State and trends of ecosystems and their services in Flanders

Key findings of the Technical Report

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Flanders Regional Ecosystem Assessment - State and trends of ecosystems and their services in Flanders

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Contents

Chapter 1 - Introduction

The Flemish Research Institute for Nature and Forest (INBO) reports biennial on the state of nature in Flanders (Northern part of Belgium). The current reporting cycle is conceived as a regional ecosystem assessment (REA) for Flanders and consists of three successive phases. The first phase (Flanders REA-S&T 2014) describes the state and trends of ecosystems and their services in Flanders and was finalised in February 2015. In the second phase (Flanders REA-P 2016), we present and apply methods and tools for taking ecosystem services into account when making policy decisions. The final phase (Flanders REA-S 2018) is a scenario report that will explore the impact of possible future scenarios on ecosystems and their services.

The reporting of the first phase (REA S&T 2014) consists of a Technical Report and a Synthesis Report. The Technical Report is a scientific background document, that provides an evidence base to answer the key questions of the ecosystem assessment. The Synthesis Report is written for a wide audience of decision makers and other stakeholders and summarizes the main findings of the Technical Report. The Synthesis Report is online available in Dutch and English.

The 26 chapters of the Technical Report were written by researchers from INBO (the Research Institute for Nature and Forest) and external partners. The Technical Report is the knowledge base for the regional ecosystem assessment. Each chapter of the Technical Report has been prepared as a separate publication and is available in Dutch at www.inbo.be/nl/technisch-rapport. After two introductory chapters, Chapters 3 to 10 seek to answer the research questions of Flanders REA-S&T. The last sixteen chapters discuss the best-known and most relevant ecosystem services in Flanders. This publication compiles the translated key findings of the 26 chapters of the Technical Report.

Chapter 2 - Conceptual Framework

- Man, economy and society are integral parts of ecosystems.
- Also in an urbanized and industrialized region like Flanders the size and the distribution of human well-being and economic welfare depend on ecosystem services.
- An insight in the importance and value of ecosystems for human well-being and economic welfare requires not only natural sciences-based knowledge on ecosystems and their supply of ecosystem services. Also ethical, socio-cultural, economic and legal knowledge about the stakeholders, their dependence of, demand for and use of ecosystem services are important for an ecosystem service oriented policy.
- In Flanders a considerable part of the natural capital stock has been converted in human, social, technical and financial capital. Because of this human well-being and economic welfare in Flanders are becoming increasingly dependent on foreign natural capital and ecosystem services are increasingly imported from abroad.
- Political decision-making and public policy are value-laden and value-based processes. It is therefore relevant, when valuing ecosystem services, to be explicit about the ethical choices or assumptions that are embedded in the used valuation methods, indicators and numbers.

Chapter 3 - Drivers

- Human activities directly or indirectly have an impact on ecosystems. Direct drivers are factors or processes that have a direct impact on ecosystems and thereby influence the delivery of ecosystem services. Indirect drivers are social processes such as population growth, economic growth and cultural shifts that shape human choices and actions and thus control the direct drivers.

- Land use change is the most important direct driver. Urbanization increases the built-up area and reduces the area that supplies ecosystem services. Urbanization also goes hand in hand with horsification and privatization of the open space, decreasing the area available for food production.

- In addition, soil sealing in built-up areas results in the loss of important functions such as carbon storage and infiltration of rainwater. This reduces the supply of ecosystem services depending on these functions (water production, maintenance of soil fertility, regulation of erosion and flood protection).

- As a result of scaling-up and industrialization in agriculture, field margins, fallow fields and small landscape elements were removed from the landscape. However, the disappearance of these landscape structures also reduced the supply of a number of important ecosystem services such as landscape experience, erosion protection, maintenance of soil fertility, pollination and pest control.

- The intensification of agriculture was accompanied by a sharp increase in the use of pesticides and fertilizers. The use of broad-spectrum insecticides often has a negative impact on non-target organisms that are responsible for the delivery of ecosystem services such as pollination and pest control. The excess use of fertilizers leads to eutrophication, resulting in the contamination of drinking water, air pollution and the loss of ecosystem services.

- Energy production, industry and traffic are major sources of noise and air pollution. Locally, ecosystem services may have a mitigating effect on the impact of these environmental pressures. However, measures to tackle the problem at source (e.g. rational use of energy and technological solutions) will always be more efficient.

- As a result of globalization environmental pollution becomes more and more a transnational issue. Climate change and invasive alien species are pre-eminently global issues and their impact on ecosystem services and society will increase in the future. Therefore these issues are being tackled increasingly through international legislation.

- Technological innovations can help to reduce the environmental impact of human activities. New technologies, however, must first undergo a thorough impact analysis in order to exclude possible negative environmental impacts.

- Although economic and financial motives usually determine the choices made by policy makers, producers and consumers, environmental criteria are becoming increasingly important. The growing environmental awareness can be an important driver for more sustainable policy choices, consumption and production. The ecosystem services concept can help to increase social support for nature, environmental issues and a more sustainable economy.

- Environmental legislation aims at reducing the impact of specific drivers on ecosystems. In addition, a number of policy tools focus on the restoration and expansion of the supply of ecosystem services. In this respect, the European Common Agricultural Policy has the potential to become a powerful lever to strengthen ecosystem services in the open space. As one of the most important players in the open space, agriculture is indeed responsible for a large number of environmental pressures, but it also has an important potential to optimize the delivery of ecosystem services.

Chapter 4 - The state of biodiversity and ecosystem services

- Only a small part of the biodiversity in Flanders is known. On the one hand there mainly exists knowledge about Red List species, European threatened species and habitats and on the other about nature values that are appreciated by people since long time.

- The knowledge about insects, worms, fungi, bacteria… that play an important role in the functioning of ecosystems and in the supply of some supporting and regulating ecosystem services is very limited.

- Roughly estimated, about 44,000 species occur in Flanders and only from about 5% the Red List status is assessed. From these, 6% is considered as regionally extinct, and one out of four is critically endangered, endangered or vulnerable.

- Each EU member state is required to monitor the trend and status of the Habitats and Bird Directive species. Within the scope of the Habitats Directive, criteria are developed to assess the conservation status of habitats and species. Currently, five of the 47 habitats (11%) and nine of the 59 species (15%) have a favourable conservation status. More than three-quarters of the habitats and more than half of the species have an unfavourable conservation status.

- According to the Biological Valuation Map 31% of Flanders has a medium or high biological value. Regionally important habitats and Natura 2000 habitats covers 6% of Flanders. Biologically valuable areas are mainly situated in the Campine region, along the coast and the big rivers and in the loamy region.

