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Indicators for mapping ecosystem services: a review

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“In nature nothing exists alone.” Rachel Carson, *Silent Spring* (1962)

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1. Introduction

Ecosystem services (ES), the benefits that humans derive from ecosystems, support people around the world. These include, *inter alia*, provisioning of food and fibre, regulating and provisioning of water, soil productivity, and use of natural areas for recreation or spiritual purposes. Furthermore, ES contribute to national economies, as highlighted by Costanza et al. (1997) and The Economics of Ecosystems and Biodiversity reports (TEEB, 2010). This contribution is not usually accounted for in national economies, partly because the financial benefits of many ES cannot be measured directly. Nevertheless, most ES can be measured through indicators and current research shows that they are being degraded. According to the World Resources Institute (WRI, 2001) and the Millennium Ecosystem Assessment (MA, 2005), natural ecosystems are declining and ES are being used unsustainably around the world. The recognition of the urgent need to safeguard ES has led to the establishment of new policies, as well as the inclusion of ES in existing policies around the world. For example, in recognition of the fact that the Biodiversity Targets for 2010 were not met, the Convention on Biological Diversity (CBD) set new targets for 2020 with the maintenance of ES as a key target of the new Strategic Plan for Biodiversity (COP 10, 2010). Out of the 20 targets set for 2020, Targets 11¹ and 14² explicitly address the conservation of ES.

The European Union (EU), signatory to the CBD, has also adopted an EU Biodiversity Strategy for 2020 in which the safeguarding of ES is explicitly included. Changes to the EU's biodiversity strategy are expected to be reflected in biodiversity conservation policies in all EU27 Member States (MS). Interest in ES and the need for indicators to measure them is clearly growing in Europe. Moreover, the EU is also involved in biodiversity conservation activities outside its borders, thus implying that changes in the new biodiversity strategy will extend to other countries, particularly developing

¹ Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

² Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

countries in which the EU supports biodiversity conservation activities and sustainable development. For example, since 1992 the EU has been supporting many activities in Africa through projects, such as ECOFAC (<http://www.rapac.org/>), OFAC (<http://observatoire-comifac.net>), and, more recently, BIOPAMA (BIODiversity and Protected Areas MAnagement) on protected areas in African, Caribbean, and Pacific (ACP) countries. Developing countries rely heavily on ES for the well-being of their citizens; therefore, their inclusion in policies on biodiversity and development may have impacts on local livelihoods. Consequently, the EU's biodiversity policy must account for ES not only within Europe but also in the developing countries where the EU is involved in conservation work.

Research on ES has grown substantially in the past decade (Nelson and Daily 2010; Seppelt et al. 2011). Many conservation organizations are dedicating resources to ES work and new consortia and centres focused on modelling ES are being established (e.g. Natural Capital Project, IASS Potsdam, ARIES, Ecosystem Services Partnership). Furthermore, new conservation journals are emerging with particular focus on ES research (e.g. Ecosystem Services & Management; Ecosystem services). Recently, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES, www.ipbes.net) was launched to guide the flow of scientific information related to biodiversity and ecosystem services to governments and practitioners. The increased interest in ES research is partly due to the inclusion of ES in conservation policies as mentioned above, but also to interest from businesses either to comply with current policies or to understand how they could be affected by potential new policies. Most importantly, some businesses are interested in understanding how to manage their dependence and impacts on ES. The World Resources Institute (www.wri.org), World Business Council for Sustainable Development (www.wbcsd.org), and the Meridian Institute (www.merid.org) provide guidelines for identifying business risks and opportunities arising from ecosystem change in their Corporate Ecosystem Services Review (Hanson et al. 2008). In this regard, some companies have formed partnerships with conservation organizations (e.g. IUCN-Shell collaborative partnership, 2007). As interest in ES grows, the need to account for them through mapping and modelling is

also growing. Information from mapping and modelling exercises can be used to estimate biophysical quantities, evaluate congruence with biodiversity, establish trends, estimate costs and trade-offs, and place monetary value on biophysical quantities (e.g. Willemen et al. 2010; Deng et al. 2011).

Research on ES must share one goal: the mainstreaming into policies and practises in order to ensure the continuous provision of ES and associated benefits to humans. According to Cowling et al. (2008) the biophysical quantification of ES is an essential step towards successful implementation of actions to safeguard them. This step most often precedes monetary valuation as well as evaluation of trends and trade-offs. Unfortunately, many ES cannot be directly quantified, thus making the use of indicators indispensable. While ES providing goods can be directly quantified, most regulating, supporting, and cultural services are less straightforward and researchers must rely on indicators or proxy data for their quantification. Furthermore, data on quantifiable ES remain limited and only a small number of indicators are being used for those that cannot be measured directly (Feld et al. 2010; Layke et al. 2011). In order to produce reliable outcomes in congruence analysis, valuation, or assessment of trends in ES, robust biophysical quantification is required. A review of indicators used for mapping ES is a necessary first step towards developing reliable and feasible indicators for mapping and modelling, as well as for bridging current data gaps.

The development of robust indicators for mapping and modelling ES is also an important step towards meeting the EU Biodiversity Targets for 2020. For example, Target 2 (Action 5) states that ecosystems and their services must be maintained and enhanced and requires EU Member States, with the help of the European Commission (EC), to map and value ES within their national territories by 2014³. This explicit inclusion of ES in EU conservation legislation imposes a responsibility on the EC to encourage the implementation of such policies by supporting the work of Member States to meet this

³ Member States, with the assistance of the Commission, will map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020.

target. At present, some Member States are very advanced in this process (e.g. the UK National Ecosystem Assessment) while others might lack the expertise to progress. In fact, lack of expertise and data is the main challenge to the achievement of this objective.

The European Commission's Joint Research Centre (JRC) has been collecting a wide variety of spatial data for years as part of its task to monitor and model the environment. Examples of such data include precipitation, primary productivity, air quality, greenhouse gas emissions, forest cover, land cover change, agricultural productivity, and soil properties. More recently, the JRC started to include ES in its modelling activities. As mentioned above, not all ES can be directly observed from the environment; therefore, the use of spatial indicators is crucial. Some of the data that the JRC has been collecting could be useful in the mapping and modelling of ES.

In this report we give an overview of spatial information used for mapping and modelling ES according to the scientific literature and evaluate the potential contribution of the JRC in supporting such initiatives at global, continental, and national level. In particular we:

- i) identify spatial indicators that have been used to map and quantify ES;
- ii) inventory the currently available spatial data on indicators in the JRC; and
- iii) identify the possible contribution of the JRC to ES mapping initiatives.

2. Inventory methods

In this report the term *data* is used to refer to the collection of actual measurements of a state, quantity, or process derived from observations or monitoring (TEEB, 2010). For example, forest cover is a measure derived from earth observation. An *indicator* serves to indicate or give a suggestion of something of interest and is derived from measures (TEEB 2010). For example, changes in forest cover can indicate the level of carbon sequestration.

2.1 Inventory of ES indicators

Currently, only few studies have collected information on the use of indicators for quantifying ES. For example, Layke et al. (2011) reviewed the 21 sub-global MA assessments. They assessed the ability of indicators to convey information on ES and data availability. Feld et al. (2009) also carried out an extensive literature review of peer-reviewed literature published between 1997 and 2007, and compared the availability and characteristics of indicators. Additionally, several lists of recommended ES indicators appeared in the literature, e.g. De Groot et al. (2010). To add to this earlier research, we reviewed indicators that have actually been used to map and model ES between 1997 and 2011. In doing so, we searched for peer-reviewed publications on ES in Scopus and ScienceDirect in June 2011. We used the search terms “quantifying environmental services”, “mapping environmental services”, “quantifying ecosystem services”, “mapping ecosystem services”, “valuing ecosystem services”, and “valuation of ecosystem services”. We found 145 studies but excluded all conceptual, opinion, and theoretical publications, thus including only papers that actually mapped or modelled ES in the final selection (78 excluded). We also excluded work on marine systems, thus focusing only on terrestrial systems. From each paper we extracted information about the ES indicators used and general information about the specific study (e.g. data source, data extent, study area, affiliated scientists; see Appendix 1 for a complete overview). We made a distinction between primary and secondary indicators, with *primary indicators* reflecting the proxy used to measure ES (e.g. “tourism attractiveness”), while *secondary indicators* provide the necessary information used to compose the primary indicator (e.g. for tourism attractiveness, the secondary indicators could be “accessibility” and

“naturalness”). Given that in most cases different names were used for the same type of indicator, we standardized all indicator names to allow for quantitative analyses.

All indicators and services were grouped according to the classification presented by The Economics of Ecosystems and Biodiversity study (TEEB 2010), in which the four following categories are defined: i) *Provisioning services*, e.g. food, water, and other resources; ii) *Regulating services*, e.g. climate, air and soil quality, carbon sequestration, erosion prevention; iii) *Habitat or Supporting services*, e.g. habitats for species and maintenance of genetic diversity; and iv) *Cultural services* (non-material benefits), e.g. recreation, tourism, and inspiration. In the cases of ambiguous names of the services or service categories we reported the classification as given by the authors of the paper (e.g. hunting as provisioning or cultural service)⁴.

We omitted published studies not included in Scopus, ScienceDirect, the sub-global assessments of the MA (2005), and national assessments. The focus solely on peer-reviewed literature allowed us to capture the current trends in this scientific field.

2.2 JRC Data inventory

For each secondary ES indicator identified in the selected papers, we checked the availability of analogous data within the JRC in order to estimate the potential to quantify and map ES as has been done in the scientific literature to date. We classified the JRC data into four categories: A) available JRC data; B) available third party data of which JRC institutes hold a local copy; C) data currently being produced at the JRC; and D) data not available to the JRC.

The main source of information was the JRC Reference Data and Service Initiative (RDSI) portal (<http://rdsi-portal.jrc.it>), a recently established initiative to collate data from scientific units working on environmental and sustainability topics. Cases in which the RDSI portal could not provide us with all the available information, other web sources

⁴ Hunting activities, in the hunter gatherer societies are considered a provisioning service, but a cultural service in European countries.

and personal communication with JRC scientists were the sources of information. For the third party data used by the JRC, we describe the data provider, as well as the access rights. This kind of data, although not directly produced by the JRC, is used in many cases as a basis for generating secondary data (e.g. the use of Shuttle Radar Topography Mission data layers for the production of Digital Elevation Models).

In this report we do not evaluate the quality of data or authenticity of data sources to map and quantify ES. Therefore, we include all indicators and data sources and consider them as equally relevant.

3. Indicators used for quantifying and mapping ecosystem services

In this section we provide an overview of the diversity of indicators and their occurrence in the different studies. We identified primary indicators that were mostly mapped in each service category and the secondary indicators used for mapping them.

Studies mapping ES have increased over the years with the number of studies in 2009 doubling by 2011 (Figure 1). We identified 67 studies that have mapped ES using various indicators for the purpose of estimating biophysical service supply, assigning monetary values to the biophysical service supply, understanding trade-offs/costs, identifying priorities, or understanding future risk through trend analysis. The majority (94%) of the studies were carried out after 2005, the year in which the second Millennium Assessment (MA) study was carried out. Before 2005 most of the studies on ES focussed on monetary valuation in order to understand the costs and benefits of certain actions (e.g. Guo et al. 2000; Guo et al. 2001). This trend does not seem to have changed since we found that most of the more recent studies had placed monetary value on the ES (Figure 2 and 3). However, the objectives of many studies were to understand the value of ES in monetary terms or simply estimate biophysical service supply rather than weighting the cost of certain *ad hoc* actions. In fact, only one study had looked at costs and benefits, a rather small percentage compared to the 26 that had placed monetary values on various ES, but did not necessarily look at costs and benefits. Nine studies estimated only biophysical service supply while further nine looked at the trends/changes in ES for different scenarios. Some studies carried out a biophysical assessment before putting monetary value on ES supply.

All four categories of ES have received some attention according to our analysis. Of the 67 studies, the regulating and provisioning services received the greatest attention with 50 studies mapping regulating services and 38 studies provisioning services (Figure 4). Thirty two studies mapped cultural services. Supporting services received the least attention with only 10 studies mapping them. Many different primary indicators were used to map the regulating and cultural ES rather than the provisioning and supporting services. The different types of primary indicators used for mapping each ES depend on

the type of service. For example, there was only one primary indicator listed for pollination as this is a straightforward service, each clearly stating that pollination was mapped. This was not the case for cultural services where many different terms were used to indicate what the authors mapped (e.g. cultural heritage, spiritual enjoyment, recreation, ecotourism, or tourism). Therefore, cultural services had many more primary indicators than provisioning and supporting services, while regulating services had the most primary indicators (Figure 5).

Secondary indicators used as input information for ES showed the same trends as the primary indicators. Regulating services had the greatest number of secondary indicators compared to all other services (ca. 90 different types). This result could be explained by the fact that regulating services, such as carbon sequestration/storage or water flow regulation, are modelled using many different secondary indicators (e.g. Deng et al. 2011; Laterra et al. 2011), thus significantly increasing the number of secondary indicators (Figure 5). This was not the case for food production where proxies were mostly used to map the service (e.g. agricultural land or grain production). Land cover proved to be an important secondary indicator for all four categories of services. Overall, it was the most common indicator comprising 16% of all secondary indicators. In fact, it was an indicator in almost every single ES mapped. Land cover data typically contain land use, such as agricultural land, vegetation types, and the built environment. Agricultural land is an important proxy for mapping food provision while vegetation cover, such as forest, can be used for quantifying carbon sequestration/storage, water regulation or even to delineate recreational areas (Helian et al. 2011; Huang et al. 2011; Nelson et al. 2009). Other common secondary indicators were nutrient fluxes and soil characteristics (e.g. structure, depth, nutrient content). Each of these indicators comprised 6% of the total secondary indicators. Vegetation map was also important and comprised ca. 5% of all secondary indicators. Table 1 shows some examples of indicators used for mapping various ES. Below we describe the indicators used to map the different types of services with emphasis on the top primary indicators for each category.

