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Contribution of natural heritage to regional economic prosperity

Preliminary assessment and an introduction to the WECAN tool

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Working together for Economically prosperous Communities through Assets of Natural heritage
Investing in Opportunities
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This research is carried out within the scope of the EU Interreg IVB project WECAN

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Abstract

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The WECAN tool is a pragmatic valuation tool to be used by the Interreg partners in the WECAN project. It can be used to explore, value and communicate the benefits of natural heritage for regional economic prosperity. The WECAN tool combines stakeholder knowledge and expert knowledge. This study presents the WECAN tool, explores how it can be used in each of the three Interreg regions, and advices on how to communicate the economic value of natural heritage to regional stakeholders.

Keywords: ecosystem services, valuation tool, regional development, nature management

Photo cover: Kristien Wintmolders.

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1 Introduction

1.1 WECAN tool

The Interreg IV project WECAN ('Working together for Economically prosperous Communities through Assets of Natural heritage') started on March 31st, 2010. The partners of the WECAN project are located in post-industrial, densely populated areas in North-western Europe. They share a decline in heavy industry, more specifically the closure of coalmines and related activities. All WECAN partners represent National or Regional Parks. The purpose of the WECAN project is to make the natural heritage in their Parks a catalyst for economic growth to benefit local communities.

WECAN partner regions

The WECAN project has six partners from three European regions:

- Regionaal Landschap Kempen en Maasland vzw (Lead partner) (BE)
- Groundwork Wales on behalf of the Valleys Regional Park (Wales - UK)
- Welsh Government on behalf of the Valleys Regional Park (Wales - UK)
- Parc Naturel Régional de l'Avesnois (FR)
- Parc Naturel Régional Scarpe Escaut (FR)
- Espaces Naturels Régionaux (FR)

The socio-economic potential of the natural heritage in the partner areas is not yet fully understood and employed, nor is the economic value of natural heritage fully appreciated by decision makers in the respective areas. Consequently, in policy choices, the economic value of natural heritage is insufficiently taken into account. One of the first steps in the WECAN project is to highlight the economic value of the natural heritage, and its potential for economic prosperity. For the estimation of the economic value, existing knowledge and experiences in the participating areas are essential. For the estimation of these values, a newly developed tool will be used. This report presents the instrument, the so-called WECAN tool. The tool - a practical instrument for the valuation of ecosystem benefits - will be used by the Interreg partners to estimate the contribution of natural heritage to economic prosperity. The tool can be used to illustrate and communicate the economic

value of natural heritage to policy makers and the general public. Economic valuation of benefits, used in conjunction with an understanding of social and cultural issues, can provide information needed to take full advantage of the potential to deliver such benefits.

1.2 Valuation methods in the Interreg partner regions

By means of a questionnaire at the start of this project a preliminary scan was made of the methodologies that WECAN Interreg partners are currently using or would prefer to use in this study. The purpose of this scan was to identify design criteria for the WECAN instrument for the valuation of ecosystems services.

Belgian partner

The Belgian partner is familiar with ecosystem valuation, in particular the economic valuation of nature for tourism. The Belgian partner possesses a rather large database of information regarding area visitors. Two studies are mentioned: The M.A.S. study on the quantification of benefits related to hikes and a case study in the TEEB report.

Additionally, several other studies on the economic valuation of ecosystems are known in Flanders, for instance the joint-research by VITO and ECOBE (UA) 'Economische waarderingsstudie van ecosysteemdiensten voor MKBA' and the Guideline on Economic Valuation of Ecosystem Benefits of the Flemish Ministry of Environment, Nature and Energy

We detected a high preference for a methodology that meets with the TEEB framework as well as a methodology that includes both benefits from tourism and other benefits. In addition, the ambition is to put into practice an econometric instrument that enables economic assessment of nature.

French partners

The two websites of the regional parks of the French partners provide lots of information. There is a high readiness to assess the benefits of the ecosystems for regional development. In addition, it is mentioned that a Sustainable Tourism working group of EUROPARC is working on the valuation of the European Charter for Sustainable Tourism in protected areas. Results are in development and not yet available.

Based on the workshop presentation of M. Cuvillier (see also Chapter 4), we note that the preferred methodology should also fit within the TEEB approach. The French partners pay attention to the interlinkages between the ecosystems and the human benefits and warn against double-counting. The focus on interlinkages is expected to result in a rather detailed assessment level. We wonder whether this detailed assessment level can be matched with the goal to develop an applicable tool that is easy to use by park managers themselves.

In addition, the French partner encourages focus on the users of the ecosystems – in other words, those who benefit from it. This enables the assessment, as well as facilitates the communication of the ecosystem benefits towards the 'audience'.