- According to the criteria of the European Water Framework Directive, only a small part (1.6%) of lakes, watercourses in polders, streams and rivers has a good status and not a single surface water has a very good status. The targets of the Water Framework Directive are thus not achieved.

- More than 90% of the biologically valuable ecosystems are planological or legally protected. A minority also is managed as nature reserve.

- The drivers land use change (including habitat loss and fragmentation), pollutants and eutrophication, invasive alien species, overexploitation of groundwater and climate change still have an important negative impact on the biodiversity of ecosystems. The impact of invasive alien species and climate change will become more important in the future.

- Europe proposes to use the MAES classification (forests, grasslands, …) for the reporting on the status of ecosystems and their services. The definition of these ecosystem classes is broadly-based, what makes an unambiguous assessment of the impact of the drivers impossible. As a consequence the member states will have to develop a more refined classification of ecosystems.

- Target 1 of the European Biodiversity Strategy to 2020 focusses on Natura 2000 areas and concentrates especially on rare species and habitats within protected areas. Target 2 focusses on the entire green space, on the restoration of all degraded ecosystems and their services. Both targets are complementary, but are directed from different policy domains.

Chapter 5 – The state of ecosystem services

- The knowledge from the 16 ecosystem services chapters allows a reliable analysis of the current state and recent trends of ecosystem services in Flanders. This chapter summarizes the information about the supply, demand and use of the various ecosystem services.
- Information on the state and trends of ecosystem services is relevant for policy at different institutional levels and for a wide range of policy issues.
- The use of most ecosystem services is unbalanced. This is mainly because the ESS demand exceeds (by far) the ESS supply and in many cases this trend will further continue. Most ecosystem services are thus heavily used.
- An unbalanced, intensive use of an ESS often goes together with negative effects on other ecosystem services. These effects result in a reduction in the ESS-supply and an increase in the ESD-demand.
- Potential improvements in the ESS state are usually situated in an adjustment of the ESS-demand. In some cases however, an optimization of the ESS-supply can provide social benefits.
- Our analysis indicates that an intervention at the level of ESS-use offers the greatest potential: a more nature-based use of ecosystem services by avoiding negative interactions and strengthening synergies between ecosystem services.
- A more comprehensive assessment of the state of ecosystem services requires more data on governance, drivers, relevant ecosystem characteristics and well-being indicators.
- Advising policy requires translation of best available knowledge from different disciplines to customized information with known reliability. This requires integrating different data types and determining the reliability of the conclusions.
- Trend-determination through a repeatable state-analysis or 'ESS-accounting' (Target 2 of the EU biodiversity strategy for 2020) requires the development of ESS indicators. The effectiveness of indicators is not only determined by scientific criteria, but also by policy and process criteria.
- The mapping of ESS-supply for accounting and scenario analysis requires the use of a reliable conversion of the modelled/mapped ESS-supply to repeatable and comparable (spatial) units.

Chapter 6 - The role of biodiversity in the delivery of ecosystem services

- Evolution created a large variety of genes, species, ecosystems and landscapes and still generates new variations adapted to changing environments. This complexity of life supports a huge amount of human activities.

- Biodiversity plays a role in each step of the ecosystem service cycle. (1) It is an important storehouse (potentially) usable for a wide range of human applications. (2) It regulates and optimises many ecosystem processes in nature. An increase in biodiversity stimulates the stability and efficiency of ecosystem functions and provides a wider range of ecosystem services. (3) Biodiversity contributes to what we can harvest and is as such a benefit. (4) Part of it, is directly valued for aesthetic and ethical values.

- The potential role of biodiversity in optimizing ecosystem functions and ESS is well documented.

- In the current use of ES, the role of biodiversity is often replaced by the input of energy and creation of technical alternatives. Each ecosystem service can be provided by a gradient ranging from natural to more technological or human-controlled ecosystems. Pollination can be delivered by wild pollinators, but also by cultivated bees in beehives. Water purification can be delivered by a natural marshland or by a high technological sewage treatment plant. When external inputs and technical solutions increase, the contribution of biodiversity decreases.

- The term ecosystem service suggests that a service is always delivered at the spatial scale of an ecosystem. However, the ecosystem service can be provided at different spatial scales i.e. the population level for pollination, the ecosystem level in forests, the landscape level for flood control and drinking water …

- The most important biodiversity components underpinning ecosystem services, are ”functional biodiversity” and ”biodiversity stocks”:

    - An ecosystem function is usually provided by a (functional) group of organisms i.e. bumblebees and bees that pollinate crops; fungi and bacteria that contribute to the decomposition of organic material; different tree species that contribute to timber production …

    - In addition, also the quantity or abundance of organisms or ecosystems is essential: large numbers of pollinators or predators, large volumes of timber, large areas of floodplain … Quantities are essential to match supply and demand of ecosystem services.

- The more services an ecosystem has to deliver at the same time, the higher its dependence on biodiversity. More (functional) species groups are required to provide and sustain the different services. An increase in biodiversity creates more stability within the ecosystem. Minor environmental changes can be absorbed by stable ecosystems, due to internal species shifts.

- Any valuation of biodiversity is subjective and depends on our knowledge of biodiversity, our cultural background and personal interest.

- The first objective of the EU Biodiversity Strategy for 2020 focuses primarily on the protection and conservation of biodiversity with a continuation of the ’preservation policy’ of endangered species and ecosystems. The second and third goal focuses on the supporting role of biodiversity for the delivery of ecosystem services. Hereby, restoration of ecosystems is linked with the sustainable use, restoration and maintenance of ESS and the establishment of green infrastructure.

- The implementation of Natura 2000 supports the supply of a lot of ecosystem services and the optimization of ecosystem service bundles generates better opportunities for halting the loss of biodiversity. In spite of their mutual strengthening both EU-targets are implemented in very different policy paths. Fine tuning between the different paths is needed.

Chapter 7 - Ecosystem services and well-being

- The ecosystem service approach provides an analytical framework to account for the well-being benefits of the natural environment.

- Ecosystems and species deliver our basic products such as food or water, and improve our environment, for example by buffering noise or reducing air pollution. In this way, ecosystem services have a big influence on our well-being.

- Having green areas nearby encourages people to take exercise. This benefits both their physical and their mental health. Outdoor recreation improves mood, counters stress and reduces the risk of illness and depression.

- Accessible green areas in a neighbourhood or district reinforce a society's cohesion and reduce crime.

- Children's development benefits from regular contact with nature. It stimulates creative play, the interaction between children and adults and reduces the symptoms of attention deficit disorder and hyperactivity. Additionally, it improves cognitive development by improving children's awareness, reasoning and operational skills. It also promotes their motor skills, including coordination, balance and dexterity.