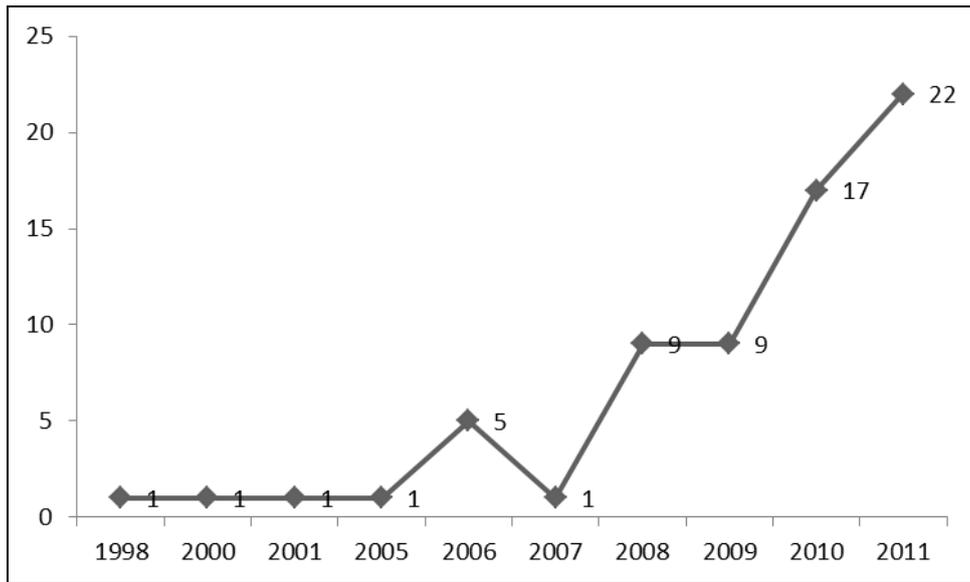


Figure 1 Number of ecosystem service studies per year

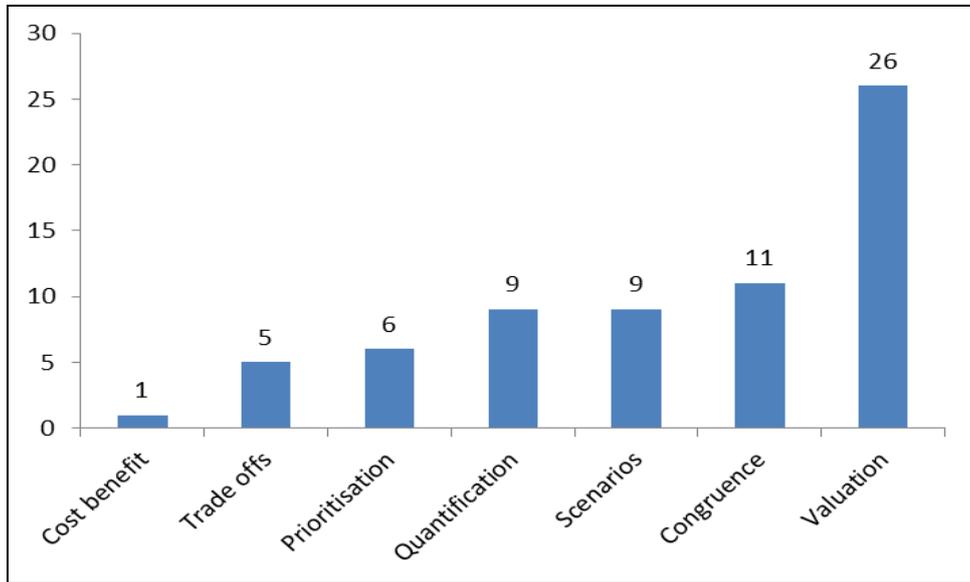


Figure 2 Number of studies and rationale for mapping ecosystem services

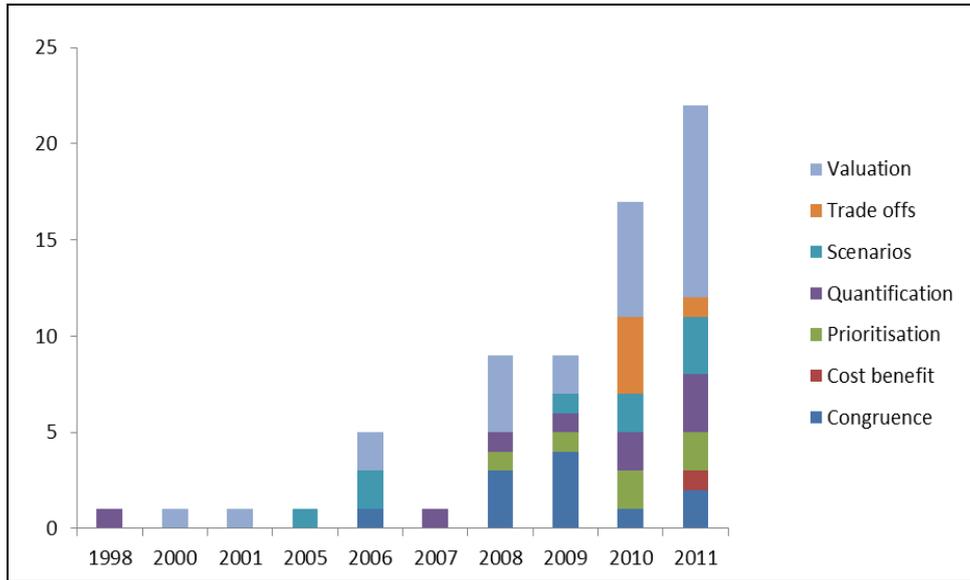


Figure 3 Number of studies per year and rationale for mapping ecosystem services

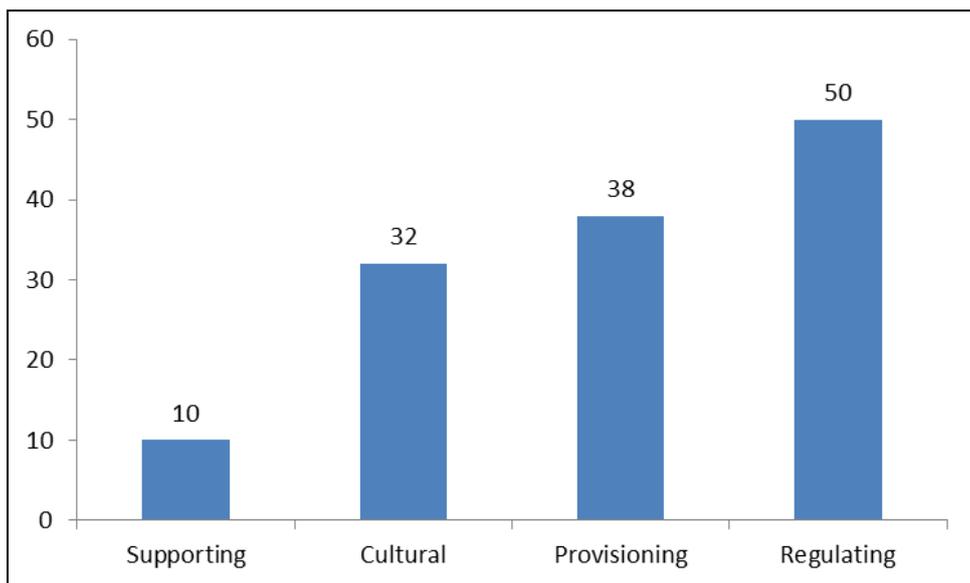


Figure 4 Number of studies that mapped the different ecosystem service categories

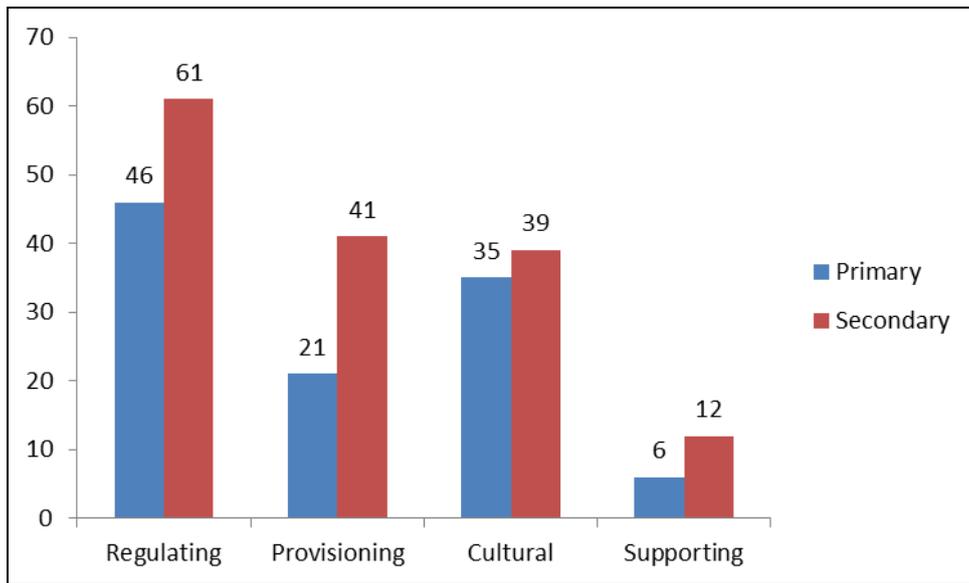


Figure 5 Number of different indicators used for mapping the four ecosystem service categories

Table 1 Examples of indicators used for mapping various ecosystem services

Ecosystem services	Secondary Indicators
Aesthetic enjoyment	Distance to Scenic site Protected areas
Air Quality Regulation	Deposition velocity Pollutant concentration Tree cover
Biological Control	Pest density
Climate Regulation	Above ground biomass Below ground biomass Forest biomass Land cover NPP Nutrient flux Soil carbon
Erosion prevention	Erodibility Land Use Slope Soil characteristics Soil retention Vegetation map
Food provision	Climatological parameters Crop yield Land cover Livestock NPP
Genetic Resources	Land cover
Inspiration for culture, art and design	Land cover Land Use landscape value
Lifecycle maintenance	Above ground biomass
Lifecycle maintenance Total	
Maintenance of Genetic Diversity	Land cover
Maintenance of soil fertility	Earthworm Land cover Litter Nutrient retention Soil characteristics
Medicinal Resources	Land cover
Moderation of extreme events	Annual flood Flood plain Hazard
Moderation of extreme events Total	
Pollination	Cost of bees

Raw materials	Crop yield
Recreation and tourism	Habitat
	Reeds cutting
	Accessibility
	Accommodation
	Cultural heritage
	Fish abundance
	Flower viewing
	Footpaths
	urban green space
Regulation of water flows	Visitors numbers
	Ground water
	Nutrient retention
	Precipitation
	Sediment retention
	Soil characteristics
	Stream flow
Waste treatment	Topography
	Human excretory
	Nutrient deposition
	Urea price
Water provision	Evapotranspiration
	Ground water
	Litter containment
	Population density
	Precipitation
	Quick flow
	River salinity

3.1 Provisioning services

Among the studies that mapped provisioning services, food provision received the most attention. Approximately 40% mapped food provisioning (12 primary indicators), such as fodder provision for livestock, grain production or productivity in landscapes (Table 2). Secondary indicators used for mapping food production include agricultural production measured in hectares of land (e.g. from land cover maps), livestock numbers or vegetation suitability for fodder production and grain yield (e.g. tons of rice and maize). Information on livestock and grain production are easily obtained from national statistics or global datasets (e.g. FAO). Land cover and vegetation maps are also easily available through continental or global data sets (e.g. GLOBCOVER, GLC2000, CORINE land cover products). This became evident in the current study with the most common indicators

for mapping food production being crop yield, land cover, and livestock numbers (Figure 6).

Our results show that 20 studies have mapped water provision. It is essential to note that water provision or supply is not the same as water regulation. The latter is the process through which clean water becomes available, while water provision or supply is water that is already available for use. Both services received increased attention as water is vital to life on earth and its value is easily appreciated by humans. Studies that mapped these services used secondary indicators, such as surface or ground water availability. Surface water in the form of runoff was frequently used as a proxy for surface water availability (Figure 7). This information can easily be retrieved from hydrological models (e.g. Egoth et al. 2008).

Table 2 Number of different types of primary and secondary indicators identified for provisioning services

		Types of Primary indicators	Types of Secondary indicators	Number of studies
Provisioning services	Food provision	12	21	28
	Water provision	3	16	20
	Raw materials	4	8	7
	Genetic Resources	1	1	1
	Medicinal Resources	1	2	2
	Ornamental Resources	0	0	0

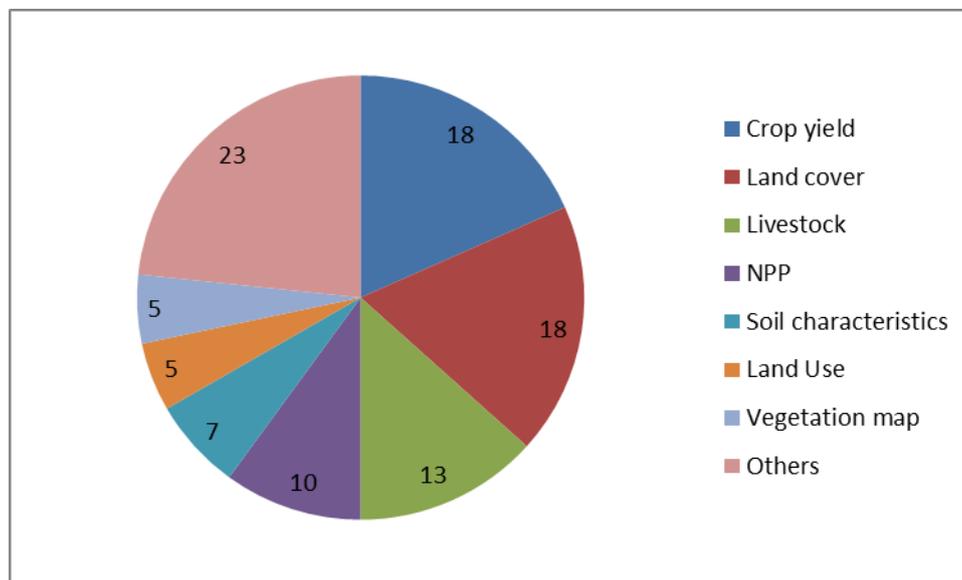


Figure 6 Secondary indicators used for mapping food provision

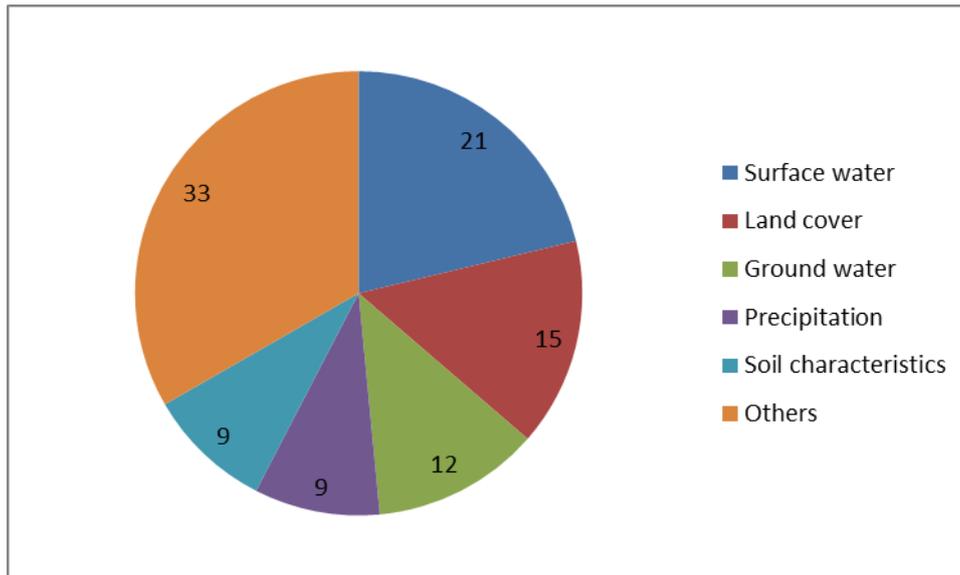


Figure 7 Secondary indicators used for mapping water provision

3.2 Regulating services

Regulating services were the most commonly found in this review. More than 75% of studies had mapped regulating services, in particular climate and water regulation (Table 3). Most of the climate regulation studies were carried out between 2008 and 2011. The Intergovernmental Panel for Climate Change (IPCC) and associated policy options, such as REDD+ (Johns et al., 2009; Biesbroek et al. 2010) have resulted in an increase in research on climate change. The consequent increase in climate regulation information has become a priority for most governments and many international bodies. Climate regulation services mainly relate to the regulation of greenhouse gases; therefore, the primary indicators for climate regulation included carbon storage, carbon sequestration, and greenhouse gas regulation. Secondary indicators used to model these primary indicators were many (19) but still less than those used for food production (21) and water regulation (24). Aboveground biomass was the most commonly used secondary indicator for climate regulation followed by land cover and belowground biomass⁵ (Figure 8). Soil carbon, nutrients, and vegetation maps were also important input data for mapping this service. Most studies that have mapped this service have put monetary value on the service, evaluated trends, or looked at congruence with biodiversity. Trends

⁵ Note that many studies derive below ground biomass from above ground biomass through a look up table

are important for projecting future losses from climate change and associated monetary value. Many species are subject to extinction due to climate change and some authors are assessing congruence with biodiversity to establish areas where there will be minimum impact for biodiversity or where biodiversity could suffer the effects of climate change (Mooney et al. 2009).

The second most common regulating service mapped was water flow regulation. Approximately one third of studies mapped this service with 11 primary indicators and 24 secondary indicators. Secondary indicators used for mapping water flow regulation were mostly nutrient retention, soil characteristics, and land cover (Figure 9). Nutrient retention is an important variable because water quality is determined by the extent of nutrient loading in water bodies. Nutrients such as nitrogen and phosphorus from agricultural land are often deposited into open water bodies leading to eutrophication, thus rendering them unusable by humans (Scanlon et al. 2007). Biophysical models for nutrient retention (e.g. nitrogen) have been developed by hydrologists to monitor nutrient loading. Outputs from these models are now being used in the context of ES as proxies for water regulation (Sandhu et al. 2008; Jenkins et al. 2010). The amount of water that reaches streams or sinks into the ground and the quality of such water is also a function of water infiltration, which is mainly dependent on soil characteristics and land cover. Natural vegetation slows runoff, thus retaining nutrients and allowing time for water to infiltrate into the ground more efficiently than on bare cultivated land where runoff is high due to sealed soil surfaces (Mills and Fey, 2004). Soil data are usually part of the soil map and are available through the agricultural sector in many countries (e.g. see section 5).

Information on soils and land cover types were also important input data for mapping soil erosion control. This proved to be an important ES shown by 18 studies that mapped this service. Again the most common indicators were land cover, vegetation map, and soil erodibility. Soil erosion control is the ability of vegetation cover to slow the movement of surface runoff, thus allowing excess water to infiltrate. The type of vegetation cover and the soil erosion potential are key indicators for mapping this ES. It is therefore not surprising that land cover/land use, vegetation map, and soil erodibility

were the secondary indicators used most frequently in quantifying this service (Figure 10).