Welsh partner

Economic valuation of ecosystem benefits seems to be common practice in the region of the UK partner. Some studies merely focus on the values towards jobs and income provided by natural parks (National Trust Wales, 2006), while other studies also include health, sense of place and cultural heritage, social inclusion as well as climate change mitigation and adaptation (WYG Planning and Design 2010; Natural Economy Northwest

s.d.). The study of Forest Research (2010) is an interesting study for this project, since it provides an overview of research findings related to the inter linkage between ecosystems and socio-economic values.

The methodologies that are used in the UK are practical, relatively easy to understand, and apparently also easy to apply. In addition, the focus is wider than on the economic value for the tourist sector only. Several human benefits are assessed as well, like social inclusion, cultural heritage, quality of place, … The methodologies fit into the TEEB philosophy but are more focussed on the human benefits instead of the interlinkage between different types of ecosystems and human benefits. There is no real differentiation in types of ecosystems. Ecosystems are mostly captured in the general term 'Green Infrastructure'. Also Defra has carried out several studies to value ecosystem services (http://www.defra.gov.uk/environment/natural/ecosystems-services/valuing-ecosystem-services/).

1.3 Purpose and outline

The WECAN project consists of several work packages which contribute to the overall objective: to determine and demonstrate how natural heritage can be utilised best as a catalyst for economic growth to benefit communities in densely-populated post-industrial areas in North- western Europe. Our study contributes to the WECAN project by providing guidance on the following aspects:

- Identification of the value of natural heritage for regional prosperity and of methods to estimate the economic value of natural heritage.
- Identification and comparison of methods used in the Interreg WECAN partner regions to value natural heritage.
- Organisation of regional workshops to test the understanding of the valuation approach and to increase awareness of the socio-economic potential of the natural heritage among regional stakeholders.
- Development of a practical instrument that the WECAN partners can use to estimate and communicate the contribution of natural heritage to economic prosperity in their region.

Chapter 2 starts with an exploration of the economic valuation of natural heritage, focusing on the purposes of valuation and different types of ecosystem valuation. It briefly presents the state of the art on economic valuation of natural heritage. Economic valuation of natural values is a complex issue. Therefore, it is important to be very clear on the purpose of the exercise in a specific context - in our case the WECAN project.

Chapter 3 introduces the WECAN tool, which is specifically developed to assess the benefits of natural heritage for regional development. This chapter starts out to clarify the approach, which is based on The Economics of Ecosystems and Biodiversity study (TEEB), 2010. Central to the approach are three steps: specifying the ecosystem (§3.2), recognizing the values (§3.3) and demonstrating the values (§3.4). Chapter 3 clarifies how the partners can put these three steps into practice.

Chapter 4 describes the lessons learned from the workshops that were organised in each of the regions to test the applicability of the WECAN tool and explores the WECAN tool by testing it on three pilots. Chapter 5 advices on the communication of the estimated economic values to local stakeholders.

2 Economic valuation of natural heritage

2.1 What is nature?

When valuing nature, the first question is: what is nature? Nature can be considered as the plants, the animals, the forests, the lakes, rivers, ... Nature is often defined as all the environmental aspects that are not man-made. However, this definition should be adjusted, since in European countries many natural reserves are artificially developed and maintained. Two other concepts that are used in valuation research to refer to nature are Ecosystems and Green Infrastructure.

An ecosystem is 'a dynamic complex of plant, animal and microorganism communities and the non-living environment interacting as a functional unit. Humans are an integral part of ecosystems. Ecosystems vary enormously in size; a temporary pond in a tree hollow and an ocean basin can both be ecosystems' according to the definition of the Millennium Ecosystem Assessment. Ecosystems delivers ecosystem services which are the benefits that the ecosystem provide to human well-being and human welfare (MA, 2006).

Green Infrastructure is a concept originating from the US and refers to an strategically planned and managed interconnected network of natural areas and landscapes (Natural England, 2012).

Nature, ecosystems and green infrastructure are in fact equivalent concepts referring to the same object and will be used accordingly in this report.

Lastly, it should be mentioned that research has concluded that what is perceived as nature tends to differ significantly among different people.

2.2 Why value nature?

One of the main reasons to value natural heritage is to improve the accuracy of policy support systems in order to avoid suboptimal decisions. After World War II, there was pressure for 'efficiency in government'. This initiated a search for ways to ensure that public funds were efficiently utilised in major public investments (Pearce, Atkinson and Mourato, 2006). The pressure for efficiency resulted in the emergence of decision support tools, like cost-benefit analysis and multi-criteria analysis, which aim to assist policy makers in their choice between several investment alternatives. The guiding principle of evaluating costs and benefits is to list all parties affected by an intervention and place a value, preferably monetary, on the (positive or negative) effect land use change has on welfare. Natural heritage can be included in decision support tools by valuing it as a provider of services - such as wood, water and pollination - to society. These services are commonly referred to as ecosystem services.