- In today's society, most people live out of daily contact with nature. On average, Flemish people spend 85% of the time indoors. The decrease of daily contact with nature resulted in an alienation from nature. Unconsciously, people get deprived of the well-being benefits of contact with nature.

- The importance of ecosystem services for our well-being appears from the overview of major health problems in Flanders. These health problems can often be linked to a greater or lesser extent to the quality and use of ecosystem services.

- Not only the optimization of ES-supply but also of ES-use may benefit individual or social well-being. In order to increase the use, and consequently, the benefits of ecosystem services, it is necessary to integrate the knowledge about the benefits of nature in a wide range of policy areas (e.g. education, health and spatial planning).

Chapter 8 - Valuation

- Valuation defines or measures the **contribution of an object to a certain goal** or set of goals. Applying valuation methods in policy therefore requires transparency with regard to the goals, norms and assumptions upon which these valuation methods are based.

- **Valuation is inextricably bound up with making choices and with decision-making**, both individually and collectively. In that sense an ecosystem service oriented policy always implies a valuation of ecosystem services.

- Valuation methods are not merely technical tools but rather **value articulating institutions**. The method defines whose values, needs and desires count, and to what extent they are accounted for, in the result of the valuation. Neither the choice of a valuation method, nor the result of a valuation study, is politically or ethically neutral.

- Economic valuation methods associate ecosystem services with an **exchange value** and aim for **welfare maximization on the basis of aggregated individual preferences**. This exchange value reveals little of the sometimes unique and irreplaceable socio-cultural or ecological values that are associated with ecosystems and ecosystem services.

- Economic valuation methods can yield socially and policy relevant insights with regard to a number of **economic benefits and costs of *changes in* ecosystem services** (the so called *marginal value*). In this way they indicate a minimum value that can be attributed to ecosystems on economic grounds. Several of these economic benefits and costs are overlooked in market transactions.

- Economic valuation methods reveal little reliable information with regard to the ***total value* of ecosystems on a large scale**, unless that these are invaluable because they sustain life on earth, society and the economy.

- Decisions, for instance land use choices, that only take the value of marketed provisioning ecosystem services into account, often do not result in a social optimum. **Internalising the economic value of non-marketed ecosystem services** in a decision-making process can result in different land use choices, and in a restoration or increase in the supply of supporting, regulating and cultural ecosystem services.

- Economic valuation requires a reliable estimate of individuals' willingness to pay for (or accept) small changes in ecosystem services. Those estimates are only possible to the extent that **critical thresholds** (e.g. safe minimum standards) of the underlying ecosystems are not exceeded. If those thresholds are exceeded then **small ecosystem changes may result in disproportionately large, nonlinear and often irreversible ecological, social and economic consequences**.

- For ecosystems and ecosystem services **below critical thresholds, knowledge with regard to cost effective measures** to restore natural capital and ecosystem service supply above this threshold, provides a **more solid basis for decision making** than information from a monetary cost-benefit analysis.

- A **critical stock of natural capital constitutes a necessary condition** for the production and maintenance of manufactured, financial, human and social capital, upon which our economic welfare and human well-being are based.

- In Flanders certain components of the natural capital stock and the resulting supply of ecosystem services have decreased below a critical minimum. Flanders compensates its local natural capital deficit through the **import of ecosystem services from foreign natural capital**. This international dimension receives relatively little attention in valuation studies commissioned by Flemish environmental and biodiversity policy.

- The economic valuation of ecosystem services is useful **as an eye-opener and for awareness raising** about how our well-being and welfare are dependent on robust and resilient ecosystems and their services. This may help to **better capture the value** of ecosystems and their services **in decision-making**.

- Economic valuation of ecosystem services may contribute to a more **equitable distribution of (access to) natural capital and ecosystem services between generations**. However, within the contemporary institutional context this is not guaranteed.

- A too strong or narrow focus on the economic exchange value of ecosystem services may trigger a **discourse** and behaviour in which other **motivations** to restore or maintain ecosystems, lose strength. This can adversely affect the **effectiveness of policy measures** that are dependent on those motivations for their success.

- Valuation studies in support of specific evaluations and scenarios of ecosystem service oriented policy need to take into account the **multiple dimensions of value**. They need to apply an according **diversity and pluralism of methods** that acknowledges the variety of values and goals that are associated with ecosystems.

Chapter 9 - Interactions between ecosystem services

- Ecosystem services (ESS) are tightly connected. Both supply, use and demand affect each other at different scales. Knowledge about negative and positive interactions (trade-offs and synergies) provides a basis for improving the supply of ecosystem services.

- Ecosystems are deliberately altered to improve the supply of (mainly provisioning) services. However, some types of ESS-use jeopardize the supply of other ESS or the future supply of the same ESS.

- The ESS-supply can be optimized by tuning the land use to the ecological potential. However, the potential for major changes in land use in Flanders is limited.

- Nature-based ESS-use - reduction of negative interactions while enhancing positive interactions - increases the overall ESS-supply. This can also secure the long-term supply. Especially changes in the use of provisioning services provide opportunities for increasing the long-term supply of ecosystem services in Flanders.

- The ESS-demand in Flanders depends on global ecosystems and the global protection and restoration of ecosystem services.

- The demand for ecosystem services is largely determined by the socio-economic context of stakeholders on a local scale.

- ESS-assessments require reliable integration of diverse information. Limitation to analysis/mapping of spatial and quantitative data of ESS-supply - often without determining reliability - holds great risks for the policy. Without an integrated analysis with ESS-demand and use over different scales, the mapping of ESS supply only has a demonstrative value.

- The development of ESS-accounting and scenario analysis requires the integration of existing knowledge and uncertainties about all aspects of ecosystem services and the development of reliable methods for participation and validation.

Chapter 10 - ESS-oriented policy

- ES oriented policy aims sustainable management of ecosystems and ecosystem services. It focuses on the resilience of the ecosystem, which is ”the capacity of a social–ecological system to sustain a certain set of benefits from biophysical processes, in face of uncertainty and change, for a certain set of stakeholders.” For this, a policy recognition of the precautionary principle, the polluter pays principle and manager gets principle is relevant.

- ESS-oriented policies recognize diversity. There are several ecosystem services, which have multiple values, and can be delivered by multiple land use. The ESS-outcome is shaped by the interplay of a variety of actors working on a variety of policy levels and in a variety of sectors. Therefore, the development and implementation of the policy would benefit from a range of policy instruments and participation forms.

- To cope with this diversity, institutions that connect (e.g. regional landscapes) and match scales (e.g. basin committees) are relevant. In addition, optimization of ecosystem services is desirable. The optimization takes into account the diversity of social interests, the consequences (far) outside the area and the implications for future generations.