Table 3 Number of different types of primary and secondary indicators identified for regulating services

		Types of primary indicators	Types of secondary indicators	Number of studies
Regulating services	Air Quality Regulation	1	3	3
	Climate Regulation (incl. carbon sequestration)	10	19	39
	Moderation of extreme events	8	8	8
	Regulation of water flows	11	24	23
	Waste treatment	6	7	8
	Erosion prevention	6	17	18
	Maintenance of soil fertility	2	5	6
	Pollination	1	5	7
	Biological Control	1	2	2

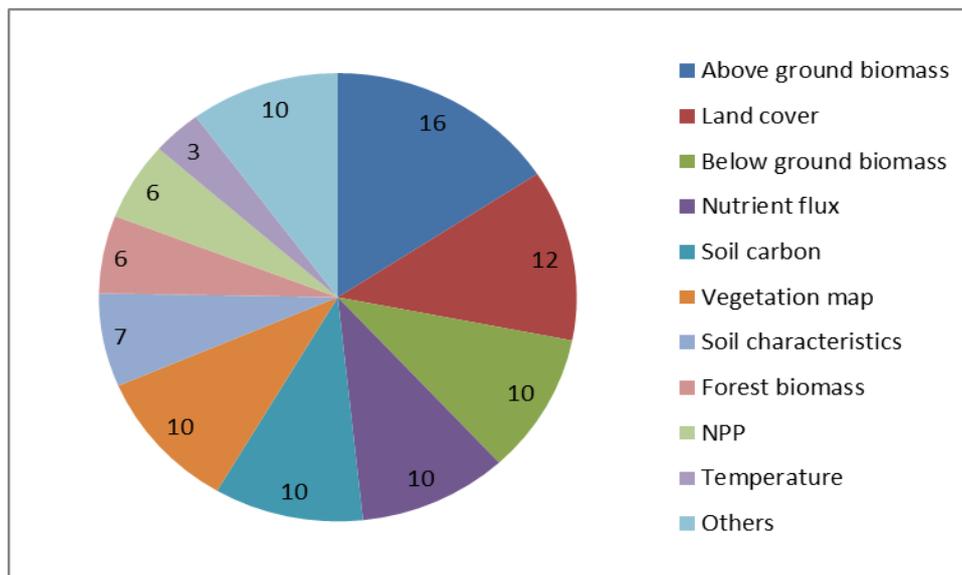


Figure 8 Secondary indicators used for mapping climate regulation

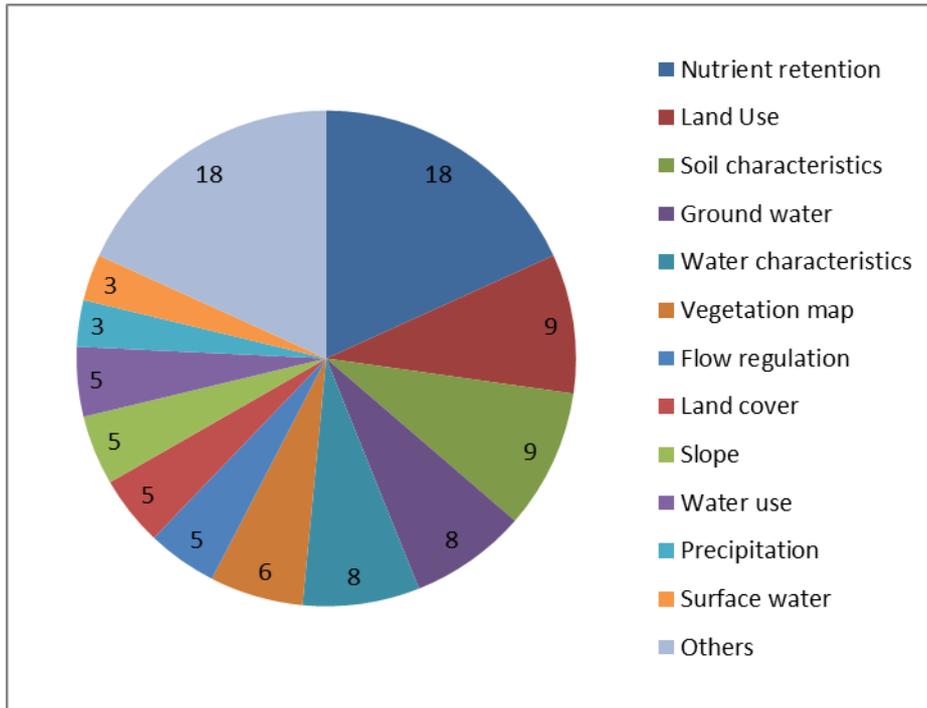


Figure 9 Secondary indicators used for mapping water regulation

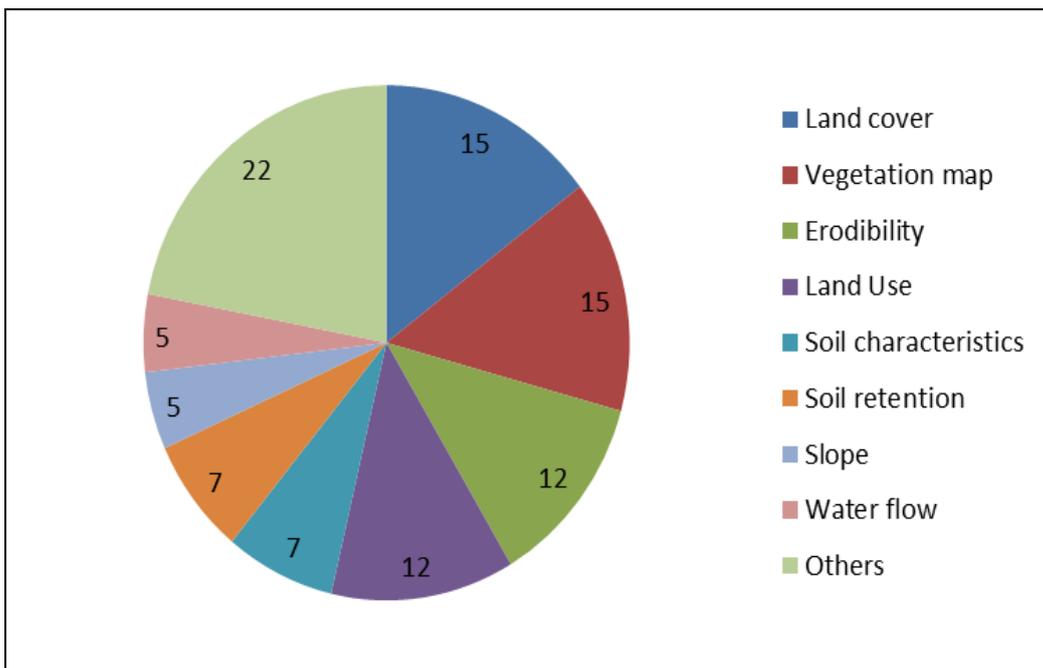


Figure 10 Secondary indicators used for mapping erosion control

3.3 Supporting services

Supporting services received the least attention of the four ES categories. All five primary indicators used for mapping this service were related to species and habitat diversity. There were also fewer secondary indicators compared to other services (Table 3). These included land cover/land use, and species and habitat conservation indices. The comparatively lower numbers of primary indicators for supporting ES could be attributed to the lack of information on these services and the few classes. First of all, there are only two classes in this category according to the TEEB classification. In the MA classification, all soil related ES are regarded as supporting services. Secondly, services like life cycle maintenance and maintenance of genetic diversity are generic for which it might be difficult to find suitable indicators. Lastly, even if one could map this service, it might be difficult to find data on indicators for mapping. Due to these challenges, supporting services received the least attention based on our study.

Table 4 Number of different types of primary and secondary indicators identified for supporting services

		Types of Primary indicators	Types of secondary indicators	Number of studies
Supporting Services	Lifecycle maintenance	5	12	9
	Maintenance of Genetic Diversity	1	1	1

3.4 Cultural services

Cultural services are mostly related to non-material benefits, for example spiritual or aesthetic value, but can be expressed in many different ways. Indicators used for mapping cultural services were mostly diverse. In fact, there were many more different types of primary and secondary indicators used for mapping this service than any other service. As many as 20 primary and 29 secondary indicators were used to map recreation and tourism (Table 5). The primary indicators to express this particular ES differed among

almost all studies and ranged from completely transformed areas, such as accommodation suitability and summer cottages, deer hunting and fishing to natural areas, such as forest for recreation. The most common secondary indicators were mainly associated with distance to resources, such as scenic sites, water bodies, or forest (e.g. Naidoo et al. 2011; Figure 11). Land cover, visitor numbers and accessibility to natural areas were also commonly used. Visitor information data are readily available and can be extracted from national statistics or from National Parks. Accessibility to natural areas could be mapped from easily accessible national or continental data on land cover and roads. However, some services, such as spiritual experience, are difficult to quantify and received the least attention. Cognitive development was not mapped at all.

Table 5 Number of different types of primary and secondary indicators identified for cultural services

		Types of Primary indicators	Types of secondary indicators	Number of studies
Cultural Services	Aesthetic enjoyment	10	11	9
	Recreation and tourism	20	29	26
	Inspiration for culture, art and design	4	3	5
	Spiritual experience	1	1	1
	Cognitive development	0	0	0

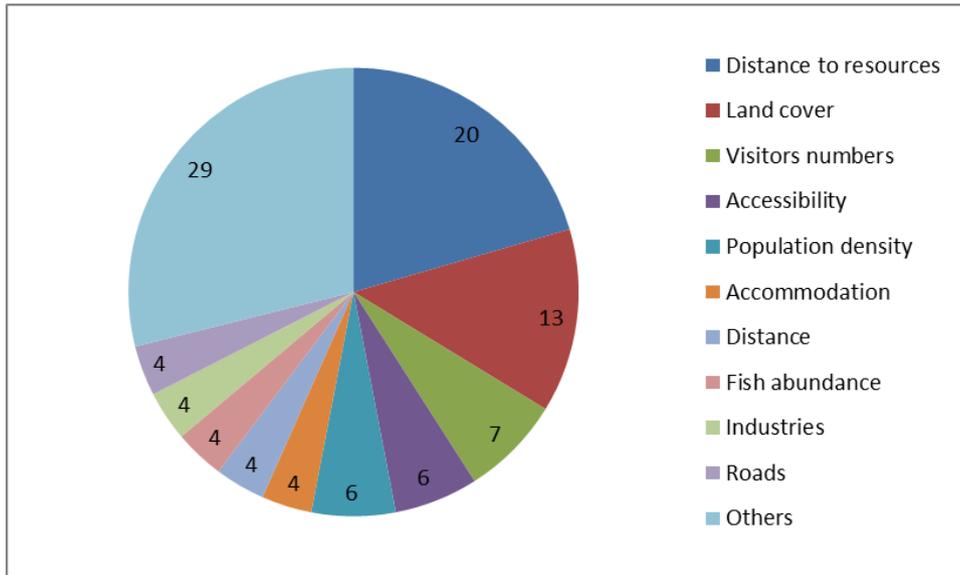


Figure 11 Secondary indicators used for mapping recreation

4. ES quantification methods

In this section we give an overview of the methods typically used to map and quantify ES. We classified the quantification methods into three groups: i) collection of primary data through direct observations; ii) proxy methods in which a single or combined indicators are used to define ES, such as composite indicators; and iii) process models in which indicators are used as variables in the equation.

In the 67 papers included in the literature review we found that a total of 260 quantified ES. Table 6 shows that the majority (69%) of these were quantified using proxy methods (or Tier 1 methods). Especially for cultural services, including subjective aesthetics and inspiration services which are difficult to directly measure and model, this proxy approach is often used (77% of the cultural services). Primary data on cultural services consist mainly of visitor counts for recreation and tourism.

Currently, process models are predominantly used to quantify regulating services (56% of the models), especially for climate regulation (incl. carbon sequestration), regulation of water flows, erosion prevention, and moderation of extreme events. The complex nature of the processes behind these services which strongly relate to the biophysical sciences explains the number of models that have been developed. Unlike cultural services, most regulating services are related with ecological function involving many processes. A single proxy cannot adequately describe or represent such processes making modelling the most adequate option.

Of the different ES categories, observed primary data are most often used in the quantification of provisioning services (22%). These primary data are derived from national statistics on agricultural production (food provision), drinking water supply (water), and timber and fibre production. However, in this category, proxy methods linking provisioning services to (indirect) indicators are most commonly used (43%), e.g. by directly linking food production to land cover classes. In some cases crop growth models were used (e.g. Li and Ren 2008; Laterra et al. 2011). In contrast, the collection of primary data as a single method is not used to quantify supporting services. Primary data

on species observations are used but only together with other indicators (e.g. Nelson et al. 2009, Willemen et al. 2008).

Among all ES categories researchers mainly use simple proxy methods which could imply large potential errors (Eigenbrod et al. 2010). Primary data on ES generally lead to a more accurate representation of the spatial distribution, although data availability is a clear problem. Most primary data on ES come from sub-national and national data sources. Only global data on agricultural yields and carbon storage are directly used to quantify food production and climate regulation.

A more generic problem is that many studies quantifying and mapping ES do not validate their results or test their methods for sensitivity. The validity of ES maps is difficult to quantify for several reasons. Firstly, lack of primary data makes the validation based on independent data complicated. Secondly, in contrast to biophysical landscape services, socio-cultural services are stakeholder, location, and time specific (Hein et al. 2006). This makes the validation of qualitative measures of, for example, cultural heritage and landscape aesthetics, difficult. Therefore, clear communication to end-users is needed regarding the different dimensions of uncertainty to avoid misinterpretation of the ES maps (Walker et al. 2003; Janssen et al. 2005). Communicating these uncertainties could be done by presenting additional maps with ranges in which ES are likely supplied. Meanwhile, methods that can quantify the uncertainty and validity of ES maps should be further explored.

Table 6 Counts of quantification methods of ecosystem services per category

	Primary	Proxy	Model	Total
Provisioning	14	46	8	68
Regulating	14	91	25	130
Supporting	0	6	5	11
Cultural	6	39	6	51
Total	34	182	44	260

In Appendix 1 details are given of the counts of quantification methods per ecosystem service.

5. Data and sources

A fundamental component in the mapping and modelling of ES is the availability of data. In this section we give an overview of the data used to map and model ES in the literature and the various sources and scales. We then put this in the context of data available at the JRC. In order to identify the data used for the quantification of ES, we focused on the secondary indicators, as these were used as a basis for the primary indicators. For each secondary indicator, we identified and grouped the type of data used (e.g. land cover maps, agricultural statistics). We determined the most commonly used data sources, the extent of datasets used for ES mapping, and explored the availability of similar data sets within the JRC, as well as potential JRC competencies to produce these indicators.

Data sources in our literature review covered a wide range of spatial extents. Data sources included point data (sampled observations), sub-national data (watersheds, provinces, states, regions, specific study areas), and data covering national, continental, and global extents. Of the 67 studies included in this review, 79% mapped ES on a sub-national level and 16% on a national level (Table 7). These sub-national studies were mostly valuation studies and quantification and mapping. The studies carried out on a continental or global level included congruence analysis, quantification, and mapping. Typical planning studies, e.g. cost-benefit, prioritization and trade-off analysis were solely carried out on sub-national level.

Table 7 Extent of the study areas of the reviewed literature, linked with the study rationale (counts of publications)

	Extent of study area (ES)				Total
	Sub-national	National	Continent al	Global	
Congruence	5	3		1	9
Cost benefit	1				1
Prioritisation	5				5
Quantification	10	4		1	15
Scenarios	9		1		10
Trade offs	5				5
Valuation	18	4			22
Total	53	11	1	2	67

To quantify ES an average of 1.9 indicators are used. The most commonly used data to derive ES indicators in the inventory were land use/cover maps, soil data, and vegetation maps. Of all inventoried data categories, 39% are at the sub-national level. These sub-national data include a wide variety of data types including hydrological maps, soil characteristics, pollution data, visitor counts, but also local land cover maps and agricultural statistics. Data typically available, on continental or global level (11% in the inventory), albeit at a lower resolution, are vegetation data (including biomass, NDVI), land cover, carbon flux estimates, and agricultural statistics. Land cover and vegetation data, obtained using satellite imagery, are widely available and often free of charge. Agricultural statistics are available from the FAOSTAT database which has global coverage. This data availability is also reflected in the ES that are mapped at continental or global level; e.g. food provisioning, and climate regulation. No global data were used to quantify supporting or cultural ES. Cultural services such as spiritual or aesthetic enjoyment are very local with variation from individuals to cultural groups; therefore mostly sub-national data sources are used. Supporting services, mostly mapped in terms of habitat suitability, often using sub-national species distribution data and conservation indices.

5.1 JRC data inventory

We explored the major available datasets that JRC institutes generate, as well as the datasets that are available at various spatial extents (from local to global), which could be used for the mapping and quantification of the ES identified in our literature review. In many cases, for different secondary indicators, the same data types were used. For example, land cover maps were used for the assessment of secondary indicators for climate regulation (Troy et al. 2006), as well as for food provision (Eigenbrod et al. 2010). We identified the most commonly used datasets that are or can be used for the mapping of ES for each ES category, based on their frequency of occurrence.

