the NSDC 2030, is the backbone of the biodiversity and cohesive land use planning. It is a spatial system which consists of non-developed biocentres with varying formal protection status and of ecological corridors connecting the existing areas with high concentration of habitats and species, and the remaining space which is important support for the natural system. (Ministry of Regional Development, 2012)

In addition, there are small-scale water retention activities of State Forest in Poland. On regional and local level there are many nature protection programmes, campaigns and projects that support GI-elements (BISE, 2018). The GRETA-questionnaire results also states that local level GI related financial incentives, like tax reliefs, are integrated into spatial planning.

Furthermore, Fronczek-Wojciechowska *et al.* (2017) have developed a proposal for a method of constructing a spatial system consisting of GI elements in Poland. Through a combined spatial analysis of population and topgraphic data the aim of the method is to enhance eldery peoples access to recreational areas. This method has been examined with empirical studies in Łódź.

Challenges and opportunities

Despite several tools that enable actions for GI development especially at the local levels, the lack of a strict definition of GI is considered as a challenge in Poland. According to the respondent of the GRETA-questionnaire, in order to implement GI more systematically there is a need for more education and engagement of the citizens.

Metadata

Responses: 1 (Advisor at Ministry of Investment and Economic Development). The answers to the questionnaire were received March 30, 2018.

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25 Portugal

Policy Overview

There is no direct national policy or strategy for green infrastructure (GI) in Portugal. In fact, it is not clear from the GRETA survey whether GI as a concept has been incorporated into national policy instruments. However, European policies related to GI, such as the EU Bird and Habitat Directive (e.g. the Natura 2000 network) and the EU Biodiversity strategy (EC, 2013) are stated to be applied widely. GI elements are also considered in different sectoral policies and strategies like the National Ecological Reserve (REN) Act, the Fundamental Network for Nature Conservation or the National Sustainable Development Strategy, Natura 2000 plan or at urban level with the Local Action Plan for Biodiversity in Lisbon 2020 (BISE, 2018). Consequently, Portuguese GI related national actions are based on already existing legislations, policies and governance measures. This in line with the EU Green infrastructure strategy (2013, p.10).

The above-mentioned National Ecological Reserve (REN) Act, aims to 1) protect water and soil resources and ensure ecosystem services, 2) protect groundwater levels, prevent and reduce the effects of maritime flood risk, drought, soil erosion and mass movements of slopes and 3) contribute to the connectivity and ecological coherence of natural areas. (BISE, 2018; EC, 2015) The REN operates at the national, regional and municipal levels and supports the integration of the connection between the core areas of nature conservation and biodiversity into the National Classified Areas (BISE, 2018). As such, REN address the fundamental core of GI, namely the multifunctionality, the connectivity and the enhancement of green and blue areas.

According to the GRETA-questionnaire, the European Regional Development fund (ERDF), European Social Fund (ESF) and the Cohesion fund (CF) from the European Union are important funds for implementation of GI in Portugal. The European Maritime and Fisheries Fund (EMFF), the European Agricultural Fund for Rural Development (EAFRD) and LIFE+ and Horizon2020 project funds were considered as somewhat important. Also, Permanent Forest Fund (FFP) and POSEUR- Operational Programme for Sustainability and Resource efficiency are acknowledged as financial incentives for GI implementation by BISE (2018).

Governance and decision-making

Based on the GRETA questionnaire European policy followed by municipal policy have the main responsibility for *developing* the GI policy and strategy in Portugal. National policy was considered to have third highest responsibility. Actors within NGOs and research were considered also relevant actors for developing GI policies and strategy but to a lesser extent. Regional policy well as the business community, were not considered to have or take on responsibility for developing GI policy and strategy in Portugal.

The *implementation* of the GI policy and strategy is considered a municipal responsibility. The city of Lisbon and its Master Development plan are examples of how GI can be implemented

by emphasising instruments like green areas, urban agriculture or green corridors (Faivre et.al, 2017). The Master Development Plan includes the ecological structure as a key factor in the city's planning strategy (BISE, 2018). Portugal is also part of the Mapping and Assessment of Ecosystems and their Services (MAES). Municipalities strong involvement on GI implementation were observed for example within a MAES study that focused on GI in urban ecosystems. Three Portuguese cities functioned as "city labs" where the MAES framework will be implemented (BISE, 2018).

Actors within NGOs followed by European policy and stakeholders were considered to have the second and third highest responsibility for implementing GI policy and strategy. Also, national policy and actors within research were stated to have somewhat important role. Business community and regional policy were considered as having the least responsibility.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; water management; agriculture, forestry and fisheries; climate change mitigation and adaptation; environmental protection; cultural heritage and rural development. Finance; energy; health and social services were policy sectors that were not considered as including elements important for GI in Portugal. If principles of GI are integrated in policy sectors of transportation and disaster prevention, this did not prove from the GRETA survey. In addition, BISE (2018) describes that GI principles are included in Portuguese marine and coastal policy.

Tools and incentives

On the national level in Portugal, information on protected area's locations is considered as always easily available. The information on the environmental quality of these areas is considered to be sometimes available. The available information is stated to be used sometimes in spatial planning process on regional and local levels.

As mentioned, municipalities have a strong role of in implementing the GI policy and strategy. Municipalities' Master Plans that consider GI and REN elements are seen as an important spatial planning tool for preserving green and blue areas with high quality in new land use developments. In addition, zoning for green space and different types of protected areas is also seen as a crucial spatial planning tool considering GI elements.

Challenges and opportunities

One challenge addressed in the GRETA-questionnaire relates to the legal frame of land use policies. The respondent states that the legal frame in Portugal does not sufficiently facilitate the land use policies which imply there is a concern that environmental objectives and GI elements are not always realised in land use planning and decisions on where to locate new developments. In addition, BISE (2018) states that better integration of GI principles into economic and environmental policy sector is needed.

Metadata

Responses: 1 (Advisor at City council of Lisbon). The answers to the questionnaire were received March 01, 2018.

Additional references

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26 Romania

Policy Overview

Romania has not developed an integrated national green infrastructure (GI) strategy, which is a core recommendation of the European Green Infrastructure Strategy. An integrated strategy appears to be needed as unsustainable economic development has caused excessive resource exploitation and habitat fragmentation throughout the country (EC, 2015). However, Romania has supported the implementation of the European Bird and Habitat directive through the Natura 2000 network, which covers over 20 percent of its territory.

Based on the two survey results, it is unclear what types of strategic policy development are currently taking place to support GI policy development at the national or regional levels. While there is no national GI strategy, key policy frameworks are understood as the support frameworks for GI implementation. This includes: The National Strategy on Climate Change and Low Carbon Development (2016-2020), the Master Plan for Transport in Romania 2030, the Territorial Development Strategy of Romania 2035 and the National Rural Development programme. Further, financial support from the EEA is being applied to support the Mapping and Assessment of Ecosystems and their Services (MAES).

In line with MAES implementation, European funds are considered an important mechanism to support GI implementation in the country. This includes the ERDF - the European Regional Development Fund, which was considered very important by both survey respondents. The Cohesion Fund was considered important by both respondents. According to the European Commission's GI policy overview (EC, 2015), these funds have been important in implementing spatial connectivity and restoration as natural ecosystems, particularly in terms of creating demonstration sites to promote raised awareness among the public.

The EAFRD - the European Agricultural Fund for Rural Development; and LIFE+ and Horizon2020 project funds were considered very important, important or somewhat important by the two respondents. Responses concerning the ESF - European Social Fund, The EMFF - the European Maritime and Fisheries Fund; and the NCFF - the Natural Capital Financing Fund were inconclusive concerning their role in promoting GI development.

Governance and decision-making

It is clear based on the two survey responses that the national government, and its associated policies, have a core role in supporting GI in Romania. Both respondents rank the national government among the most important governance spheres for both GI policy *development* and *implementation.* Both respondents also note the importance of the municipal scale in terms of GI policy *development* (ranked second and fourth most important by the respondents) as well as policy *implementation* (ranked second and third most important by the respondents).

Beyond the shared opinions concerning the roles of national and municipal government, the two survey respondents report differing opinions concerning the roles of different governance actors for developing GI policy and implementing GI in practice. This makes it difficult to comment on the relationship between European, national, regional, local, research, NGO and private sector actors in the support of GI. For example, European policy and stakeholders are considered most important for policy *development* by one of the stakeholders, but least important by the other. Perhaps most notably, the role of the regional government is unclear both in terms of policy development and implementation. Thus, it appears that European policy and stakeholders are crucial in terms of programme and funding support, while most GI initiatives are coordinated by national actors and supported through local implementation.

Key Sectors

The respondents from Romania reacted on which policy sectors that address GI-principles. Both respondents agreed that GI is addressed through sectoral policies on agriculture, forestry and fisheries; climate change mitigation/adaptation; environmental protection; and rural development. Further, one of the two respondents stated that GI is addressed through policies on land use and spatial development; transportation, water management; energy and disaster prevention. One respondent specifically highlighted integration between GI and the transport sector through the development of integrated transport and green infrastructure planning in the Danube-Carpathian region for the benefit of people and nature.

Based on the survey results, it is unlikely that GI is explicitly referenced in finance; cultural heritage; health and the social services sectors.

Tools and incentives

For financing, besides the above-mentioned EU-funds, funding is also available through the European Environment Agency for MAES implementation and, together with Norwegian Grants, to support the implementation of Green Infrastructure through four priority domains: biodiversity and ecosystem services, pollution reduction, energy efficiency, renewable energy and adaptation to climate change (EC, 2015).

On a national level, it appears that some *GI information platforms* have been developed. Information about the location of protected areas is viewed as always available through digital maps on the Ministry of Environment's website (2018a). Further, information about environmental quality of these areas in terms of biodiversity rates, ecosystem services and/or other quality measures is also often available through the websites of protected areas, and on Ministry's website (2018b). This information is stated to be often used in regional and local spatial planning, especially when developing management plans for protected areas. Green space factor was also mentioned by one respondent as an example of planning instruments that have been implemented to support elements of GI.

Challenges and opportunities

A core challenge for the development of GI is that Romania has a recent history of rather unsustainable economic development, which has caused excessive resource exploitation and habitat fragmentation throughout the country. In this context, GI can be seen as having a great potential in terms of motivating the preservation and restoration of natural landscapes for the multiple social, economic and environmental benefits that would be available.

It appears, however, that consistent concern to promote GI in practice is less prevalent than in other European countries. While there are numerous research activities taking place (e.g. through the University of Bucharest) these are having a relatively small impact in planning and practice. Rather, GI policy and strategic efforts appear to be the impact of top-down steering and investment through the EU. Specific interventions are generally developed by a few local institutions (municipalities), which consider GI in the development of master plans or other strategies. Unfortunately, these efforts are not coordinated through regional or national actors and opportunities for mainstreaming local ideas and good practices are missing. Likewise, there is a shortage of national initiatives to promote common GI solutions, and the overall fragmentation between administrative authorities creates a lack of collaboration concerning GI.

Meta data

Responses: 2 (Professor at the University of Bucharest & Councilor at the Ministry of Regional Development and Public Administration). The answers to the questionnaire were received February 23, 2018.

Additional references

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Ministry of Environment (2018b) http://www.anpm.ro/biodiveritate, accessed 24 May 2018

27 Slovakia

Policy Overview

There is no direct national policy or strategy for green infrastructure (GI) in Slovakia. Instead, GI is included in different sectoral policies and strategies like the updated National Biodiversity Strategy 2020 (2014), the updated Wetlands Program 2015-2024 and the Environmental Strategy of the Slovak Republic 2030, which is currently undergoing a strategic environmental assessment (SEA) process. Consequently, Slovakian GI strategy is based on already existing legislations, policies and governance measures. This in line with the EU Green infrastructure strategy (2013, p.10).

Above mentioned strategies and programs acknowledge the multifunctional benefits of GI, especially its benefits to climate change adaptation as well as for nature and biodiversity protection. The National Biodiversity Strategy for 2020 (2014) acknowledges GI as one of its main target areas. GI is seen as an explicit tool to ensure ecosystem preservation and to enhance ecosystem services.

For spatial planning processes on national and regional levels the National Building Act and The Act N0.543/2002 on Nature and Landscape Protection regulates the placement of green spaces, and the green networks of the so called Territorial System of Ecological Stability (TSES).

According to the GRETA-questionnaire, the European Regional Development fund (ERDF), the Cohesion fund (CF), the European Agricultural Fund for Rural Development (EAFRD) and LIFE+ and Horizon2020 project funds from the European Union are very important funds for implementation of GI in Slovakia. The European Social Fund (ESF) was considered as somewhat important. Also, the state's own environmental funds are acknowledged as financial incentives or subsidies for GI implementation.

Governance and decision-making

Based on the GRETA questionnaire municipal policy and stakeholders, followed by the national policy and stakeholders, have the main responsibility for *developing* the GI policy and strategy in Slovakia. Actors within research followed by regional policy and stakeholders were considered also relevant actors for developing GI policies and strategy. NGOs and business community were ranked as the fifth and sixth relevant body for developing GI policy in Slovakia. European policy and stakeholders were considered to have least responsibility.

The *implementation* of the GI policy and strategy is considered a national responsibility. Municipal policy and stakeholders followed by regional policy and stakeholders were considered to have the second and third highest responsibility. Also, actors within NGOs and research were stated to have somewhat important role for implementing GI policy and strategy. The business community and European policy and stakeholders were considered as having the least responsibility.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; climate change mitigation and adaptation; environmental protection; cultural heritage; health; social services and rural development. Transportation; agriculture, forestry and fisheries; disaster prevention; finance and energy were policy sectors that weren't considered as including elements important for green infrastructure in Slovakia.

Tools and incentives

On the national level in Slovakia, information on protected area's locations are considered as often easily available. This information is available in the central government's web page (Geoportal, 2018). The information on the environmental quality of these areas was, however, considered to be rarely available. The available information is stated to be used sometimes in spatial planning process on regional and local levels.

Another information tool mentioned in the GRETA-questionnaire is a methodological guidance for spatial planning published by the national institute for urban planning (URBION, 2009). It provides more GI related information, like share of woody plant land cover, share of vegetation surface or so called 'impermeability index'. A tool that is supposed to facilitate the climate change adaptation in spatial planning process by maintaining more permeable land in urban areas.

There are also some building regulations and so called "coefficient of vegetation areas" available in Slovakia that notice the importance of green space when developing areas in to housing, commercials or other built up land in the spatial planning process. The National Building Act regulates for example the placement of green spaces, important landscape elements and other elements of the Territorial System of Ecological Stability. This system is a type of ecological network with GI elements like connectivity of core green areas, so called 'bio-centres'.

Territorial System of Ecological Stability is also part of the Slovak National Act N0.543/2002 on Nature and Landscape Protection. GI related elements are regulated as an obligatory part of spatial planning process at the national and regional level through this instrument. In addittion, to national guidelines and regulations, there are various GI related local projects and initiatives which facilitate the implementation of GI in Slovakia. (BISE, 2018)

Challenges and opportunities

Many of the GI aspects have been included in the national spatial planning and decision-making process in Slovakia. However, the respondent to the GRETA-questionnaire states that the implementation of GI, especially in urbanised areas, is still lacking behind. For the implementation to take place, the respondents ask for more methodological support from national level. Also, good practice examples and more guidance for methodology to elaborate GI strategy on local levels would be needed.

Metadata

Responses: 1 (Environmental expert for the Union of Slovak Cities). The answers to the questionnaire were received March 21, 2018.

Additional references

BISE (2018) https://biodiversity.europa.eu/countries/gi/slovakia, accessed April 27, 2018

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28 Slovenia

Policy Overview

In Slovenia there are several projects which encompass green infrastructure (GI) principles, but so-far no umbrella policy specific for GI. GI is, however, integrated in the Spatial Development Strategy of Slovenia (Of. Gazzette of Rep. of SI, 76/2004, Ministry of the Environment, Spatial Planning and Energy, 2004). This strategy and its accompanied guidelines were adopted in 2004, and must be followed in sectoral policy documents and spatial planning documents at lower institutional levels. The strategy explicitly addresses GI, although translated as "zeleni sistem" (e.g. green system).

The respondent to the GRETA-questionnaire from the Ministry for the Environment and Spatial Planning express that GI in the Spatial Development Strategy of Slovenia is foremost related to the vision, objectives, priorities and guidelines regarding natural, cultural and urban landscapes. However, guidelines for development of specific activities in cultural and natural landscape, such as agriculture, forestry, water management, tourism, natural hazards, and defence is also possibly affecting the implementation of GI in Slovenia.

According to Marot *et al.* (2015) the term 'Zeleni sistem' represents individual parts of open space in a town or a settlement differing in function, structure, and the degree of naturalness. The components of the green system are parks, children's playgrounds, school gardens, squares, vegetation and greenery along the streets, roads, water streams, and in residential areas, suburban meadows, suburban and urban forests and the like.

For urban areas, legislation to integrate and prioritise green urban systems have been in place since 2002. The motivation for this is that green areas are one of the important elements for quality of life in cities. This is especially highlighted in the latest updated version of the Spatial Planning and Management Act (2017). Work is also ongoing to include new spatial plans on regional levels. In the draft versions of the policy for these regional plans they are stated to include regulations on green infrastructure system which will be interconnected also with regional and green city systems.

Other GI-related policy processes mentioned as important for Slovenia are for instance the Bird and Habitat Directive (within which the Natura-2000 network is an important tool for implementation), the Territorial Agenda 2020, the Alpine convention; the European landscape convention, and the Biodiversity Conservation Strategy.

The EU-wide initiative on Mapping and Assessment of Ecosystems and their Services (MAES), to be done 2014-2020, seem to have been well carried through in Slovenia (MAES, 2016). Local and regional assessments and mapping have been executed based on a national standardised methodology, and land use data of forested and agricultural areas are according to MAES (2016) to be continuously updated in 4-year cycles.

Regarding funding, the respondents to the GRETA-questionnaire gave some divergent answers on the importance of EU-funds for the implementation of GI in Slovenia. The European Regional Development fund (ERDF), as well as the LIFE+ and Horizon2020 project funds were considered either very important or important. The European Agricultural Fund for Rural Development (EAFRD) were considered important or somewhat important. The Cohesion fund (CF) were considered important by the researchers, but not important by the respondent from the Ministry for the Environment and Spatial Planning. The EMFF - the European Maritime and Fisheries Fund was considered as not so important, and none of the respondent thought the European Social Fund (ESF) was important for the implementation of GI in Slovenia.

Governance and decision-making

Based on the answers to the GRETA questionnaire national policy and stakeholders have the main responsibility for *developing* the GI policy and strategy in Slovenia. According to the respondent from the national authority, this national leadership is followed by regional and municipal policy and stakeholders. Fourth most important are researchers. NGOs, European policy and stakeholders and the business community were also considered to have or take on responsibility for developing GI strategy in Slovenia. The respondents from academia instead considered that after the national level policy and stakeholders, municipal policy and stakeholders, research and regional policy and stakeholders as the order for how important different stakeholders are to develop strategy and policy for GI.

Also, the *implementation of* the GI policy and strategy was seen as a responsibility for national policies and stakeholders. The respondent from the national authority considered the regional and municipal policy and stakeholders to have the second and third highest responsibility. European policy and stakeholders on fourth place. NGOs, the business community and research were stated to have somewhat important role for implementing GI policy and strategy. The respondents from academia considered the municipal policy and stakeholders and research to have the second and third highest responsibility. European policy and stakeholders on fourth place. Regional policy and stakeholders, NGOs, and the business community were considered as having the least responsibility.

Key Sectors

Based on the questionnaire, GI principles are included within sectors of land use and spatial planning; transportation, water management; agriculture, forestry and fisheries; environmental protection; disaster protection; energy; cultural heritage; health and rural development.

Climate change mitigation and adaptation; finance and social services are policy sectors that do not with certainty explicitly address GI in Slovenia. Other policy fields considered important for GI in Slovenia that were not listed in the survey were urban development.

Tools and incentives

On a national level, georeferenced information about where protected areas are considered as always easily available. Information of Natura 2000 areas can be found at the homepage of

Ministry of the Environment and Spatial Planning (2007). The Slovenian Environment Agency (2018) have information on national and local protected areas, as well as ecologically important areas in their online Environmental Atlas. There is no national monitoring system specific for protected areas but some data on environmental quality is available at the national site for environmental indicators (Ministry of the Environment and Spatial Planning, 2018).