Ecosystems and natural benefits are valued for various purposes. Depending on the valuation purpose, a different valuation approach is required. The table below summarises the four main valuation purposes and the most appropriate valuation approach.

Table 1

Valuation purpose and valuation approach.

Valuation purpose	Valuation approach
1. To understand the contribution that ecosystems make to society	Determining the total value of the current flow of benefits from an ecosystem
2. To assess whether the intervention is economically worthwhile	Determining the net benefits of an intervention that alters ecosystem conditions
3. To identify winners and losers for ethical and practical reasons	Examining how the costs and benefits of an ecosystem (or an intervention) are distributed
4. To help make ecosystem conservation financially self-sustaining	Identifying potential financing sources for conservation

Source: Pagiola, Von Ritter and Bishop, 2004; European Environment Agency, 2010

In May 2011, we held workshops in each of the Interreg partner regions. From the workshops it became clear that although arguments to value natural heritage were rather similar in each region, the focus of interest differed considerably. All partners aimed to increase awareness among stakeholders of the socio-economic benefits of natural heritage, which corresponds to the first valuation purpose. However, the Belgian partner was particularly interested in the exploration and communication of the connection between ecosystem services and human well-being. The French partner was strongly interested in methodological issues related to monetary valuation of values, and the limitations of the various valuation methods and monetary valuation. The Welsh partner was mainly interested in the exploration of the socio-economic potential of natural heritage for regional development in the area.

2.3 State of the art on natural heritage valuation research

Expressing ecosystem benefits into monetary values has started in 1960. Main publications regarding the valuation of ecosystem are the work of Costanza et al. (1997), the Millennium Ecosystem Assessment (MA, 2005)) and the TEEB study, which provides a framework to assess and valuate ecosystem services (Kumar, 2010). Given the expectation that the TEEB study will become the internationally agreed standard for the valuation of ecosystems, this framework is used in our study.

Today a body of theoretically sound methodologies exists for the valuation of most (if not all) ecosystem service flows (Bateman et al., 2011). However, some bottlenecks remain. Several current research programs focus on these bottlenecks.

The first bottleneck is the issue of market price as a mean to reflect the value of nature. Market prices are by definition based on scarcity. For example, as long as clean water is abundantly available, the price for clean water will tend to be very low, whereas we all know that clean water is extremely valuable.

A second bottleneck is the issue of natural goods which do not have a market price. In these situations, stated preference methods can be used to estimate the value of non-market goods and services. These methods are controversial because they are based on asking people questions, as opposed to observing their actual behavior.

A third bottleneck is the high complexity of the functioning of the ecosystem services and the uncertainty related to the provisioning of ecosystem services to society. It is related to the question 'how much' ecosystem is needed to provide certain services?

It should be stressed that the existing methodologies for economic valuation are better suited for the examination of changes in value than for estimation of the total value of ecosystems. Simply stated: without ecosystems, there would be no people living on this earth and therefore the value of ecosystems is infinite. An additional advantage of examining change rather than a total value is that some costs and benefits may be netted out, or not affected, thus reducing the size of the effort (see the example of conversion from broadleaved trees to conifers in the Belgian workshop in the Section 4.1).

A fourth bottleneck is related to scale levels. Asking 'how valuable is an ecosystem?' begs the question 'valuable to whom, in what context, on which scale level?' The scales at which ecosystem services are generated and supplied determine the interests of the various stakeholders in the ecosystem. Services generated at a particular ecological level can be provided to stakeholders at a range of institutional scales, and stakeholders at a particular institutional scale can receive ecosystem services generated at a range of ecological scales. When the value of a particular ecosystem service is assessed, different indications of its value will be found depending upon the institutional level at which the analysis is performed. For example, local stakeholders may particularly value a production service that may be irrelevant at the national or international level. Hence, if a valuation study is implemented with the aim of supporting decision-making on ecosystems, it is crucial to indicate on whose perspectives the values are based.

In conclusion, there is a lot of scientific debate on economic valuation of nature, which involves the issues mentioned above and many more. In spite of these problems there is much to be gained from the approach, particularly in the context of regional development. It may help to highlight, clarify and quantify the contribution of ecosystems at the regional level; it also helps to identify the possible losses and opportunities of changes in land use. Working together on new perspectives, while taking advantage of the opportunities offered by ecosystem services is perhaps more important for regional stakeholders than the actual numbers in Euros.