- Based on ESS-policy process and content conditions 19 indicators were derived and used to determine the similarity of historical and current water, forest, nature and agriculture legislation with ESS-oriented policy.

- The similarity of water legislation with the ESS reference increases significantly during time (1967 until 2013) and is high for the second water policy document. The increase in similarity was due to content elements (matching scales and multi-functionality) and to a lesser extent to process elements (participation).

- The similarity between the forest code of 1854 and ESS-oriented legislation was low. By contrast it is high for the changed forest decree 1999 and 2014. The increase in similarity was the result of change in content elements (introducing multi-functionality) and process elements (forest groups) The Flemish forest groups can be seen as a very well developed bridging organization. The organization bridges the government with the many private forest owners and is a platform that also includes different governments (like municipalities, provinces and Flemish government) and different knowledge types.

- The similarity between the EU agricultural legislation and ESS-oriented legislation is still limited and increase only gradually since the creation of the common agricultural policy. The criteria that have undergone the greatest change over time are related to content (landscape scale, optimization) as well as process (instrument types, role of market and civil society). Nevertheless there are still many possibilities to improve. The main improvements are the creation of bridging organizations (the link the different stakeholders) and take into account the spatial and temporal consequences of agricultural policy.

- The similarity between nature legislation and the ESS oriented legislation is especially high for the changed nature decree 2002 and 2014. The increase in similarity is the result of changes in content (recognizing precautionary principle, polluter pays principle, manager gets principle, including spatial and temporal effects of the policy) and to a lesser extent by some process changes (number of subsystems where policy intervenes, e.g. drivers, social welfare, ecosystem).

Chapter 11 - ESS Food production

- 45% of the land area in Flanders is used for the ecosystem service food production. Less than 1% of this area uses agro-ecological practices. Food is mainly produced using modern agricultural practices.
- In order to fully meet the current demand for food of the Flemish population (if no food is imported) 60% of the land area in Flanders is needed. 28% of this area is needed to produce vegetable foods (i.e. fruit, vegetables, grain) and 72% is needed to produce animal-based foods (i.e. meat, eggs, milk). The required area per capita is 1,282 m^2.
- The use of food and feed as pet food significantly reduces the total supply of food in Flanders. The estimated land area used for cats, dogs and horses amounts to 20% of the total land area in Flanders.
- The use of external inputs like fertilizers and pesticides in modern agriculture led to a significant increase in food production. However, these external inputs have a negative impact on biodiversity and on the resistance to stress (i.e. drought, diseases).
- Biodiversity itself plays an important role in almost all food-related ecosystem processes (i.e. nutrient retention, pest control, pollination).
- Agro-ecological farming requires more land than modern agriculture due to its lower food yield per hectare. However the land area that can be used for food production on a global scale is limited. This implies the demand for food (i.e. less meat) should be altered. It is not easy to change the demand for food and this probably requires changes in the system. Changes in existing systems are rare because they go against existing power relationships and habits.
- Food companies and suppliers are limited in number and are therefore powerful. The food industry and in particular the supermarkets determine the price and the characteristics of the products supplied. The suppliers determine which products and under what conditions products are supplied by farmers.
- Food is a basic human need. This implies the availability of sufficient and healthy food, that consumers have access to this food and that this food can and will be used in a healthy way. In Flanders there is enough food available and the food is safe. 15% of the Flemish population does not have sufficient livelihoods to buy this food. The Flemish inhabitant eats unhealthy, including too much meat and not enough vegetables. 44% of the population is overweight and 14% obese. The health costs of obesity makes out 42% of total health costs in Flanders.
- Farmers are the managers of the ecosystem service food production. The compensation they receive for this is low. For example, a farmer needs at least 25 hectare to receive a gross income comparable to a wage earner. Only farmers that are in the top 25% of the best performing arable farms and get government subsidies achieve this. An average company needs at least 65 hectares without subsidies. For comparison: an average arable farm is 17 hectares in area. The 5% largest arable farms are at 52 hectares in area.
- The modernization of agriculture in Flanders was and still is associated with a decline in biodiversity. Mainly the species that are tied to nutrient-poor conditions and specialists (i.e. skylark) are declining in number. Even though most environmental pressures have declined. For instance, the pressure on aquatic life has been reduced by 60% between 1990 and 2010.
- Modern agriculture is associated with numerous negative effects on other ecosystem services. These negative effects can be reduced by a system change to agro-ecological farming. The ecosystem services of agro-ecological farming per hectare are greater than those of modern agriculture.

Chapter 12 - ESS Game production

- Ecosystems in Flanders support the production of game. These species are hunted both for recreational purposes and for the consumption of their meat. In addition, certain wild species are also hunted to reduce potential negative effects (damage, disturbance, predation, ...). In this chapter, only the use of game as food is discussed.

- Flanders counts approximately 12,000 active hunters. Every year they kill more than 800,000 animals, representing an estimated total weight of 720,000 kg. This represents a total economic value of about 1,861 million euros. Game is also imported because the demand is higher than what the hunting sector in Flanders can supply.

- Game species have species-specific habitat requirements. They are also highly mobile and their habitat requirements may differ during the year. Several ecosystems are important for the supply of game. The occurrence of a game species largely depends on the ecosystem. Big game (wild boar and deer) prefer forest and wetlands, while small game (such as partridge and hare) is more common in agricultural areas. Waterfowl (e.g. wild duck) is bound to the presence of water features.

- The trend of the game harvest shows a decrease of the ecosystem service in Flanders. This can be explained by a population decline of some wild species as a result of, for example, agricultural intensification, the decrease in habitat quality, the increased predation pressure and a modified hunting legislation. Currently, the colonization of new habitat by wild boar and the sharp increase of their abundance is limited to the eastern part of Flanders. The contribution of wild boar in the provision of the ecosystem service is currently limited.

- The provision of the ecosystem service is largely regulated by specific hunting legislation. It provides subsidies for habitat improvements for game species among other things.

- Also the nature legislation has an impact on the use (where can be hunted) as well as the supply of the ecosystem service (protection of the habitat). By subsidizing the management of nature reserves, this legislation indirectly also supports game species.

- Certain wild species cause damage to agricultural crops and young trees. This ecosystem service conflicts with other services such as food and wood production. The use of the ecosystem service (culling) also controls damage. The use of the service is also closely related to a cultural ecosystem service, namely recreational hunting. Hunting can conflict with other forms of outdoor recreation.

- The biggest knowledge gap is the lack of data on the game populations and on the socio-economic aspects of the ecosystem service. Priority should be given to the collection of basic field data in order to (1) obtain an understanding of the relationships between the occurrence of wild species and habitats and land use, (2) to examine the impact of the use of the ecosystem services on population dynamics and (3) get insight the economic importance of game in Flanders.