In general, the JRC assembles and produces data for at least 11 broad categories of data types that are used (according to the scientific literature) to map and model ES. These data are organized in databases, some of which are available online to the public, while others are still being developed. We only describe the datasets (or parts of the datasets) that can provide data for quantifying and mapping ES, based on the data types we found in our scientific literature review. For details on these data sources see Appendix 2.

a) Greenhouse gases and atmospheric conditions

Two datasets describing atmospheric conditions are available at the JRC

- i) Greenhouse Gases in Agriculture, Forestry and other Land Uses [AFOLU]: This database collates information for each of the EU27 countries about the role of agriculture and forestry in climate change mitigation, as well as the impact of climate change on terrestrial ecosystems. Data are available on different variables, from allometric biomass and carbon factors with estimates for certain biomass types or biomass carbon content, to agricultural land use maps. Data from this database can be used to model carbon storage / sequestration services and provisioning services, such as crop yield correspondingly.
- ii) Emissions Database for Global Atmospheric Research [EDGAR]: This database provides past and present anthropogenic greenhouse gas emissions and air pollutants by country and on a spatial grid at a global level. Data are available on emissions from agricultural activities and livestock statistics, and are based primarily on collected data, as well as IPCC and FAO sources. Such data on

greenhouse gasses is key input data for modeling carbon sequestration, air quality regulation services, as well as food provisioning services (livestock).

b) Land and Vegetation Condition

Land use/cover data are available specifically for African, Caribbean, and Pacific (ACP) countries at global scale (GLC2000 map) as well as EU27 level [(CORINE Land Cover for 1990, 2000 and for 2006 (remains incomplete)]. Data produced in eStation include meteorological data, and monitoring of fire occurrence at a global and continental level (for Africa). Data are currently being produced on net primary productivity, timber production, biomass values, and logging. These types of data are important in mapping carbon storage and are used as secondary data to map a wide array of services, such as food security or genetic resources.

c) Biodiversity information

Data are available at a global level on habitat provision and species' habitat suitability (eSpecies and eHabitat catalogue at DOPA platform), as well as biodiversity indicators and protected areas (APAAT). This type of data can be used for the mapping and modelling of a variety of services, including recreation, erosion control, and life cycle maintenance.

d) Forest Resource Monitoring data

Two major databases are provided by the JRC in this regard; one at a global level and another one at a continental (EU27) level.

- i) TREES Database: Data cover a global level, but focus on tree cover changes in the tropics, sub-tropical, and Siberian regions. There is a significant amount of information that could be used for the quantification of ES using indicators mainly on forest biomass values and carbon stock, as well as to address land-cover dynamics issues.
- ii) FOREST Database: At the continental (EU27) level another database focuses on the development of information systems and services for forests in Europe. The main research activities focus on forest fires, forest biodiversity, forest condition, and forest resources modeling in relation to climate change throughout Europe.

Both databases can be used as a source of information for production of raw material, or forest cover (secondary indicator for a variety of primary indicators).

e) *Food security data*

An available JRC database (FOODSEC) gives information regarding plant water availability, agricultural inputs, and agricultural productivity as well as food supply at the global level. Moreover, available datasets within this database that are or could be used as secondary ES indicators are on the Good Agriculture and Environmental Condition as well as Farm Advisory System. These types of data are commonly used to map food provision services.

f) *Water resources*

The JRC is involved in the modelling of water resources mainly in Europe including the Atlantic islands, Iceland, and Turkey. There are two main datasets available.

- i) Catchment Characterisation and Modelling database [CCM]. Contains data on a hierarchical set of river segments and catchments based on the Strahler order, a lake layer and structured hydrological feature codes based on the Pfafstetter system.
- ii) Fate of Agrochemicals in Terrestrial Ecosystems database [FATE]. Contains data on nutrient fluxes and holds a database that consists of information at the EU27 level on denitrification rates, nutrient pressure, and, in particular, nitrogen emissions, phosphorus values, deposition velocity in rivers, and groundwater characteristics. The nitrogen fluxes are currently the main indicators used for modelling water quality regulation.

g) *Natural Hazards data*

Three databases on natural hazards are available within the JRC:

- i) Global Disaster Alert and Coordination System Database [GDACS]. JRC captures information about near real-time alerts through the monitoring of natural hazards, such as tsunamis, cyclones, windstorms, and floods at a global level. Some of the data provided are monitored by other institutes (e.g. NASA, NOAA, USGS). However, JRC also has access to these datasets.

- ii) FLOODS Database. JRC also gathers information on river floods and flood risk in Europe, resulting from on-going research, as well as from publicly available information from EU countries. It provides information based on the monitoring of flood pressures in Europe, as well as on future projections. This type of data is used for the modelling and mapping of regulating services for the moderation of extreme events.
- iii) European Forest Fire Information System Database [EFFIS]. This dataset addresses forest fires in Europe in a comprehensive way, providing EU level assessments from pre-fire to post-fire phases. Other than the on-line web based system, a large EU fire database is maintained within EFFIS. Furthermore, it reports on yearly forest fires in Europe. At the global scale there is information on the Global VGT burnt area product 2000 (GBA 2000) which has produced a map of the areas burnt globally for the year 2000, using the medium resolution (1 km) satellite imagery provided by the SPOT-Vegetation system and to derive statistics of area burnt per type of vegetation cover. This type of data may be important in modelling natural hazards.

h) Soil characteristics

Data on soil characteristics are provided at both continental and global scale in the SOILS dataset. At the continental level, the European Soil Portal contributes to a thematic data infrastructure for soils in Europe. It also promotes the activities of the European Soil Bureau Network. Data are mainly provided on soil characteristics, silt accretion, soil carbon, below-ground biomass, soil conservation measures, soil erosion, and earthworm density (the latter mainly at national level). At the global scale, the Harmonized World Soil Database contains data on soil characteristics as well as supplementary data on soil quality (e.g. nutrient availability, rooting conditions, excess salts, and soil workability). Soil characteristics are one of the main input data on many regulating and provisioning services as discussed above.

i) Fishing activities data

JRC holds national level data on Fisheries Management and Economics which are collected under the Data Collection Framework by the MS to compile European fisheries databases. The data are collected from STECF (Scientific, Technical and Economic Committee for Fisheries) experts in order to provide scientific advice to the Commission or from DG MARE officials to serve ad hoc requests. These data are used mainly for information on recreational ES but could also be used on food production, habitat provision or life cycle maintenance.

j) Climate change data

JRC holds this database on bias corrected high resolution climate change projections based on the ENSEMBLES dataset. The dataset consists of high resolution (25 Km) bias corrected daily climate data (mean, maximum and minimum temperature, and total precipitation) at the continental scale (EU27). It comprises the years 1961 to 1991 and 1991 to 2100 that has been estimated under the A1B emission scenario. The dataset contains 12 different model realizations from the FP6 ENSEMBLES project, which have been bias corrected (Dosio and Paruolo, 2011). The bias corrected data can be used mainly for the mapping and quantification of regulating ES.

k) Life cycle emission and resource consumption data

The European Life Cycle Database (ELCD) comprises life cycle emission and resource consumption data from front-running EU-level business associations and other sources for key materials, energy carriers, transport, and waste management. Among its 250 datasets, it holds data on waste water treatment, land filling, fuel emissions, material production, and electricity consumption. Data are also available at the global level, mainly on transport services and emissions. The respective data sets are officially provided and approved by the named business association; some datasets are in the preparatory phase and will be added subsequently. These data can be used for the assessment of regulating services, such as air quality regulation.

Apart from these datasets, the JRC also uses data that are provided by third-party data providers, such as the PANGAEA database from GBIF (see also Appendix 2). It is thus evident that the data types available at the JRC, whether produced by the JRC or made available by third parties, can mainly be used to generate indicators for the regulating and provisioning services (Figure 12). Some of the data types (e.g. land cover) are used as secondary indicators in all ES categories, whereas others are used only for certain types of ES, such as the SAR (species-area relationship) indicator used to quantify biodiversity values in the supporting/habitat ES. In Table 8 all the data available from the JRC datasets are presented and classified based on their availability within the JRC (A: available JRC data, B: available third party data for which JRC institutes hold a local copy, C: data currently being produced in the JRC and D: unavailable data). It is evident that land cover maps, the most common secondary indicators are available at the JRC. In fact, for many of the most commonly used secondary indicators, the JRC holds a local copy. For forest cover the JRC produces its own maps and owns the data, but also holds copies of global datasets. Among these commonly used datasets, the JRC also owns climate data, fish abundance, groundwater characteristics, habitat presence and suitability, land use change, runoff, soil characteristics, timber, vegetation maps, and water flow. For data like forest cover, habitat presence and suitability, NPP, and timber, the JRC is also in the process of producing new datasets or updating/extending the existing ones to larger spatial extents. These databases are either freely available (~55%), only within the institute (~27%), only upon request from the corresponding DGs (Directorate-General) (~12%), or part of the datasets is not available since in some cases the information given is sensitive (~7%).

In general, most of the JRC data seem to be available or are being produced at a national, continental or global level. Particularly for the provisioning and regulating services, all JRC data are available at global, national, and continental level. Regarding habitat/supporting services, most JRC data are at global level, which seems to be of high value since most of the studies assessing these services in the scientific literature use data at national or sub-national level.

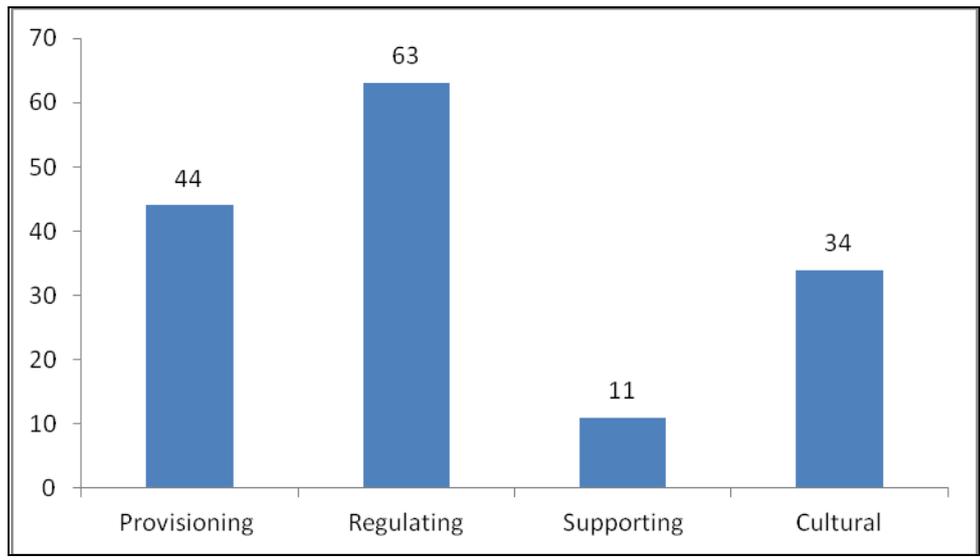


Figure 12 Frequency of occurrence of data sources for all four ecosystem services categories within the JRC (types A, B, C)

Table 8 The data types used for generating secondary indicators according to our literature review and the corresponding ES categories for which they can be used along with their availability within the JRC. [A: JRC data, B: third party data available in the JRC, C: JRC data under development]

Data types for Secondary Indicators	Provisioning	Regulating	Supporting / Habitat	Cultural
Accessibility maps	A,B	A,B	A,B	A,B
Climate	A, B	A, B	o	A, B
DEM	A, B	A, B	o	B
Estuarine habitat	B	o	o	B
Fish abundance	A, B	o	o	A, B
Forest cover	A, C	A, C	A, C	A, C
Ground water data	A	A	A	o
Habitat maps	o	A, C	o	A, C
Land cover	A, B	A, B	B	B
Land use change	o	A, B, C	o	A, B, C
Litter	B	B	o	o
Crop market values	B	B	o	B
Net Primary Productivity (NPP)	B, C	B, C	o	o
Population	B	o	o	B
Runoff	A, B	A, B	o	o
Slope	A	A	o	A
Soil Characteristics	A, B	A, B	A, B	o
Timber	A, B, C	A, B, C	o	o
Vegetation map	A, C	A, C	o	o
Water flow	A, B	A, B	o	o

There is also a list of secondary indicators found in our review, for which JRC has no data at all (see Table 9). The majority of these are specialized, small scale indicators produced by several research groups outside the JRC, such as maple syrup values, or residents' preferences, which are indicators used for regional level assessments and are case-specific. As mentioned earlier for a few secondary indicators and the corresponding data types used, such as tourist information data, the JRC does not have these data or the intention to generate such data in the near future. Similar is the case for pollination services, indicating a potential lack of expertise at the JRC in this field. There is, however, a JRC assessment of the pollination services carried out at the EU27 level by Maes et al. (2011), in which land cover maps were used as input data, but no pollination data were available.

Table 9 List of indicators for which JRC has no data availability

Secondary Indicator	Count	ES Category
Species Area Relationship (SAR) scores	1	Supporting
Health of ecological community	1	Regulating
Species economic value	1	Cultural
Fallow biomass	1	Provisioning
Flower viewing	1	Cultural
Hunting data	2	Cultural
Joint Character Areas (JCAs)	1	Cultural
Maple syrup	1	Provisioning
Pollination information	1	Regulating
Residents' preferences	1	Cultural
Reed cutting	1	Provisioning
Waterfowl harvested	1	Cultural

6. Meeting Target 2 of the EU Biodiversity Strategy

As mentioned in the introduction, the European Commission recently adopted a Biodiversity Strategy for 2020. An important target set in the strategy is the mapping and valuing of ES by each Member State. For this target to be met, they must have access to the required data and expertise. In this report, we evaluated existing expertise and ES studies in the Member States. For this purpose only first authors and their affiliations were considered. We found first authors only in 9 European countries (Figure 13), 8 of which are EU Member States. Most studies were carried out by experts from the UK and the Netherlands, which is not surprising as the UK is the only MS that has conducted a nationwide assessment of its ecosystems and the services they provide, including their monetary value (UK NEA 2011). Furthermore, we found that most of the work in Europe on ES has been carried out in countries where the expertise is concentrated (Figure 14) and at sub-national level. Our findings give a general overview; however, there may be more experts in Europe than are represented in this study. This is because we only considered peer reviewed publications, although some work on ES can be found in the grey literature (e.g. reports, PhD theses etc.). For example, Portugal and Norway were part of the Millennium Ecosystem Assessment (<http://www.maweb.org>) but are not listed in this study as countries where expertise or studies of ES exist. Spain, Switzerland, and France have reported national assessments and several countries, including The Netherlands, Germany, and Scandinavian countries plan or carry out national TEEB studies. The Czech Republic has assessed ES of their grasslands.

Clearly, a coordinated approach at European scale to national assessments of ES is necessary in order to achieve the ambitious agenda set by the EU Biodiversity Strategy. As a relatively new field, there is a shortage of expertise not only in Europe but also in other countries. Only 10 other countries outside the EU had expertise in this field, with the USA and China taking precedence (with 19 and 11 first author publications, respectively), and South Africa following with 8 first author publications. In order to increase expertise in the EU, investment in training would be recommended as chances of importing expertise are slim. Despite this setback, many experts involved in the work on ES are scientists who have been involved in other related disciplines (e.g. biodiversity

conservation or ecological economics). This is because the mapping and valuing of ES is a multidisciplinary research activity involving experts from, *inter alia*, economics, soil science, hydrology, ecology, and biodiversity conservation. Besides a lack of expert scientists in this field, data availability is also a major challenge; we discuss this in section 5 of this report.

Another important challenge that the EU must face in order to facilitate the work on ES as required by legislation is to provide guidelines for mapping and valuing activities. According to the UNEP-WCMC (2011) and Lamarque et al. (2011), indicators used for mapping various ES and the final output of their assessment depend on the objective of the stakeholders and their understanding of the ES in question. Consequently, as demonstrated by Lamarque et al. (2011) one can have completely different outputs for the same service at the same study site if the stakeholders and objectives differ. Also in this study we found that some studies mapped actual ES, whereas others mapped potential services. Furthermore, while some studies mapped values and benefits, others mapped functions and the services. For example, 50% of all studies that assessed congruence between biodiversity and ES, mapped ecosystem functions rather than the services, while 50% of the monetary valuation studies mapped benefits or ES or certain values. While some studies delineate areas where these services are produced, others simply rank land cover classes. In conclusion, any legislation concerning mapping/quantification and valuing of ES must have clear guidelines on how this should be carried out based on the objective, in order to guarantee consistency. Considering the wide range of indicators used to quantify single ES it is evident that there is no consensus about how and what to map, thus making cross-country evaluations impossible.