In the WECAN approach we have tried to find a balance between the scientific complexity and the request for pragmatism by the Interreg partners. Therefore, two types of knowledge are needed: expert knowledge and stakeholder knowledge. If the context of the project is regional development, and regional stakeholders are the main beneficiaries, stakeholder participation is necessary to be able to focus in a pragmatic way on the values which are felt to be important in the area. This is why we have chosen an interactive approach rather than a desk study approach.

3 WECAN tool to assess the contribution of nature in regional development

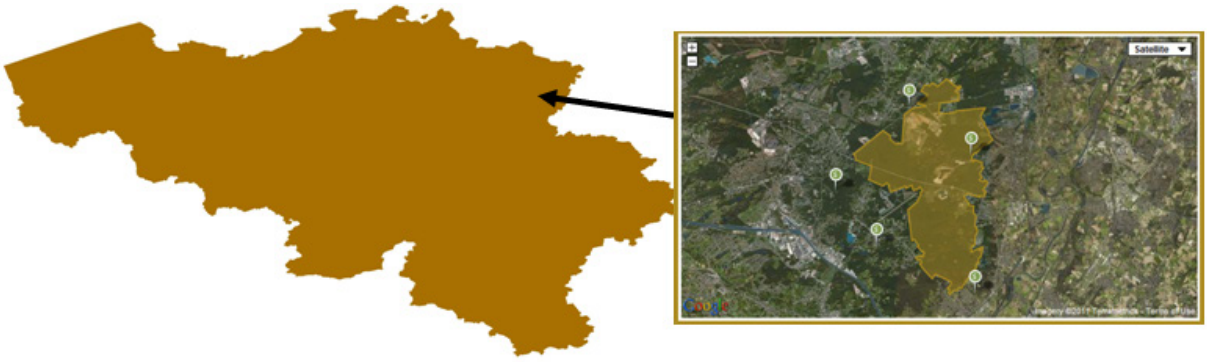
The WECAN tool presented in this Chapter aims to assist in the estimation of the contribution of natural heritage to regional development by the Interreg partners *themselves*. Therefore, the idea behind the tool was to provide a pragmatic accuracy within the complex relations between ecosystems and economy. Regional development is a broad concept that relates on the one hand to economic welfare in terms of income, employment and regional Gross Domestic Product (GDP), and on the other hand to human well-being related to quality of life. Natural heritage is defined as the ecosystem types that are present within the physical boundaries of the management authority of the Interreg partner. The tool is designed to derive estimates for the value of ecosystem services in the area. The tool is a framework which guides the user in the process of valuation; it indicates which data are to be collected, it suggests how to estimate the economic value, it structures information and provides guidelines for communication. It consists of the guideline in this Chapter 3 and an Excel sheet. The Excel sheet consists of four core worksheets, plus an introduction and reference sheets, and a series of 'help' sheets, which propose a valuation approach per type of ecosystem services and give default estimates which can be used if local data are unavailable.

3.1 Introduction to the Interreg partners

The WECAN approach is explored for each Interreg partner.

3.1.1 Belgian Interreg partner - Nationaal Park Hoge Kempen

Regionaal Landschap Kempen en Maasland is the Belgian partner in the WECAN project. It is a collaboration organization of the province, municipalities, nature organizations and farmers organizations, dealing with projects on the crossroad of tourism, nature conservation, landscaping, regional economy. One of their projects is the National Park Hoge Kempen. This National Park is the first national park in Belgium. It has been