Chapter 13 - ESS Wood production

- The ecosystem service wood production is defined as the capacity of a vegetation (e.g. closed forest) or landscape elements (row of trees, tree-filled garden, wood side, …) to deliver usable wood (expressed in m^3 / ha per year) in a renewable way. 'Usable wood' means wood that has a direct useful function. This may be as a raw material for industrial processing or as firewood for energy generation.

- Only a limited area of Flanders consists of woodland or green areas (forest and other tall green) that can potentially provide the ecosystem service. Moreover, a significant part of this potential is - consciously or unconsciously - not used. Within the formal market (= especially the industrial wood market) turnover exceeds greatly the local supply. This market is highly globalized (import / export). However, there is a large informal market of private firewood, which turns out to be much larger than the formal market. The importance of the ecosystem service wood production in Flanders is larger than what can be inferred from the formal market.

- Some 250,000 m^3 of wood is supplied annually through formal channels (public wood sales, wood sales coordinated by forest groups). This supply consists of about 2/3 of wood for industrial processing and 1/3 of firewood. There is also direct private sale to professional wood merchants, presumably in the same proportions. These volumes are estimated at 200,000 m^3 per year. Finally, there is the very large informal market for private firewood. This is estimated at over 500,000 m^2 of wood per year. We conclude that about 1 million m^3 of wood is harvested annually in Flanders, and that more than 3/4 of that wood is used for private firewood.

- Public policy focuses on conserving and expanding land use types with potential for wood production. Policy instruments do not encourage wood production but rather other ecosystem services, landscape and nature conservation (reserves, …). This is in line with changing social expectations of forest and landscape element. This leads to a reduction of the capacity for and use of, wood production.

- Forest, trees, hedges and tall green in residential and recreational areas provide the ecosystem service wood production. The total area of "wood-producing" ecosystems has declined in recent decades (despite the policy to preserve them). Include urbanization, industrialization, rationalization and scale enlargement in agriculture plays a role.

- The development of the market for green energy may in the future lead to significant shifts in the implementation of the ecosystem service wood. This increased demand for energy wood can enter into competition with traditional markets (pulp, firewood) which can translate into higher prices and increased harvesting of wood remaining in the forest unused in the past. Actually this is not yet an important issue in Flanders (northern Belgium).

- A higher biodiversity (tree species mix, heterogeneity in the structure, …) can provide a higher resistance and resilience against disturbances that jeopardise wood production. However, the direct impact of a higher diversity (tree species mix) on the productivity is unclear, and strongly depends on differences in growth rate between tree species.

- Wood production as an ecosystem service can coexist well with biodiversity goals, provided the forest is managed with an eye to its natural value. In certain situations, increased wood production may even go along with more biodiversity, but often the relationship is rather the opposite: a further maximization of wood production will have a negative to very negative impact on biodiversity (and vice versa).

- The ecosystem service wood production can coexist with other ecosystem services (green space for outdoor activities, regulation of air quality, global climate regulation, water production, game production, regulation of erosion risk, regulation of flooding risk, …). This positive interaction is often less pronounced when deployed on maximizing wood harvesting.

- The use of wood has a direct impact on health and well-being (better living environment, ...). Also other land uses which are inextricably linked to wood production (forests and tall green) generate health and other financial and non-financial benefits.

Chapter 14 - ESS Production of energy crops

- Energy from biomass is a form of renewable energy and is achieved through a variety of biomass flows and conversion techniques. The ecosystem service (ESS) 'production of energy crops' includes a part of this biomass. The production of energy from biomass is increasing and covered in 2012, partly due to the use of imported biomass, slightly less than 5% of the energy consumption in Flanders.

- The European Renewable Energy Directive of 2009 is a key driver for the growing demand for renewable energy. In Belgium, it is expected that the contribution of bio-based energy in this will increase to 89% for transport, 78% for green heating and cooling and 48% for green electricity by 2020.

- The current supply in Flanders from the ESS energy crop production is 2 PetaJoule (10^{15} Joules) per year. This covers 0.13% of the total domestic (Flemish) energy demand. This supply is established through about 250,000 hectares of land area, including 6,900 hectares of farmland.

- From the current Flemish supply of silage maize, corn and sugar beet less than 2% is used for energy purposes, the majority goes to food production. The current Flemish supply of rapeseed and cereals is lower than what we use for energy purposes. The deficit (> 50%) is imported from abroad. Clippings are hardly used (<1%) for the production of energy.

- From the total Flemish capacity of woody biomass to produce bio-based energy 5.5% is actually harvested and used. The majority of the woody biomass that is used for energy purposes comes from foreign ecosystems.

- The cultivation of energy crops creates a partial trade-off with the ESS food and wood production and causes direct and indirect changes in land use. The use of residues like clippings and crest wood for energy production has the important advantage that this requires almost no additional land area. There are also no trade-offs for the ESS food and wood production.

- The cultivation of annual energy crops requires higher inputs of fertilisers and pesticides, and a more intensive land use than the cultivation of perennial energy crops. The impact on biodiversity and the environment of the increase in land area used for the production of energy crops depends on the original land use and the choice of crop.

- The species richness of grasslands aimed at high biomass production is lower because only a few highly productive species dominate. Forests aimed at a high biomass production have little structural variation and low volumes of dead wood so the ecological values are rather limited. The harvest of stem and crest wood can upset the nutrient balance and acidity of forest soils.

- The assumed reduction in greenhouse gas emissions from the use of certain bio-based fuels compared to fossil fuels is increasingly questioned, especially when taking into account the greenhouse gases released by (1) direct and indirect changes in land use and (2) conversion of bio-based fuels into energy.

- A future increased use of bio-based fuels as a result of policy objectives, can lead to a high import of biomass and bio-based fuels. This may give rise to direct and indirect changes in land use, a changed forest management or land speculation, with negative consequences for local people.

Chapter 15 - ESS Water production

- Water production covers the whole of hydrological and ecological processes that support the production of water of sufficient quality for human consumption.

- Flanders suffers from a ”severe water scarcity”. As the per capita availability of water in Flanders is very low compared to other countries of the Organisation for Economic Cooperation and Development (OECD), the sustainable use of water is very important.

- Numerous sectors depend on water production of different quality: fresh or salt, and in various degrees of purification, depending on the use. *Consumption* is the use of water that is no longer available for other users. The biggest (fresh surface) water consumers are shipping, energy and industry sectors (together 90%).