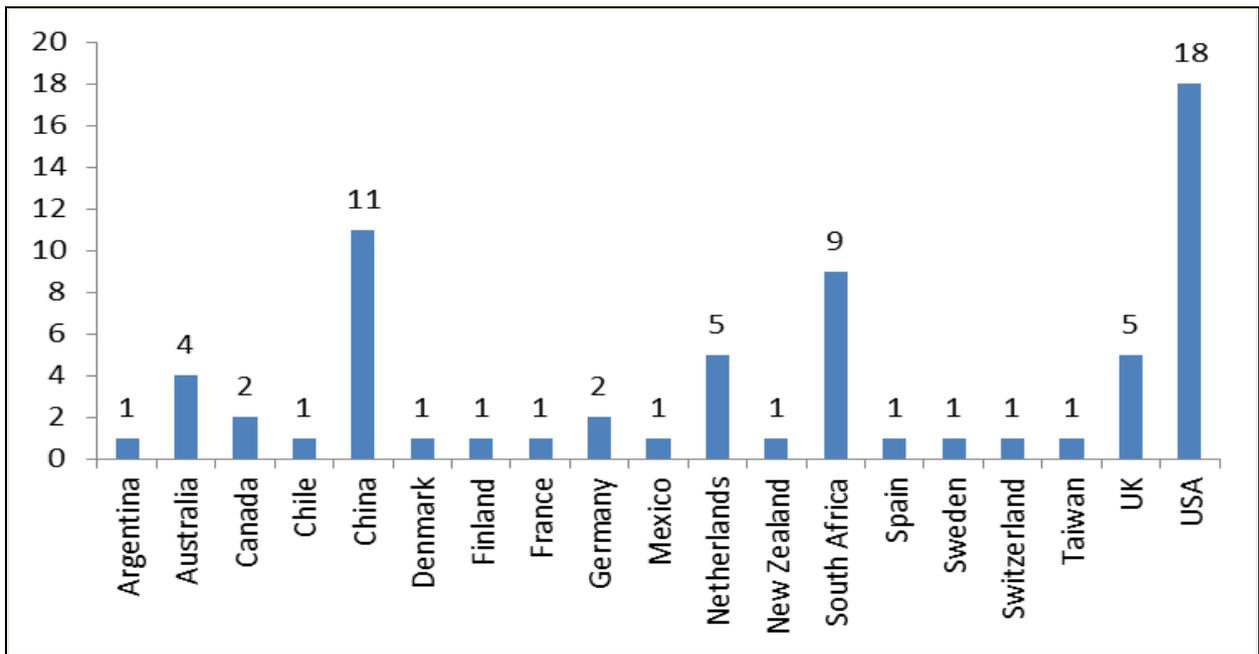


Figure 13 Number of first authors per country

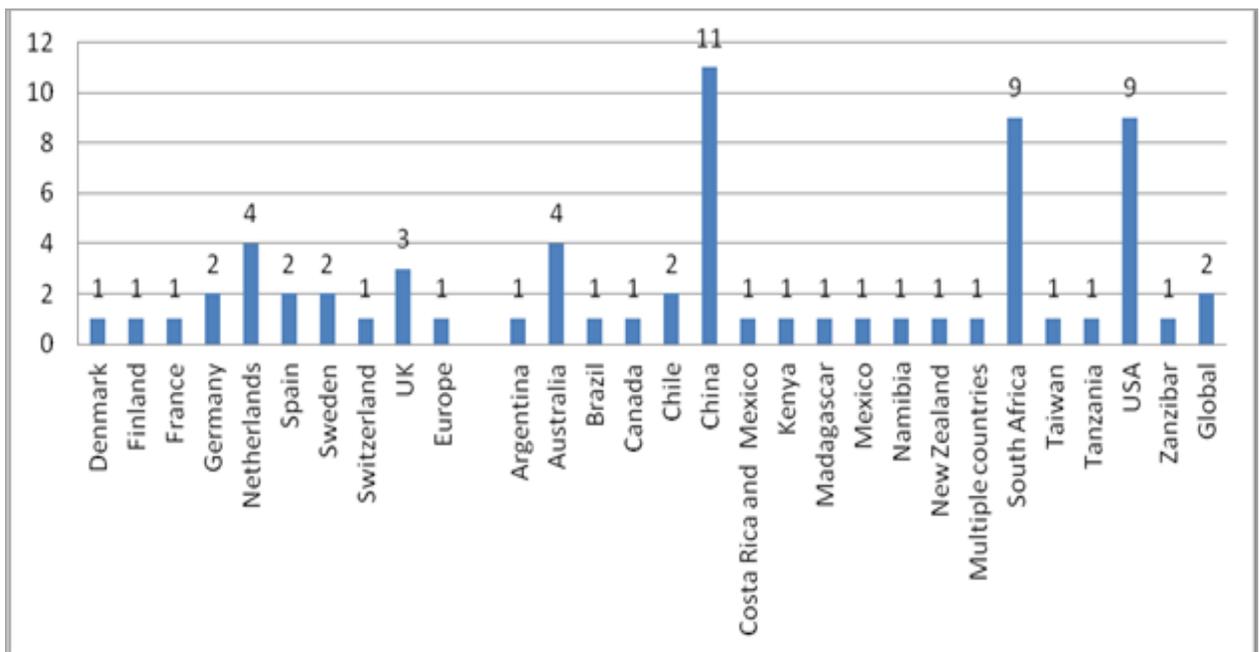


Figure 14 Number of case studies per country and region

7. Conclusions and recommendations

This report gives a general overview of indicators and data types used to quantify and map ES and evaluates the potential contribution of the JRC to this research field. Our main findings are summarized below:

- All four categories of ES according to the TEEB classification can be mapped using indicators. Regulating services have received more attention in the scientific literature than any other service category. On average 3.9 different ES are mapped per study.
- Simple proxy methods remain the most commonly used method for mapping ES, despite their highest potential error as highlighted by Eigenbrod et al. (2010). This could be partly because primary data are costly, especially at national and continental levels. On the other hand, complex models require sound knowledge, data, and methodological approaches to describe the processes underlying ES supply.
- A large variety of primary indicators are currently used to express one single ES. This makes ES maps of different studies difficult to compare.
- Single indicators are usually insufficient to quantify and map ES; therefore, many different indicators and thus data sources are needed to quantify them.
- The most common indicators for mapping ES are land use/cover, soils, vegetation, and nutrient related indicators. Most of these data are available in and outside the JRC at large extents and low resolution.
- Data available at a national or larger level mostly relate to provisioning and regulating services followed by supporting and cultural services. These results confirm findings from earlier reviews (Layke 2011; UNEP-WCMC 2011).
- The JRC holds 82% of the data types used to map ES (owned or not), therefore could play a data-broker role for the Member States. An example of this is the FISHERIES database, in which data on fisheries are collected from the Member States, and processed to develop consistent and complete databases in order to share this type of data with DG MARE to serve EU policy.

- Most of the data currently available at the JRC are either at national or continental level, while new global databases are being developed. These large extent datasets could play an important role in ES mapping efforts as mostly small extent data have been used in the literature.
- Although the JRC has data on secondary indicators for mapping various ES, it seems that accessibility to such datasets is a problem.
- Data resolution is an essential aspect to be taken into account when referring to ES mapping. Large scale data, such as land cover, are available at low resolutions (e.g. JRC global land cover data and European soil database have a 1 km x 1 km resolution). Minimal resolution, however, depends on the ES type mapped. ES with very site-specific ecological processes, e.g. pollination, need higher resolution data compared to generic services, such as climate regulation through carbon sequestration.
- The RDSI IES data portal is a first initiative towards a unified data inventory that could be used by end-users within the JRC for research and policy support.
- The majority of ES mapping studies in the scientific literature have focused mainly on assessments smaller than national level. Therefore, Member States can use the methodological approaches, rather than the mapped outcomes.
- An important contribution that the EC could make in order to support the Member States and other initiatives involved in mapping ES is by directly providing spatial information and mapping guidelines for consistency in the ES cartography.

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Appendix 1: Summary of studies and indicators of the literature review

Ecosystem Service	Primary indicator	Secondary Indicators	Extent of data	Method	Extent of study area	Country Study	Country Author	Rationale	Reference
Food provision	Fodder provision	Livestock	National	Primary	Local	South Africa	South Africa	Valuation	O'Farrell_2011_J of Arid Env't
Food provision	Productivity index	Crop yield	Local	Primary	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
Food provision	Fodder provision	Livestock	Local	Proxy	Local	South Africa	South Africa	Congruence	Reyers_2009_Ecol&Soc
Food provision	Commodity production value	Crop yield	Local	Proxy	Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
		Timber production	Local		Local				
Food provision	Grain production	Crop yield	Local	Proxy	Local	Australia	Australia	Prioritisation	Crossman_2010_EcolEcon
		NDVI	Local		Global				
Food provision	Agricultural production	Land cover	national	Proxy	National	UK	UK	Quantification	Eigenbrod_2010_Biolog_Cons
		Crop yield	national		National				
Food provision	Fodder provision	NPP	Local	Proxy	Local	France	France	Congruence	Lamarque-2011_Comptes Rendus Biologies
		Crop yield	Local		Local				
		Livestock	Local		Local				
		hay production	Local		Local				
Food provision	Agricultural production	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia
Food provision	Productivity index	NPP	Global	Model	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
		Soil characteristics	Local		Local				
Food provision	Productivity index	NPP	National	Model	Local	Brazil	USA	Valuation	Klemick_2011_Journal of Environmental Economics and Management
Food provision	Fodder provision	Vegetation map	Local	Proxy	Local	South Africa	South Africa	Trade offs	Egoh_2010_ConsBiology
		Vegetation map	Local		Local				
Food provision	Fish production	Vessel data	National	Proxy	Local	USA	UK	Valuation	O'Higgins_2010_Ecol_Society
		Estuarine habitat	Local		Local				

		Abundance of fish	Local		Local				
Food provision	Agricultural production	Land cover	Local	Proxy	Local	Germany	Germany	Scenarios	Lautenbach_2011_Ecological indicators
		Soil characteristics	Local		Local				
Food provision	Grain production	Crop yield	Global	Primary	Local	South Africa	South Africa	Scenarios	van Jaarsveld_2005_Phil. Trans. R. Soc. B
Food provision	Agricultural production	Land cover	National	Primary	National	China	China	Valuation	Chen_2009_EcolEcon
		Municipal maps	National		National				
		Crop yield	National		National				
Food provision	Fodder provision	NPP	National	Proxy	Local	USA	USA	Congruence	Chan_2006_PloS Biology
		Livestock	National		Local				
Food provision	Fodder provision	Livestock	National	Primary	National	South Africa	South Africa	Congruence	Wilgen_2008_J.Env.Manag.
Food provision	Agricultural production	Land Use	Continental	Proxy	Continental	Europe	Netherlands	Scenarios	Metzger_2006_Agriculture Ecosystems and Environment
Food provision	Agricultural production	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Food provision	Grain production	Crop yield	National	Primary	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Food provision	Soil productivity	Soil characteristics	National	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Food provision	Productivity index	NPP	National	Model	Local	China	China	Valuation	Li_2008_AgricultSciChina
		Climatological parameters	National		Local				
Food provision	Fodder provision	Livestock	Global	Proxy	Global	USA	USA	Congruence	Naidoo_2008_PNAS
		Vegetation map	Global		Global				
Food provision	Fodder provision	Livestock	National	Proxy	National	China	China	Quantification	Zhang_2010_Biogeosciences
Food provision	Fodder provision	Fodder provision	National	Proxy	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
Food provision	Grain production	Ground water	National	Model	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
		Soil characteristics	National		local				
		Land Use	National		local				

		Land Use	National		local				
		Crop yield	National		local				
Food provision	Agricultural production	Crop yield	Local	Model	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		NPP	Local		Local				
		Livestock	Local		Local				
		Market prices	Local		Local				
Food provision	Agricultural production	Crop yield	National	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Food provision	Pork production	Pigs production	national	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Food provision	Maple syrup	Maple syrup	National	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Food provision	Reindeer	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Food provision	Fodder provision	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Food provision	Fish production	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Food provision	Wild vegetables	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Food provision	Waste and hydro energy	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Food provision	Fodder provision	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Food provision	Fish production	Fish catch	Local	Primary	Local	Netherlands	Netherlands	Valuation	Hein_2006_Ecological economics
Water provision	Water supply	Surface water	Local	Primary	Local	South Africa	South Africa	Valuation	O'Farrell_2011_J of Arid Env't
Water provision	Water supply	Ground water	Local	Primary	Local	South Africa	South Africa	Valuation	O'Farrell_2011_J of Arid Env't
Water provision	Water supply	Surface water	National	Proxy	Local	South Africa	South Africa	Prioritisation	Egoh_2011_JEM
Water provision	Water supply	Precipitation	NA	Proxy	Local	China	China	Congruence	Bai_2011_Ecological Complexity
		DEM	NA		Local				
		Soil characteristics	NA		Local				
		Soil characteristics	NA		Local				

		Evapotranspiration	NA		Local				
		Land cover	NA		Local				
Water provision	Water supply	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Water provision	Water supply	Distance to water resources	Local	Primary	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
Water provision	River salinity	River salinity	Local	Primary	Local	Australia	Australia	Prioritisation	Crossman_2010_EcolEcon
Water provision	Water supply	Quickflow	Local	Proxy	Local	Chile	Chile	Congruence	Lara_2009_ForestEcolManag
		Ground water	Local		Local				
Water provision	Water supply	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia
Water provision	Water supply	Surface water	Local	Proxy	National	South Africa	South Africa	Congruence	Egoh_2009_BiolConserv
Water provision	Water supply	Surface/ground water	Local	Model	Local	South Africa	South Africa	Scenarios	van Jaarsveld_2005_Phil. Trans. R. Soc. B
Water provision	Water supply	Surface water	National	Proxy	National	South Africa	South Africa	Congruence	Wilgen_2008_J.Env.Manag.
		Ground water	National		National				
Water provision	Water supply	Precipitation	National	Proxy	local	USA	USA	Congruence	Chan_2006_PloS Biology
Water provision	Water supply	Precipitation	National	Proxy	Local	China	China	Valuation	Li_2008_AgricultSciChina
		Litter containment	NA		Local				
		Soil characteristics	NA		Local				
Water provision	Water supply	Surface water	Global	Proxy	Global	USA	USA	Congruence	Naidoo_2008_PNAS
Water provision	Water supply	Surface water	National	Proxy	National	South Africa	South Africa	Congruence	Egoh_2008_AgricEcosystEnviron
Water provision	Water supply	Water supply	National	Proxy	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
Water provision	Water purification	Surface water	Local	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Water provision	Water supply	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Water provision	Water supply	Population density	Global	Proxy	National	Madagascar	USA	Valuation	Wendland_2010_EcolEcon

		Land cover	National		National				
		Water flow direction	NA		National				
		Slope	Global		National				
Water provision	Water supply	Ground water	National	Proxy	Local	Netherlands	Netherlands	Valuation	Willemen_2010_EcolEcon
Raw materials	Raw material	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia
Raw materials	Timber production	DEM	National	Model	Local	Switzerland	Switzerland	Valuation	Gret-Regamey_2008_Journal of Environmental Management
		Land cover	National		local				
		Temperature	National		local				
		Forest	National		local				
Raw materials	Fuel wood	Wood production	Local	Primary	Local	South Africa	South Africa	Scenarios	van Jaarsveld_2005_Phil. Trans. R. Soc. B
Raw materials	Reeds	Reeds cutting	Local	Primary	Local	Netherlands	Netherlands	Valuation	Hein_2006_Ecological economics
Raw materials	Raw material	Farm prices	National	Primary	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Raw materials	Raw material	Raw material	NA	Model	Local	South Africa	USA	Trade offs	Chisholm_2010_EcolEcon
Raw materials	Fuel wood	Wood production	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Genetic Resources	Genetic resources	Land Cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Medicinal Resources	Medicinal plants	Land cover	National	proxy	National	China	China	Valuation	Chen_2009_EcolEcon
		Satellite image			National				
Medicinal Resources	Medicinal plants	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Air Quality Regulation	Air purification	Tree cover	Local	Primary	Local	USA	USA	Cost benefit	Escobedo_2011_Environmental pollution
Air Quality Regulation	Air purification	Pollutant concentration	Local	Proxy	Local	Chile	USA	Quantification	Escobedo_2009_LandscUrbPlan
		Deposition velocity	Local		Local				
		Tree cover	Local		Local				
Air Quality Regulation	Air purification	Pollutant concentration	Local	Proxy	Local	China	China	Valuation	Jim_2008_JEnvManag
		Tree cover	Local		Local				