The spatial information is stated to be used often or sometimes in spatial planning decisions at local and regional levels. The respondent from the national planning authority mentions that the act on environmental protection prescribes that an environmental report should be prepared for each spatial development process in order to analyse the potential impacts what the implementation of the plan will have on protected areas.

According to Marot *et al.* (2015), most of the researchers and practitioners in Slovenia view the GI concept to be comparative with sustainability, vulnerability and resilience in the Slovenian context. This indicate that work on GI have been ongoing before the GI strategy on European level came into place in 2013.

Some municipalities in Slovenia have initiated work on 'green space factor', which means that in every new development of housing areas an amount of land should be preserved for green and/or blue space. Some municipal spatial plans also include figures on maximum density of built-up areas. These initiatives are not mandatory from the national level.

In addition to the above section regarding funding, the Cohesion policy 2014-2020 have been extensively used for funding Natura 2000 areas in Slovenia (BISE, 2018). One of the respondent to the GRETA -questionnaire also express that the Cohesion policy includes measures that have been used for renewing and enhancing 'degraded urban land'.

Challenges and opportunities

Although there is no umbrella strategy for GI in Slovenia the spatial planning system seem well suited to strategically and theoretically define networks of green and blue areas. The respondent from the Ministry for the Environment and Spatial Planning express that the multifunctionality of GI is to be understood as an objective to fulfil in spatial planning. This to make the intricate model calculations for ecosystem services, and other types of computer modelling ongoing in the research community, possible to implement in the physical landscape. Using the multifunctionality of green areas as an objective in spatial planning can contribute to achieving synergy among different uses of space, and not act as competing uses for the same space. The respondent also highlights that heterogeneous elements and human uses must be allowed in the green areas that make up the GI-network. For instance, at one side of a city the GI could be a retention area, at the other recreation, while in city centres rivers and its banks could be a major amenity area with recreational importance, while at the same time providing also runoff and climate regulation functions. In other words, as green infrastructure possibly includes many different functions for humans and societies, it is not viewed as necessary that

the physical expression of the green infrastructure is only based on areas protected for nature qualities.

One challenge that can be drawn for GI-implementation in Slovenia, as also indicated elsewhere in Europe, is that although a national spatial planning strategy is in place, that georeferenced information on protected areas and their environmental qualities is provided on national levels, the decisions on where to invest in socio-economic developments (e.g. build new housing, commercial areas or industries) is not always based on this information. This mean that the spatial planning on municipal and city level does not always consider the strategically defined green infrastructure. Sometimes other interests are prioritized (cf. EC, 2015).

Moreover, land ownership issues in relation to developing a network of accessible green and blue areas are stated as a challenge. In turn, the ongoing maintenance of the GI (its green areas and connections) is stated as a challenge, together with establishing and maintaining institutional support for GI.

Meta data

Responses: 3 (Official at Ministry for the Environment and Spatial Planning; and two Academics at University of Ljubljana, Biotechnical faculty, Department of landscape architecture). The answers to the questionnaire were received between April 5 and April 9, 2018.

Additional references

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29 Spain

Policy Overview

The respondent to the GRETA-questionnaire state that there is not a specific strategy for Green Infrastructure (GI) on national level in Spain, and that the Green Infrastructure strategy (European Commission, 2013) have not really been adopted. This is confirmed by the Biodiversity Information System of Europe (BISE, 2018) as it is stated that elaboration of a national strategy on Green Infrastructure, Connectivity and Ecological Restoration is an on-going process in Spain.

The respondent to the GRETA-survey express that the in-place policy regime for GI in Spain is in compliance with the Bird and Habitat Directive (within which the Natura-2000 network is an important tool for implementation). Other GI-related policy processes relevant for Spain is for instance the EU-wide initiative on Mapping and Assessment of Ecosystems and their Services (MAES), to be done 2014-2020. As of 2015, a group of 60 Spanish researchers had assessed and analysed the economic and social value of Spanish ecosystem services. This work has been done in collaboration with the Spanish Ministry of Agriculture, Food and Environment (Santos Martin, 2015).

Although no national GI strategy is in place, the European Commission (2015) express that GI is incorporated in existing national legislation. For instance, the law on Natural Heritage and Biodiversity (42/2007) is stated to impose a general obligation for the autonomous regions to take measures aimed at ensuring environmental connectivity, while various regional laws focus on connectivity of natural areas (European Commission, 2015).

Regarding funding, the respondent to the GRETA-questionnaire gave some divergent answers on the importance of EU-funds for the implementation of GI in Spain. Although no European funds were stated to be used for implementing GI, a number of European funding mechanisms were indicated as important for contributing to the implementation of GI measures. The European Regional Development fund (ERDF) and the NCFF - the Natural Capital Financing Fund was stated to be very important in this regard. The European Agricultural Fund for Rural Development (EAFRD) was considered as important for the implementation of GI in Spain.

Governance and decision-making

There is a clear multilevel governance perspective that structures GI policy development and implementation in Spain. In terms of both *developing* and *implementing* policy and strategy for GI the main responsibility is on European policy level, followed by national and municipal policy and stakeholders. Further, also based on the survey results, researchers are considered to be fourth most important for developing GI policy and strategy in Spain. This is followed by actors in NGOs and the Business community. Among the actors listed in the survey, regional policy and stakeholders were not considered as having responsibility for developing or implementing GI-policy and strategy in Spain.

Key Sectors

According to the respondent from Spain, green infrastructure principles are included within the policy sector of land use and spatial development plans; water management; environmental protection and cultural heritage. For the sectors agriculture, forestry and fisheries; climate change mitigation/adaptation; energy; health; social services; and rural development green infrastructure was not considered to be included, neither in legislation, or other policies. For the two other policy sectors listed in the survey, transportation and finance, GI-principles are not explicitly referred to.

Tools and incentives

On a national level, information about where protected areas are located in Spain were considered as often easily available by the respondent to the GRETA-questionnaire. Also, information on the environmental quality of these areas are considered as often easily available. This information, was stated to be used in spatial planning on regional and local levels. The respondent did not, however, refer to where this information could be found.

For incentives important for the development of GI in Spain, previous research acknowledges the network of ecological corridors in the Autonomous Community of Madrid, The Andalusia Network of Natural Protected Spaces (RENPA) and the 'Anela verda' in Barcelona (Andreucci, 2013; Sanesi et al., 2017). Sanesi et al. (2017, p.165) report that "*the 'Anela verda' in Barcelona includes a network of 12 protected areas located around the city, which are connected by ecological corridors*".

Challenges and opportunities

The respondent to the GRETA-questionnaire express that the main challenge for developing a green infrastructure in Spain, is the lack of political commitment. This challenge is also indicated elsewhere in Europe, and show that although georeferenced information on protected areas and their environmental qualities is provided on national levels, the decisions on where to invest in socio-economic developments (e.g. build new housing, commercial areas or industries) is not always based on this information. This mean that the spatial planning on municipal and city level does not always consider the strategically defined green infrastructure. Sometimes other interests are prioritised.

The respondent to the GRETA survey also state that a solution for further enhancement of GI in Spain would be to place more mandate on the regional planning level. This could indeed enhance the connectivity of green areas beyond municipal administrative boarders and territories, as the regional planning have a broader spatial perspective. Such a development must however be balanced with the possibilities for the public to be engaged in the processes of spatial planning. As reported by researchers such as Slätmo (2017) spatial planning and land use governance within Europe builds on the subsidiarity principle. This means that decision making should be as close to citizens as possible with respect to the capacity to conduct it satisfactorily. The principle as such aims to ensure participation and

acknowledgement of local contexts. However, on another scale of decision making, it is important to acknowledge that the sum of local decisions can be degrading for life supporting resources, such as green areas for biodiversity, climate change adaptation and mitigation, water and air regulations, and recreation.

Meta data

Responses: 1 (Public administrator at the Regional planning office in Madrid). The answer to the survey were received February 16th 2018.

Additional references

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30 Sweden

Policy Overview

As compliance to the EU Green Infrastructure Strategy, Sweden is developing its new national green infrastructure strategy during 2018. The Swedish Environmental Protection Agency (*in Swedish: Naturvårdsverket*) is coordinating the development of a new National Green Infrastructure Strategy, which corresponds to the EU Green Infrastructure Strategy recommendations. A main component of the national strategy will be regional Green Infrastructure Action Plans, which are being developed by each regional County Council together with local authorities (municipalities) and other actors. This process is expected to be completed in 2018. More information is available online on the website of the Swedish Environmental Protection Agency (2018a).

Although the process of implementing a governance structure is ongoing, legislation promoting sustainable land use and environmental care have been implemented in Sweden since 1999 when the Environmental Code was made in to jurisdictional force. The Environmental Code is explicitly referenced to in the Plan and Building Act, meaning for instanced that tools such as EIA and SIA must be used for any new development and/or plan. Both the Environmental Code and in the Plan and Building Act refers to the public interest that must be considered in any new development, some of which is well in line with the concept of Ecosystem services. More information is available online on the website of the Swedish National Board of Housing, Planning and Building (2018a;2018b)

Governance and decision-making

In Sweden, local authorities (municipalities) have the main responsibility for spatial planning. In line with this, there is a clear multilevel governance perspective that structures GI policy development and implementation in Sweden. This corresponds to overall strategic guidance provided by the European Union on one hand and the strong role of municipalities as the main institutions responsible for planning and implementing GI related actions on the other hand.

In terms of *developing* green infrastructure policy and strategy the three respondents show both shared opinions and differing perspectives. All three respondents agree that research, NGO's and the business community do not have main responsibilities that contribute to policy or strategy development. Two of the respondents (coming from individuals working with national agencies) prioritize policy development responsibility in a top down manner – from the European or national level down to the municipal level. The one respondent working for a municipal institution responded by indicating bottom-up perspective – with municipalities having the main role, followed by regions, the national scale and then European institutions. This likely relates to the fact that alongside national strategies and regional action plans, green infrastructure strategies related to planning land use development are a common feature of municipal intervention. Thus, "responsibility for policy development" is a matter of interpretation

over the role and influence of national strategies vis-à-vis the role local green infrastructure policy and implementation.

The multilevel governance perspective in terms of GI *implementation* is quite clear based on the three responses. Again, one respondent feels that the bottom-up perspective is crucial in this regard, while another respondent places the main responsibility with the national scale, followed by regions and municipalities. Again, this is likely due to differing interpretations for what specific activities comprise policy implementation. For example, policy financing, monitoring, evaluation, and revision may entail a top-down perspective, while action plans and implementation of GI related projects emanate from local and regional scales. Interestingly, one respondent agrees with the top-down perspective, and highlights the importance of European policy. This likely points to the overall structure where the EU Green Infrastructure Strategy is a core influence for the development of a national GI framework, which in turn supports the development of regional action plans and ultimately promotes local project investment.

Key Sectors

Based on their own expertise, each of the three respondents reacted on whether green infrastructure principles are included in national policy and/or legislation across key sectors. The results must be treated as being based on the experiences and subjective opinions of the individual responses. Nevertheless, it is clear that Green Infrastructure is explicitly included within national environmental protection policy, and it is likely that it is also explicitly referenced within policies for land use and spatial development; transportation; water management; agriculture, forestry and fisheries; climate change mitigation/adaptation; health and rural development. GI principles are likely to be less prevalent or well understood within the finance, disaster prevention, energy, cultural heritage and social services sectors.

Tools and incentives

On a national level, it appears that GI information platforms are quite well developed. Information about the location protected areas is viewed as always or often easily available, and information about environmental quality in protected areas is available. For example, the Swedish Environmental Protection Agency provide two different web portals over the protected areas and national parks in Sweden (2018b; 2018c). Also, other institutional bodies provide open access map layers over land patterns and land use. Two of the three respondents stated that this information is always or often used regarding spatial development at the local or regional levels.

Instruments for calculating the biotope area factor are also included in some local authorities (municipal) plans as innovative ways of calculating GI requirements for new developments. The National board of housing, building and planning (Boverket) recently published a web-based guidance on how to integrate ecosystem services in planning and building processes where different models for calculating biotope area factors are mentioned as one example. While there

are no direct financial incentives for implementing GI projects, regional governments receive national funding for the development of their GI action plans.

Challenges and opportunities

Another practical challenge relates to the conceptual perspective of green infrastructure. While GI needs to be seen as a "political" or communicative concept rather than a scientific one, in order to be operative, there needs to be improved practical understandings of how to acknowledge the GI component of various policies, strategies, plans and projects. Accounting for green infrastructure policy strategy and especially actions is thus challenging because many actors work with different elements of green infrastructure, but not always under GI explicitly.

The main opportunity ahead is the fact that all regional governments are currently working to develop their action plans for Green Infrastructure (during 2018), which will be a part of the national strategy. While these plans have involved dialogue with municipalities and businesses/NGO's/people that have effect on the landscape in hearing processes, the coming challenge ahead will be about funding and coordinating the implementation of the proposed actions at the local municipal planning levels.

Meta data

Responses: 3 (Senior Scientific Officer at the Swedish Environmental Protection Agency, Senior Advisor responsible for biodiversity at the Swedish Transportation Agency and a landscape architect at Malmo Municipality). The answers to the questionnaire were received between January 26th and February 13th 2018.

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31 Switzerland

Policy Overview

According to the respondent to the GRETA-survey, strategies and policies for green infrastructure (GI) is included in the Swiss Biodiversity Strategy (2017). This despite, Switzerland is not an EU-member, and therefore not forced to adapt to European policies and regulations, such as the European Bird and Habitat directive, the accompanying Natura 2000 network, and the Mapping and Assessment of Ecosystems and their Services (MAES). Among the strategic goals of the Swiss Biodiversity Strategy is to develop an ecological infrastructure. The first phase of the strategy and its goals is being implemented 2017-2023. For implementation 4 immediate measures, 9 synergetic measures and 6 pilot projects are prioritised (Swiss Biodiversity Strategy 2017).

As a non-EU-member state Switzerland do not utilize European funding for implementation of GI. The respondent to the GRETA-questionnaire however state that there are several instruments of the Swiss agricultural policy that aim at promoting biodiversity.

Governance and decision-making

In terms of *developing* GI policy and strategy the main responsibility is on national policy and stakeholders, followed by regional policy and stakeholders. Also, based on the survey results, researchers and NGOs are considered to be third and fourth most important for developing GI policy and strategy in Switzerland. Among the other actors listed in the survey, the policy and stakeholders on municipal and European levels were considered as having some responsibility, while the business community were considered as having the least responsibility for developing GI-policy and strategy.

Regional policy and stakeholders have the main responsibility for *implementing* GI in Switzerland. Followed by national policy and stakeholders and actors within NGOs. The policy and stakeholders on European levels and municipal levels were considered fourth and fifth most important. Further, actors within research and in the business community are also considered as having or taking on responsibility for implementing GI in Switzerland.

Key Sectors

The respondent to the GRETA-questionnaire from Switzerland considered GI to be included within policy sectors of land use and spatial development; transportation; water management; agriculture, forestry and fisheries; climate change mitigation/adaptation; environmental protection; disaster prevention; finance; energy; cultural heritage; and rural development. Moreover, it is likely GI is not explicitly referenced within policies for health; and social services.

Tools and incentives

On a national level, georeferenced information platforms for GI seems well developed. Information about the location of protected areas is always easily available at an online platform provided by Schweizerische Eidgenossenschaft (2018). Information on environmental quality

in protected areas (e.g. biodiversity rates, ecosystem services and/or other quality measures) are also considered to be always easily available according to the respondent to the survey. More specifically, the monitoring program "Monitoring the effectiveness of habitat conservation in Switzerland" is especially designed to follow the biological quality of the biotopes of national importance (WSL and FOEN, 2018).

The provided information is stated to be always used in decision making processes regarding spatial development on regional and local levels. The respondent to the GRETA-survey express that the protection of the biotopes of national importance is legally binding for land owners, whether public or private.

In addition to the above-referred structural integration of GI, previous research acknowledges the 'Green Roofs of Basel' as a project based GI-incentive in urban areas. Andreucci (2013, p.419) state that this initiative is "*funded from an Energy Saving Fund and emphasizes energy-saving benefits. The interesting aspect is that it also delivers key co-benefits such as overall micro-climate regulation, better rainwater runoff management and some biodiversity benefits, leading the assessment of the initiative to conclude to a positive cost-benefit ratio*".

Challenges and opportunities

The respondent to the GRETA-questionnaire did not express any specific challenges with the continuous GI-implementation in Switzerland.

Meta data

Responses: 1 (Scientific collaborator at Federal Office for the Environment, FOEN). The answers to the questionnaire were received March 13th,2018.

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32 United Kingdom

Policy Overview

There is no overarching framework for Green Infrastructure (GI) in the United Kingdom (UK), but each of the four countries has their own GI related policy plans. These are strategies and policies for preservation of biodiversity, environmental or marine plans. The UK strategies are especially directed to GI in urban contexts. This way of including GI principles into existing strategies, policies and legislation, is in line with the EU strategy on GI (EC, 2013, p.10), as it expresses that GI-principles can be implemented by using the existing policy and financial instruments.

The Department for Communities and Local Government in England, and its devolved administrations in Wales, Scotland and Northern Ireland are responsible for spatial and land-use planning policies. They have developed National or Regional Planning Policy Frameworks which guide the long-term spatial planning and how these are expected to be applied in decisions regarding land and water use. The National Planning Policy Framework (NPPF) for England address GI related measures under four separate objectives. In this plan protected green areas and local green spaces are acknowledged as a ground for healthy communities.

GI principles are also included in the policy of Green Belt land e.g. to prevent urban sprawl. This policy has been in place since after the second world war, and mean that green areas in a ring around several of the cities should be preserved. The Green Belt policy is in place to meet the challenges of climate change, flooding and coastal change, for urban citizens to have easy access to parks and other recreational areas, and to conserve and enhance the natural environment. In order to achieve this latter objective, the NPPF addresses that the planning system should "*minimise the impacts on biodiversity and provide net gains in biodiversity where possible, contribute to the Government's commitment to halt the overall decline in biodiversity and establish coherent ecological networks that are more resilient to current and future pressures*". (NPPF, 2012, p.26-27)

In addition, the document "National Policy Statement for National Networks" acknowledges the GI and Green Belts and their multifunctional benefits to climate change adaptation and land use management (Department for Transport, 2014).

The National Biodiversity Plans and Strategies as well as all EU nature conservation directives are coordinated by the Department for Environment, Food and Rural Affairs (DEFRA) and its devolved administrations (BISE, 2018). UK National Ecosystem Assessment 2012, which is related to the EU wide initiative on Mapping and Assessment of Ecosystem and their Services (MAES) has also been a GI related policy process in UK (MAES, 2018).

It is worth noting that the term of green infrastructure in UK might sometimes be used with more broader meaning than how it is described within the GRETA project. As described above, the term has been used for several years in UK's spatial planning system by applying it to the housing and economic growth agendas. In this context it gives significantly lower priority to

biodiversity and ecological coherence than the GI concept as described by the EC (Andreucci, 2013).

Regarding funding for implementation of GI in UK, the respondent to the GRETA-questionnaire, states that the European Regional Development Funds (ERDF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development and LIFE+ and Horizon 2020 project funds from the European Union are very important.

Governance and decision-making

Based on the results from the GRETA questionnaire, the responsibility for *developing* and *implementing* the GI policy and strategy lies foremost at the national governance level. European policy followed by regional policy were considered to have the second and the third most important role on developing and implementing GI policy. NGOs role is considered the fourth and municipal policies the fifth most important for *development* of GI policy. For *implementing* the GI policy, the relevance of these governance levels is seen the other way around. Actors within research and business community are seen with the least importance for developing and implementing the GI policies in UK.

Besides this multilevel governance perspective that structures the GI policy, there is also an alliance of leaders from business, politics and civil society that drives actions for sustainable economy in the UK. This alliance has published a policy proposal for Green Finance, to increase private investments in green infrastructure. Within the document, investments in GI are regarded as an opportunity to reduce the costs of meeting the UK's strategic and environmental policy objectives, secure more jobs and gain more economic growth (Aldersgate group, 2018). However, somewhat different definition on green infrastructure is also used here by considering investments on low carbon building or energy generation within the concept.