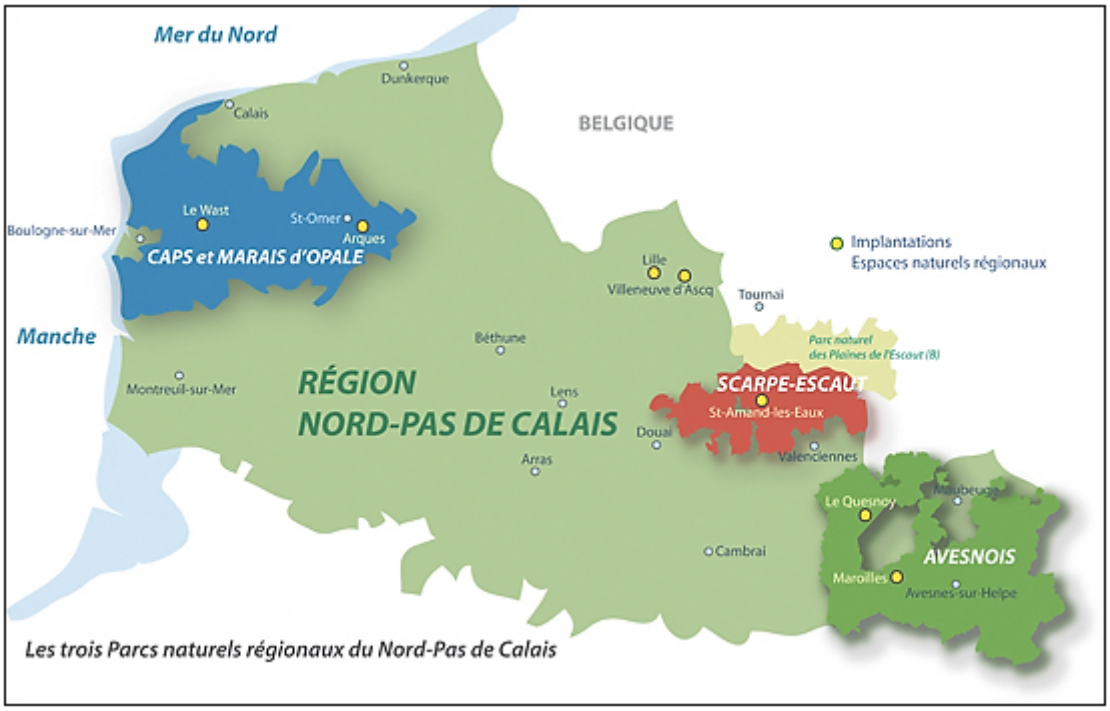
inaugurated in March 2006. The area of about 5700 ha is located within the municipalities Dilsen-Stokkem, Maasmechelen, Zutendaal, Lanaken, Genk and As (http://www.nationaalpark.be/). The National Park is located in a former mining area. It contains pine forests, heathlands, creeks, valleys, ponds, agricultural landscapes and hills and is managed by the Flemish Agency for Nature and Forestry.
Source: www.nationaalpark.be

3.1.2 French Interreg partners - Espaces Naturels Régionaux (ENRx), Parc Naturel Régional Scarpe-Escaut, Parc Naturel Régional de l'Avesnois

Interreg partners of the French region Nord-Pas de Calais are Espaces Naturels Régionaux (ENRx), Parc Naturel Régional Scarpe-Escaut and Parc Naturel Régional de l' Avesnois. These partners are situated in a former mining area in the North of France. Espaces Naturels Régionaux supports all three parks in the region and aims to put into practice the objectives of the 'chartres' and regional policy programs. These objectives and programs include informing and educating the public, organizing activities for the larger public, preserving the patrimony of the orchards, the farms and the horse races and coordinate park programs related to human well-being and biodiversity (http://www.enrx.fr/fr/les_3_parcs_du_nord_pas_de_calais/les_parcs_en_nord_pas_de_calais).

Parc Naturel Régional Scarpe-Escaut is located in the North of France between Valenciennes, Douai and Lille and consists of about 50.000 ha. In between 48 municipalities, there is a large wealth of agricultural landscapes, historical heritage, forests, grassy plains, rivers and creeks (http://www.pnr-scarpe-escaut.fr/fr/index.aspx).

Parc Natural Régional de l'Avesnois is situated in the south-east of the region Nord-Pas de Calais. The area is known for its variety in landscapes: forests, grassy fields, bocages and freshwater ecosystems (http://www.parc-naturel-avesnois.fr/fr/index.aspx).



Source: http://www.enrx.fr/

3.1.3 Welsh Interreg partners - Groundwork Wales on behalf of Valleys Regional Park (Welsh Government)

The Valleys Regional Park is situated between Monmouthshire and Carmarthenshire and south of the Brecon Beacons National Park in between the cities Cardiff, Swansea and Newport. The area is mountainous and hilly, there are lakes, forests and grasslands (http://www.thevalleys.co.uk/).

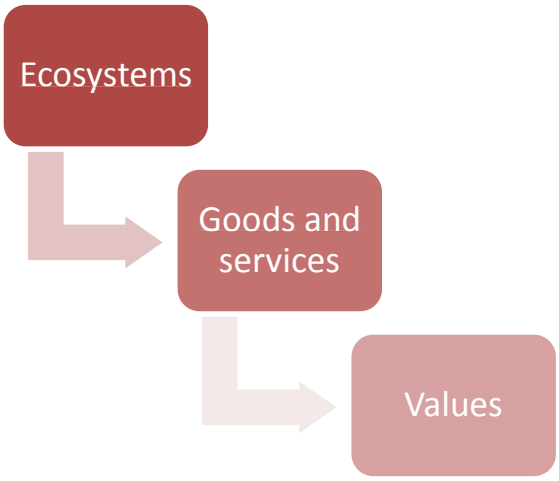
Valleys Regional Park is a voluntary partnership of over 40 organisations delivering environmental and heritage-based regeneration across the south Wales valleys, which are famous for their mining heritage, green valleys, and iconic towns and villages. Its aim is to stimulate economic development and regenerate the area by raising the quality and maximising the potential of the area's natural and cultural heritage assets and generating local pride through partnership activity. Groundwork Wales is a key partner in VRP and hosts the staff for the WECAN project (WECAN booklet; www.wecan-interregIVB.eu).