Climate Regulation	Carbon storage	Forest biomass	Local	Model	Local	China	China	Valuation	Deng_2011_Energy Procedia
		Forest biomass	Local		Local				
		NPP	Local		Local				
		Soil carbon	Local		Local				
		Soil Characteristics	Local		Local				
		Soil Characteristics	Local		Local				
Climate Regulation	Greenhouse gas emissions (GHCV)	Soil carbon	Global	Model	Global	Review	USA	Valuation	Anderson_2011_Global Change Biology
		Above ground biomass	Global		Global				
		Nutrient flux	Global		Global				
		Nutrient flux	Global		Global				
		Nutrient flux	Global		Global				
Climate Regulation	Carbon storage	Above ground biomass	Local	Proxy	Local	Tanzania	UK	Scenarios	Swetnam_2011_JEM
		Below ground biomass	Local		Local				
		Below ground biomass	Local		Local				
		Soil Characteristics	Global		Local				
		Below ground biomass	Local		Local				
		Land Cover	National		Local				
Climate Regulation	Climate regulation	Temperature	Local	Primary	Local	Germany	Germany	Scenarios	Bastian_2011_Ecological indicators
Climate Regulation	Carbon sequestration	Above ground biomass	Local	Proxy	Local	Germany	Germany	Scenarios	Bastian_2011_Ecological indicators
Climate Regulation	Carbon Sequestration	NPP	Local	Primary	Local	Australia	Australia	Prioritisation	Crossman_2011_Env'tal Modelling & software
Climate Regulation	Carbon storage	Soil carbon	Global	Primary	Local	South Africa	South Africa	Prioritisation	Egoh_2011_JEM
Climate Regulation	Carbon sequestration	Above ground biomass	NA	Proxy	Local	China	China	Congruence	Bai_2011_Ecological Complexity
		Below ground biomass	NA		Local				
		Below ground	NA		Local				

		biomass							
		Soil characteristics	NA		Local				
		Land cover	NA		Local				
Climate Regulation	Climate regulation	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Climate Regulation	Carbon sequestration	Vegetation map	Local	Primary	Local	USA	USA	Cost benefit	Escobedo_2011_Environmental pollution
Climate Regulation	Climate regulation	Temperature	Local	Proxy	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
		Precipitation	Local		Local				
Climate Regulation	Carbon storage	Soil carbon	Local	Primary	Local	USA	USA	Valuation	Gascoigne_2011_Ecological Economics
Climate Regulation	Carbon storage	Land cover	Local	Primary	Local	USA	USA	Valuation	Gascoigne_2011_Ecological Economics
Climate Regulation	Carbon storage	Above ground biomass	Local	Proxy	Local	South Africa	South Africa	Congruence	Reyers_2009_Ecol&Soc
		Below ground biomass	Local	Proxy	Local				
Climate Regulation	Carbon sequestration	Above ground biomass	Local	Proxy	Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
		Below ground biomass	Local		Local				
		Soil carbon	Local		Local				
		Forest biomass	Local		Local				
		Social value	Local		Local				
Climate Regulation	Carbon sequestration	Forest biomass	Local	Model	Local	Australia	Australia	Prioritisation	Crossman_2010_EcolEcon
		Co2							
Climate Regulation	Carbon storage	Soil carbon	National	Proxy	National	UK	UK	Quantification	Eigenbrod_2010_Biolog_Cons
		Above ground biomass	National		National				
Climate Regulation	Carbon storage	Above ground biomass	Local	Primary	Local	China	China	Quantification	Li_2011_Agriculture Ecosystems and Environment
		Soil carbon	Local	Primary	Local	China	China		
Climate Regulation	Climate regulation	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia

Climate Regulation	Carbon storage	Above ground biomass	Global	Proxy	Global	Global	USA	Quantification	Youn_2011_PROCEDIA computer science
		Vegetation map	Global	Proxy	Global	Global			
Climate Regulation	Carbon storage	Soil carbon	National	Proxy	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
Climate Regulation	Carbon storage	Above ground biomass	Local	Proxy	Local	South Africa	South Africa	Trade offs	Egoh_2010_ConsBiology
		Vegetation map	local		Local	South Africa	South Africa		
Climate Regulation	GHG mitigation	Nutrient flux	Local	Model	Local	USA	USA	Valuation	Jenkins_2010_EcolEcon
		Social carbon	Global		Local				
Climate Regulation	Carbon storage	Vegetation map	Continental	Proxy	National	South Africa	South Africa	Congruence	Egoh_2009_BiolConserv
Climate Regulation	Gas regulation	Nutrient flux	Local	Model	Local	China	China	Valuation	Guo_2001_Ecological Economics
		Nutrient flux	Local		Local				
Climate Regulation	Carbon storage	Above ground biomass	National	Proxy	Local	USA	USA	Congruence	Chan_2006_PloS Biology
Climate Regulation	Carbon storage	Soil carbon	Local	Primary	Local	Australia	Australia	Scenarios	Collard_2006_Agriculture ecosystems and Environment
Climate Regulation	Climate regulation	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Climate Regulation	Carbon storage	Above ground biomass	National	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
		Below ground biomass	National		National				
Climate Regulation	Carbon storage	Above ground biomass	Local	Model	Local	Costa Rica and Mexico	Canada	Quantification	Kalacska_2008_J Env Manag
		Below ground biomass	Local	Model	Local	Costa Rica and Mexico	Canada	Quantification	Kalacska_2008_J Env Manag
Climate Regulation	Carbon storage	Land cover	National	Model	Local	China	China	Valuation	Li_2008_AgricultSciChina
		NPP	National		Local				
		Above ground biomass	National		Local				
Climate Regulation	Carbon Storage	Vegetation map	Global	Proxy	Global	USA	USA	Congruence	Naidoo_2008_PNAS

Climate Regulation	Carbon sequestration	Nutrient flux	Global	Model	Global	USA	USA	Congruence	Naidoo_2008_PNAS
Climate Regulation	Carbon Storage	Vegetation map	National	Proxy	National	South Africa	South Africa	Congruence	Egoh_2008_AgricEcosystEnviron
Climate Regulation	Carbon sequestration	Forest biomass	National	Proxy	National	UK	UK	Congruence	Tratalos_2007_Landscape and urban planning
Climate Regulation	Climate regulation	Temperature	National	Proxy	National	UK	UK	Quantification	Tratalos_2007_Landscape and urban planning
Climate Regulation	Greenhouse gas emissions regulation (N2O)	Vegetation map	National	Proxy	National	China	China	Quantification	Zhang_2010_Biogeosciences
		Soil characteristics	National		National				
		Climate	Global		National				
Climate Regulation	Riparian zone	Distance to Stream	National	Proxy	Local	Australia	Australia	Prioritisation	Pert_2010_EcolComplex
		Vegetation map	Local		Local				
		Land cover	Local		Local				
		Slope	National		Local				
Climate Regulation	Greenhouse gas regulation	NPP	Local	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		Soil characteristics	NA		Local				
		Nutrient flux	NA		Local				
		Land cover	NA		Local				
Climate Regulation	Carbon sequestration	NPP	Global	Proxy	Local	Canada	Canada	Scenarios	Raudsepp_2010_PNAS
		Crop removal	National		Local				
Climate Regulation	Carbon sequestration	Nutrient flux	NA	Model	Local	South Africa	South Africa	Trade offs	Chisholm_2010_EcolEcon
		Fire occurrence	NA		Local				
Climate Regulation	Climate regulation	Land cover	Continental	proxy	Continental	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Climate Regulation	Carbon sequestration and storage	Land cover	Continental	proxy	Continental	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Climate Regulation	Carbon Storage	Vegetation map	Global	Proxy	National	Madagascar	USA	Congruence	Wendland_2010_EcolEcon

Moderation of extreme events	Disturbance regulation	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Moderation of extreme events	Risk assessment	Hazard	Local	Model	Local	Spain	Spain	Valuation	Lozoya_2011_Environmental science and policy
		Hazard	Local		Local				
Moderation of extreme events	Flood attenuation	Water holding capacity	National	Proxy	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
Moderation of extreme events	Avalanche protection	DEM	National	Model	Local	Switzerland	Switzerland	Scenarios	Gret-Regamey_2008_Journal of Environmental Management
		Land cover	National		local				
		Temperature	National		local				
Moderation of extreme events	Flood control	Land cover	National	Proxy	local	USA	USA	Congruence	Chan_2006_PloS Biology
		Riparian zones	National		local				
Moderation of extreme events	Disturbance prevention	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Moderation of extreme events	Flood prevention	Flood plain	Local	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		Annual flood	NA		Local				
Moderation of extreme events	Flood prevention	Land cover	Continental	proxy	Continental	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Regulation of water flows	Water quality	Erosion	Local	Proxy	Local	Australia	Australia	Prioritisation	Crossman_2011_Env'tal Modelling &software
Regulation of water flows	Water quality	Vegetation map	Local	Proxy	Local	Australia	Australia	Prioritisation	Crossman_2011_Env'tal Modelling &software
Regulation of water flows	Water regulation	Ground water	National	Proxy	Local	South Africa	South Africa	Prioritisation	Egoh_2011_JEM
Regulation of water flows	Water quality	Nutrient retention	Local	model	Local	China	China	Congruence	Bai_2011_Ecological complexity
		Nutrient retention	Local	model	Local	China	China	Congruence	Bai_2011_Ecological complexity

Regulation of water flows	Water regulation	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Regulation of water flows	Water regulation	Flow regulation	Local	Proxy	Local	South Africa	South Africa	Congruence	Reyers_2009_Ecol&Soc
		Water quality regulation	Local	Proxy	Local	South Africa	South Africa	Congruence	Reyers_2009_Ecol&Soc
Regulation of water flows	Water quality	Slope	Local	Proxy	Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
		Soil characteristics	Local		Local				
		Soil characteristics	Local		Local				
Regulation of water flows	Water resources	Surface water	Local	Proxy	Local	Taiwan	Taiwan	Valuation	Huang_2011_Ecological complexity
Regulation of water flows	Environmental flows	Water use	Local	Proxy	Local	Australia	Australia	Prioritisation	Crossman_2010_EcolEcon
		Ecological community	Local		Local				
Regulation of water flows	Water quality	Water characteristics	Local	Primary	Local	Mexico	Mexico	Congruence	Martinez_2009_ForestEcolManag
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Land use	Local		Local				
Regulation of water flows	Water regulation	Land use	National	Model	Local	Kenya	USA	Valuation	Simonit_2011_EcolEcon
		Wetland	National		Local				
		Fish stock	Local		Local				
		Nutrient retention	Local		Local				
Regulation of water flows	Water regulation	Water characteristics	National	Proxy	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
		Water characteristics	National		Local				
Regulation of water flows	Water filtration	Land use	National	Model	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment

		Water flow	National		Local				
		Topography	National		Local				
		Soil characteristics	NA		Local				
Regulation of water flows	Water filtration	Nutrient retention	NA	Model	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
		Sediment retention	NA		Local				
Regulation of water flows	Water filtration	Precipitation	National	Model	Local	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
		Land cover	National		Local				
		Land use	National		Local				
		soil characteristics	NA		Local				
Regulation of water flows	Water quality	Nutrient retention	Local	Model	Local	Kenya	USA	Valuation	Simonit_2011_EcolEcon
Regulation of water flows	Water recharge	Ground water	National	Proxy	Local	South Africa	South Africa	Trade offs	Egoh_2010_ConsBiology
		Water characteristics	National		Local				
Regulation of water flows	Water regulation	Vegetation map	Local	Proxy	Local	China	China	Valuation	Guo_2000_Ecological Application
		Slope	Local	Proxy	Local				
		soil characteristics	Local	Proxy	Local				
Regulation of water flows	Water regulation	Vegetation map	Local	Proxy	Local	Germany	Germany	Scenarios	Lautenbach_2011_Ecological indicators
		Land use	Local		Local				
Regulation of water flows	Water regulation	Ground water	National	Proxy	National	South Africa	South Africa	Congruence	Egoh_2009_BiolConserv
Regulation of water flows	Water regulation	Flow regulation	Local	Model	Local	China	China	Valuation	Guo_2001_Ecological Economics
		Water retention	Local		Local				
Regulation of water flows	Water regulation and supply	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Regulation of water flows	Hydrological flow	Precipitation	National	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
		Water use	National		National				
		Water use	National		National				
		Ground water	National		National				

Regulation of water flows	Water regulation	Ground water	National	Proxy	National	South Africa	South Africa	Congruence	Egoh_2008_AgricEcosystEnviron
Regulation of water flows	Storm water interception	Surface water	National	Proxy	National	UK	UK	Quantification	Tratalos_2007_Landscape and urban planning
Regulation of water flows	Riparian zone	Distance to stream	National	Proxy	Local	Australia	Australia	Prioritisation	Pert_2010_EcolComplex
		Vegetation map	Local		Local				
		Land use	Local		Local				
		Slope	National		Local				
Regulation of water flows	Water filtration	Flow regulation	Local	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		soil characteristics	NA		Local				
		Water characteristics	NA		Local				
Regulation of water flows	Water regulation	Above ground biomass	NA	Model	Local	USA	USA	Trade offs	Chisholm_2010_EcolEcon
		Stream flow	NA		Local				
Waste treatment	Waste treatment	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Waste treatment	Nitrogen retention	Nutrient deposition	Local	Proxy	Local	Sweden	Sweden	Quantification	Jansson_1998_LandscEcol
		Human excretory	Local		Local				
Waste treatment	Nitrogen retention	Nutrient retention	Local	Model	Local	USA	USA	Valuation	Jenkins_2010_EcolEcon
		Nutrient retention	Local		Local				
		Nutrient retention	Local		Local				
		Market value	NA		Local				
Waste treatment	Waste assimilation	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Waste treatment	Nitrogen retention	Nutrient retention	National	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
		Urea price	National		National				
Waste treatment	Nutrient retention	Nutrient deposition	Local	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
Waste treatment	Phosphorus retention soil	Soil retention	Local	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Waste treatment	Nutrient sequestration	Land cover	Continental	proxy	Continental	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp

Erosion prevention	Soil erosion	Erosion	Local	Proxy	Local	Australia	Australia	Prioritisation	Crossman_2011_Env'tal Modelling & Software
Erosion prevention	Soil retention	Vegetation map	National	Proxy	Local	South Africa	South Africa	Prioritisation	Egoh_2011_JEM
		Erodibility	National		Local				
Erosion prevention	Erosion control	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Erosion prevention	Soil retention	Geomorphology	NA	Proxy	Local	China	China	Congruence	Bai_2011_Ecological Complexity
		Climate	NA		Local				
		Vegetation map	NA		Local				
		Land use	NA		Local				
Erosion prevention	Soil retention	Land use	Local	Primary	Local	USA	USA	Valuation	Gascoigne_2011_Ecological Economics
Erosion prevention	Soil erosion	Precipitation	Local	Proxy	Local	South Africa	South Africa	Congruence	Reyers_2009_Ecol&Soc
		Soil characteristics	Local		Local				
		Soil characteristics	Local		Local				
Erosion prevention	Water retention	Water flow	Local	Proxy	Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
		Water flow	Local		Local				
Erosion prevention	Soil erosion	Land cover	Local	Proxy	Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
		Soil characteristics	NA		Local				
		Topology	NA		Local				
Erosion prevention	Land cover	Forest cover	Local	Proxy	Local	Taiwan	Taiwan	Valuation	Huang_2011_Ecological complexity
Erosion prevention	Soil retention	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia
Erosion prevention	Soil retention	Vegetation map	National	Model	National	South Africa	South Africa	Congruence	Egoh_2009_BiolConserv
		Erodibility	National		National				
Erosion prevention	Soil retention	Soil retention	Local	Model	Local	China	China	Valuation	Guo_2001_Ecological economics
		Land use	Local	Model	Local				
		Soil deposition	Local	Model	Local				
		Soil retention	Local	Model	Local				

Erosion prevention	Soil retention	Land cover	National	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Erosion prevention	Soil retention	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Erosion prevention	Soil retention	Erodibility	NA	Model	Local	China	China	Valuation	LI_2008_AgricultSciChina
		Erodibility	NA		Local				
		Slope	NA		Local				
		Vegetation map	Global		Local				
		Land use	Global		Local				
Erosion prevention	Soil retention	Vegetation map	National	Proxy	National	South Africa	South Africa	Congruence	Egoh_2008_AgricEcosystEnviron
		Litter	National		National				
		Erodibility	National		National				
Erosion prevention	Riparian zone	Distance to stream	National	Proxy	Local	Australia	Australia	Prioritisation	Pert_2010_EcolComplex
		Vegetation map	Local		Local				
		Land use	Local		Local				
		Slope	National		Local				
Erosion prevention	Soil retention	Land cover	Continental	proxy	Continental	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Erosion prevention	Soil retention	Soil retention	National	proxy	Continental	Argentina	Argentina	Trade offs	Laterra_2011_Agriculture Ecosystems and the environment
Maintenance of soil fertility	Soil productivity	Soil characteristics	National	Proxy	Local	South Africa	South Africa	Prioritisation	Egoh_2011_JEM
		Litter	National		Local				
Maintenance of soil fertility	Nutrient cycling	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Maintenance of soil fertility	Soil productivity	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia
Maintenance of soil fertility	Soil productivity	Soil characteristics	National	Model	National	South Africa	South Africa	Congruence	Egoh_2009_BiolConserv
		Litter	National		National				
Maintenance of soil fertility	Soil productivity	Earthworm	National	Primary	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Maintenance of soil fertility	Soil productivity	Soil characteristics	Local	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
		Nutrient retention	Local		National				

Maintenance of soil fertility	Soil productivity	Soil characteristics	National	Proxy	National	South Africa	South Africa	Congruence	Egoh_2008_AgricEcosystEnviron
		Litter	National		National				
Soil quality	Soil organic matter	Land use	National	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		Soil carbon	National		Local				
Soil quality	Soil organic matter	Land use	Local	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Soil quality	Soil productivity	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Soil quality	Nutrient cycling	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Pollination	Pollination	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Pollination	Pollination	Land cover	Local	Proxy	Local	China	China	Congruence	Bai_2011_Ecological Complexity
Pollination	Pollination	Land use	Continental	Model	Local	Sweden	USA	Scenarios	Jansson_2010_Ecol_Society
		Land cover	NA						
Pollination	Pollination	Habitat	Local	Proxy	Local	Germany	Germany	Scenarios	Lautenbach_2011_Ecological Indicators
		Habitat	Local		Local				
Pollination	Pollination	land cover	National	Proxy	Local	USA	USA	Congruence	Chan_2006_PloS Biology
		Crop yield	National		Local				
Pollination	Pollination	Cost of bees	National	Primary	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Pollination	Pollination	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Biological Control	Biological control	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Biological Control	Pest control	pest density	Local	Primary	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Lifecycle maintenance	Forest basin	Forest cover	Local	Proxy	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
		Land use	Local		Local				
Lifecycle maintenance	Habitat suitability	SAR score	Local	Proxy	Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
		Biodiversity value	Local		Local	USA	USA	Scenarios	Nelson_2009_FrontEcolEvol
Lifecycle maintenance	Species conservation	Species	Local	Model	National	UK	UK	Quantification	Eigenbrod_2010_Biolog_Cons
Lifecycle maintenance	Oxygen supply	Land use	Local	Model	Local	China	China	Valuation	Li_2008_AgricultSciChina