Key Sectors

Based on the results from the questionnaire, GI-principles are included within sectors of land use and spatial development plans, transportation; water management; agriculture, forestry and fisheries; climate change mitigation and adaptation; environmental protection; disaster prevention; finance; energy cultural heritage; health; social services and rural development.

Tools and incentives

On a national level in UK, information on protected area's locations, other nature areas and land use, as well as the information on environmental quality of these areas, are considered as always easily available. This kind of information is provided by the Environment Agency (EA, 2018). However, it is not clear from the survey results how this information is used in spatial planning on regional and local levels.

The spatial information and GIS data for e.g. National Parks, Marine Conservation Zones or Special Protected Areas are provided on-line through the government's webpage (GOV.UK, 2018) or each country's own map services (e.g. England map service, (Magic, 2018)). In turn,

various other GI related GIS based tools are also available according to BISE (2018). They are designed for habitat network assessment and mapping.

Challenges and opportunities

The respondent to the GRETA survey did not address any specific opportunities or challenges for GI related issues in UK. However, BISE (2018) address for instance funding as a challenge but widespread public support and understanding of the importance of GI as opportunities ahead.

Because of UK's wider perspective to perceive the term of green infrastructure it is also not so clear to distinguish which national policy tools are exactly directing policy makers or planners into the physical development of green areas or their connectivity and which are steering more in general towards green transition, e.g. low carbon, resource efficient or eco-friendly society (e.g. suggested tools within the report of Aldesgate group, 2018). Because of UK's and the respondent's broader GI perception, the results from GRETA survey points out policy tools that were considered to be too far from GRETA projects definition on GI. This for instance measures for enhancing energy efficacy in firms and other types of organisations.

Metadata

Responses: 1 (Senior Executive Officer in ERDF Managing Authority for England, Department for Communities and Local Government). The answers to the questionnaire were received April 6, 2018.

Additional references

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Annex IV-C Method and criteria for good practice examples

Several previous studies have indicated good practice examples for Green Infrastructure (GI) (Andreucci 2013, EC, DG Environment - Directorate B and the European Environment Agency, 2018; EC, 2016; Zinko et al. 2018). These studies imply that a good practice is related to a well-defined project and that the project is explicitly addressing GI, however, they do not provide the specific criteria used to select good practice examples.

The aim of the 25 GRETA good practice examples is to build upon this work by identifying good practice examples that facilitate the design and implementation of GI across a range of territorial scales and in relation to multiple different sectors/issues. This aims to broaden the scope of the criteria to include not only project based good practices, but to highlight the diverse nature in which GI can be implemented. More specifically, the good practice examples will focus on identifying successes in GI implementation that have taken place at the regional or local scale, particularly those that harness functional territorial perspectives, such as city-regions, cross-border regions, macro-regions, and regions with territorial specificities. The good practice examples will also seek to describe how modern tools, policies and processes for implementing GI development are used by local or regional planning authorities, and how local and regional governments liaise with private sector actors and local stakeholders for successful GI implementation.

Four criteria for choosing good practice examples for GI have been formulated using an iterative research process (e.g. abduction). This means that the criteria are based on previous studies, planning and governance theory and the empirical data collected for the national fact sheets in the GRETA project.

The criteria for identifying good practice GI examples include:

1. Legitimising multi-level and functional governance structures; or
2. Innovative policy solutions or tools; or
3. Economic good practices; or
4. Daily management practices, and projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas.

When analysing and choosing the initiatives to include as good practice examples, the aim was to have the best geographic coverage of ESPON countries as possible. Therefore, the good practices were identified from a questionnaire sent out to 32 European countries, and case study-based work within the GRETA-project.

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Annex IV-D Good practice examples for GI

The GRETA analysis of policy and planning for GI and ES in Europe have identified that spatial planning tools used for including green infrastructure in territorial planning are diverse [13]. Official authorities best practice examples to implement GI are a wide range of tools, plans, programmes, nature parks, strategies, campaigns; as well as actor-networks and financing projects that monitors, establish and/or enhance the quality of the non-built up environment. In turn, both private actor initiatives and civil society organisations initiatives that are positive for GI are presented here. All the below good practices have a direct or indirect positive influence on green and blue infrastructure and they are transferable. This mean that they are possible to scale up or scale out to other contexts and countries.

Strategic good practices:

1. Creation of regional planning committees to show long-term political leadership for GI implementation (as in the Reykjavik capital area, Iceland) Regional
2. Implementing GI in urban spatial planning via four step national criteria legitimised in planning legislation and driven via bottom up approaches (as Hämeenlinna, Pori, Heinola, Hanko, Porvoo, Turku, Kotka, Forssa and Kuopio, Finland) Local & urban
3. Establishing cross-border cooperation's to make full use of the potentials that GI entails (as the EGTC Euroregion Nouvelle Aquitaina-Euskadi-Navarre, France and Spain) Regional
4. Implementing GI through a focus on recreation and health to ensure cross-border territorial planning (as the cross-border Greater Copenhagen and Skåne committee, Sweden and Denmark) Regional
5. Developing regionally adapted methods to ensure integration of Ecosystem Services in spatial planning (as the Trnava region, Slovakia) Regional
6. Utilising green areas as a part of the tourism-based development (as the Alba Iulia Municipality, Romania) Local & urban
7. Using extreme rainproof solutions in the design of houses, gardens, streets, and parks (as the Waternet the Netherlands) Local & urban
8. Establishing long-term monitoring of biodiversity to develop current governance practices in a way that the physical network of green areas can be preserved, and the biodiversity quality maintained (as WSL and FOEN, in Switzerland) Member state
9. Setting strict targets for climate-smart investments to ensure reaching the Paris agreement on Climate change adaptation and mitigation (as the European Fund for Strategic Investments, European union) European
10. Integrating GI for flexible and long term sustainable use of a purpose built urban area (as the London Olympics Park, in UK) Local & urban

[13] For method and criteria for choosing good practice examples see Annex A (below)

11. Enhancing the quality and quantity of green space through Biodiversity plans with strict targets of improvements (as the city council of Lisbon, in Portugal) Local & urban
12. Considering landscape connectivity as a critical target for management of Natura 2000 network (as the “Ecological corridor for habitats and species in Romania”-project) Regional
13. Using strong visionary leadership to implement GI in times of sustainable urban transformation (as the public authority in Ljubljana, Slovenia) Local & urban
14. Reducing heat-related risks and adapt to climate change by implementing nature-based solutions (as the Benicalap-Ciutat Fallera district in Valencia, Spain) Local & urban

Detailed good practices:

15. Securing inhabitants´ access to outdoor recreation areas by setting targets for accessibility in spatial planning (as the municipality in Oslo, Norway) Local & urban
16. Changing regularly information on nature conservation cross state borders and promote green areas locally through a festival (as in the cross-border region North Livonia, Estonia and Latvia) Regional
17. Restoring and enhance high-quality wetland environments with financing from lottery grant (as the Seven Lochs Wetland Park, Scotland) Regional
18. Developing a freely available decision support software tool for biodiversity and ecologically based land use planning that includes economic analysis options (as the ‘Zonation’, in Finland) Member state
19. Decreasing the risk of flooding and polluting drink water by compensating private property owners for investing in water management (as in Copenhagen, Denmark) Local & urban
20. Integrating a Green space factor as part of planning and building practices. For every surface that a developer wants to seal with buildings, asphalt or concrete, they will need to compensate this with something else being green or blue (as the local planning authority in Malmö, Sweden) Local & urban
21. Increasing water availability in a cost-effective way through rainwater harvesting, storm water management and greywater reuse systems (as The Alter Aqua Programme, in Malta) Member state
22. Implementing green roof constructions adapted for Mediterranean environments (as the University of Malta, Malta) Local & urban
23. Restoring former golf courses and create new multifunctional open spaces in close proximity to housing areas (as the Honey park in Dún Laoghaire-Rathdown, Republic of Ireland) Regional
24. Increasing the number of green roofs and green walls constructions and reach a more sustainable rainwater management (as the Municipality Bratislava Karlova Ves, Slovakia) Local & urban

25. Protecting biodiversity by reconnecting fragmented habitats and decrease barrier-effects for mammals and amphibians by implementing wild-life crossings (as the Goois Natuurreservaat Foundation, in Netherlands) Regional

Good Practice Example 1: Regional perspectives to develop the Icelandic capital area with consideration to green infrastructure	SAMTÖK SVEITARFÉLAGA Á HÖFUÐBORGARSVÆÐINU	**Country:** Iceland
Who: The Regional Planning Committee of the Capital Region the Samtök sveitarfélaga á höfuðborgarsvæðinu (SSH), together with the local authorities of the municipalities Garðabæjar, Hafnarfjörðkaupstaður, Kjósarhreppur, Kópavogsbær, Mosfellsbær, Reykjavík City and Seltjarnarnesbæjar		**Year of implementation:** 2014
Link: Practice example identified in the GRETA questionnaire http://www.ssh.is/svaedisskipulag http://www.ssh.is/images/stories/Hofudborgarsvaedid_2040/HB2040-2015-07-01-WEB_Undirritad.pdf		
Characterised criteria: 1. Legitimising multi-level and functional governance structures		
Description: In March 2014 the Regional Planning Committee of the Capital Region in Iceland approved a proposal for a new regional structure of the capital area, namely the regional plan for the Capital area 2015-2040 (Svæðisskipulag höfuðborgarsvæðisins). This plan will be the anchor for future development. The plan is aiming to support the development of a high-quality transportation system, and a balanced extend of recreational, conservation and forestry and agriculture-based land areas. The plan is also trying to map more detailed knowledge about the outdoor uses of the public non-built up areas which can enable favourable development of connected hiking routes.		
Good Practice Elements: The plan of Reykjavik capital area shows political leadership for GI implementation with long-term goals. The plan is conducted together with regional planning committee and public participation.		

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X		X	X	X	X	X

Good Practise Example 2: **National Urban Parks Finland**	KANSALLINEN KAUPUNKIPUISTO	**Country:** Finland
Who: The Ministry of Environment together with the cities managing the parks		**Year of implementation:** 2000-2001
Link: Practice example identified in the GRETA case study work http://www.e-julkaisu.fi/hameenlinnan_kaupunki/national-urban-parks/mobile.html#pid=1 & http://www.ym.fi/fi-FI/Luonto/Luonnon_monimuotoisuus/Luonnonsuojelualueet/Kansalliset_kaupunkipuistot		
Characterised criteria: 1. Legitimising multi-level and functional governance structures		

Description: *The Finnish approach of National Urban Parks provides an example how conservation work for urban green infrastructure can be integrated into spatial planning policy in a consistent way. NUPs are established to preserve the beauty of a cultural and natural landscape and to maintain the ecological corridors, biodiversity, cultural and natural heritage in urban areas. The park must be a solid natural space with connections also to the neighbouring agricultural and forest land. Finnish Ministry for Environment coordinates the establishment process.*

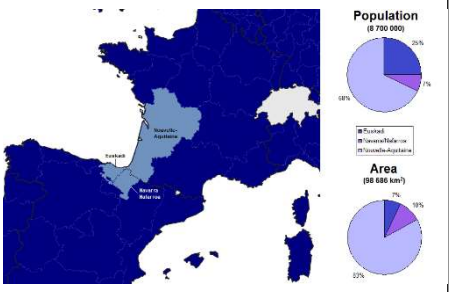
The ministry has the criteria for the potential NUPs: First, the park must contain natural areas with valuable biodiversity, cultural elements relevant to the history of the city and parks and green areas with architectural or aesthetic significance. Second, the park should cover an area big enough to walk from one part of town to another through the park. Third, the park should function as an ecological corridor allowing species to access and interact with green and blue nature areas outside the city. Finally, the park should be located in the city centre or the immediate surrounding area. The Finnish Land Use and Building Act chapter 9 includes legislation for establishing the NUPs.

At the moment, there are nine Finnish cities who have implemented National Urban Park. (Hämeenlinna, Pori, Heinola, Hanko, Porvoo, Turku, Kotka, Forssa and Kuopio) All of the nine cities are committed to the park's action plans that are prepared in consultative cooperation with the Ministry of the Environment.

Good Practise Elements: Well-established national planning instrument which is integrated into spatial planning policy in a consistent way.

Good Practise Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X	X	X	X		X	

Good Practise Example 3: European grouping of territorial cooperation (EGTC) Euroregion Nouvelle Aquitaine- Euskadi-Navarre LLET Akitania-Euskadi-Nafarroa Euroeskualdea AECT Eurorregión Aquitania-Euskadi-Navarra GECT Eurorégion Aquitaine-Euskadi-Navarre		**Country:** France and Spain
Who: Regional Governments of Nouvelle Aquitaine, Basque Country and Navarre		**Year of implementation:** 2006
Link: Practice example identified in the GRETA case study stakeholder consultation http://www.naen.eu/en/		
Characterised criteria: 1. Legitimising multi-level and functional governance structures		

Description: The Euroregion Nouvelle Aquitaina-Euskadi[14]-Navarre is a cross-border area, with over a 100 000 km² and a population of 8,5 million inhabitants. In the region, institutions particularly from Aquitaine and Euskadi have been engaged in cooperative partnerships for more than 20 years. The primary objectives of the European Grouping for Territorial Cooperation (EGCT) are:

- To foster a comprehensive, multi-faceted approach to cooperation
- To develop territorial cooperation in a European context
- To enhance the visibility of the 3 regions at a European level

Concretely, the EGCT can attract and manage European funding and, where appropriate, act as project commissioner on development programmes launched as part of this initiative. The EGCT will work constantly to attract further European funding for projects created by institutions and organisations from the Euroregion.

A Strategic Plan was approved for the period 2014-2020 which contains the Axes and Lines of Action where the activity of the Euroregion is framed. http://www.aquitaine-euskadi.eu/es/strategie/plan-strategique-2014-2020.The Euroergion is an example of shared governance and a democratic process which aims to foster citizenship and local involvement. The EGCT will work to get local elected officials on board, calling upon the expertise of key socio-professional players represented by means of consultation groups established in both regions.

Good Practise Elements: Example of long term cross border cooperation with extraordinary potential for integrating GI in their work for territorial development. This especially in the regions' maritime basins, its coastal and mountainous areas where transnational cooperation

[14] Euskadi is the name of the Basque Country región in basque language. In this document we will use Basque Country Region and Euskadi to refer to this territory.

and further action to promote GI could be well in line with green growth, enhanced employment rates and ecosystem-based management.

Good Practise Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X	X	X	X	X	X	X

Good Practice Example 4: The Greater Copenhagen and Skåne Committee cross border cooperation	GREATER COPENHAGEN	**Country:** Denmark & Sweden
Who: The Greater Copenhagen and Skåne Committee		**Year of implementation:** 2000

Link: Practice example identified in the GRETA case study
http://www.greatercph.com/about

Characterised criteria: 1. Legitimising multi-level and functional governance structures

Description: In the border area of Sweden and Denmark there is a cross-border cooperation committee working with cross-border solutions for the Greater Copenhagen and Scania region since 2000. The Greater Copenhagen and Skåne Committee is the formal political cooperation between the 79 municipalities and 3 regions of the Öresund region. The aim of the Greater Copenhagen and Skåne Committee is *to eliminate the cross-border barriers that prevent economic growth and business development in the region – trying to connect people across countries and cultures.*

The focus of the cross-border committee is mainly on solving work-related issues for people living in one country but working in the other, such as mobility, taxes and pensions. It also entails collaborations for enhanced exchange in innovation, trade, education, culture, sports and leisure time activities. Projects dealing with food production, research (ESS), life science, tourism, branding, investments, lighting and infrastructure.

It would be a natural opportunity to extend the cross-border cooperation by including green infrastructure as a natural tool to make the region even more integrated. This to ensure one of the committees stated cooperation goals; enhanced exchange in leisure time activities. Although there are different jurisdictions for spatial planning, in Denmark a formal top-down

approach (in this part of the country) and in Sweden a formal bottom-up approach, such collaborations would certainly enhance the possibilities for the inhabitants' possibilities to access and use the green and blue areas.

In the Danish part of the region the green infrastructure is called green wedges and in the Swedish part green structures. Despite the different names and jurisdictions due to the different countries, the motivations for ensuring green infrastructure via spatial planning is very similar. It is acknowledged that GI is multifunctional, but the social focus on recreation enable a basis for spatial planning beyond municipal, regional and state territories.

Good Practice Elements: The well-established cross border committee The Greater Copenhagen and Skåne Committee have a great potential to include green infrastructure in its further work. This to meet one of the stated goals for the cooperation: enhanced exchange in leisure time activities.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
				X	X	X	X	X

Good Practice Example 5: Landscape-ecological planning in urban and peri-urban area in Trnava		**Country:** Slovakia
Who: Institute of Landscape Ecology SAS, Bratislava Constantine the Philosopher University		**Year of implementation :** From 2010 onwards

Link: Practice example identified in GRETA case study

http://www.openness-project.eu/node/36

https://www.researchgate.net/publication/308889284_Trnava_Slovakia_Example_of_OpenNESS_project_Urban_Study

Characterised criteria: 2. Innovative policy solutions or tools

Description: The Trnava Region is located almost in the geographical center of Europe and has a common border with three states – the Czech Republic, Austria in the north and Hungary in the south– which creates favorable conditions for developing cross-border cooperation. The Morava marks the border with the Czech Republic and Austria, while the Danube forms the border with Hungary in the south. It shares a border with the Bratislava, Nitra and Trenčín regions. The Trnava Region is very active in the analysis of ES- being involved in FPVII EC research projects such as Openness Project Operationalization of Natural Capital and Ecosystem Services. It has developed and tested usable methods for valuation of selected ecosystem services at the local and regional level and promoted their incorporation into the spatial planning process and in the broader decision-making process in Slovakia.

Impacts/benefits:

- Review of key national regulatory frameworks, planning and strategic documents in the research area
- Test several approaches of Ecosystem Services assessment, development of new methods contributing to spatial and urban planning
- Regularly organized meetings, active work with stakeholders, raised public awareness
- Positive feedback from the potential users of new methods.
- Policy recommendations and actions to be implemented by local authorities, regional authority, partly also by Ministry of Environment.

Good Practice Elements: The Trnava case is a good example of how the collaboration and broad discussion between researchers and planners working in particular projects could lead to an effective knowledge-based decision making.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X		X	X	X		X	

Good Practise Example 6: **The integrated strategy for urban development in Alba Iulia Municipality**		**Country:** Romania
Who: Alba Iulia Municipality		**Year of implementation:** 2014- 2020
Link: Practice example identified in the GRETA case study http://urbact.eu/alba-iulia-3 and https://albaiuliasmartcity.ro		
Characterised criteria: 2. Innovative policy solutions or tools		

Description: Alba Iulia municipality is considered a pioneer and pro-active city in terms of integrated urban development in the Romanian context. Between the year 2007 and 2013, the municipality implemented a Plan for Integrated Urban Development, which has delivered important outputs and results. The municipality rehabilitated the largest citadel in Romania (18th century Vauban fortification). Alba Iulia is today considered a city for the people where tourism and culture are the long-term development triggers.

In later years, the municipality has developed an Integrated Strategy for Urban Development for the period 2014-2023, towards a more attractive place for living, working, investing and visiting. It has a double aim i) making Alba Iulia a green, smart, cohesive, inclusive and competitive city. ii) getting the tourism-based development of the city to the next level. The aims provide also an opportunity for the implementation of Green Infrastructure and Nature-based Solutions in a more comprehensive way.

One concrete example of how Green Infrastructure have been integrated with the urban development strategy is the park, Arboretum. Located in the middle of a city forest, on the Mamut Hill the Arboretum is covering 21 hectares. The park has more than 1200 species of birds. After the establishment of the park in 2001 the chemical treatments of the plantations have been eliminated. Also, in the park you will discover, on a winding trail, an alley 140 meters long. The trail is made out of cones, quartz, hay, straw, sand, wooden rods, bamboo sticks, river stones, oak leaves, hornbeam seeds. It is the place where you can stroll barefoot as a free therapeutic massage. Inside the park there is a museum that hosts wood collections.