- Data on groundwater and surface water usage are spread across various administrations and often difficult to compare as they are measured for different purposes. Matters concerning the supply of clean water and the effects of the use of clean water reach beyond the borders of Flanders. However, spatial indicators for subprocesses can be developed.

- Trends in the supply and use of drinking water can be analysed using data from the water companies, but these volumes are only a small portion of the total water consumption.

- Non-phreatic aquifers are very vulnerable to unsustainable exploitation. This takes into account the recharge rate and potential negative effects on water-dependent habitats.

- Land use change is the main driver influencing the supply of this ESS. Legislation also plays an important role, such as the Water Framework Directive and the regional standards for water quality and groundwater.

- Understanding this ESS and answering questions about supply, demand and sustainable use requires the integration of often complex data and models regarding water quantity and quality, utilization and consumption. Given the low water availability and great societal dependency, this integration is urgently needed.

Chapter 16 - ESS Pollination

- For nature to be able to provide the ecosystem service pollination, viable populations of pollinating insects must have sufficient habitats near crops that require pollination. Also more technological solutions like cultured pollinators are possible.
- Due to a lack of knowledge and local variations in the supply and use of this service, it is impossible to analyse the state and trend of this ecosystem service. However, the pollination dependence of crops could be mapped.
- Globally, 87 out of the 124 most important food crops are dependent on animal pollination. These crops represent about 35% of the global food production. No data are available for Flanders.
- Natural pollination contributes to the availability of food. The economic value of this ecosystem service could be modelled using the replacement cost method or the production cost method.
- In order to optimise the use of this service, a change is required in agricultural technology, landscape design and land use.
- With respect to policy, the ecosystem service pollination fits within initiatives to improve functional agro-biodiversity and agro-environmental measures, which are implemented at an international (CAP) and a local (RDP) level.
- More knowledge is required, both on the ecological and economic aspects of this ecosystem service.

Chapter 17 - ESS Natural pest control

- For nature to be able to provide the ecosystem service natural pest control, viable populations of natural enemies are required. Also technological solutions like cultured natural enemies for non-chemical pest control are possible.
- Due to a lack of knowledge and local variations in the demand, supply and use of this service, it is impossible to analyse the state and trend of this ecosystem service.
- In Northwest Europe, the potential losses of the crop yields due to pests and competition with weeds may be up to 60%. Despite the use of pesticides still around 20% is actually lost. No data are available for Flanders.
- Natural pest control contributes to the availability of food, and could potentially reduce the adverse health effects and the costs of pesticide use. Economic valuation methods for pollination could be adapted to calculate the value of natural pest control.
- In order to optimise the use of this service, a change is required in agricultural technology, landscape design and land use.
- Natural pest control may also contribute to wood production and energy crop production.
- With respect to policy, the ecosystem service natural pest control fits within initiatives to improve functional agro-biodiversity and agro-environmental measures, which are implemented at an international (CAP) and local (RDP) level.
- More knowledge is required, both on the ecological and economic aspects of this ecosystem service.

Chapter 18 - ESS Maintenance of soil fertility

- In a natural ecosystem soil fertility is maintained by intensive interaction between the soil structure (physical), the soil food web (organic) and the nutrients (chemical) available. As soon as man began to use this ecosystem service, the initially closed nutrient cycle was broken up and soil degradation started.
- Soil maintenance focused, for a very long time, only on the chemistry of soils. The importance of soil organisms and soil structure was undervalued and gradually deteriorated (trend).
- The current status of the chemical soil fertility of Flemish fields and pastures is usually good with respect to acidity. However, the organic matter content is significantly lower in these fields and pastures compared to other land use types in Flanders. Since organic matter content is the main indicator for maintaining soil fertility, this indicates an unsustainable evolution.
- The main threat to the conservation of soil fertility in Flanders is the far-reaching intensification in agriculture (in terms of inputs, tillage, crop choice and crop rotation). For this reason soils cannot recover naturally. Intensification appears essential and will therefore have to become more sustainable, with a minimal impact on the environment ('sustainable intensification').
- The conservation of soil fertility is, in addition to its importance for producing ESS, also essential for the provision of regulating ESS, namely water quality regulation, global climate regulation, flood regulation and regulation of erosion risk. The conservation of biological soil fertility increases the resilience of the soil and contributes to natural pest control.
- Failure to maintain soil fertility means soil degradation which we cannot afford in this ever faster growing world threatened by food, energy and fibre shortage.
- The sustainable and skilful preservation of the three components of soil fertility has a positive feedback with almost all regulatory ecosystem services.
- The most feasible measure to maintain soil fertility is a good organic matter management because the biological, chemical and physical components benefit. More specific, policy should focus on a complementary approach regarding tillage, crop rotation and fertilization in order to guarantee that soil fertility is managed in a sustainable way.
- Measures for the maintenance of soil fertility have a positive effect on biodiversity (soil food), which in exchange has plenty of positive feedback mechanisms (i.e. the disease suppression or resilience of the soil).

Chapter 19 - ESS Air quality regulation

- Air pollution is a major issue in Flanders. Especially fine particulate matter has a large share in the environmental disease burden. Flemish as well as foreign sources contribute to high fine particulate matter concentrations. Industry, transport and agriculture emit the largest part of fine particulate matter (PM_{10}) in Flanders.

- Ecosystems purify the air by the removal of pollutants from the air through the process of deposition. In forests in particular, more pollutants are deposited than elsewhere. Conifers are efficient removers of fine particulate matter, while deciduous forests absorb gaseous substances more easily.

- Models show that the reduction of air pollution by vegetation is limited in comparison with technological measures at the source. Moreover, traffic emissions, consisting of very fine particulate matter ($PM_{2.5}$) and NO_2 are less efficiently captured by vegetation.

- The advantage of ecosystems is that they can capture different pollutants simultaneously. A good mix of tree species (coniferous and deciduous), provides a better reduction of several pollutant types.

- In cities, tree rows may increase the concentration of pollutants, because ventilation under their crowns is low (*street canyon* effect).

- Despite the decreasing trend of certain pollutants such as SO_2, concentrations of other pollutants such as PM, O_3 and NO_2 remain high. This demonstrates the need for both technological measures at the source and air quality regulation by ecosystems.

- Policies and standards regarding air quality regulation are focused on technological measures at the source, in which a reduction of the emission of pollutants is a central aspect.

- Forests can capture nitrogen from the air, leading to nitrate leaching and soil acidification. This in turn leads to a loss of biodiversity, soil degradation and reduction of the soil and groundwater quality. The use of the ESS air quality regulation at concentrations that are too high can have a negative effect on other ESS provided by the forest.