		Above ground biomass	Local		Local				
Lifecycle maintenance	Habitat suitability	Ground water	National	Model	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
		Soil characteristics	National		Local				
		Land cover	National		Local				
		Conservation index	Local		Local				
Lifecycle maintenance	Habitat suitability	Habitat	NA	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		Conservation	Continental		Local				
		Habitat	National		Local				
Lifecycle maintenance	Habitat suitability	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Lifecycle maintenance	Intrinsic value	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Lifecycle maintenance	Habitat suitability	Ground water	National	Model	Local	Netherlands	Netherlands	Valuation	Willemen_2010_EcolEcon
		Soil characteristics	National		Local				
		Land cover	National		Local				
		Conservation index	Local		Local				
Lifecycle maintenance	Habitat suitability	Ground water	National	Model	Local	Netherlands	Netherlands	Congruence	Willemen_2010_EcolInd
		Soil characteristics	National		Local				
		Land cover	National		Local				
		Conservation index	Local		Local				
Maintenance of Genetic Diversity	Genetic resources	Land cover	Local	Proxy	Local	Spain	USA	Valuation	Brenner_2010_OceanCoastalMan
Aesthetic enjoyment	Nature reserves basin	Distance to resources	Local	Proxy	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
Aesthetic enjoyment	National scenic spot	Distance to Scenic site	Local	Proxy	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
Aesthetic enjoyment	WTP for improvement in the environment	Willingness to pay (WTP)	Local	Primary	Local	Australia	Australia	Prioritisation	Crossman_2010_EcolEcon

Aesthetic enjoyment	Aesthetic value	Site	Local	Proxy	Local	USA	USA	Quantification	Sherrouse_2011_Applied Geography
		DEM	Local		National				
		Slope	Local		National				
Aesthetic enjoyment	Scenic beauty	DEM	National	Model	Local	Switzerland	Switzerland	Valuation	Gret-Regamey_2008_Journal of Environmental Management
		Land cover	National		local				
		Temperature	National		local				
Aesthetic enjoyment	Spiritual, aesthetic, recreational services	Protected areas	Local	Primary	Local	South Africa	South Africa	Scenarios	van Jaarsveld_2005_Phil. Trans. R. Soc. B
Aesthetic enjoyment	Aesthetic and amenities	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics
Aesthetic enjoyment	Aesthetics	Land use	National	Proxy	National	New Zealand	New Zealand	Valuation	Sandhu_2008_EcolEconom
Aesthetic enjoyment	Nature appreciation	Rare species	National	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Aesthetic enjoyment	Aesthetic landscape	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Recreation and tourism	Recreation	urban green space	Local	Proxy	Local	Germany	Germany	Scenarios	Bastian_2011_Ecological Indicators
Recreation and tourism	Tourism	Flower viewing	Local	Proxy	Local	South Africa	South Africa	Valuation	O'Farrell_2011_J of Arid Env't
Recreation and tourism	Tourism	Viewsheds	Local	Primary	Local	South Africa	South Africa	Valuation	O'Farrell_2011_J of Arid Env't
		Visitors numbers	National		Local				
Recreation and tourism	Aesthetics and recreation	Land cover	Local	Proxy	Local	Spain	USA	Quantification	Brenner_2010_OceanCoastalMan
Recreation and tourism	Recreation	Water fowls	Local	Proxy	Local	USA	USA	Valuation	Gascoigne_2011_Ecological Economics
Recreation and tourism	Potential Tourism	Viewsheds	Local	Proxy	Local	South Africa	South Africa	Quantification	Reyers_2009_Ecol&Soc
Recreation and tourism	Land cover	Forest cover	Local	Proxy	Local	Taiwan	Taiwan	Valuation	Huang_2011_Ecological complexity
Recreation and tourism	Recreational use	Visitors numbers	National	Primary	National	UK	UK	Quantification	Eigenbrod_2010_Biolog_Cons
Recreation and tourism	Recreational fishing	Fish abundance	Local	Proxy	Local	Chile	Chile	Congruence	Lara_2009_ForestEcolManag

	opportunities								
Recreation and tourism	International tourism	Visitors numbers	National	Proxy	National	Zanzibar	USA	Valuation	Lange_2009_OceanCoastManag
		Visitors stay	National		National				
		Visitors expenses	National		National				
Recreation and tourism	Fishing	Fish abundance	National	Proxy	National	Zanzibar	USA	Valuation	Lange_2009_OceanCoastManag
		fish consumption	National		National				
Recreation and tourism	Recreation	Land cover	National	Proxy	Local	China	China	Valuation	Helian_2011_energy Procedia
Recreation and tourism	Fishing	Monetary value	Local	Proxy	Local	USA	UK	Valuation	O'Higgins_2010_Ecol_Society
		Habitat	Local		Local				
		Fish abundance	Local		Local				
Recreation and tourism	Waterfowl hunting	Habitat	Local	Proxy	Local	USA	USA	Valuation	Jenkins_2010_EcolEcon
		Hunting	National		Local				
Recreation and tourism	Outdoor recreation	Land cover	Local	Proxy	Local	Germany	Germany	Scenarios	Lautenbach_2011_Ecological indicators
		Traffic census	Local		Local				
Recreation and tourism	Ecotourism	Resource availability	National	Model	National	Namibia	USA	Valuation	Naidoo_2011_Journal of Applied Ecology
Recreation and tourism	Trophy hunting	Resource availability	National	Model	National	Namibia	USA	Valuation	Naidoo_2011_Journal of Applied Ecology
Recreation and tourism	Tourism	Accessibility	National	proxy	National	China	China	Valuation	Chen_2009_EcolEcon
		Visibility from scenic spots	National		National				
Recreation and tourism	Recreation	Natural Areas	National	proxy	local	USA	USA	Congruence	Chan_2006_PloS Biology
		Accessibility	National		Local				
		Population density	National		Local				
Recreation and tourism	Outdoor recreation	Non urban areas	Continental	Proxy	Continental	Europe	Netherlands	Scenarios	Metzger_2006_Agriculture Ecosystems and Environment
Recreation and tourism	Recreation	Visitors numbers	Local	Primary	Local	Netherlands	Netherlands	Valuation	Hein_2006_Ecological Economics
Recreation and tourism	Recreation	Land cover	National	Proxy	Local	USA	USA	Valuation	Troy_2006_Ecological economics

Recreation and tourism	Accommodation suitability	Land cover	National	Model	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
		Land cover	National		Local				
		Distance	National		Local				
		Distance to resources	National		Local				
		Distance to resources	National		Local				
		Distance to resources	National		Local				
		Accessibility	National		Local				
		Distance to resources	National		Local				
		Accommodation	National		Local				
Recreation and tourism	Potential leisure cycling population	Distance to resources	National	Proxy	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
		Roads	National		Local				
		Population density	National		Local				
		Industries	National		Local				
Recreation and tourism	Potential recreational use	Footpaths	NA	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		Cultural heritage	NA		Local				
		Distance to resources	NA		Local				
		Distance to resources	NA		Local				
		Population density	National		Local				
Recreation and tourism	Deer hunting	Hunting	Local	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Recreation and tourism	Number of tourist attractions	Visitors numbers	Local	Proxy	Local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Recreation and tourism	Summer cottages	Tax	Local	Proxy	local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Recreation and tourism	Forest recreation	Forest cover	Local	Proxy	local	Canada	Canada	Trade offs	Raudsepp_2010_PNAS
Recreation	Recreational use	Visitor numbers	NA	Proxy	Local	Denmark	Denmark	Valuation	Verje_2010_EcolComplex

and tourism									
			NA		Local				
Recreation and tourism	Recreation	Land cover	Continental	proxy	Local	Finland	Finland	Quantification	Vihervaara_2010_EcolComp
Recreation and tourism	Accommodation suitability	Land cover	National	Model	Local	Netherlands	Netherlands	Valuation	Willemen_2010_EcolEcon
		Land cover	National		Local				
		Distance	National		Local				
		Distance to resources	National		Local				
		Distance to resources	National		Local				
		Distance to resources	National		Local				
		Accessibility	National		Local				
		Distance to resources	National		Local				
		Accommodation	National		Local				
Recreation and tourism	Potential leisure cycling population	Distance to resources	National	Proxy	Local	Netherlands	Netherlands	Valuation	Willemen_2010_EcolEcon
		Roads	National		Local				
		Population density	National		Local				
		Industries	National		Local				
Recreation and tourism	Accommodation suitability	Land cover	National	Model	Local	Netherlands	Netherlands	Congruence	Willemen_2010_EcolInd
		Land cover	National		Local				
		Distance	National		Local				
		Distance to resources	National		Local				
		Distance to resources	National		Local				
		Distance to resources	National		Local				
		Accessibility	National		Local				
		Distance to resources	National		Local				
		Accommodation	National		Local				

Recreation and tourism	Potential leisure cycling population	Distance to resources	National	Proxy	Local	Netherlands	Netherlands	Congruence	Willemen_2010_EcolInd
		Roads	National		Local				
		Population density	National		Local				
		Industries	National		Local				
Inspiration for culture, art and design	Cultural and spiritual	Land cover	Local	Proxy	Local	Spain	USA	Quantification	Brenner_2010_OceanCoastalMan
Inspiration for culture, art and design	Authenticity landscape	Land use	National	Proxy	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP
Inspiration for culture, art and design	Landscape value	landscape value	National	Proxy	Local	UK	UK	Scenarios	Posthumus_2010_EcolEcon
		Land use			Local				
Inspiration for culture, art and design	Natural heritage local and Sami cultures	Land cover	Continental	proxy	Local	Finland	Finland	Trade offs	Vihervaara_2010_EcolComp
Spiritual experience	Research and educational bases	Distance to resources	Local	Primary	Local	China	China	Prioritisation	Shi_2009_FrontEarthSciChina
Inspiration for culture, art and design	Authenticity landscape	Land cover	National	Proxy	Local	Netherlands	Netherlands	Quantification	Willemen_2008_LUP

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Appendix 2: Overview JRC data

Primary indicator	Secondary Indicators	Data owned by the JRC (Yes/No)	Database	Data Link [Data available in the JRC (owned or third party)]	Extent of JRC data	Access rights
Fodder provision	Livestock	Yes	EDGAR Database	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Productivity index	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Fodder provision	Livestock	Yes	EDGAR Database	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Commodity production value	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
	Timber production	No	FAOSTAT	FAOSTAT	Global	Free access
Grain production	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
	NDVI	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
Agricultural production	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Fodder provision	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
	Livestock	Yes	EDGAR Database	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
	Hay production	No	FAOSTAT	http://faostat.fao.org/default.aspx	Global	Free access
Agricultural production	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Productivity index	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Soil characteristics	Yes	SOILS Database	http://eu soils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
		No	Harmonized World Soil Database	http://www.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/index.html	Global	Free access
Productivity index	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
Fodder	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access

provision	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fish production	Vessel data	No	Vessel Monitoring System	N/A	Continental	DG-MARE (EC)
	Estuarine habitat areas	No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
		No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [Global Biodiversity Information Facility (GBIF)]	http://data.gbif.org/datasets/provider/145	Global	Free access
	Fish abundance	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
Agricultural production	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
		No	Harmonized World Soil Database	http://www.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/index.html	Global	Free access
Grain production	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Agricultural production	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Municipal maps	No	Communes 2001-2008	http://www.gisco.eurostat.cec/gisco/cfm/mapservices.cfm	Continental	Free access
		No	Countries 2006	http://www.gisco.eurostat.cec/gisco/cfm/mapservices.cfm	Continental	Free access
		No	GAUL (Global Administrative Unit Layer) 2008	http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691	Global	Free access
	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.

Fodder provision	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Livestock	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Fodder provision	Livestock	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Agricultural production	Land Use	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	National	European Commission only.
Agricultural production	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Grain production	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Soil productivity	Soil characteristics	Yes	SOILS Database	http://eu soils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
		No	Harmonized World Soil Database	http://www.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/index.html	Global	Free access
Productivity index	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Climatological parameters	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
Fodder provision	Livestock	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fodder provision	Livestock	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Fodder provision	Fodder provision	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Grain production	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eu soils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
		No	Harmonized World Soil Database	http://www.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/index.html	Global	Free access
	Land Use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Crop yield	Yes	AFOLU	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission	

			Database			only.
Agricultural production	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Livestock	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
	Market prices	No	FAOSTAT		Global	Free access
Agricultural production	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Pork production	Pigs production	Yes	EDGAR DATABASE	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	Free access
Maple syrup	Maple syrup	No	N/A	N/A	N/A	N/A
Reindeer	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fodder provision	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fish production	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Wild vegetables	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Waste and hydro energy	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fodder provision	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fish production	Fish catch	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
Water supply	Surface water / Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water supply	Precipitation	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
		No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access

	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Evapotranspiration	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water supply	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water supply	Distance to water resources	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
River salinity	River salinity	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water supply	Quickflow / Groundwater	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water supply	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water supply	Surface/ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water supply	Precipitation	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
	Litter containment	Yes	EDGAR DATABASE v4.0	http://edgar.jrc.ec.europa.eu/factsheet_4a-b-d2.php	Global	European Commission only.
		Yes	ELCD Database	http://lca.jrc.ec.europa.eu/lcainfohub/datasets/html/processes/19728650-4cf4-11dd-ae16-0800200c9a66_02.01.000.html	Continental	DG-ENV (EC)
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Water supply	Surface water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.

		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water purification	Surface water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water supply	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water supply	Population density	No	Gridded Population of the World, version 3 (GPWv3)	http://sedac.ciesin.columbia.edu/gpw/	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Water flow direction	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Water supply	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Raw material	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Timber production	DEM	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Temperature	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
	Forest cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
Fuel wood	Wood production	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.

Reeds	Reeds cutting	N/A	N/A	N/A	N/A	N/A
Raw material	Farm prices	N/A	N/A	N/A	N/A	N/A
Raw material	Raw material	Yes	ELCD Database	http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm	Global/Continental	Free access
Genetic resources	Land Cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Medicinal plants	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Satellite image	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Medicinal plants	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Air purification	Tree cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
Air purification	Pollutant concentration	Yes	EDGAR Database	http://edgar.jrc.ec.europa.eu/index.php	Global	European Commission only.
	Deposition velocity	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	European Commission only.
		Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	European Commission only.
	Tree cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
Air purification	Pollutant concentration	Yes	EDGAR Database	http://edgar.jrc.ec.europa.eu/index.php	Global	European Commission only.
	Tree cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
Carbon storage	Forest biomass	Yes	EFDAC Forest resources	http://efdac.jrc.ec.europa.eu/index.php/efris	Global	European Commission only.
	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Soil Characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Soil Characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Greenhouse gas emissions (GHCV)	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Above ground biomass	Yes	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.

	Nutrient flux	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Carbon storage	Above / Below ground biomass	Yes	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
	Soil Characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Land Cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Climate regulation	Temperature	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
Carbon sequestration	Above ground biomass	Yes	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Carbon Sequestration	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
Carbon storage	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Climate regulation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon sequestration	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Climate regulation	Temperature / Precipitation	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
Carbon storage	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Carbon storage	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon storage	Above / Below ground biomass	Yes	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Carbon sequestration	Above / Below ground biomass	Yes	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access

		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Forest biomass	Yes	EFDAC Forest resources	http://efdac.jrc.ec.europa.eu/index.php/efris	Global	European Commission only.
	Social value	N/A	N/A	N/A	N/A	N/A
Carbon sequestration	Forest biomass	Yes	EFDAC Forest resources	http://efdac.jrc.ec.europa.eu/index.php/efris	Global	European Commission only.
Carbon storage	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Carbon storage	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
	Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.	
	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Climate regulation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon storage	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
	Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.	
	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon storage	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Carbon storage	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
	Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.	