Good Practise Elements: The Integrated Strategy for Urban Development represents an opportunity for the implementation of Green Infrastructure and Nature-based Solutions in a comprehensive way. The case also exemplifies how Green Infrastructure could become in itself a booster for territorial development associated to recreation, mobility and tourism the long-term development triggers.

Good Practise Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X			X	X		X	

Good Practice Example 7: Stimulating policies for green infrastructure in Amsterdam	waternet waterschap amstel gooi en vecht gemeente amsterdam	**Country:** The Netherlands
Who: A water company – Waternet – took the initiative to start the platform Amsterdam Rainproof, which is a network of organisations with a core team of five to ten people.		**Year of implementation:** 2014

Link: Good practice example identified in the GRETA case study, suggested by a stakeholder during Consultation B

https://www.rainproof.nl/

https://amsterdamsmartcity.com/projects/amsterdam-rainproof

https://urbanland.uli.org/industry-sectors/infrastructure-transit/every-drop-counts-making-amsterdam-rainproof/

Characterised criteria: 2. Innovative policy solutions or tools

Description: A water company (Waternet) established the Amsterdam Rainproof platform to help address flooding from rainwater due to grey infrastructure development (impermeable buildings and pavement) and encourages people to consider the possibility of extreme rainfall in the design of houses, gardens, streets, and parks. There was a need to design outdoor urban green spaces where rain could be retained and stored. "*The platform Amsterdam Rainproof collects and connects solutions, products and initiatives. Rainproof is a movement of citizens, public servants and entrepreneurs. We put the issue on the agenda of politicians and residents. Together we create a more resilient city for dealing with extreme rainfall.*" https://amsterdamsmartcity.com/projects/amsterdam-rainproof

The concept of 'polder roofs' was introduced by a group of social entrepreneurs who call themselves De Dakdokters ('the Roof Doctors'). The 'polder roof' is the ideal foundation for green roofs, roof gardens, and green roof parks. https://dakdokters.nl/en/polder-roofs/

Good Practice Elements: Collaborative approach helps to build adaptive capacity among citizens and other public and private sector stakeholders. Small scale local green infrastructure.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
		X					X	

Good Practice Example 8: Monitoring the Effectiveness of Habitat Conservation

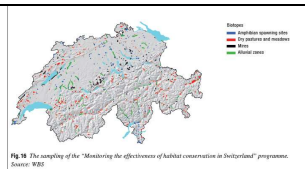


Fig.16 *The sampling of the "Monitoring the effectiveness of habitat conservation in Switzerland" programme. Source: WSL*

Country: Switzerland

Who: Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) and Federal Office for the Environment (FOEN)

Year of implementation: 2011

Link: Practice example identified in the GRETA questionnaire https://www.wsl.ch/en/microsites/monitoring-the-effectiveness-of-habitat-conservation-in-switzerland.html.

Characterised as criteria: 2. Innovative policy solutions or tools

Description: The Effectiveness of Habitat Conservation in Switzerland is a monitoring program that records biodiversity data. Established in 2011, the program is currently (2018) in the first year of the second data collecting cycle.

The programme is a part of developing current governance practices in a way that GI can be preserved more systematically in Switzerland. Among other activities, the Confederation have adopted four monitoring programmes that are specifically focused on Switzerland's biodiversity. One of these programmes are the long-term monitoring of biodiversity in areas with the formal status and zoned as 'nationally important habitats'.

This program examines whether the alluvial zones, mires (fens and raised bogs), amphibian spawning sites and dry meadows and pastures are changing in line with their protection goals and whether their area and quality are preserved according to set goals and management plans.

The process used to record the vegetation in the various types of biotopes is the same one used for areas that do not have the national important habitats status, which makes it possible

to compare changes in landscapes with no protection status with those in the biotopes of national importance.

Good Practice Elements: Establishing long-term monitoring of biodiversity is a part of developing current governance practices in a way that the physical network of GI can be preserved, and the biodiversity quality maintained.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X			X					

Good Practice Example 9: The European Fund for Strategic Investments (EFSI), 40% target for climate-smart investments

Country: EU

Who: The European Fund for Strategic Investments

Year of implementation: 2017

Links: http://www.eib.org/en/efsi/efsi-projects/index.htm?c=&se=6
https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan-europe-juncker-plan/european-fund-strategic-investments-efsi_en
IRISH WATER 2015-2018 - ERVIA http://www.eib.org/en/projects/pipelines/pipeline/20150224

Characterised criteria: 3 Economic good practice

Description: In March 2018, the European Commission (2018) launched an Action Plan on Financing Sustainable Growth. This Action Plan sets out a road map to achieve the commitments set in the Paris Agreement on climate change and the UNs 2030 Agenda, both from 2015. The Action Plan states that investments needed to achieve the targets agreed in Paris is beyond the capacity if the public sector alone. This including a 40% cut in greenhouse gas emissions, around €180 billion of additional investments a year are needed.

The EU is providing public funds to attract more private investments. In particular, the extended and reinforced European Fund for Strategic Investments (EFSI 2.0), in force since 31 December 2017, proposes a 40% climate-smart investment target. Among the 71 Environment and resource efficiency projects that have been cofounded with money from the EFSI are projects that can be perceived as a good practice example for preserving and enhancing GI in terms of water quality. As an example, the ERVIA project in Ireland is funded by EFSI. Its total budget is 459 million Euro, of which 200 million EFSI funding. The project's aim is to enhance

water management, drinking water, sanitation and sewage with plans located in various parts of Ireland.
Good Practice Elements: The EFSI have a 40% climate-smart investment target.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
		X				X		

Good Practice Example 10: Olympics Parklands Green Infrastructure		**Country:** UK
Who: the Olympic Delivery Authority (ODA)		**Year of implementation:** 2012
Link: Practice example identified in the GRETA questionnaire http://www.queenelizabetholympicpark.co.uk/the-park/things-to-do and http://webarchive.nationalarchives.gov.uk/20180426101359/http://learninglegacy.independent.gov.uk/		
Characterised criteria: 4. Projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas.		
Description: When London won the bid to host the 2012 Olympic Games and Paralympic Games, the work started to transform the brown field area of east London's Lower Lea Valley into an Olympic Park. Plans to tackle the 'environmental, economic and social degradation' of the area had not proved deliverable in the past. In 2006, the Olympic Delivery Authority (ODA) developed two revised Olympic Park Masterplans that were used as planning documents and hands on tools by the many designers, contractors and operators working on the Park. By agreeing the final Masterplan at that early stage of the project, the ability to bear down on potential cost increases and to make future cost savings was significantly increased. The ODA overcame previously intractable physical barriers and reconnected the site to the surrounding city. All though the Masterplans envisioned the Olympic Games to showcase London, wherever practicable the ODA prioritised to deliver long-term benefits after the 2012 Games. This through a masterplan flexible enough to function as a framework for a future, low-carbon community. Some of the recommendations from implementing the vision of a Masterplan are to "Think in a creative, pragmatic and delivery conscious, way to realise masterplan aspirations" and to "Future-proof the capacity and location of utilities, transport, movement and green space infrastructure in the first phase to deliver a high quality and sustainable long-term development		

platform". Currently, the 2.5 km^2 park is full of opportunities for activity, but visitors can also escape the hustle of urban living through the green open spaces and its tranquil waterways.

Good Practice Elements: The London Olympics Park provides a valuable and high-profile example of how to design a green infrastructure within a dense and complex urban area. It also shows that effective green infrastructure delivery cannot be fully realised without a clear strategic framework and high-level political commitment.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X		X	X	X	X	X

Good Practice Example 11: Local action plan for Biodiversity Lisbon 2020

Country: Portugal

Year of implementation: 2017-2020

Who: Coordinated by City Council of Lisbon

Links: The good practice example was identified from the GRETA questionnaire results https://www.cbd.int/doc/nbsap/sbsap/pt-sbsap-lisbon-en.pdf and http://www.cm-lisboa.pt/

Characterised criteria: 4. Projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas.

Description: Through the Lisbon Biodiversity plan Lisbon has ambitious goal to increase the Urban Biodiversity by 20% until 2020. Lisbon was also pioneer in the concept of applying for an ecological landscape in the Master Plan, whose idea meanwhile was adopted in National legislation. The so called green plan is, since 2012, embedded in the Master Plan, pointing to a 20% increasing in green areas. In Lisbon, Biodiversity is thus a concept of performance for the green infrastructure that is being the land support for a holistic approach toward climate goals. It is the first municipal strategy on biodiversity in Portugal. The strategy lists main tasks which most of are related to increase the number of green spaces in the city and to is establish better connections, green corridors, between them.

The strategy and its implementation are expected to improve the knowledge, the awareness and the action in terms of Biodiversity which simultaneously means better environmental quality, more the green and blue infrastructure and more enhanced ecosystem services. Many of the planned and ongoing actions follow a Convention on Biological Diversity (CBD) mechanisms, adopted at the 10th Conference of the Parties to the CBD the Action Plan for Cities. Good dialogue, social involvement and better management practices were identified as the key success factors for implementation of the strategy. The municipal Agency of Energy

and Environment and the Institute for Nature Conservation and Biodiversity and many other partners were involved at the initiative phase of the biodiversity plan.
Good Practice Elements: Forerunner for other municipalities in Portugal. Improves the knowledge and awareness of the GI benefits. Holistic approach with practical plans to enhance the quality and quantity of green space.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X		X	X	X	X	X

Good Practice Example 12: Mapping of ecological corridors		**Country:** Romania
Who: UniTBv - Universitatea "Transilvania" din Braşov, Universitatea Bucureşti / Centrul de Cercetare în Ecologie Sistemică, Ecodiversitate şi Sustenabilitate, National Institute for Research and Development in Forestry "Marin Drăcea", Fundația Carpați – Carpathian Wildlife Foundation, Asociația Zarand (ACDB)		**Year of implementation:** 2015-
Links: http://corehabs.ro/en/		
Characterised criteria: 4. Projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas.		
Description: The project called "Ecological corridor for habitats and species in Romania" (COREHABS) is a national level project in 2009-2014 with 1.1 M€ budget funded by the European Economic Space (SEE) 2009-2014. The project emerged from the identified need to foster the connection between Natura 2000 sites and interconnect them. By identifying the ecological corridors, the project is expecting to increase the benefits of GI to people and especially for the different populations of native species of flora and fauna. Its main approach from the beginning was to consider landscape connectivity as a critical target for management of Natura 2000 network. Its overall objective is to develop a system of methodologies necessary to establish ecological corridors at a national, regional and local level by identifying critical areas (mapping the network connectivity) in Romania in order to improve the scientific, technical and administrative set up for monitoring and long-term managing of the ecological corridors. One of the first lesson learned from the project is the necessity of considering critical areas for biodiversity in the spatial planning. The project has submitted a proposal for ecological corridors to be considered in legislation.		
Good Practice Elements: The project improves daily management practices with better knowledge about existing GI and clearer concepts and methodology to identify and enhance new areas for ecological connectivity.		

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X			X		X			X

Good Practice Example 13: Ljubljana Green Capital	City of Ljubljana	**Country:** Slovenia
Who: City of Ljubjana		**Year of implementation:** 2007-

Links: Practice example identified in the GRETA questionnaire
https://www.ljubljana.si/en/

Characterised criteria: 4. Projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas

Description: In 2007, the "Vision Ljubljana 2025" was introduced to turn the capital of Slovenia into a sustainable city, which means a city living in harmony with its natural environment. With the mission to ensure the best service for inhabitants and visitors, and persistently strengthening the quality of life for all. The territorial vision of Ljubljana was one of a green city without all car parks, a city that seamlessly entwines urban development with rural preservation and respects its intrinsic connection to the surrounding ecosystem and the environment.

Over 1700 projects and initiatives later, the fruits of the Mayors vision have dramatically transformed the entire landscape of the city. Former brownfield sites along the Sava River have been transformed into footpaths, cycle routes, horse-riding trails and cafés. Due to good conservation of the natural environment, around 20% of the land within the City of Ljubljana is protected with natural environment status (Natura 2000, ecological areas and protected areas). Ljubljana has around 542m^2 of public green areas per resident. One of the protected areas, the Tivoli, Rožnik and Šišenski Hrib Nature Park are located in the city centre. With more than 1.7 million visitors each year (2016) it is the most frequently visited green areas in Slovenia. The landscape is covered with natural forest and is home to numerous species that are important in terms of nature conservation and appear on the Red List of endangered species. In 2016, the Tivoli park got a new management plan important for e.g. preserving the environmental quality for the European threatened pond turtle (Emys orbicularis).

Good Practice Elements: As part of the public authority vision “Ljubljana Vision 2025” various projects were implemented to foster the green infrastructure within the urban transformation of the capital of Slovenia.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X	X	X	X	X	X	X

Good Practise Example 14: Nature Based Solutions for reducing heat stress and improve connectivity between green spaces in Benicalap-Ciutat Fallera district Grow Green | VALÈNCIA		**Country:** Spain
Who: City Council of Valencia, Las Naves, the Polytechnic University of Valencia, Paisaje Transversal, Bipolaire and Tecnalia.		**Year of implementation:** 2017-2022
Link: Practice example identified in the GRETA case study http://growgreenproject.eu/city-actions/frontrunnercities/		
Characterised criteria: 4. Projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas**.**		
Description: To reduce heat-related risks Valencia have implemented nature-based solutions at a demonstration project site in the Benicalap-Ciutat Fallera district. This to tackle the warm-temperate subtropical climate, with hot summers and little rainfall. Climate change analyses for the city suggest that increasing temperatures, extreme weather events, and decreasing rainfall are likely for the remainder of the century. The demonstration project in Valencia aims to reduce heat stress and improve connectivity between green spaces in the city, the coast, and the nearby rural landscapes. As part of the project, traditional urban gardens will be rehabilitated to create opportunities for sustainable urban agriculture, including production of local vegetables and fruit irrigated with recycled grey water. A small forest will be developed using native species to enhance biodiversity and ecological connectivity, as well as to manage storm water by temporarily storing runoff. Other actions will be taken using appropriate plant species to further improve the ecological connectivity and reduce heat stress.		
Good Practise Elements: Valencia applies, a multi-stakeholder and co-creation approach being applied for the identification of relevant urban challenges, co-design of interventions, co-monitoring of the effectiveness and performance of the co-design interventions, social awareness of the importance of greening the urban environment. The city foresees the development and implementation of a Nature- based Solution Strategy by 2022. The Valencia demonstration project will contribute to the evidence base of nature-based solutions in cities for cost-effective, replicable means of increasing urban climate and water resilience, social, environmental and economic benefits, to underpin the development of NBS policies and the global NBS market.		

Good Practise Example address the following functions								
Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X	X	X	X		X	X

Good Practice Example 15: Good access to recreational areas in Oslo due to local green blue structure planning	OSLO KOMMUNE	**Country:** Norway
Who: The local authority (municipality) Oslo		**Year:** 2016
Link: Practice example identified in the GRETA questionnaire Municipality of Oslo webpage https://www.oslo.kommune.no/politikk-og-administrasjon/statistikk/miljostatus/areal-og-friomrader/#gref		
Characterised criteria: 1. Legitimising multi-level and functional governance structures		
Description: The total area of Oslo is 454 km^2. Of this area, 300 km^2 is public non-built up land (Marka). In 2016, 98 % of the inhabitants living in Oslo have less than 300 meters to a green space from their house or apartment. Since 2006 this accessibility has increased. This is a result of politically anchored strategies for urban development, which means that the city has expanded in areas with good access to green space and that newly established housing areas have established new green areas in close proximity to the houses.		
Good Practice Elements: The access to green space for the urban inhabitants in Oslo have thanks to legitimising governance and planning been secured and even enhanced.		

Good Practice Example address the following functions								
Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
				X	X		X	

Good Practise Example 16: Wetland Protection and Rural Development in the Transboundary Area North Livonia		**Country:** Estonia & Latvia
Who: Nature Conservation Agency of Latvia Direct Responsibility for the maintenance of the Latvia Protected areas in the Latvian-Estonian border region		**Year of implementation:** 2006

Link: Practice example identified in the GRETA case study stakeholder consultation
http://www.digar.ee/arhiiv/en/books/11903

https://www.researchgate.net/publication/286342661_Master_Plan_for_North_Livonia-_Wetland_Protection_and_Rural_Development_in_the_Transboundary_Area_of_Latvia_and_Estonia

Characterised criteria: 1. Legitimising multi-level and functional governance structures

Description: The Master plan for North Livonia: Wetland protection and rural development in the transboundary area of Latvia and Estonia (2006) presents an analysis of main transboundary biodiversity management issues and provide directions for tuned development of Green Infrastructures of the transboundary area, including recommendations for main management sectors (Protected area management, Water management and hydrology, Forestry, Eco-tourism, Cultural Heritage, Game management and hunting, Agriculture, the Estonian Native Cattle etc.). Part of above mentioned segments are included in sector policies and planning documents of respective countries. Cultural and economic cooperation and area promotion through the cross-border festival “Wetlivonia” Salacgrīva(LV)/ Häädemeeste (EE) is organized by the respective border municipalities.

Interconnected network of wetlands, woodlands, waterways and their respective wildlife habitats is embedded in: a) separately protected area complex on Latvian and Estonian border areas, which includes Nature reserves and Biosphere Reserve and are b) consequently, united in transboundary protected area officially acknowledged as the fifth transboundary RAMSAR site in the World.

Good Practice Elements: Regular exchange of information on current and foreseen activities undertaken between Nature Conservation authorities of both countries.

Additionally, a Representative Group of the Republic of Latvia for the Intergovernmental Commission of the Republic of Latvia and the Republic of Estonia for the Promotion of Cross-Border Cooperation is established (CM Regulation No 461, 2017) representing border municipality interests. The Wetlivonia festival is ensuring the cross-border activities in a festive manner.

Good Practice Example address the following functions								
Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X				X			

Good Practice Example 17: Seven Lochs Wetland Park, Central Scotland Green Network		**Country:** Scotland
Who: The Seven Lochs Partnership members: Glasgow City Council; North Lanarkshire Council; Glenboig Development Trust; Provan Hall Community Management Trust; The Conservation Volunteers Scotland; Forestry Commission Scotland; and Scottish Natural Heritage.		**Year of implementation:** 2016 (establishment of the Seven Lochs Partnership)
Link: Practice example identified in the GRETA case study by a stakeholder during Consultation C. http://sevenlochs.org/ Vision and masterplan: https://issuu.com/gcvgreennetworkpartnership/docs/120815145940-b9e507d9d9614bb4bc64dbc593e1b47e		
Characterised criteria: 2. Innovative policy solution		
Description: At over 16km^2, it is Scotland's largest urban heritage and nature park. The Seven Lochs Wetland Park vision is a new park of national significance that sustains and enhances a high-quality wetland environment that: (i) protects and enhances biodiversity; (ii) promotes health and well-being; and (iii) contributes to environmental, economic, and social regeneration. "*A 5 year, £6.8million work programme is now underway, supported by a grant of £4.5million from the Heritage Lottery Fund, along with funding from Seven Lochs Partnership members and range of other funders. The park is still a 'work in progress', and over the next 4*		

years we will restore and enhance heritage and nature, develop new visitor facilities, create new paths and cycle routes, and offer a range of heritage learning and engagement opportunities for people of all ages." - http://sevenlochs.org/ . The Seven Lochs Partnership was established in 2016 to: (i) develop the Seven Lochs Wetland Park as a major new heritage and nature park for Scotland; (ii) deliver the Heritage Lottery Fund supported Seven Lochs Heritage Project; and (iii) drive forward the creation on a new green network extending from the park into surrounding communities.