Source: http://www.thevalleys.co.uk/

3.2 The approach

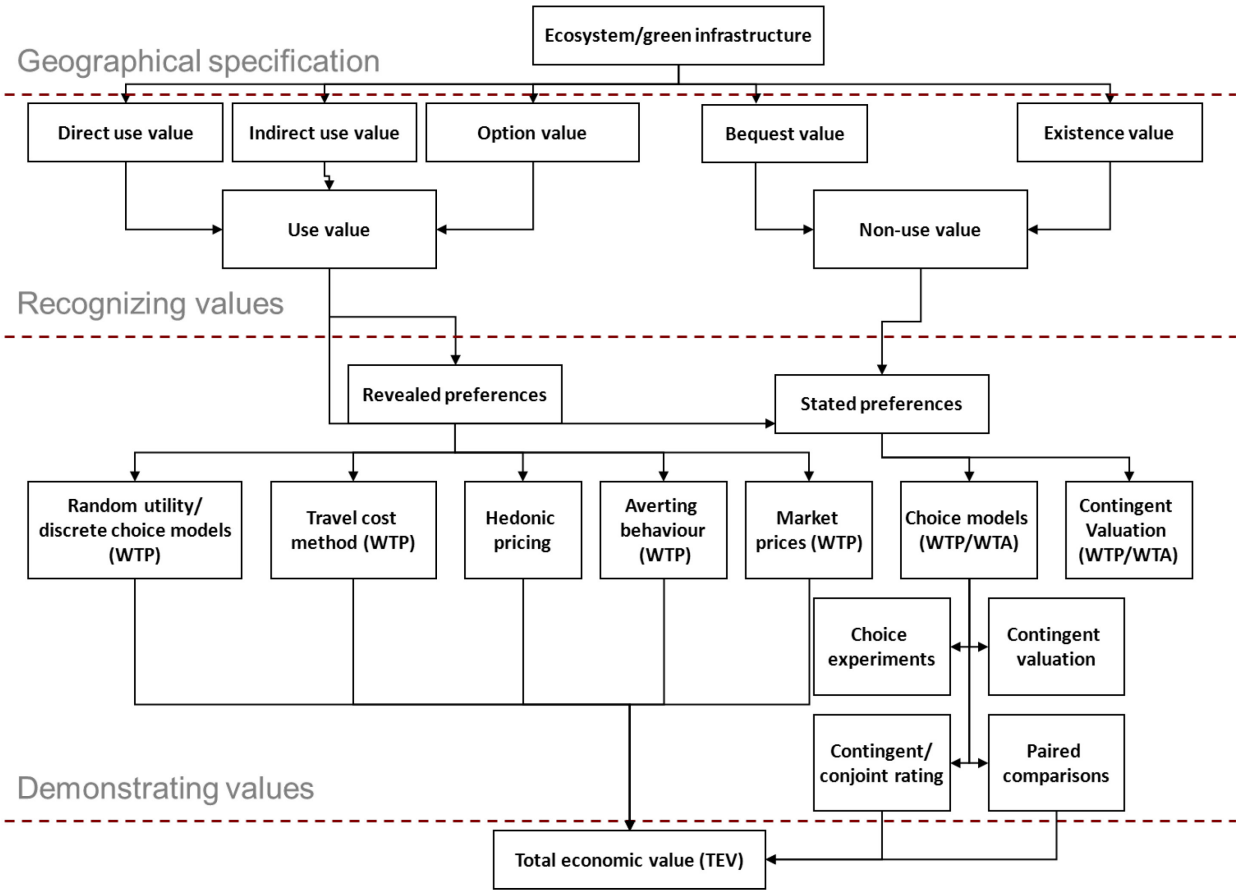
There are three steps in the approach:

1. Specifying the ecosystems and ecosystem elements like water bodies, hedges, etc.
2. Recognizing the valuable goods and services: identifying and assessing the full range of ecosystem services.
3. Demonstrating the value: estimating the values.



Source: Simplification of the framework in De Groot, Fisher and Christie, 2010.

Figure 1
Three steps approach.



a) WTP = Willingness to Pay/ WTA = Willingness to Accept

Figure 2
Valuation approach[a]

3.2.1 Step 1: Specifying the ecosystem

3.2.1.1 Theory: Background information on ecosystems and ecosystem services

An ecosystem is a combination of natural physical elements in a certain area. A distinction can be made between terrestrial ecosystems like forests and grasslands, and aquatic ecosystems like marine ecosystems and freshwater ecosystems such as ponds and lakes, streams, rivers and wetlands. In Europe, the CORINE Land Cover nomenclature is often used to specify the ecosystem and its elements.