	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
GHG mitigation	Nutrient flux	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Social carbon	Yes	SOILS Database	http://eu soils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Carbon storage	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Gas regulation	Nutrient flux	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Carbon storage	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Carbon storage	Soil carbon	Yes	SOILS Database	http://eu soils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Climate regulation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon storage	Above / Below ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Carbon storage	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Carbon Storage	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon sequestration	Nutrient flux	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Carbon Storage	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon sequestration	Forest biomass	Yes	EFDAC Forest resources	http://efdac.jrc.ec.europa.eu/index.php/efris	Global	European Commission only.
Climate regulation	Temperature	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
Greenhouse gas	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access

emissions regulation (N2O)	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Climate	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
Riparian zone	Distance to Stream	Yes	TEN Inland WaterWays Network - Transport Networks	http://ec.europa.eu/transport/infrastructure/basis_networks/basis_networks_en.htm	Continental	DG-MOVE (EC)
	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Greenhouse gas regulation	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Nutrient flux	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon sequestration	NPP	Yes	eStation	http://estation.jrc.ec.europa.eu/	Continental	Free access
	Crop removal	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Carbon sequestration	Nutrient flux	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Fire occurrence	No	FIRMS (Fires)	http://firefly.geog.umd.edu/firms/	Global	FAO, NASA
		Yes	Global Burnt area db (Bioval)	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Climate regulation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon sequestration and storage	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Carbon Storage	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Disturbance regulation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Risk assessment	Hazard	No	FLOODS Database	http://www.bafg.de/nn_267044/GRDC/EN/02_Services/05_Special_DBs/ETNR/etnr_node.html?_nnn=true	Continental	GRDC
		No	Global Runoff Data Centre	http://www.bafg.de/GRDC/EN/Home/homepage_node.html	Global	Free access
		No	FIRMS (Fires)	http://firefly.geog.umd.edu/firms/	Global	FAO, NASA

		No	GDACS Database	http://www.gdacs.org/	Global	Free access
		No	GlobeSec Database	http://dma.jrc.it/map/	Global	Free access
		Yes	Global Burnt area db (Bioval)	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
Flood attenuation	Water holding capacity	Yes	FLOODS Database	http://www.bafg.de/nn_267044/GRDC/EN/02_Services/05_Special_DBs/ETNR/etnr_node.html?_nnn=true	Continental	GRDC
Avalanche protection	DEM	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Temperature	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
Flood control	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Riparian zones	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Disturbance prevention	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Flood prevention	Flood plain	Yes	FLOODS Database	http://www.bafg.de/nn_267044/GRDC/EN/02_Services/05_Special_DBs/ETNR/etnr_node.html?_nnn=true	Continental	GRDC
	Annual flood	Yes	FLOODS Database	http://www.bafg.de/nn_267044/GRDC/EN/02_Services/05_Special_DBs/ETNR/etnr_node.html?_nnn=true	Continental	GRDC
Flood prevention	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water quality	Erosion	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Water quality	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water regulation	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water quality	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapViewer.aspx?id=1	Continental	Free access
Water regulation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access

Water regulation	Water quality / Flow regulation	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water quality	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Water resources	Surface water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Environmental flows	Water use	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Ecological community	N/A	N/A	N/A	N/A	N/A
Water quality	Water characteristics	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water regulation	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Fish stock	No	Regional fisheries management organizations RFMO	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access

Water regulation	Water characteristics	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water filtration	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Water flow	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Topography	Yes	Geological Map 1:5 million - Geology - View	http://www.onegeology.org/home.html	Global	European Commission only.
Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.	
Water filtration	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Sediment retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Water filtration	Precipitation	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Water quality	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Water recharge	Ground water / Water characteristics	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water regulation	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Soil	Yes	SOILS	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission

	characteristics		Database			only.
Water regulation	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Water regulation	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water regulation	Flow regulation / Water retention	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water regulation and supply	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Hydrological flow	Precipitation	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
	Water use	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Water regulation	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental
No			WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
No			HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Storm water interception	Surface water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)

		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Riparian zone	Distance to stream	Yes	TEN Inland WaterWays Network - Transport Networks	http://ec.europa.eu/transport/infrastructure/basis_networks/basis_networks_en.htm	Continental	DG-MOVE (EC)
	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Water filtration	Flow regulation	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eu soils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Water characteristics	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Water regulation	Above ground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
		Yes	Global Burnt area	http://bioval.jrc.ec.europa.eu/products/burnt_areas_gba2000/global2000.php	Global	European Commission only.
	Steamflow	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Waste treatment	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Nitrogen retention	Nutrient deposition	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Human excretory	Yes	ELCD Database	http://lca.jrc.ec.europa.eu/lcainfohub/datasets/html/processes/19728650-4cf4-11dd-ae16-0800200c9a66_02.01.000.html	Continental	DG-ENV (EC)
Nitrogen retention	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Market value	N/A	N/A	N/A	N/A	N/A

Waste assimilation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Nitrogen retention	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
	Urea price	N/A	N/A	N/A	N/A	N/A
Nutrient retention	Nutrient deposition	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Phosphorus retention soil	Soil retention	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Nutrient sequestration	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil erosion	Erosion	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil retention	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Erodibility	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Erosion control	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Geomorphology	Yes	Geological Map 1:5 million - Geology - View	http://www.onegeology.org/home.html	Global	European Commission only.
		Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
	Climate	No	WorldClim	http://www.worldclim.org/	Global	Free access
		Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil erosion	Precipitation	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Water retention	Water flow	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access

Soil erosion	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Topology	Yes	Geological Map 1:5 million - Geology - View	http://www.onegeology.org/home.html	Global	European Commission only.
Land cover	Forest cover	Yes	EFDAC Forest resources	http://efdac.jrc.ec.europa.eu/index.php/efris	Global	European Commission only.
Soil retention	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Erodibility	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil retention	Soil retention	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Soil deposition	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Soil retention	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil retention	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Erodibility	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Litter	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Erodibility	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Riparian zone	Distance to stream	Yes	TEN Inland WaterWays Network - Transport Networks	http://ec.europa.eu/transport/infrastructure/basis_networks/basis_networks_en.htm	Continental	DG-MOVE (EC)
	Vegetation map	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access

	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Soil retention	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil retention	Soil retention	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil productivity	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Litter	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Nutrient cycling	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil productivity	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil productivity	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Litter	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil productivity	Earthworm	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil productivity	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Nutrient retention	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	Free access
Soil productivity	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Litter	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil organic matter	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Soil carbon	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
Soil organic matter	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Soil productivity	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Nutrient cycling	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Pollination	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Pollination	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Pollination	Land use	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	National	European Commission only.

	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Pollination	Land cover	No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
		No	PANGAEA - Publishing Network for Geoscientific and Environmental Data	http://data.gbif.org/datasets/provider/145	Global	Free access
	Habitat	Yes	DOPA	http://dopa.jrc.ec.europa.eu/node/4	Regional	European Commission only.
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Pollination	Crop yield	Yes	AFOLU Database	http://afoludata.jrc.ec.europa.eu/DS_Free/AF_Agri.cfm	Continental	European Commission only.
Pollination	Cost of bees	N/A	N/A	N/A	N/A	N/A
Pollination	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Biological control	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Pest control	Pest density	Yes	FATE Database	http://fate-gis.jrc.ec.europa.eu/geohub/MapView.aspx?id=1	Continental	European Commission only.
Forest basin	Forest cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Habitat suitability	SAR score	N/A	N/A	N/A	N/A	N/A
	Biodiversity value	No	PANGAEA [Publishing Network for Geoscientific and Environmental Data (GBIF)]	http://data.gbif.org/datasets/provider/145	Global	Free access
		No	IUCN Red List of Threatened Species	http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria	Global	Free access
		Yes	EuroGEOSS	http://www.eurogeoss.eu/default.aspx	Continental	Free access

Species conservation	Species	No	PANGAEA [Publishing Network for Geoscientific and Environmental Data (GBIF)]	http://data.gbif.org/datasets/provider/145	Global	Free access
		No	IUCN Red List of Threatened Species	http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria	Global	Free access
		Yes	EuroGEOSS	http://www.eurogeoss.eu/default.aspx	Continental	Free access
Oxygen supply	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Aboveground biomass	No	Saatchi Global Map	Saatchi et al. 2011	Global	Saatchi et al. 2011
		Yes	EFFIS Database	http://effis.jrc.ec.europa.eu/	Continental	Free access
Habitat suitability	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
	Soil characteristics	Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Conservation index	No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [GBIF]	http://data.gbif.org/datasets/provider/145	Global	Free access
		Yes	EuroGEOSS	http://www.eurogeoss.eu/default.aspx	Continental	Free access

		Yes	African PAS (DOPA-WDPA)	http://bioval.jrc.ec.europa.eu/APAAT/	Continental	European Commission only.
Habitat suitability	Habitat	No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
		No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [in Global Biodiversity Information Facility (GBIF)]	http://data.gbif.org/datasets/provider/145	Global	Free access
		Yes	DOPA	http://dopa.jrc.ec.europa.eu/node/4	Regional	European Commission only.
		No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [GBIF]	http://data.gbif.org/datasets/provider/145	Global	Free access
	Conservation	Yes	EuroGEOSS	http://www.eurogeoss.eu/default.aspx	Continental	Free access
		Yes	African PAS (DOPA-WDPA)	http://bioval.jrc.ec.europa.eu/APAAT/	Continental	European Commission only.
		No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
	Habitat	No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [in Global Biodiversity Information Facility (GBIF)]	http://data.gbif.org/datasets/provider/145	Global	Free access
		Yes	DOPA	http://dopa.jrc.ec.europa.eu/node/4	Regional	European Commission only.
		Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access

Intrinsic value	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	
Habitat suitability	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.	
		No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)	
		No	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access	
		Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.	
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	
	Conservation index	No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [GBIF]	http://data.gbif.org/datasets/provider/145	Global	Free access	
		Yes	EuroGEOSS	http://www.eurogeoss.eu/default.aspx	Continental	Free access	
		Yes	African PAs (DOPA-WDPA)	http://bioval.jrc.ec.europa.eu/APAAT/	Continental	European Commission only.	
	Habitat suitability	Ground water	Yes	CCM Database	http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=23	Continental	European Commission only.
			No	WISE river basin districts	http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1	Continental	DG-ENV (EC)
No			HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access	
Soil characteristics		Yes	SOILS Database	http://eusoils.jrc.ec.europa.eu/esdb_archive/ESDB/Index.htm	Continental	European Commission only.	
Land cover		Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	

	Conservation index	No	PANGAEA - Publishing Network for Geoscientific and Environmental Data [GBIF]	http://data.gbif.org/datasets/provider/145	Global	Free access
		Yes	EuroGEOSS	http://www.eurogeoss.eu/default.aspx	Continental	Free access
		Yes	African PAs (DOPA-WDPA)	http://bioval.jrc.ec.europa.eu/APAAT/	Continental	European Commission only.
Genetic resources	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Nature reserves basin	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
National scenic spot	Distance to Scenic site	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
WTP for improvement in the environment	WTP	N/A	N/A	N/A	N/A	N/A
Aesthetic value	DEM	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Slope	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Scenic beauty	DEM	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Temperature	Yes	ENSEMBLES	http://ensembles-eu.metoffice.com/index.html	Continental	European Commission only.
		No	WorldClim	http://www.worldclim.org/	Global	Free access

Spiritual, aesthetic, recreational services		No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
	Protected areas	No	WDPA	http://www.wdpa.org/	Global	Free access
Aesthetic and amenities	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Aesthetics	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Nature appreciation	Rare species	No	Digital Distribution Maps of The IUCN Red List of Threatened Species	http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria	Global	Free access
Esthetic landscape	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Recreation	Urban green space	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Tourism	Flower viewing	N/A	N/A	N/A	N/A	N/A
Tourism	Viewsheds	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
	Visitors numbers	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Aesthetics and recreation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Recreation	Water fowls	Yes	HydroSHEDS	http://hydrosheds.cr.usgs.gov/index.php	Global	Free access
Potential Tourism	Viewsheds	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Land cover	Forest cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
Recreational use	Visitors numbers	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access

Recreational fishing opportunities	Fish abundance	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
International tourism	Visitors numbers / stay / expenses	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Fishing	Fish abundance	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
	Fish consumption	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
Recreation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Fishing	Fish Monetary value	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
	Fish Habitat	No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)

	Fish abundance	No	Regional fisheries management organizations (areas) - Highly migratory species - RFMO - Area management	http://ec.europa.eu/fisheries/cfp/international/rfmo/index_en.htm http://www.fao.org/fishery/statistics/collections/en	Global	EEA / FAO
Waterfowl hunting	Habitat	No	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
	Hunting	N/A	N/A	N/A	N/A	N/A
Outdoor recreation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Traffic census	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
Ecotourism	Resource availability	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Trophy hunting	Resource availability	N/A	N/A	N/A	N/A	N/A
Tourism	Accessibility	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Visibility from scenic spots	No	SRTM / ASTER	http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp	Global	Free access
Recreation	Natural Areas	Yes	Natura 2000	http://ec.europa.eu/environment/nature/natura2000/index_en.htm	Continental	DG-ENV (EC)
	Accessibility	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Population density	No	Gridded Population of the World, version 3 (GPWv3)	http://sedac.ciesin.columbia.edu/gpw/	Global	Free access

Outdoor recreation	Non urban areas	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	
Recreation	Visitors numbers	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access	
Recreation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	
Accommodation suitability	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access	
	Accessibility	No	Open Street Map	www.openstreetmap.org		Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database		Continental	European Commission only
	Distance to resources	No	Open Street Map	www.openstreetmap.org		Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database		Continental	European Commission only
	Accommodation	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources		Continental	Free access
Potential leisure cycling population	Roads / Distance to resources	No	Open Street Map	www.openstreetmap.org		Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database		Continental	European Commission only
	Population density	No	Gridded Population of the World, version 3 (GPWv3)	http://sedac.ciesin.columbia.edu/gpw/		Global	Free access
	Industries	No	Settlements v 3.0 - Land cover - Dataset	http://www.gisco.eurostat.ec.europa.eu/gisco/cfm/mapservices.cfm		Continental	Free access
		No	FAOSTAT Database	http://faostat.fao.org/default.aspx		Global	Free access
Potential recreational use	Footpaths	No	Open Street Map	www.openstreetmap.org		Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database		Continental	European Commission only
	Cultural heritage	N/A	N/A	N/A		N/A	N/A

	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Population density	No	Gridded Population of the World, version 3 (GPWv3)	http://sedac.ciesin.columbia.edu/gpw/	Global	Free access
Deer hunting	Hunting	N/A	N/A	N/A	N/A	N/A
Number of tourist attractions	Visitors numbers	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Summer cottages	Tax	N/A	N/A	N/A	N/A	N/A
Forest recreation	Forest cover	Yes	TREES Database	http://bioval.jrc.ec.europa.eu/	Regional	European Commission only.
Recreational use	Visitors numbers	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Recreation	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Accommodation suitability	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Accessibility	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Accommodation	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Potential leisure cycling population	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Roads	No	Open Street	www.openstreetmap.org	Global	Free access

			Map			
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Population density	No	Gridded Population of the World, version 3 (GPWv3)	http://sedac.ciesin.columbia.edu/gpw/	Global	Free access
	Industries	No	Settlements v 3.0 - Land cover - Dataset	http://www.gisco.eurostat.cec/gisco/cfm/mapservices.cfm	Continental	Free access
		No	FAOSTAT Database	http://faostat.fao.org/default.aspx	Global	Free access
Accommodation suitability	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
	Accessibility	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Accommodation	No	EUROSTAT Database	http://epp.eurostat.ec.europa.eu/portal/page/portal/tourism/data/other_sources	Continental	Free access
Potential leisure cycling population	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Roads	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
	Population density	No	Gridded Population of the World, version 3 (GPWv3)	http://sedac.ciesin.columbia.edu/gpw/	Global	Free access

		No	Settlements v 3.0 - Land cover - Dataset	http://www.gisco.eurostat.ec.europa.eu/geoportal/geo-stat/2011/landcover/landcover.html	Continental	Free access
	Industries	No	FAOSTAT Database	http://faostat.fao.org/default.aspx	Global	Free access
Cultural and spiritual	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Authenticity landscape	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Landscape value	Landscape value	N/A	N/A	N/A	N/A	N/A
	Land use	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Natural heritage local and Sami cultures	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access
Research and educational bases	Distance to resources	No	Open Street Map	www.openstreetmap.org	Global	Free access
		No	Transport network database v 3.0	http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database	Continental	European Commission only
Authenticity landscape	Land cover	Yes	GLC2000	http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php	Global	Free access

European Commission

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Title: Indicators for mapping ecosystem services: a review

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Abstract

Ecosystem services are the benefits that humans derive from ecosystems, such as food provisioning, water regulating and provisioning, soil productivity, and use of natural areas for recreation. The current challenge is to mainstream ecosystem services into policies and practices in order to ensure the continuous provision of these benefits to humans. The European Union has adopted an EU Biodiversity Strategy for 2020 in which the target of safeguarding ecosystem services is explicitly included. One crucial step to account for ecosystem services is the spatial quantification of the service supply. To this end, the development of robust indicators is needed. In this report we give an overview of spatial information used for mapping and modelling ecosystem services according to the scientific literature and evaluate the potential contribution of the JRC in supporting such initiatives at global, continental, and national level. We found a large diversity of indicators used for mapping different ecosystem services. The most common indicators are based on data related to land use/cover, soils, vegetation, and nutrients. Most of these data are available in and outside the JRC to a large extent and at low resolution. The JRC holds 82% of the data types used to map ecosystem services and could support the Member States and other initiatives involved by directly providing spatial information.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