Good Practice Elements: multi-stakeholder partnership, use of lottery funding mechanism in conjunction with other sources of funding**,** and multi-level governance and partnership working to support implementation.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X	X	X	X		X	X

Good Practice Example 18: Zonation Conservation planning software

Country: Finland

Who: Finnish Environment Institute, Atte Moilanen and his research group at the University of Helsinki

Year of implementation: 2009 (applied for the first time)

Link: Practice example identified in the GRETA questionnaire http://www.syke.fi/en-US/Research__Development/Ecosystem_services/Specialist_work/Zonation_in_Finland/Zonation_software

Characterised criteria: 2. Innovative policy solutions

Description: Zonation is a freely available decision support software tool for ecologically based land use planning including applications in spatial conservation planning and ecological impact avoidance. It is capable of data rich, large scale, high resolution spatial conservation prioritization. Zonation operates on spatial data about biodiversity features (species, habitats, ecosystem services), costs and threats. It can also utilize information about uncertainty and ecological factors such as connectivity. A major property of Zonation is that it can maintain the many dimensions of biodiversity through prioritization. Zonation implements a broad set of methods and analyses in one package, allowing versatile use for solving many different types of problems. It has been used in many analyses for scientific articles, national-scale conservation projects and in an analysis assessing regional ecological network in a capital region of Finland.

Good Practice Elements: Multidisciplinary and practical tool to support decision-making. It includes variety feature-specific analysis options (e.g. costs or opportunity cost analysis) that can support economic good practices.								
Good Practice Example address the following functions								
Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X	X	X	X	X				

Good Practise Example 19: Climate adaptation by private actor investments	Energi Vand	**Country:** Denmark
Who: Klimatilpasning af GF Kløverbladet: CALL Copenhagen, HOFOR and the municipality of Copenhagen.		**Year of implementation:** 2009-
Link: Practice example identified in the GRETA case study work Climate adaption by private property: https://arcg.is/1amOP0 Climate adaption strategy homepage: http://www.klimatilpasning.dk/1176		
Characterised criteria: 2. Innovative policy solutions		

Description: To adapt to climate change and build in resilience in water management the municipality of Copenhagen together with a range of other actors, have implemented a measure that compensate private actors for investing in water management (e.g. rain water and sewage) on their own properties. The initiative is in place to decrease the risk of flooding's and polluting drink water. These types of measures are especially important in coastal areas were effects of climate change is most severe in terms of risk of flooding and coastal erosion.

The policy tool of compensating private land owners for water management is existing in several Danish municipalities. In Copenhagen it is part of the public authority's climate adaptation strategy. The initiative is called Klimatilpasning af GF Kløverbladet after the housing area where it all started. On the webpage it is possible to learn more about the process of implementation, how the consortium is adapting the water management to each location, and how the water of the private property is related to the hydrology of the municipality. The good practice is a collaboration between CALL Copenhagen (e.g. the climate adaptation living lab of Greater Copenhagen), the water and waste management company HOFOR, the municipality of Copenhagen, and the private house owners that want to have their property adapted to climate change.

Good Practise Elements: In Copenhagen private property owners are compensated for investing in water management on their own properties. This policy tool decreases the risk of flooding and polluting drink water.

Good Practise Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
		X						

Good Practice Example 20: Green space factor for implementing green blue infrastructure in built up environments

Country: Sweden

Who: The city of Malmö

Year of implementation: 2001

Link: Practice example identified in the GRETA case study https://malmo.se/Bo-bygga--miljo/Miljoarbetet-i-Malmo/Malmo-stads-miljoarbete/Hallbar-stadsutveckling/Miljobyggstrategi-for-Malmo/Information-och-goda-exempel/Ekosystemtjanster-och-gronytefaktorn/Gronytefaktor.html

Characterised criteria: 2. Innovative policy solutions or tools

Description: Green space factor has been included as a part of the local authority's Environmental Building practice. This mean that for every surface that a developer wants to seal (buildings, asphalt or concrete) they will need to compensate this with something else being green or blue. The green space factor is meant to secure a minimum amount of green and blue spaces in new development areas. Reduction of noises, air pollutions and water purification are three ecosystem services that are especially important in cities. The idea for a green space factor was introduced at the housing and planning fair Bo01 in Malmö in Sweden in 2001. Inspired by this idea, the planning authorities in Malmö in Sweden developed a formula for development of greener housing blocks. Since then the planning authorities are using the green space factor in many projects.

Green space factor is included as a part of the local authority's Environmental Building Code. This mean that for every surface that a contractor wants to put solid materials on they will need to compensate this with something else being green or blue. The green space factor measures how ecosystem services are produced by the green and blue environments. The tool has its emphasis on assessing the noise and air pollution reduction and water purification that are especially important ecosystem services in cities.

In the comprehensive territorial plan for Malmö, approved by the political board in 2014, it is stated that Malmö shall be developed to a sustainable, dense, green and mixed city. One of

the strategies to fulfil a greener city is the green space factor. Within the green space factor is a formula which qualitative values are created with the help of a quantitative formula. The formula in Malmö is Green area factor = eco-efficient space/property space. The idea behind, the method, the user guide for calculating the green space factor, and housing blocks that have been transformed using the green space factor are transparently communicated and available for public, private and any other actor on the Swedish local authority webpage.

Good Practice Elements: The innovative planning tool the Green space factor is a part of the local authority's Environmental planning and building practice. For every surface that a developer wants to seal with buildings, asphalt or concrete, they will need to compensate this with something else being green or blue.

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X		X	X	X	X		X	X

Good Practice Example 21: The Alter Aqua - Non-Conventional Water Resources Programme in Malta	Global Water Partnership Mediterranean	**Country:** Malta
Who: The Global Water Partnership - Mediterranean, the Ministry for Energy and Health, the Ministry for Gozo and the Eco-Gozo Project, as well as The Coca-Cola Foundation and The General Soft Drinks Co. Ltd.		**Year of implementation :** 2011-2017
Link: Practice example identified in the GRETA questionnaire https://www.gwp.org/en/NCWR/ncwr-programme/NCWR-Programme-Mediterranean/Programme-in-Malta/ncwr-activities-in-malta/		
Characterised criteria: 3. Economic good practices		
Description: The Alter Aqua - Non-Conventional Water Resources Programme in Malta is a multi-stakeholder initiative aimed at mobilising non-conventional water resources to increase water availability in a sustainable, cost-effective way and promote a new water culture, at both a local and a national level. The programme s activities included installation and reinstatement of non-conventional water resource's systems like rainwater harvesting, storm water management and greywater reuse systems in selected public buildings and areas. By its practical actions the programme has positively impacted the lives of 65,000 people in the Maltese Islands by collecting and reusing more than 17 million litres of water on an annual basis. Its applications to install greywater recycling system and reinstate of the rainwater harvesting reservoirs have opened new opportunities to collected rainwater to use it for landscape irrigation and new forestation projects as well as green roof irrigation. The programme included various awareness raising campaigns and capacity building towards sustainable water use. The target groups for these actions were school students, teachers, local authorities, local technicians, national NGOs.		
Good Practice Elements: Economic good practices through both publicly and privately funded project that succeed to increase public awareness with multi-stakeholder's involvement.		

Good Practice Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X		X		X		X	X	

Good practice example 22: LifeMedGreenRoof Project		**Country:** Malta
Who: University of Malta		**Year of implementation :** 2013 -1017

Link: The good practice example identified in the GRETA case study
https://www.um.edu.mt/ben/faculty/the_lifemedgreenroof_project
http://www.lifemedgreenroof.org/?lang=en
http://www.lifemedgreenroof.org/wp-content/uploads/2017/eop/programme.pdf

Characterised criteria: 4. Invest and support projects that enhance the quality of existing GI, or connect habitats and create new green areas to ensure GI implementation.

Description: The LifeMedGreenRoof project commenced in November 2013 with the aim of creating a base line study on green roofs for Malta. Although green roofs provide many benefits, within the Mediterranean the technology is not as wide spread as in Northern European countries. Between 2014 and 2017, the project has established best practice in green roof construction in a Mediterranean environment with the aim of encouraging the dissemination of such technology within towns and citiesin Malta and Italy. (UoE 2017)

The LifeMedGreenRoof project was a pilot study to demonstrate potential multi benefits of green roofs in dense built up urban areas with little existing green space. Project scope was restricted to University premises and may offer some insight and lessons learnt to implementing green roofs within hot, dry and densely populated urban areas.

Good Practise Elements: pilot project to establish best practice for green roof construction in a Mediterranean environment.

Good Practise Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
		X	X				X	

Good practice example 23: Honeypark, Dún Laoghaire-Rathdown		**Country:** Republic of Ireland
Who: Dún Laoghaire-Rathdown Council, Parks and Landscapes Services department and Planning department		**Year of implementation:** Ongoing development
Link: The good practice example identified in the GRETA case study https://dlrcoco.ie/sites/default/files/atoms/files/appendix14.pdf page 55		
Characterised criteria: 4. Invest and support projects that enhance the quality of existing GI or connect habitats and create new green areas to ensure GI implementation.		
Description: Honeypark is recent residential development privately built on the site of an old golf course. The public open spaces have been designed as 'multifunctional green infrastructure' (ref DLR GI Strategy). It has resulted in a residential development incorporating multifunctional open spaces, including a featured lake. This wetland has been designed to provide flood storage, habitat, recreation and aesthetic functions. The wetland attenuates the flow of storm water, as well as providing habitat for a variety of species and recreational opportunities for the local community. Throughout the development planting schemes have been installed providing shading, privacy and permeable surfaces to attenuate storm water flow and filter pollutants and sediment.		
Good Practice Elements: A good example of land restoration and how GI has been incorporated into local planning policy by Parks and Landscapes, Drainage and Planning departments.		

Good Practise Example address the following functions

Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
		X	X		X		X	

Good Practice Example 24: GI management with nature-related solutions and biodiversity protection		**Country:** Slovakia
Who: Municipality Bratislava Karlova Ves		**Year of implementation:** 2017-2023
Links: Practice example identified in the GRETA questionnaire http://www.ceeweb.org/wp-content/uploads/2016/12/Smart-and-green-version7_online.pdf		
Characterised criteria: 4. Projects that enhance the quality of existing green/blue areas, linked/connected habitats or created or restored green areas		
Description: Bratislava Karlova Ves has a project to enhance the quality of urban green infrastructure with tailored management practices of green space. By these acts they are aiming to decrease the carbon footprint and simultaneously support the biodiversity in urban environment. The new management practices were started to implement in 2016. The principal objective of the project is to increase the number of green roofs and green walls constructions, that will help to reach the sustainable rainwater management as one of the adaptation and mitigation option and to increase biodiversity protection in areas with the special focus on bees and other insect pollinators. Tailored GI management practices with special focus on biodiversity's maintenance will have positive effects of city's green infrastructure. The management practices will consider the diversity of the territory's ecologic and landscape differences. The actual principles are applied in alternated mowing (lawn) regimes, in actions that support flowering meadows and insect's pollination. The tailored mowing practices, especially during the summer heat and dry seasons will have positive effects on biodiversity, providing flowers and shelter for insects and pollinators. These actions will decrease the CO_2 emissions and will keep more humidity. [15] The project has had following actions: ● Attracting bees, butterflies, and other pollinators through planting of flowers, creation of flowering meadows, etc. ● Building insect hotels in public green areas (the wooden structures, filled with logs with holes, different kind of stems cut cane, vine branches and dry earth, that are meant to tempt a wide variety of wild bees). ● Creating herb and insects spiral (the wall of dry stones built in a spiral shape helps to warm and dry light soil) ● Creating the heaps of boughs, stones, hay, dead leaves for the hibernation of hedgehogs (Erinaceus europaeus) and heaps from stones and sand for lizards (Lacerta viridis) and slow (Anguis fragilis) ● Using the native species and eliminating the invasive species of plants and trees ● Planting trees and provide the relevant tree care ● Creating the wet areas and water retention and infiltration areas ● Providing information campaigns for pupils and public		
Good Practice Elements: The driver to better urban green space management practices was partially the good cooperation with local NGOs. Also, the private sponsors of the project show its aspects to economic good practice example.		

[15] Information provided by Zuzana Hudekova in the GRETA questionnaire 2018-03-21

Good Practice Example address the following functions								
Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X		X	X		X		X	

Good Practice Example 25: The wild life crossing Zanderij Crailoo		**Country:** The Netherlands
Who: Goois Natuurreservaat		**Year of implementation:** 2006

Links:

Practice example identified in the GRETA questionnaire

https://gnr.nl/

Characterised criteria: 4. Projects that linked/connected habitats

Description: Wild life crossings are a good practice example for GI as these corridors reconnect fragmented habitats. The first wild life crossings in Europe was established in the 1950s. With over 600 crossings and ecoducts in the country, the Netherlands is one of the leading countries for the implementation. In 2006 the world's longest ecoduct-bpass overpass the Natuurbrug Zanderij Crailoo opened. Located between Bussum and Hilversum in the province of Noord-Holland, this wildlife crossing is 800 m long, 50 m wide. It spans a railway line, business park, river, roadway and a sports complex. The project cost 14.7 million euros and was initiated by the Goois Natuurreservaat Foundation. This foundation is a Dutch nature conservation organization from 1932. The ecoduct connects the Gooi with the Utrecht Heuvelrug, creating the second contiguous forest and heathland area in the Netherlands. The bridge is, however, not only built for animals. There is also a bike path and a riding trail over it.

Good Practice Elements: Protect biodiversity by reconnecting fragmented habitats and decrease barrier-effects for mammals and amphibians.

Good Practice Example address the following functions								
Protect biodiversity	Preserve cultural heritage	Mitigation and/or adaptation to climate change	Ecosystem services incl. food production	Promote health and well-being	Recreational and amenity	Enhancing green economy	Urban attractiveness	Social cohesion and inclusion
X				X				

Annex V Policy and practice guidelines

Annex V-A: Methods used to develop the policy guidelines and briefs

The policy guidelines and briefs were collaboratively and iteratively co-produced with the GRETA team and with written and face-to-face input from the Advisory Group members. Input was also received from the ESPON PST and MC on a draft of the policy guidelines.

Recruitment of a pan-European Advisory Group on GI

- The Advisory Group consisted of 10 private sector, planning, and policy making end-users (Annex V-B).
- A thorough stakeholder analysis process helped the GRETA team to identify networks, groups, departments and organisations to target for recruitment.
- The Advisory Group members reviewed a draft version of the policy guidelines and assisted in the choice of topics and audiences for a set of three additional briefings based upon their understanding of end-user needs.

Creation of policy guidelines and briefings

- The purpose of the guidelines and briefings is to provide end-users with clear information about the potential opportunities and challenges related to GI and how GI can be promoted and developed in different political and geophysical contexts.
- The main guidelines report was drafted by the GRETA team based upon the policy and practice recommendations that emerged from the GRETA project.
- The GRETA policy guidelines were informed by:
  - A state-of-the-art review of green infrastructure research in Europe;
  - An in-depth analysis of green infrastructure synergies, trade-offs, supply, and demand;
  - An innovative spatial analysis methodology;
  - An assessment of changes in green/blue infrastructure at the city level;
  - 32 national fact sheets and 25 best practice examples; and
  - 12 multi-scale case studies representing different spatial, institutional, and jurisdictional settings.
- The draft guidelines were reviewed by the Advisory Group members, using the questions outlined in Annex V-C to structure the feedback/review process.
- A face-to-face workshop meeting with the Advisory Group members on 15/11/18 helped to refine the policy guidelines. The agenda for the Advisory Group Meeting and participants list can be found in Annex D. A workshop report can be found in Annex-E.
- During the face-to-face meeting, topics and audiences for three practice-focused briefings were identified via majority vote.
- The policy guidelines were revised based on input from the Advisory Group and feedback on the draft version submitted as part of the draft final report.
- The briefings were developed based on the input from the Advisory Group and the EGTC as well as a workshop amongst GRETA partners which reviewed project findings that could

provide practice-focused specificity for the briefings. As such, the topics for two briefings reflect exactly the focus suggested by the Advisory Group; the third has been modified in order to reflect interest for a methods-focused briefing.

Annex V- B: Advisory Group Members

Marta Bystrowska

Institution: Ministry of Economic Development, Department for Development Strategy, Urban Policy Unit

Job title: Chief Specialist in Urban Policy Unit

Country: Poland

Carles Castell Puig

Institution: Barcelona Provincial Council

Job title: Natural Areas Expert

Country: Spain

Jernej Červek

Institution: Ministry of the Environment and Spatial Planning

Job title: Senior Adviser, Environment and Spatial System Service

Country: Slovenia

Giovanni Fini

Institution: City of Bologna

Job title: Coordinator Environmental Quality Unit

Country: Italy

Marcin Grądzki

Institution: Ministry of Environment, Department of Sustainable Development and International Cooperation

Job title: Senior Specialist

Country: Poland

Eleri Kautlenbach

Institution: Ministry of Finance

Job title: Advisor – Spatial Planning Department

Country: Estonia

Thomas Kiwitt

Institution: Verband Region Stuttgart

Job title: Managing Director of Planning

Country: Germany

Mick Lennon

Institution: University College Dublin, School of Architecture, Planning and Environmental Policy

Job title: Lecturer in Planning and Environmental Policy

Country: Ireland

Julie Raynal

Institution: European Commission Directorate-General for Environment

Job title: Biodiversity Policy Officer, Biodiversity Unit

Country: Belgium

Frederick-Christoph Richters

Institution: Ministry of Sustainable Development and Infrastructure, Department of Spatial Planning and Development

Job title: Policy Advisor

Country: Luxembourg

Stefan Schindler

Institution: Umweltbundesamt GmbH Environment Agency Austria (EAA)

Job title: Senior Researcher in Biodiversity & Nature Conservation

Country: Austria

Torgeir Esig Soerensen

Institution: Environment and Development, City of Stavanger

Job title: Head of Parks and Streets Department

Country: Norway

David Struik

Institution: The International Society of City and Regional Planners (ISOCARP)

Job title: Project Manager EU Projects

Country: Netherlands

Annex V- C: Policy Guidelines Review Questions

Shared with the Advisory Group on 25/10/18 as a template to elicit their review feedback on draft policy guidelines prior to Advisory Group meeting on 15/11/18.

Policy Guidelines – Review Questions
Validation What areas are most useful / relevant? Why? What areas are least useful / relevant? Why? Would you be able to use this information to inform your decision-making? If yes, how? If no, why not?
Gap Analysis

Are there findings from GRETA that need to be more fully brought into the policy guidelines? If yes, which ones and why?
Clarification What, if any, parts of the policy guidelines were inaccurate, ambiguous or confusing? What, if anything, could we do to make this information clearer?
Additional Resources / Sources Do you have suggestions of additional resources/sources that we should be pointing towards in Section 4, for example, recent research projects or policy development?
Structure / Format of Guidelines for Accessibility Please provide any comments on the document's structure in terms of readability and usability. Would it be useful to cross reference to sections of the final GRETA report to support recommendations (i.e. as we have done with the PowerPoint presentation)?
New Research What, if any, further future research might be required to build upon GRETA findings?
What else comes to mind that you would like to feed back?

Annex V-D: Advisory Group Meeting Agenda and participants list

Time	Event	Materials and Content
09.30 – 10.00	Registration	• Name badges • Morning coffee/food available.
10.00	Context and introductions	• Brief introductions: about them (introductions), about GRETA, about us (Hutton), context setting for the day. • Sharing expectations, objectives and meeting structure/plan.
10.30	Reviewing/consolidating/ acknowledging the draft policy guidelines feedback. Policy guidelines next steps.	• Plenary presentation of the general themes of the feedback from Advisory Group. [Hutton] • Breakout groups to workshop areas in need of improvement, resources overlooked, input gathered via prepared templates and sharing back to the group.
11.30	Coffee break	
11.45	Developing the GRETA briefings	• Brainstorm possible themes/topics for 3 briefings (facilitated small group/briefing). • Gap analysis (include evidence of existing guidance/information so as not to reinvent the wheel).
13.00	Lunch break	
13.45	Developing the GRETA briefings	• Allow Advisory Group members to self-select into groups to develop a plan for the content of each briefing.
14.30 – 15.30	Breakout group sessions	• Design these sessions carefully to make the best use of the time.
15.30	Coffee break (?)	
15.45	Final concluding session	• Brainstorm additional outreach mechanisms (webinar, infographic, other ideas). • Bring it all back together – what have we learned, next steps, concluding sessions.
16.30	Close of meeting	Dinner/drink plans if people are still in town…

Advisory Group Meeting Attendees

Name	Institution
Carles Castell Puig	Barcelona Provincial Council (Spain)
David Struik	The International Society of City and Regional Planners (ISOCARP) (Netherlands)
Eleri Kautlenbach	Ministry of Finance, Spatial Planning Department (Estonia)
Frederick-Christoph Richters	Ministry of Sustainable Development and Infrastructure, Department of Spatial Planning and Development

	(Luxembourg)
Marta Bystrowska	Ministry of Economic Development, Department for Development Strategy, Urban Policy Unit (Poland)
Mick Lennon	University College Dublin, School of Architecture, Planning and Environmental Policy (Ireland)
Stefan Schindler	Environment Agency Austria (EAA) (Austria)
Thomas Kiwitt	Verband Region Stuttgart (Germany)
Torgeir Esig Sørensen	Environment and Development, City of Stavanger (Norway)
Efrén Feliu Torres	Tecnalia (Spain)
Gemma García Blanco	Tecnalia (Spain)
Raquel Ubach	Autonomous University of Barcelona (Spain)
Jessica Maxwell	The James Hutton Institute (Scotland)
Kate Irvine	The James Hutton Institute (Scotland)

Annex V-E: Advisory Group Workshop Report

Workshop Overview

The ESPON GRETA Advisory Group members gathered with four members of the ESPON GRETA project team members on 15 November 2018 at Casa Convalescència in Barcelona, Spain (**Figure 1**).