Each of these ecosystems provide goods and services to society, like provisioning goods which are the products obtained from ecosystems, including for example food, raw materials and ornamentals like decorative plants, skeletons or other accessory. Regulating services refer to the benefits that people obtain from the regulation function of ecosystem processes, for instance by purification, carbon sequestration or hazard regulation. Cultural services refer to the social (intangible) benefits people obtain like education and sense of place (TEEB, 2010). Supporting services are a special type of goods and services. They are absolutely required to provide the three other types of goods and services. In this way they are preconditional and indirectly provide ecosystem goods and services. Due to complex interrelations and the risk of double counting, supporting services are usually not considered in the valuation. In some cases, the ecosystem services are provided by a few physical elements, in other cases the provision of the services depends on the combination of several types of physical elements.

Table 2

Land cover types (CORINE)

Level 1	Level 2	Level 3
Artificial surfaces	Urban fabric	111 Continuous urban fabric 112 Discontinuous urban fabric
	Industrial, commercial and transport units	121 Industrial or commercial units 122 Roads and rail networks and associated land 123 Port areas 124 Airports
	Mine, dump and construction sites	131 Mineral extraction sites 132 Dump sites 133 Construction sites
	Artificial non-agricultural vegetated areas	141 Green urban areas 142 Sport and leisure facilities
Agricultural areas	Arable land	211 Non-irrigated arable land 212 Permanently irrigated land 213 Rice fields
	Permanent crops	221 Vineyards 222 Fruit trees and berry plantations 223 Olive groves
	Pastures	231 Pastures
	Heterogeneous agricultural areas	241 Annual crops associated with permanent crops 242 Complex cultivation 243 Land principally occupied by agriculture, with significant areas of natural vegetation 244 Agro-forestry areas
Forests and semi-natural areas	Forests	311 Broad-leaved forest 312 Coniferous forest 313 Mixed forest
	Shrub and/or herbaceous vegetation association	321 Natural grassland 322 Moors and heathland 323 Sclerophyllous vegetation 324Transitional woodland shrub
	Open spaces with little or no vegetation	331 Beaches, dunes and sand plains 332 Bare rock 333 Sparsely vegetated areas 334 Burnt areas 335 Glaciers and perpetual snow
Wetlands	Inland wetlands	Inland marshes 412 Peatbogs
	Coastal wetlands	421 Salt marches 422 Salines 423 Intertidal flats
Water bodies	Continental waters	511 Stream courses 512 Water bodies
	Marine waters	521 Coastal lagoons 522 Estuaries 523 Sea and ocean

Source: European Environment Agency (1994), CORINE land cover. Commission of the European Communities. Brussels. 163 pp.

3.2.1.2 Practice: Ecosystems and Interreg partners

To put step 1 into practice, the different ecosystems present in the area should be identified. The CORINE land cover can be used to classify the study area into different land cover types. This data can be downloaded for free on the website of the European Environment Agency:
http://www.eea.europa.eu/themes/landuse/interactive/clc-download. The map legend and the meaning of the different labels can be found in this document:
http://www.epa.ie/downloads/data/corinedata/EPA_legend_colours_Corine_data.pdf. Besides, most governmental environmental agencies possess GIS maps of land use which might be even more accurate than

the CORINE land cover, which could be used instead. This information should be described in sheet 1 of the Excel

Table 3

List of potential ecosystem services in WECAN areas.

Category	**Potential Ecosystem services**
Provisioning services	Food Fuel (including wood and dung) Timber, fibres and other raw materials Fresh water Biochemicals, natural medicine and medicinal resources Ornamental resources
Regulation services	Carbon sequestration Climate regulation through control of temperature and rainfall patterns Water regulating Hazard regulating Pollination Regulation of pests and pathogens Protection against noise and dust Detoxification and purification
Cultural services	Provision of cultural, historical and religious heritage Scientific and educational information Opportunities for recreation and tourism Amenity service: provision of attractive housing and living conditions/aesthetic values Social relations/social cohesion Sense of place Cultural identity/cultural diversity

(Based on Ehrlich and Ehrlich, 1981; Costanza et al., 1997; De Groot et al., 2002; Millennium Ecosystem Assessment, 2005; Hein and Luttik, 2008).