- The efficiency of vegetation in capturing PM, O_3 and NO_2 should be studied better in order to estimate the reduction of air pollutants more accurately. There are indications that the air-purifying capacity of vegetation decreases with high concentrations of pollutants. Also, certain deposition mechanisms of fine particulate matter, such as resuspension, are insufficiently studied at high wind speeds and in different land uses. Currently, negative feedback mechanisms and complex deposition patterns are insufficiently incorporated into models to quantify the deposition rates of PM, O_3 and NO_2 by vegetation and other land uses.

Chapter 20 - ESS Regulation of noise

- The Indicator Report 2012 of the Flemish Environment Agency states that 13.5% of the people in Flanders are potentially seriously affected by noise pollution. Road traffic and transport are the main sources of noise pollution.

- Prolonged exposure to the typical noise caused by road traffic has significant negative effects on human health, including sleep disturbance and increased risk of cardiovascular disease.

- Vegetation structures and landscape features can contribute to the regulation of noise by the physical reduction of the noise level which a person is exposed to, as well as by the psychological reduction that nature exerts on the experience of sound.

- The extent to which noise is reduced by vegetation and landscape structures depends on land cover, vegetation type, biomass density and structure, the location and extent of the vegetation between source and receiver and micro-meteorology. The physical noise reduction by vegetation can be used as an alternative for traditional measures for noise regulation.

- The psychological effect of vegetation and other spatial characteristics on the experience of noise is complex. This depends among other things, on the extent to which a source of noise is shielded from the view, on the degree to which potentially disturbing noise is mixed with natural sounds and on the expectations of individuals. Because of interactions between all these elements, it is difficult to describe the psychological sound experience through simple source - receiver relationships. Ample research shows that the visual presence of vegetation has a positive effect on the perception of sound and thus can be considered as a full ecosystem service, together with physical noise reduction.

- Along regional roads with potential noise pollution (> 55 dB (Lden)), the built-up area potentially affected by noise pollution equals the area with a noise reducing soil cover. Therefore, the ecosystem service might be important. This is especially true for the psychological effect of vegetation on the regulation of noise.

- The Flemish government focuses on the implementation of the European Environmental Noise Directive (Directive 2002/49 / EC). However, the implementation strategy does not include measure in which vegetation or green infrastructure is used for noise regulation.

Chapter 21 - ESS Regulation of erosion risk

- The total soil loss due to water erosion in Flanders is estimated at 1.7 million tons. About 0.5 million tons end up in our waterways annually. 40% of the soil lost comes from 36,000 ha of land that is highly susceptible to erosion.

- This analysis assumes that only ecosystems with low susceptibility to erosion, located in erosion-prone areas, can provide the ecosystem service regulation of erosion risk. The analysis shows that the ESS is provided by 223,400 ha in Flanders. The avoided erosion equals 1.7 million tons per year. In contrast, in erosion-prone area 71,900 ha is covered with ecosystems with high susceptibility to erosion, causing 400,000 tons to erode.

- For society, the financial benefits from measures to reduce erosion are much bigger than the costs. For the farmer, who executes the measures, the costs exceed the benefits. Therefore, most farmers will not take erosion-reducing measures without subsidies from the government.

- Due to a more strict policy on erosion, the surface area on which farmers are required to take measures to reduce erosion increased from 10,000 ha up to 50,000 ha.

- The ecosystem service regulation of erosion risk depends on by abiotic ecosystem features (relief, precipitation, soil texture, soil structure, roughness of the soil surface). These abiotic features determine, together with vegetation or crop residues, whether an area is prone to erosion or not. The ecosystem service is highest in erosion-prone areas with high soil cover (by vegetation and crop residues), a good soil structure, a rough soil surface and where eroded soil is captured and stored as high as possible in het landscape.

- Various erosion-reducing measures have a positive effect on biodiversity. The agricultural sector wants to limit this positive effect to avoid crop damage by this biodiversity.

Chapter 22 - ESS Flood regulation

- Floods cause disasters worldwide with a large economic cost that is likely to grow at an unchanged policy. The importance of flood protection is recognized worldwide and action programs are managed by the European Floods Directive.

- The integrated management of floods and drought through the principle of ‘retaining-storing-draining’, is one of the outlines in Flemish water policy. This view corresponds well with the ecosystem service approach.

- The main pressures are climate change, population growth and urbanization, which increase the risk of flooding but also the damage caused by flooding.

- Around 30% of Flanders is currently regarded as sensitive to flooding. Under the current water management, a big part of it is protected with dikes. About 4% of the area is flooded at least once in 100 years. Within that 4% lives an estimated 1% of the population.

- Currently, only about 0.8% of Flanders is formally designated as floodplain.

- In a large part of the flood-prone areas the current land use and management can be fine-tuned so that it is compatible with the prevailing flood regime. The official designation of these areas as ‘floodplain’ could help to reduce conflicts between water storage and demand for protection against flooding.

- The solidarity between the owners and users of areas upstream with owners and users downstream influences the choice of management options/plans. This principle of solidarity between land users living upstream and downstream is essential and should be integrated into policy instruments.

- Flood plains provide a bundle of ecosystem services. The more natural the flooding process and the floodplain itself, the better the match with other ecosystem services, both cultural and regulating.

- An increase in flooded area, flood frequency and flood duration can have a positive impact on the aquatic fauna. Flooded terrestrial vegetations often change because of the increased inflow of nutrients. The quality of the river water determines whether or not certain vegetation types can remain under the flood regime.

- Transitional zones between infiltration areas and valleys function as a sponge, capturing run off water. They can reduce peak flows and purify water at the same time. The quantitative contribution of these intermediate areas to flood protection by water retention is poorly known.

Chapter 23 - ESS Coastal Protection

- Sandbanks, mudflats, salt marshes, beaches and dunes provide a natural protection against storm surges and marine flooding.
- Today, the largest part of the coastline is mainly protected by wide or narrow dune belts.
- Especially in coastal dune strips, the biotic component mar ram grass offers protection against the pounding of the sea's waves.
- Coastal protection can be valued by accounting for the avoided casualties and economic damage caused by floods, as well as by the avoided costs of construction and maintenance of infrastructure for coastal protection.
- The demand for and importance of this ESS is increasing because of further urbanization of the coastal plain, and climate change. The obstruction of natural dune formation and stabilization of dunes threaten the future delivery of this ecosystem service. Dunes cut off from the natural dynamics have a reduced regenerating ability after storms.
- Besides economic benefits, natural coastal protection has also synergies with recreation and biodiversity.
- In terms of spatial-planning the coastal strip is largely consolidated. There are, however, local opportunities for improving the use of natural coastal protection by removing old dikes, and the provision of appropriate recreational infrastructure.