Figure 1. Casa Convalescència in Barcelona, Spain, the location for the GRETA Advisory Group workshop held on 15 November 2018.

The purpose of this meeting was threefold:

(i) review the key recommendations that emerged from the feedback received from the Advisory Group on the Draft Policy Guidelines;
(ii) improve the policy guidelines based upon end-users needs and expertise; and,
(iii) determine and outline the topics for the three practice briefings.

The attendees also contributed diverse recommendations for future areas of research and for ensuring effective outreach and dissemination of the research results. The workshop agenda is provided in Table 1.

Table 1. Advisory Group Meeting Agenda

Time	Event
09.30 – 10.00	Registration
10.00 – 10.30	Introductions and Context Setting
10.30 – 11.30	Improving the Draft Policy Guidelines
11.30 – 11.45	***Coffee Break***
11.45 – 13.00	Brainstorming the GRETA Briefings – Part I
13.00 – 14.00	***Lunch Break***
14.00 – 15.00	Developing the GRETA Briefings – Part II
15.00 – 15.30	Developing the GRETA Briefings – Part III
15.30 – 15.45	***Coffee Break***
15.45 – 16.30	Considering Outreach and Dissemination
16.30	Close of meeting

This document describes the purpose, process, and outcomes of each stage of the workshop. This has been documented to allow transparency of the process of engaging with the Advisory Group members and to inform future potential engagement with end-user groups in applied ESPON projects.

1. Activity 1: Introductions

1.1 Purpose: To showcase the diversity of perspectives, experiences and sectors of the attendees and the scale(s) at which they work with green infrastructure, i.e. local, national, regional, European, international. To get to know one another in order to set the stage for 'thinking and doing together' throughout the day.

1.2 Process: A short activity related to the different scales at which each attendee works. Attendees organised themselves from the local/city level on the left of the room, national/regional level in the middle, and European/international on the right (**Figure 2**).

Figure 2. Advisory Group meeting attendees ordered according to the different scales (local/city level on the left, national/regional in the middle, European/international on the right) at which they work.

Attendees were then invited to introduce themselves by name, institution, role and country, and to answer one of the four questions which had been provided at the time of arrival to the workshop:

- Why did you decide to accept the ESPON GRETA Advisory Group member role?
- Why do you think green infrastructure is valuable?
- How do you personally benefit from green infrastructure?
- How are you currently working with green infrastructure?

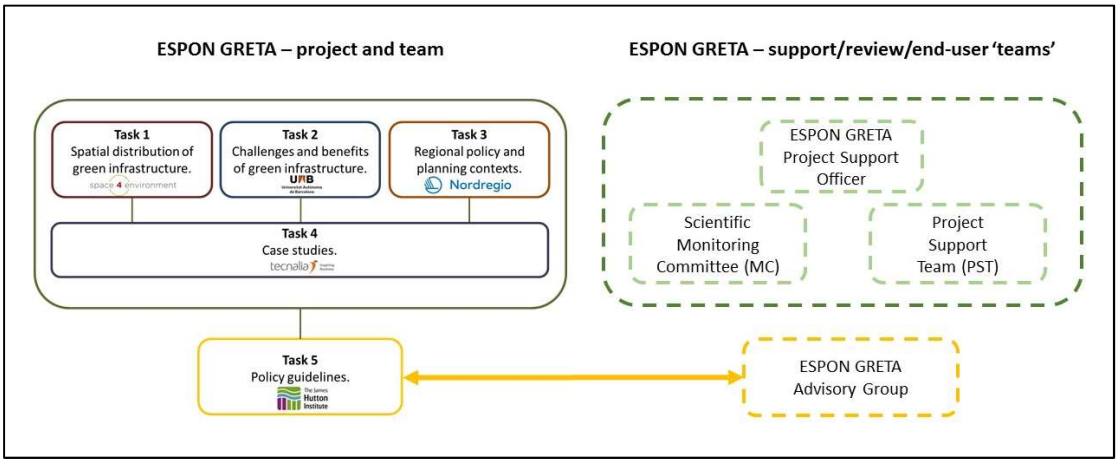
1.3 Outcome: Scale has been an important topic within the GRETA project, from the resolution of the spatial analysis to the multi-scale case studies. The Advisory Group stakeholders were selected through a stakeholder analysis with careful attention to ensuring it consisted of members operating at different scales and within different sectors related to green infrastructure. This exercise offered a clear visual of this breadth of experience and the diversity of the members. It also facilitated the introductions in an inventive and participatory manner which provided additional topics about which attendees could discuss.

2. Activity 2: Context Setting

2.1 Purpose: To describe and contextualise the role of the Advisory Group within the ESPON GRETA project, to outline the focus of the workshop, and to emphasise the opportunity for shared learning among attendees (including GRETA project team members) and co-development of end-user relevant output.

2.2 Process: In plenary, a GRETA project team member provided brief introductory remarks to the group. This presentation purposefully began by noting and acknowledging the diversity of experience and perspectives in the room (e.g. geographical, scale, sector). An overview of the GRETA project team and the GRETA 'teams' (**Figure 3**) was provided which included a description of the unique role of the Advisory Group within the project.

Figure 3. Diagram illustrating GRETA project partners and tasks along with opportunities for



input and engagement with different 'teams' (e.g. project support, scientific, Advisory Group) on scientific merit, relevance for end-users, and meeting the funder's objectives.

This presentation sought to remind the Advisory Group meeting attendees that GRETA involves five partner organisations and is an 18-month applied ESPON project that ends March 2019. Project-related feedback had thus far been received from the ESPON GRETA Project Support Officer, the Scientific Monitoring Committee, and the Project Support Team during the project. The role of the Advisory Group is to advise on the development of the policy guidelines and practice briefings.

The GRETA project specifically wanted to involve different groups of end-users in the process to help:

- Validate the relevance and applicability of the draft policy guidelines;
- Identify relevant results for end-users to form the basis of three practice briefings;
- Select priority topics for end-users; and,
- Consider future research needs and to broaden outreach and dissemination possibilities.

Three different levels of engagement that were used with the GRETA Advisory Group members can be seen in **Figure 4**.

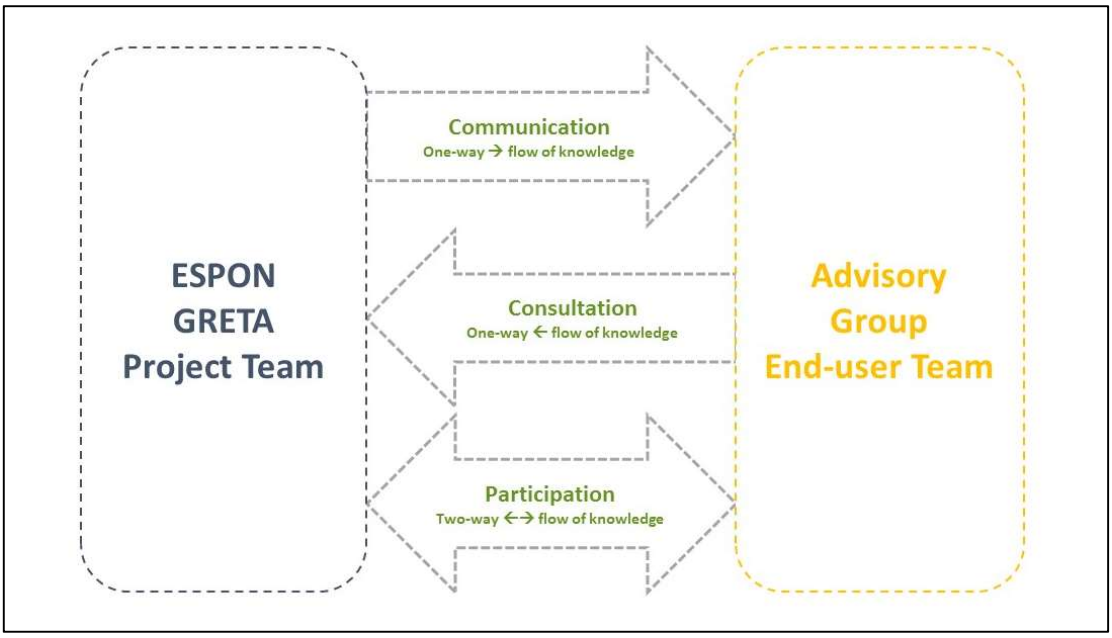


Figure 4. Three levels of engagement used with GRETA Advisory Group.

The GRETA project team shared the Interim Report with the Advisory Group, which was a one-way flow of knowledge in the form of *communication*. The GRETA project team solicited feedback from the Advisory Group on the Draft Policy Guidelines, which was a one-way flow of knowledge in the form of *consultation*. Specifically, the Draft Policy Guidelines were shared with the Advisory Group on 25 October 2018. Members of the Advisory Group sent their feedback, based upon a template of review questions (**Annex V-B**, GRETA Draft Final Report), on 8 November 2018 in advance of the workshop. The feedback was used to inform the structure and discussions for the workshop through which the GRETA project team and the Advisory Group worked together to revise the policy guidelines and begin to develop the practice briefings; this was a two-way flow of knowledge in the form of *participation*. The workshop's aim was thus to create a space and time in which all attendees could:

(i) 'think and do' together;
(ii) validate the relevance and applicability of the GRETA findings;
(iii) draw on one another's knowledge and expertise; and,
(iv) encourage knowledge exchange and co-production with end-users.

This context setting session ended with an exploration of the norms for working together during the workshop. These included: mutual respect, shared learning, open mindedness, one person speaking at a time, focus on the usability of the GRETA findings, and the use of a 'parking lot' sheet of flip chart paper for ideas that 'don't quite fit but that we do not want to lose'.

2.3 Outcome: The purpose of the day was clarified and a set of norms for working together over the course of the day was validated.

3. Activity 3: Improving the Policy Guidelines

3.1 Purpose: The third activity included a brief plenary presentation on the high-level recommendations that emerged from the written feedback received from the Advisory Group on the Draft Policy Guidelines document. **Figure 5** depicts the main high-level recommendations for improving the draft policy guidelines.

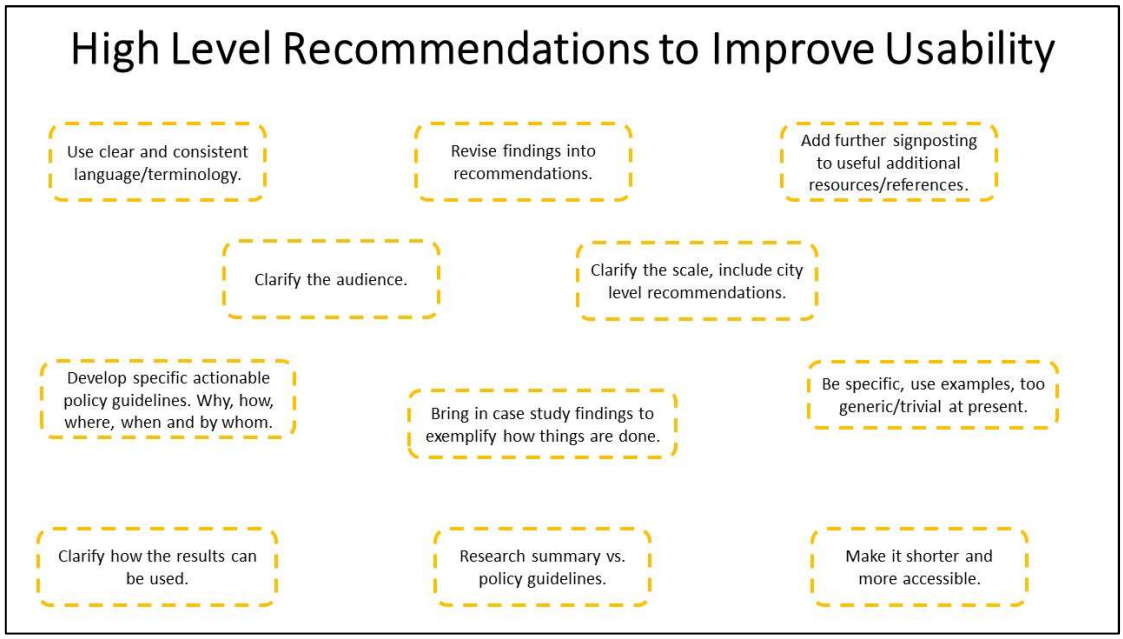


Figure 5. A summary of the main high-level recommendations for revision of the GRETA policy guidelines from the written feedback received from the Advisory Group prior to the workshop.

The GRETA team then presented their proposed approach for integrating these recommendations. Based upon one of the main recommendations - related to being clear about the difference between a research synthesis and a policy guidelines document - the GRETA team proposed the following modifications to its approach:

1. incorporate the content of the Draft Policy Guidelines into a research summary to be improved upon based on the detailed and thoughtful feedback received from the Advisory Group; and,
2. develop a short, accessible, actionable policy guidelines document.

Activity 3 was structured to solicit input on how to focus the proposed shorter policy guidelines document to these specific audiences, and how to make sure the GRETA findings were made clear and actionable for them.

3.2 Process: The Advisory Group members were asked to self-select into three groups. The topic areas for these groups were based upon the sections of the Draft Policy Guidelines that had been identified by Advisory Group members' in their written feedback to the GRETA team as the most useful/actionable. These were:

1. Section 3.1 literature review of benefits and challenges of green infrastructure;
2. Section 3.2 on the analysis of synergies, trade-offs, supply, and demand; and,

3. Section 3.3 based on the spatial analysis methodology (with suggestions that the national fact sheets, best practice examples, and case studies should be used as examples and insight on 'how to' at different scales and within different sectors).

Each group was asked to consider what, if anything, could be adapted and improved upon from the draft policy guidelines. It also asked what else the GRETA team could showcase that might be useful to policy makers. The questions posed to each group to consider included:

- Clarifying the target audience. Who is the policy maker?
- What are the key policy messages from GRETA that are relevant for them? What do they need to know?
- How can we make these key policy messages clear and actionable? What can they do as a result of reading this?
- Develop at least one example of an actionable policy guideline.

The groups then provided feedback on their discussions in plenary.

3.3 Outcomes: The three groups had good discussions and proposed a way forward for the next iteration of the policy guidelines. All three groups proposed that:

(i) the policy guidelines should include specific sections/messages for specific scales;
(ii) infographics should be used to make the information more user friendly and accessible; and,
(iii) that the messages need to focus on what the policy make can 'do' or 'what is in it for them'.

The detailed input received from each group was documented to be used to inform the next iteration of the policy guidelines.

4. Activity 4: Brainstorming the GRETA Briefings

4.1 Purpose: This session was designed to facilitate discussion between Advisory Group members on the GRETA findings that were most relevant to end-users needs. They were asked to contemplate and identify the various potential topics for the practice briefings.

4.2 Process: The GRETA team provided a description of what the practice briefings were intended to be/do, specifically, a more focused in-depth mechanism for making the project findings more accessible to particular audiences. The GRETA team also provided some examples of topics for the practice briefings. Topic examples were drawn from the GRETA teams' own considerations as well as topics identified as relevant and of interest by the Advisory Group members in their written feedback (**Table 2**).

Table 2. Examples of topics for the GRETA practice briefings.

Topics	**Policy themes** (for example: biodiversity, water, climate change)
	Scale (for example: city, landscape, regional)
	Research methods and findings (for example: GRETA spatial analysis methodology, synergies and trade-offs, economic valuation methods, national fact sheets, case studies, best practice examples)
Audience	**Stakeholders** (for example: planning, policy making, non-government organisations)
	Other?
Topics of interest and relevance to the Advisory Group based upon feedback received	Guidelines on how to downscale the analysis.
	Recommendations on identifying and quantifying benefits and challenges.
	How to use the GRETA typology in practice.
	Examples at different scales of 'how to'?
	How to align with the Strategic Environmental Assessment process?
	Other?

The activity included individual time to brainstorm and outline a potential topic for a practice briefing, where the Advisory Group members were asked to consider and answer the following questions:

- Area of focus related to GRETA project?
- Audience?
- Why is this needed/useful?

The Advisory Group members then each presented/pitched their idea in plenary. These ideas were captured on large post-it notes and placed on a flipchart. The group then discussed the ideas in order to clarify the focus of the proposed briefing topics, the ideas were clustered and/or combined where relevant/appropriate, and any ideas that were beyond the scope of the GRETA data/findings were moved to the parking lot for future research. Each Advisory Group member was then given three 'votes', in the form of sticky dots. They were asked to cast their votes over lunch to allow further time for consideration and discussion.

4.3 Outcome: The activity resulted in a list of 11 proposed briefing topics, which the Advisory Group members had the opportunity to individually propose and pitch and then collectively discuss and vote upon. The proposed topics included:

1. Benefits of green infrastructure for biodiversity / species protection.
2. Online interactive map allowing people to zoom in to their area of interest.
3. Green infrastructures contribution to climate change mitigation and adaptation.
4. Human wellbeing benefits from green infrastructure.
5. Contribution of primary sector to green infrastructure.
6. City level green infrastructure.
7. Evidence for benefits of green infrastructure.
8. Integrating green infrastructure into SEA for spatial planning.
9. Disseminating and integrating green infrastructure concepts to spatial planning.

10. Policy themes and cross border integration/coordination.
11. Green infrastructure in integrated planning.

Through the plenary discussion two sets of topics were combined: topics #8 and #9; topics #10 and #11. There were thus nine possible topics for briefings on which voting took place over lunch with the aim to identify three top priority topics based on end-user input.

5. Activity 5: Developing the GRETA Briefings

5.1 Purpose: This session involved sharing the outcome of the vote by Advisory Group members on which of the ten proposed briefings they considered most relevant. The group discussed the feasibility of developing these three practice briefs based upon the GRETA research findings and this resulted in three practice briefing topics.

- **Practice Briefing 1**: Insight on the benefits and challenges of green infrastructure (drawn from topic #7 from Activity 4).
- **Practice Briefing 2**: Integrating green infrastructure into SEA for spatial planning (drawn from topics #8 and #9 from Activity 4).
- **Practice Briefing 3**: Coordinating and integrating [GI efforts/GI benefits] across policy sectors [working on green infrastructure] (drawn from topics #10 and #11 from Activity 4).

The purpose of this activity was to focus the Advisory Group's expertise on further outlining and developing the practice briefings to ensure they were relevant and applicable for end-users.

5.2 Process: The Advisory Group members were asked to self-select to work on the practice briefing that they felt they could best contribute to and that was of most interest to them (**Figure 6**).

Figure 6. Advisory Group practice briefing breakout groups.

The breakout groups were asked to answer the following questions:

- Context, why is this needed/useful?
- Who is it relevant for (audience)?
- What from GRETA is important to include here (methods/approach/results)?
- What could the structure of this brief look like (aiming for 6-8 pages)?
- What figures/tables would be helpful?
- What are the key findings/messages?
- What are the key recommendations?
- Other resources to reference?

One member of each group was asked to take notes and to stay at their group/table, while the other members of the group moved to the next briefing to learn about what they were developing and to contribute additional ideas and expertise. They then moved one last time to the next briefing, before returning to their original briefing topic/theme. The groups were then given further time to consolidate, elaborate, and refine the outlines and proposed content for the briefings based upon what they had learned from and contributed to the other groups. This was captured on flipcharts and notes for the GRETA team to take forward following the workshop.

5.3 Outcome: The outcome of this activity included the identification of three topics and outlines for the GRETA practice briefings with ideas for how the three build upon, and align, with one another. The activity also helped to integrate and cross reference ideas and expertise between the three briefings. All three groups recommended that using symbols and/or infographics would help the accessibility and usefulness of the practice briefings. Advisory Group members also recommended that the topics and content developed for the practice briefings (including the topics not chosen) could be used as structure and content for the policy guidelines. The five proposed topics that were not taken forward are detailed in Section 7 – Future research and optional practice briefings. Content for proposed topics #7, #8, #9, #10, and #11 were integrated into the GRETA practice briefings.

6. Activity 6: Reflections, outreach, and dissemination

6.1 Purpose: This final activity provided a space and time to reflect upon the discussions and developments related to the policy guidelines and practice briefings that took place throughout the day. It also provided an opportunity to identify mechanisms for wider dissemination of the policy guidelines and practice briefings.

6.2 Process: The GRETA project team described the next steps for the refinement of the policy guidelines and the development of the practice briefings, including: (i) developing the shorter policy guidelines document based upon the Advisory Group's review of and written feedback on the draft policy guidelines and the input received during the workshop; (ii) developing the three practice briefings based upon input received during the workshop and further discussion with the rest of the GRETA project team; (iii) developing a workshop report for inclusion as an appendix to the GRETA final report; and, (iv) making use of the ESPON website as a

mechanism for dissemination of the project findings. A plenary discussion was then facilitated to answer the following questions:

- What has come to mind since the focus on policy guideline development (Activity 3) that you would like to share before the end of the workshop?
- What has come to mind in terms of the briefings (Activities 4 and 5) that we have developed that you would like to share before the end of the workshop?
- How can we reach the identified audiences for the policy guidelines and the practice briefings?

6.3 Outcome: This activity resulted in some additional reflections and recommendations from the Advisory Group that have been incorporated into the development of the policy guidelines and practice briefings. It also resulted in recommendations for further outreach and dissemination, which have been summarised in **Table 3**.

Table 3. Advisory Group recommendations for further outreach and dissemination.

Recommendation	Description
URBACT	A European exchange and learning programme promoting sustainable urban development.
ICLEI	Local governments for sustainability.
World Urban Parks	International organisation representing the vibrant urban parks, open space and recreation sector.
ESPON Contact Points Network	A European wide network of national institutions nominated by the Member and Partner States involved in the ESPON 2020 Cooperation Programme.
Urban Agenda	An integrated and coordinated approach to deal with the urban dimension of EU and national policies and legislation.
Covenant of Mayors	A European co-operation movement involving local and regional authorities.
Green Spider Network	A network of heads of communication and information officers from environment ministries and national environmental agencies across Europe.
Natura 2000	A network of nature protection areas in the territory of the European Union.
Emerald Network	An ecological network made up of Areas of Special Conservation Interest.
IUCN	The global authority on the status of the natural world and the measures needed to safeguard it.

IAIA	The leading global network on impact assessment.
European Landscape Architects	
LIFE National Contact Points	The EU's financial instrument supporting environmental, nature conservation and climate action projects throughout the EU.
Metrex	The Network of European Metropolitan Regions and Areas.
Purple	Peri-urban regions platform Europe.
ThinkNature	Platform for nature-based solutions.

The Advisory Group members recommended that the GRETA project team make an effort to proactively target these organisations and networks, ideally by speaking during their events. Many Advisory Group members stated that they would be interested to host the project team to disseminate the research findings and build capacity in their countries/regions (particularly in Luxembourg and Poland).

7. Future research and optional practice briefings

This section compiles ideas placed in the 'Parking Lot' and the six ideas proposed but not taken forward as GRETA practice briefings (see **Section 4**). Where there was similarity between ideas in the Parking Lot and the proposed briefing ideas, material has been combined. This list of ideas could form the basis of future research and or the basis of additional practice briefings drawn from GRETA and other relevant projects.

7.1 Ideas raised as potential future research directions

1. Quality of GI, i.e. it is not just the quantity but also the quality of green infrastructure that is important. Reports identified as relevant to this topic include:
    a. DG Envt Reports.
    b. EEA Reports, e.g.
        i. Green infrastructure & territorial cohesion (2011).
        ii. Landscape fragmentation in Europe (2011).
        iii. Spatial analysis of GI in Europe (2014).
2. The role and relevance of private sector (e.g. developers, land owners) with regards to GI. For example, is it an opportunity or a restriction for private landowners to contribute to GI?
3. Agriculture and forestry sector policies such a CAP as conflicting policies for GI implementation.
4. Further develop the benefits of GI, e.g.:
    a. How much biodiversity is enough to provide various benefits.
    b. Conduct a 'State of evidence' for Benefits and Challenges of GI, i.e. where are the gaps (this was not possible in GRETA as the literature review was not

systematic therefore not able to convincingly state the research gaps) - for example develop a scale of evidence (e.g. 5-point scale to illustrate depth of knowledge 1 = weak to 5 = v strong).

i. see UK National Ecosystem Assessment for infographic example of how this was done for state of ecosystems.
ii. see Benefit Catalogue infographic done by Canada in the 1990s

c. Identify research gaps on GI benefits and challenges (not possible in GRETA as the literature review was not systematic, therefore not able to convincingly state the research gaps).

5. City focused ideas:
    a. The city's competitive advantage.
    b. Conduct a city level analysis – why GI needed? what benefits gained? What evidence?
    c. Cities identified through GRETA analysis where GI has increased - why did this increase occur? This is an opportunity for future research.
6. Matrix on synergise and trade-offs.
7. Network Theory – how we understand GI.

7.2 Practice briefing ideas not taken forward

The details of the briefing topics that were not taken forward are provided here. The structure is based on the process undertaken in Activity 4 where Advisory Group members were asked to propose an idea considering the topic, the relevant audience and why such a practice briefing was needed.

1. Benefits of green infrastructure for biodiversity / species protection.
    a. Audience: National scale decision makers & Local Citizens
    b. Why needed:
        i. Need to build awareness as to why GI is important for biodiversity and why biodiversity is important to citizens.
        ii. Need metrics for how to measure such benefit
        iii. Need metrics / targets as to 'how much GI is enough' for benefit to be experienced
2. Online interactive map allowing people to zoom in to their area of interest.
    a. Audience: multiple audiences with differing expertise, e.g. amateur, colleague, politician, citizen, expert
        i. Green Spider Network
        ii. Natural organisations (Fanbase and privately owned land)
        iii. Changemakers who could have one of the biggest impacts (e.g. agricultural sector)
        iv. private landowners

v. ‘blue people’ (i.e. those working in water; there is overlap of themes but they name it differently e.g. sustainable urban drainage systems)

b. Why needed: important to communicate ‘what could be’ vs ‘what is’. Having an interactive map would allow people to know (i) what current level of GI is; (ii) what a different amount of would like.

3. Green infrastructures contribution to climate change mitigation and adaptation (at city / FUA and landscape scale).
    a. Audience:
        i. National and regional planners and policy makers in the climate policy.
        ii. DG Climate and DG Environment
    b. Why needed: climate change is an increasingly high-level challenge of high prominence. While Gi might not be first solution that comes to mind for CC adaptation and mitigation, it provides multiple benefits at urban and landscape scale. Trade-offs mean that policy makers need to have more evidence available tom make informed and meaningful decisions.
    c. Evidence from GRETA to draw on:
        i. Benefits of GI;
        ii. Map 7 illustrating potential GI serving purposes of CC policies at landscape (also some examples at local level).
        iii. Synergies and trade-offs of ES: most regions are monofunctional for CC;
        iv. integration of GI in CC policies at national level
4. Human wellbeing benefits from green infrastructure.
    a. Audience: Local Government
    b. Why needed: Most people live in cities and in cities GI impact will hast most impact, e.g. climate change adaptation and mitigation, air quality, water management. Landowners don’t want GI; they want to build houses. This means that policy makers have to be strong and they have to understand what is GI and why cities need GI (what is benefit of GI for cities). Human wellbeing is a popular theme for them thus couching GI in terms of benefits for human wellbeing would be good way to get GI into their thinking and policies.
5. Contribution of primary sector to green infrastructure.
    a. Audience: Agriculture / Forest / Livestock stakeholders; Those with political responsibility (e.g. EU, state members, regions)
    b. Why needed: In many countries the primary sector is highly relevant for GI strategy and development (rural areas). As they have big impact (plus and minus) on biodiversity water, connectivity, climate change… Message is about multi-functionality of GI (e.g. ecological): focus less on provisioning services, much more on regulation, cultural service and ecological functions. Integrate

clear messages of this multi-functionality of GI into these regulations (e.g. CAP)

6. City level green infrastructure.
    a. No details provided.

8. Conclusion

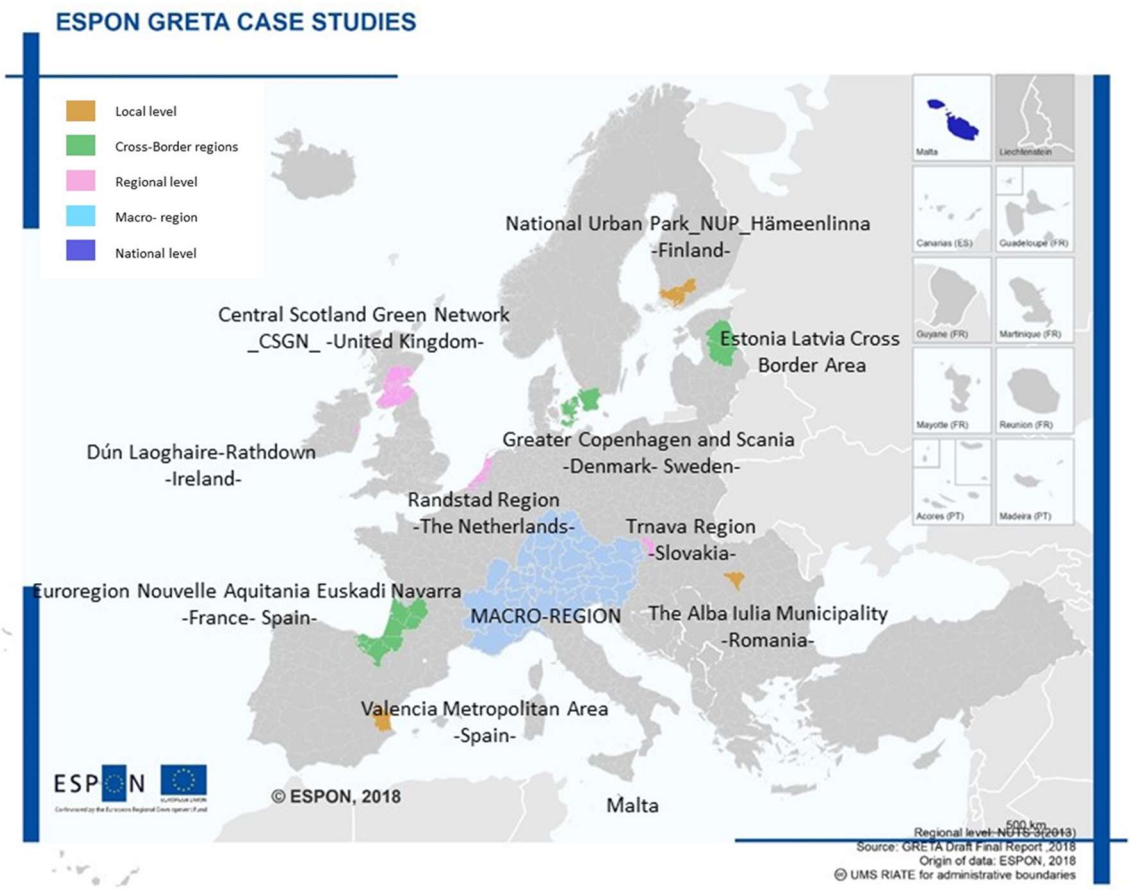
The GRETA team received detailed and thoughtful feedback from the Advisory Group members prior to (in the form of written feedback), during (in the form of verbal discussion) and after (via email) the workshop. The process enabled the opportunity to 'think and do' together and co-develop the policy guidelines and practice briefings. An additional outcome included the opportunity for learning and sharing of ideas across scales, sectors and European regions in terms of challenges and opportunities for implementation of green infrastructure.

Annex VI Case Studies

Introduction

GRETA investigated 12 case studies that represented different spatial, institutional and governance settings and that ranged from urban centres to rural countryside. The case studies served to:

i. gain knowledge on implementation factors, drivers and constraints in different planning systems and territorial realities;
ii. gain insights on the use and applicability of economic methods in decision making; and
iii. gather knowledge for policy and practice as input and inspiration for the policy recommendations.



Map 7 .ESPON GRETA selected case studies

Method

The activities undertaken at the case study level incorporated a combination of desk-based analysis alongside online questionnaires and pre-structured interviews to key actors in each of the case study areas, including: (i) decision and policy making representatives; and (ii) those involved in designing, planning, implementing and managing green infrastructure (GI).

A series of three consultations were developed to gather relevant information from case studies on different aspects of GI spatial analysis, policies, planning and implementation. The consultation process was seen as a combined approach of an online survey and or a telephone interview (which used the survey questions as the basis) with stakeholders to facilitate getting good engagement and to address any clarifications needed.

Consultation A – Economic Valuation

The questionnaire included 20 questions structured in 2 main parts. The first part aimed at understanding the current use and awareness of valuation methods by respondents while the second part aimed at identifying their perceived barriers and interest of using such methods. We used a mix of open-ended and closed-ended questions to combine comparable results as well as qualitative material; respondents also had the possibility to comment on their responses. Analysis of Consultation A is described in Annex III-C.

Access to Consultation A https://survey.tecnalia.com/limesurvey/index.php/214247?lang=en

Consultation B – Characterising green infrastructure and ecosystem services characterisation

The objective of this consultation was to identify good practice guidelines, opportunities and challenges that could be useful for a variety of regions and cities. Responses to Consultation B were used to assess the usefulness of the GRETA methodology, a methodology specifically developed to delineate and map the main green infrastructure (GI) elements and their multifunctionality, as well as identifying their capacity to contribute to several policy goals. Questions in Consultation B were designed to help us gain further insight into the enabling factors that exist in different regions and cities. We also sought to gather information on the challenges and barriers that may compromise the implementation of GI. The final set of questions focused on identifying the general benefits and potential synergies and trade-offs associated with GI projects.

The maps produced for Consultation B in the GRETA project were intended to provide a starting point for discussion about the applicability of the GRETA methodology from European to local application. As such they i did not aim to be a substitute for the maps or other planning material that already exist at local case study level nor were they aiming to characterize the GI on regional or local level. They were not developed to be used as an output from case study levels.

The landscape elements in the maps are produced based on standardized European data sets with a minimum mapping unit of 25ha (i.e. CORINE Land Cover 2012) – smaller geographical features are not depicted. The Consultation B aimed at finding the gaps between datasets produced at the European level and any other data sets produced at regional and local scales.

Access to Consultation B https://survey.tecnalia.com/limesurvey/index.php/614564?lang=en

Results

Table 1: Number of respondents by case study to online Consultation B

Country	Case study	Number of responses
Romania	Alba Iulia Municipality	0
UK	Central Scotland Green Network (CSGN)	0
Ireland	Dún Laoghaire-Rathdown	4
France-Spain	Euroregion Nouvelle Aquitania- Euskadi-Navarra	6
Denmark-Sweden	Greater Copenhagen and Scania	1
Malta	Malta	0
Netherlands	Randstad	
Estonia - Latvia	Estonia- Latvia cross-border area	2
Slovakia	Trnava Region	1
Finland	Urban Parks in Finland	1
Spain	Valencia Metropolitan Area	2
Grand Total		**17**

Note *The number of respondes to the online survey, does not necessarily imply the number of respondents- since in some cases the surveys have been completed from the institutional perspective.*

For all case studies, telephone conversations (and for some case even face to face meetings as it has been the case for i.e. Copenhagen and Scania, Alpine region, Euroregion Aquitania-Euskadi-Navarra) allowed the completion of the consultation B.

Consultation C - Analysis of governance, policy and financial frameworks

The successful implementation of green infrastructure (GI) projects requires a combination of governance structures, integrated policies and financial support. This consultation therefore aimed to investigate the governance systems in place in each case study area in order to determine how policies and policy makers enable the implementation of GI projects in the case study areas.

Responses to Consultation C aimed to help us identify: (i) how much funding (money and personnel) is currently used for GI in the case study regions; (ii) if this funding is sufficient for implementing and maintaining GI; and (iii) the main sources of funding (public tax-based funds, private investments, NGOs or others). Consultation C also examined whether policies compliment or conflict with GI and assesses policy makers' knowledge needs for making full use of GI development potential.

Access to Consultation C

https://survey.tecnalia.com/limesurvey/index.php/129674?lang=en

Results

Table 2 Number of respondents by case study to online Consultation C

Country	Case study	Number of responses
Romania	Alba Iulia Municipality	0
UK	Central Scotland Green Network (CSGN)	0
Ireland	Dún Laoghaire-Rathdown	0
France-Spain	Euroregion Nouvelle Aquitania- Euskadi-Navarra	1
Denmark-Sweden	Greater Copenhagen and Scania	1
Malta	Malta	0
Netherlands	Randstad	2
Estonia - Latvia	Estonia- Latvia cross-border area	0
Slovakia	Trnava Region	1
Finland	Urban Parks in Finland	0
Spain	Valencia Metropolitan Area	0
Grand Total		

Note *The number of respondes to the online survey does not necessarily imply the number of respondents- since in some cases the surveys have been completed from the institutional perspective.*

For all case studies, telephone conversations (and for some case even face to face meetings as it has been the case for i.e. Copenhagen and Scania, Alpine region, Euroregion Aquitania-Euskadi-Navarra) allowed the completion of the consultation C.

The results from the desk based analysis and the outcomes from the online consutations and the interviews have been materialized in 12 individual case study reports.

Policy messages and recommendation still to be developed and finalised, informed by input from the ESPON GRETA Advisory Group meeting held on the 15th November 2018 in Barcelona.

Bellow it is briefly described:

i) the potential GI network in each case study, as delineated by the GRETA project, analysing the identified synergies and trade-offs between the ES provided by the GI network and its potential for serving several policy objectives, and providing a relative analysis of the region with the general EU patterns.

ii) How do the case studies fare in meeting the existing demand for regulating, provisioning and cultural services offered by the GI network, based on GRETA analysis of: flood protection, soil erosion, water quality and recreation.

The Alba Iulia Municipality (Romania) NUTS 3 region RO121: GI covers most of the Alba Country, serving large part of the territory. However, special attention should be devoted to the Mureș river plain where conflicts may arise because mixed uses (agricultural, transport infrastructures, residential and industrial areas). It should be ensured that the existing potential for GI is consolidated to avoid further fragmentation and to keep the balance with the above-mentioned mixed uses. There is a clear West-East divide. While in the Western part potential GI is well structured, in the sense that it ensures connectivity of protected areas, the connectivity on the Eastern part is weaker threatened by the agricultural activity and different infrastructures. Therefore, connectors on the Mureș river plain need to be consolidated to ensure a coherent GI network. In terms of multifunctionality, all the area is capable to support at least two of the three policy objectives. It is of special concern the limited capacity to support water policies related to flood prevention, erosion control and limitation of soil erosion. There are no spatial issues related to synergies or trade-offs. It is not expected that improving certain conditions would have no side effects on other ES. There is already a good connection of the GI inside the city and in the peri-urban areas. However, the pressure from agriculture and built-up areas requires specific attention on the GI in order to avoid further fragmentation. Also in the peri-urban area, we found some GI with lower multifunctionality. It could be concluded that the region has good conditions for the implementation of a multifunctional GI network at landscape level; there is a large cluster of hubs (protected areas) well connected with the potential to provide several ES. However, the Mureș plain is the area with higher complexity given the intensity of uses (e.g. agriculture). Therefore, good planning is required to ensure the GI in this specific area, which will also facilitate the connectivity of protected areas. Regional and local knowledge should be used to better understand the limitations of the GI to support water policies. Regarding supply and demand for flood regulation and soil erosion the balance tend to be positive, in the sense that the supply is higher than the demand in most of the area. In practical terms it would mean that improving or reinforcing GI with the objective of water retention will have a substantial benefit. Water pollution is still a big challenge and substantial increase on the provision of water purification is still required under current status in most of the municipality. With regards to regulation, the analysis do not show a clear pattern but a diversed mixed of areas where supply meet the demand together with areas in need for reinforcing supply that could be partly explained as direct link with population density.