Chapter 24 - ESS Global climate regulation

- Preventing greenhouse gas emissions and stimulate additional carbon storage in ecosystems is important for the mitigation of climate change in Flanders. The net contribution of individual management measures is often difficult to estimate since it involves small changes that occur over a large area and time period, with corresponding spatial and temporal variation.

- The carbon stock of an ecosystem is the net result of the processes of photosynthesis and respiration. Ecosystem structures (texture, drainage, land cover) are the basic parameters of these processes. The climate and human influences (tillage, erosion, sedimentation, fertilisation, and harvest) are external factors that affect carbon stocks.

- The carbon content of the soil in Flanders is highest in wet, clay soils. Forests and permanent grasslands contain a higher soil carbon stocks than fields. Additional measurements are needed to accurately determine the soil carbon stock of peat, heather, swamp and semi-natural grassland.

- Urbanization and shifts between the surface area of permanent grassland and arable land have a major impact on soil carbon stock in Flanders. Urbanization is often associated with the clearing of the upper carbon-rich layer. Covering the soil leads to stabilization of the remaining carbon stock.

- Carbon sequestration can be controlled through management measures in agriculture and forestry. Carbon sequestration in Flanders went down the past decades as a result of intensive drainage of wet soils for agriculture. The same applies for well drained cropland where fertilization decreased because of stricter regulations and/or the application of fertiliser low in carbon.

- There is evidence that sequestration in forest biomass will increase in Flanders in the short term because of a higher temperature and atmospheric CO_2 concentration. Climate change may also play a role in the observed decrease in carbon stocks in arable soils, with degradation processes in the soil accelerated by higher temperatures.

- Global climate regulation provides economic, ecological and social benefits. Not all of these benefits can be expressed in monetary terms. However, the monetary value of these benefits is a way to anchor the ecosystem service firmly into policy. There are various valuation methodologies for climate regulation. Currently, the marginal reduction receives a lot of attention. .

- The ecosystem service (ESS) global climate regulation has a strong synergy with the regulatory ESS maintaining soil fertility and flood protection, as well as producing ESS production of energy crop, wood production and drinking water production. A negative interaction can occur if the carbon stock is maximized at the expense of agriculture and forestry.

- Biodiversity and climate regulation are inseparable. Maximizing carbon storage in ecosystems has a positive impact on biodiversity. A higher species diversity stimulates both underground (in terms of soil) and above ground (in terms of vegetation) carbon storage. Conversely, a stable environment is important for the continued existence and the resilience of ecosystems.

- Policies that encourage carbon storage in terrestrial ecosystems in a direct way are scarce in Flanders. However, within the recently renewed European Rural Development Program (RDP-III) there is extra attention for carbon storage. Other legislations such as the Nature Decree or subsidies for afforestation/reforestation also have a beneficial effect.

Chapter 25 - ESS Water quality regulation

- The ecosystem service water quality regulation (nutrient removal) is provided best in the (water) soil or sediment, at the transition between oxygen-rich and oxygen-poor conditions, which is found in swampy areas.

- The mechanisms of nutrient removal and their biological components are well known, but because of the large spatial variation the ESS is difficult to map for large areas.

- Demand for nitrogen and phosphorus removal from wastewater and surface water is very high, due to the high emissions of nutrients by households, industry and agriculture into the environment, and the resulting deterioration of water bodies.

- A large part of household and industrial waste load is purified in wastewater treatment plants. However, this treatment is, together with the self-purifying capacity of water bodies, currently insufficient to meet the quality standards for surface water (demand).

- The capacity of ecosystems to regulate the water quality is reduced by poor ecological and hydro-morphological conditions.

- Well-designed morphological and hydrological measures in riparian zones and watercourses can enhance the self-purifying capacity of ecosystems substantially and could be an efficient way to further improve water quality.

- A monetary valuation of water quality regulation is possible through an avoided abatement costs approach or through the environmental costing model. The latter is a tool for assessing the cost-efficiency of environmental policy in Flanders. However, the greatest added value of this ecosystem service lies in the (improved) provision of other ecosystem services.

- Improved ecological and morphological conditions of watercourses and riparian areas can help to achieve a higher biodiversity and enhanced the provision of other ecosystem services.

- The policy measures regarding the supply, demand and use of the ecosystem service water quality regulation, fit under the Water Framework Directive and related standards and management measures.

- Effective indicators for this ESS can be developed through an in-depth analysis of the many available data and indirect indicators, complemented with additional research.

Chapter 26 - ESS Green space for outdoor activities

- The importance of this ESS in today's society is substantial. Green space gives people a place to exercise and get in touch with the natural environment.

- People are increasingly aware of the positive effects of outdoor activities on their physical, mental and social well-being and the development of children. That is why these green spaces are frequently visited in our leisure time, but also for daily activities they offer a pleasant environment.

- In highly urbanized areas, green spaces are often scarce. Approximately 21% of the people in Flanders do not have a green space within walking distance for everyday use.

- Not all green spaces are equally attractive for recreational activities such as hiking and cycling. The attractive green spaces for recreation and experiencing nature are unevenly distributed across Flanders. The most attractive areas are the valley of the River Ijzer, Heuvelland and the polders of the east coast and River Scheldt, the valleys of larger rivers, Flemish Ardennes, the Sonian and Meerdaal forests, the Campine region, Haspengouw and Voeren.

- Many people in Flanders have a hectic life and spend much of their time indoors in sedentary activities. This creates, in combination with the strong urbanization, a demand for quality green space for outdoor activities.

- High biodiversity adds value to nature experience and recreation. High biodiversity is one of the aspects of green spaces that are appreciated by people. Intensive use of green spaces for outdoor activities can pose a threat to biodiversity, especially by disturbance of wildlife.

- Ensuring good quality and accessible green spaces close to people is high on the policy agenda in Flanders. Policy also aims at ensuring equal availability of green spaces for every citizen. The presence of greenery close to people is seen as very important for the quality of living, because of its favourable impact on the living environment and health (air purification, regulation of noise ...), social (space for socializing) and urban issues (promotion of the city, attracting residents ...).

- A green environment increases the value of the living environment by offering a pleasant view from the house or garden, a pleasant environment for functional trips and more and better opportunities for regular outdoor activities. Houses and apartments are more expensive when they are adjacent to or near parks and other green spaces, especially in an urban context where greenery is scarce.

- Currently, we have no clear picture of the equipment of green space for outdoor activities. Research about the use of green spaces and the motives of Flemish people to visit green spaces is scarce. This poses a problem for the monitoring of the ecosystem service.

- The human appreciation of non-material benefits from nature has a major impact on decisions concerning the management and policies of green spaces. Rather than treating these benefits as a sort of black box, they could be identified and measured in order to make better informed decisions.