National Urban Parks Finland: the city of Hämeenlinna FI109 and the NUTS3 **region Kanta-Häme** FI1C2:: Most of the region is well covered by GI, serving large part of the territory. However, special attention will require the axis Tampere- Hämeenlinna- Riihimäki to ensure the connectivity of the GI. Potential GI is well structured in the sense that it ensures connectivity of protected areas. Therefore, GI could be a valuable instrument to ensure connectivity in the whole region. On the other hand, the share of protected areas inside GI is low. This suggests that about 80% of the potential network at the regional level is composed of unprotected landscape elements that deserve special attention. Case study shows however, that special attention is given to regional ecological connectivity and recreational values of green space.

Most of the potential GI is monofunctional, with limited capacity to support all three policies. More detailed information, at local level, would be required to confirm these limitations, and to identify where specific ecosystem services could be improved by appropriate management. Improvement of provision of ecosystem services could be counter-balanced by regional/local patterns of nitrogen deposition indicated by the trade-off linked to gross nutrient balance (see Annex II-B for more details). Additional information will be required to evaluate the exact impact of nitrogen deposition and implications for another ES. Hämeenlinna has multilevel governance examples about GI managements. City's National Urban Park (NUP) is one of the examples. It could be a strategic element to consolidate and to integrate the cross-sectoral concept of GI into municipal and regional management practices. However, the major challenge is the limited capacity to support multiple policies, and the predominance of monofunctional GI. Additional information, at regional and local level, is needed to better understand the limitations on the provision of ecosystem services and options for improvement. Generally speaking the analysis undertaken shown a positive balance of supply and demand for flood protection, soil erosion, and recreation, with water quality representing a challenge and substantial increase on the provision of water purification is still required under current status in the whole area, with the exception of the southwest of Forssa showing a well-balanced pattern.

Valencia Metropolitan Area (Spain): The strong pressure of Valencia metropolitan region could isolate the potential GI in big patches, disconnected from the plains. Better links with the peri-urban area could improve the GI network and reduce its fragmentation. Integration of blue infrastructure could also facilitate these connections. The structure of the GI is characterised by large-continuous hubs. Therefore, ensuring the connectors is important to avoid isolation of the large hubs. In terms of multifunctionality, all the area is capable to support at least two of the three policy objectives. It is of special concern the limited capacity to support water policies, in particular low provision of water retention capacity and soil erosion control. This clearly highlights the need for additional information, at local scale, to better understand these limitations, and to identify needed actions. There is potential for improvement of multifunctionality with a (limited) multiplier effect, i.e. improving one ES can enhance other ES at the same time. The major challenge is the connectivity between the city, the peri-urban areas and the rural areas. Valencia region has good conditions for the implementation of a multifunctional GI network on the basis of existing large hubs (protected areas). However, there is a clear geographic divide, with an intensive land use on the plains (agriculture and urban development) which challenges the connectivity between the city, the peri-urban area, and beyond. The potential GI could support biodiversity and climate change policies. Regional and local knowledge is required to understand the limitations on the lower performance to support water policies. Most of the area show a good GI network capacity for flood protection, whereas soil erosion, water quality and recreation show an unbalanced pattern (supply does not met demand) This general pattern could be partially explained as direct link with population density. In practical terms it would mean that improving or reinforcing GI with the objective of soil erosion, water quality and recreation will have a substantial benefit.

Greater Copenhagen and Scania (Denmark- Sweden) NUTS3 areas: SE224, DK011, DK012, DK013, DK021, DK022: About 2/3 of the Greater Copenhagen region has a very low coverage and highly fragmented GI, leading to differential accessibility depending on the cities. Agricultural areas, currently not included in the potential GI in the GRETA project (but is included in the GI in the spatial planning in the Danish part of region since 1947, and in the Swedish part of the region 'High Nature Farmland' is included as part of the planned GI since 2012/2013). The agriculture land could play an important role increasing the connectivity and availability of GI at landscape level. This would require appropriate agricultural practices, and land management, to have such a role on improving connectivity of GI. Moreover, the sustainable agriculture management could enhance connectivity of existing natural and semi-natural areas currently not part of the GI given its isolation. The potential GI is not ensuring the connectivity of protected areas, mainly in the Danish part of the region. Therefore, the efforts should focus on connecting these isolated spots and consolidating areas not protected that already contribute to the GI. Multifunctionality is very limited since most of the area is only capable to support one or two policy objectives. The existing capacity to support biodiversity should be consolidated, indicating future actions to integrate other natural and semi-natural areas. More detailed information on ES, at local level, would be required to confirm where specific ecosystem services could be improved by appropriate management. The relatively high share of GI on the peri-urban area should be taken as an opportunity to better integrate the urban and rural areas throughGI. To ensure good accessibility to the relative large population in the region, it would be appropriate to increase the amount of green areas, this by further developing spatial planning for recreation and leisure activities in the work of the cross-border committee. The analysis on supply and demand suggest that the GI network has a great capacity for meeting demand for flood protection, soil erosion and recreation, whereas water purification constitutes a big challenge (very high deficit of demand) which could be partly explained due to the limited multifuncionality of the GI network.

Estonia Latvia Cross Border Area NUTS3 areas: E008 Lõuna-Eesti, and LV008 Vidzeme: Most of the Estonia Latvia cross border area is well covered by GI, serving large part of the territory and probably giving balanced access to most of the population. Potential GI is well structured in the sense that it ensures connectivity of protected areas. Therefore, GI could be a valuable instrument to ensure connectivity in the whole region. On the other hand, there is room for improvement since about 50% of the potential network at the regional level is composed of unprotected landscape elements that deserve special attention by stakeholders.In terms of multifunctionality, most of the area is capable to support at least two of the three policy objectives. It is of special concern the limited capacity to support biodiversity policies in part of Lithuania (lower habitat quality on average), and climate change policies in part of Estonia. There is potential for improvement of multifunctionality with a multiplier effect, i.e. improving one ES can enhance other ES at the same time. There is a need to ensure the green urban area inside Tartu to avoid further shrinking and to improve the connection with the peri-urban area, where a strong competition for the land occur.This cross-border region has a good

potential to implement multifunctional GI. Hubs, i.e. protected areas, are well connected in the whole region without a border effect. However, there may be some limitations to support biodiversity policies in part of Lithuania, and climate change policies in part of Estonia. The observed synergies between most of ecosystem services may facilitate the implementation or improvement of the GI. Tartu is the most critical area given the strong pressure of urban development, which has reduced green urban areas and increased the risk of fragmentation of already week GI on the peri-urban area. The analysis undertaken on supply and demand show a great capacity of the GI network in terms of flood protection, erosion control and recreation, whereas substantial increase on the provision of water purification is still required under current status. Potential for cross-border cooperation in that connection is particularly relevant in the eastern part of the region (i.e. around Miso) where the difference in terms of supply and demand in the two countries is quite obvious.

Euroregion Nouvelle Aquitania Euskadi Navarra (France- Spain): The Euroregion Nouvelle Aquitania Euskadi Navarra encompasses the following NUTS2 areas: ES21 País Vasco and ES22 Comunidad Foral de Navarra and FR61 Aquitaine. For the purposes of GRETA project, the case study will be limited to: ES212 Gipuzkoa; ES220 Navarra; FR613 Landes; and FR615 Pyrénées-Atlantiques. Most of the Euroregion is well covered by GI, serving large part of the territory and probably giving balanced access to most of the population. The exception is Lot-et-Garone where the main constraint is the low percentage of protected areas. There is potential to increase the GI area. Potential GI is well structured in the sense that it ensures connectivity of protected areas. Therefore, GI could be a valuable instrument to ensure connectivity in the whole region. On the other hand, the share of protected areas inside GI is mid to low. This suggests that on average 60% of the potential network at the regional level is composed of unprotected landscape elements that deserve special attention by stakeholders in order to not be lost into urban or intensively managed agricultural areas. In terms of multifunctionality all the area is capable to support the three policy objectives, although not attaining its maximum. The current potential is good, but there is room for improvement. There is potential for improvement of multifunctionality with a (limited) multiplier effect, i.e. improving one ES can enhance other ES at the same time. There is an exception in Gipuzkoa and Pyrénées-Atlantiques were the trade-offs may be related to regional/local patterns of nitrogen deposition which are not counterbalanced with the capability to provide this ES (see Annex II-B for more details). Additional information will be required to evaluate the exact impact of nitrogen deposition and implications for another ES. There is a need to ensure a good connection between the core city and the peri-urban areas since the available GI inside the city is on the lower range in the European context, and has been decreasing between 2006 and 2012. On the other hand, the GI on the peri-urban areas already provide a good connection with GI at landscape level due to the contribution of Natura 2000 sites present in the region. Therefore, the links between protected areas need to be ensured in order to have a functional GI.It could be concluded that the region has good conditions for the implementation of a multifunctional GI network at landscape level; there is a large cluster of hubs (protected areas)

well connected with the potential to provide several ES. However, some trade-offs related to nutrients balance need to be analysed to better understand the potential negative impact of nitrogen deposition. Green infrastructure at landscape level is well connected with peri-urban areas. However, green urban areas at the core city have been decreasing and there is a need to ensure a good connectivity between the city and peri-urban area. As a result of the analysis on supply and demand, we can observe that the GI network supplies high capacity for flood control and for reducing soil erosion rates. Thus, no specific policy action may be required. However it is observed that efforts for reinforcing GI network with the objective of water purification and recreation would be needed.

Trnava Region (Slovakia) NUTS3 SK021: Most of the Trnava region has a very low coverage of GI, concentrated in few spots, and part of a larger network that extends its borders. Agricultural areas, currently not included in the potential GI, could play an important role increasing the connectivity and availability of GI at landscape level. This would require appropriate agricultural practices, and land management, to have such a role on improving connectivity of GI. Moreover, ensuring connectivity with rivers, which already contribute to the potential GI, could improve its coverage. The potential GI does not ensure the integration of all protected areas. Therefore, the efforts should focus on connecting these isolated spots and consolidating areas not protected that already contribute to the GI. Multifunctionality is very limited since most of the area is only capable to support one or two policy objectives. The existing capacity to support biodiversity should be consolidated, indicating future actions to integrate other natural and semi-natural areas. More detailed information, at local level, would be required to confirm where specific ecosystem services could be improved by appropriate management. There are no spatial issues related to synergies or trade-offs. It is not expected that improving certain conditions would have no side effects on other ES. Although the city and the peri-urban area have a high share of green infrastructure, its distribution does not ensure its connectivity resulting in large isolated spots. Improving these links may also increase the accessibility to green urban areas. The analysis undertaken on supply and demand reveal that GI network has a psotive balance in terms of flood protection, soil erosion control and to some extent also recreation, whereas water purification is still a big challenges and efforts for reinforcing GI network with this aim are needed.

Dún Laoghaire-Rathdown NUTS3 IE061: The area has a major constraint defined by the extent of urban areas. Therefore, good planning and management on the interface between urban and rural areas is key to maintain a coherent GI network. Connectivity of protected areas is a major issue on the wider region since the potential GI does not ensure a complete connectivity. Most of the potential GI is monofunctional, with limited capacity to support all three policies. More detailed information, at local level, would be required to confirm these limitations, and to identify where specific ecosystem services could be improved by appropriate management; improvement of the capacity of provision of ES is not expected to have negative side effects. The Dún Laoghaire-Rathdown is located in a metropolitan context, which poses an important constraint to the development of GI. Potential GI covers a low area of the whole

region, with low multifunctionality. Agricultural areas could play an important role to support the development of GI. GI has two major constrains in this area: i) Artificial areas cover large part of the region, limiting the space for GI; (ii) the effect of the coast (an interface between land and sea) as a border The GRETA project only considered the landside landside given the boundary conditions of the project; in the future, it would be appropriate to integrate the seaside. Resuts of the analysis undertaken on supply and demand reveal that effort for reinforcing GI network for water purification and recreation is still a challenge in some pats of the study area which will have a substantial benefit.

Randstad Region (The Netherlands) NUTS2 NL31 and NL32: Potential GI is probably close to maximum that could be attained given the geographic constrains. It is remarkable its relative homogenous distribution in a highly dense area. Therefore, it would be advisable to consolidate the network. Enlarging the GI would require the integration of some agricultural areas by appropriate agricultural practices. Given the high density and pressures from different land uses, it is critical to maintain the integrity of the links (all natural and semi-natural areas not protected). This would ensure the connectivity of the protected areas. Most of the area is able to provide multifunctionality. However, more detailed information, at local level, would be required to understand limitations on the biodiversity and how to improve it. There are no spatial issues related to synergies or trade-offs. It is not expected that improving certain conditions would have no side effects on other ES. Green infrastructure is relatively low in most of the cities. Although this could be counterbalanced by its coverage on the peri-urban area, the spatial pattern does not ensure the connectivity through different levels. Peri-urban areas are those with higher pressure for competition of different land-uses, therefore special attention would require ensuring equal accessibility to green infrastructure. The analysis undertaken for supply and demand in the study area show that the GI network has a good capacity for flood protenction and soil erosion control whereas water purification and recreation remains a challenges. A clear deficit of recreational service (low supply together with high demand) is shown in the coastal area, that could be partly explained as direct link with industrialization and with population density.

Central Scotland Green Network (CSGN) (United Kingdom): The Central Scotland Green Network is spread across two NUTS 2 regions (UKM7 Eastern Scotland and UKM8 South Western Scotland). Potential GI covers about 40% of the region, mainly following a N-S pattern. Therefore, on the two extremes of the W-E axes (i.e. around Ayr and Eastern of Edinburgh) the coverage is very low. GI has a relatively even distribution, serving substantial part of the territory. However, there are large areas around Ayr and Eastern of Edinburgh with poor coverage at landscape level. Fragmentation is the main constrain to extend GI in these two areas. All protected areas are integrated and connected on the potential GI. About 35% of the GI is covered by protected areas. Potential GI is well structured in the sense that it ensures connectivity of protected areas. Therefore, GI could be a valuable instrument to ensure connectivity in the whole region. On the other hand, large part of the potential GI is unprotected, which requires special attention to preserve its functionality. The potential GI, and related

ecosystem services, are able to support the three policy objectives, being biodiversity the one with highest multifunctionality. Soil erosion control and water purification. In terms of multifunctionality, all the area is capable to support at least two of the three policy objectives. It is of special concern the limited capacity to support water policies related to flood prevention, erosion control and limitation of soil erosion. Most of the ES have a neutral relationship, i.e. there is no interaction or no influence between ES. There are no spatial issues related to synergies or trade-offs. It is not expected that improving certain conditions would have no side effects on other ES. Share of green urban areas inside the city and in peri-urban area is relatively high (about 65% on average), except in Glasglow (35%). However, this is counterbalanced by the larger coverage of GI on the peri-urban area. Green urban areas remained stable between 2006 and 2012. There is a need to ensure a good connection between the core city and the peri-urban areas, in particular in Glasglow. On the other hand, the GI on the peri-urban areas already provide a good connection with GI at landscape level ensuring good accessibility.The GI network shows a positive balance between supply and demand for flood protention, soil erosion control and recreation. Efforts for reinforcing GI network with the objective of water purification would be very beneficial.

Malta: GI coverage is very limited in Malta; most of the existing GI is covered by protected areas. Potential GI covers about 10% of Malta, limited by the urban development and, to a lesser extent, agriculture. Being an island poses a challenge to the integration of multiples uses in a limited space. Given these constrains, agricultural areas could support GI. On the other side, all protected areas are integrated on the GI and all of them are connected. About 30% of Valletta is covered by green urban areas, which positions this city within the lowest range in Europe. This is compensated by larger coverage of GI in peri-urban areas. Green urban areas slightly decreased between 2006 and 2012. There is a need to consolidate green urban areas to avoid further decrease and improve connectivity with peri-urban areas

Alpine macro-region

The Potential GI covers about half of the Alpine Macroregion with large regional disparities:

- Austria, Slovenia, Northern Italy (except Poo Valley), France, and Switzerland: the potential GI covers almost 80% of the corresponding regions.
- Germany and Poo Valley have lower coverage and very fragmented GI. In the case of Northern Italy, rivers play an important role as part of the GI in a region densely populated which faces strong pressures from transport networks, metropolitan areas and agricultural intensification.

In terms of the integration of protected areas, the Alpine region shows a high level of connection of hubs (protected areas). Protected areas represent medium to high share of the total GI .

- Potential GI is well structured in the sense that it ensures connectivity of protected areas. Therefore, GI could be a valuable instrument to ensure connectivity in the whole region.

The extension of the Alpine region and its geographic diversity is reflected on the different situations regarding the potential multifunctionality of GI. One constrain is derived from the high elevation areas in mountains, characterized by the presence of bare rock on the surface. This results in very low values for most of the ecosystem services. Therefore, these areas need to be considered in this context.

- Slovenia, the Northern part of Italy (excludign the Poo Valley) and part of France (Franche-Comté NUTS FRC2) are the regions with highest capability to provide multifunctionality for the three policyes analysed.
- The rest of the region has some limitations. It's worthwhile to mention the case of Austria, where there is a large network of protected areas, however, the connectIng areas have lower capacity to provide ecosystem services.

In relation of the synergies and trade-offs between the ES, most of the ES have a neutral relationship, i.e. changes in on ES does not have impact on other ES. However, there is a strong trade-off between gross nutrient balance and soil erosion control, and gross nutrient balance with net ecosystem productivity in Northern Italy .

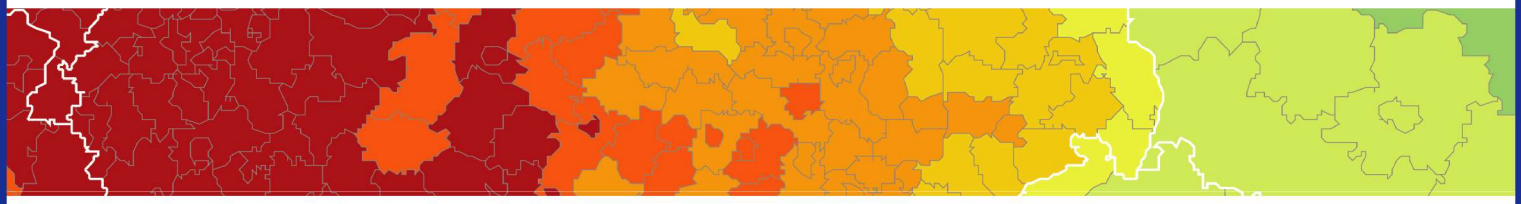
- There are conditions to improve the multifunctionality in the region, for example in Austria where no trade-offs have been identified.
- A major concern is the Poo Valley, were more detailed information is required to understand its potential limitations.

There is a high variability on the available GI inside the cities. However, accessibility is medium to high in the cities of the region.

The evaluation from stakeholders have concluded that:

- This approach may be useful to provide a broad regional context.
- At more detailed level there is enough data in the region. Therefore, to develop a GI map this detailed information should be used.
- There are discrepancies on the evaluation of the GI produced by GRETA. These discrepancies are partly linked to different interests. For example one criticism arose from the need to better integrate recreational aspects.
- The larger discrepancies have been observed on the definiton of the policy priorities and related ecosystem services. The priorities and the perspective of the stakeholder are relevant on this regard.
- There is a lot of knowledge on GI. Projects like GRETA could help to visualize and disseminate GI in more understandable way. Maps are good tools for communication.

The analysis undertaken for supply and demand in the study area show that the GI network has a positive balance in terms of flood protenction, soil erosion control and recreation as a general pattern, being water purification the major challenge, with a clear deficit (low supply together with high demand) predominant in the easetern area i.e. Austria and Eslovenia.



ESPON 2020 – More information

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The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.