3.2.2 Step 2: Recognizing the values of ecosystems to society

3.2.2.1 Theory: Background information on ecosystem goods and services and human welfare and well-being

As mentioned in the paragraph above, ecosystems provide goods and services that directly or indirectly benefit human well-being and that influence welfare from local to global scale (Global Canopy Programme, 2010). The (potential) supply of goods and services, and as a consequence, the amount of benefits, depends on the type of ecosystem, as well as the quality of the ecosystem and the available ecosystem network. The demand depends on societal needs at different scale levels. To simplify the valuation exercise, the approach proposed in this study focuses on the benefits and values derived from ecosystem goods and services. The value depends on the proximity of the ecosystem, the accessibility and the way the ecosystem is used.

Two main categories of values are distinguished:

- Use values are values that arise from the use of ecosystems, for example value deriving from wood sale.
- Non-use values are values that derive from benefits the environment may provide that do not involve using it in any way, for example the value of the presence of ecosystem for the next generations.

It is known that use value will decline when distance between the user and ecosystem becomes larger (distance decay). Non-use value is not solely related to distance, but more related to cultural and political boundaries (EEA, 2010).

Three different kind of use-values are (Smith, de Groot, Perrot-Maître and Bergkamp, 2006):

- Direct-use value, also known as the extractive, consumptive or structural use value, is mainly derived from goods that can be extracted, consumed or enjoyed directly, like drinking water, fish and hydropower.
- Indirect-use value, which mainly derives from the services that the environment provides including regulation of river flows, flood control and water purification.
- Option value, which is the value attached to maintaining the possibility of obtaining benefits from ecosystem goods and services at a later stage, e.g. ecosystem services that appear to have a low value now, but could have a much higher value in future because of new information or knowledge.

Non-use-values are (Smith, de Groot, Perrot-Maître and Bergkamp, 2006):

- Existence value, which is the value people derive from the knowledge that something exists, even if they never plan to use it.
- Bequest value, which is the value derived from the desire to pass on ecosystems to future generations.

This section describes the connections between ecosystem services and the related social and economic benefits (based on TEEB, 2010). These connections are important since they explain how natural heritage contributes to economic prosperity. This may help to increase the awareness of regional stakeholders.

Provisioning goods and services

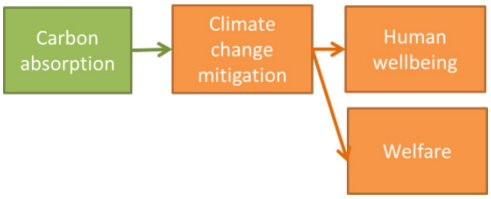
Products from land, like food, raw materials, medicinal resources, fresh water

Ecosystems like nature, water, landscape and soil provide goods and services people use directly to meet their needs, like food and water to survive, raw materials to build houses, roads and furniture, medicinal resources to recover from illness, water to clean their house. The provisioning of goods and services contributes to human well-being and quality of life.

In addition, the exploitation of the products from land in the region generates economic activity, providing income to regional companies which are directly and indirectly involved in the activities. It also generates jobs for the region.

The total (net) amount of income from resource extraction contributes to the welfare level in the area. The contribution to total welfare consists of the net income from selling the products from the land to consumers inside and outside the area.

Regulating services



Carbon absorption - climate change mitigation

Green infrastructure absorbs carbon. In the context of climate change mitigation, this absorption is valuable, since carbon dioxide is expected to threaten human well-being as well as welfare due to the climate change effect. Carbon absorption is relevant at the global scale; in short, carbon absorption delivered by local ecosystems provides a benefit to society worldwide. The economic benefits are related to avoided costs due to the avoided climate change effect.

Water cycling

The water cycling properties of green infrastructure are useful for two reasons. The first is its self-cleaning capacity (water purification). Green infrastructure can purify waste water, which contributes to environmental quality, and indirectly to health and human well-being. When the quality of the environment is high, agricultural production will be of high quality too, which may result in a higher product price (for farmers). The economic value of water purification can also be calculated by estimating the avoided costs of purifying water by technical means.

A second benefit of water cycling to society is the capacity to adapt to climate change. This service is also named hazard regulation. Green infrastructure and water bodies can be used to reduce drought and to cope with flooding. This results in increased security to climate change effects and avoided costs for drought and flood protection.

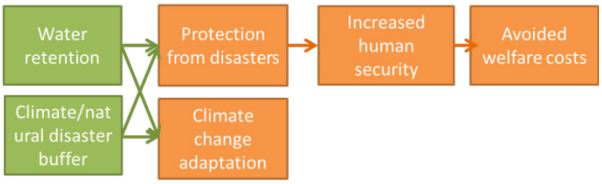
Local climate regulation

Green infrastructure can compensate the heat effect during summers in cities. It may provide urban people with an area where they can find relief from the heat, the stress and the poor air quality in cities, thus contributing to well-being. In addition, costs on energy consumption and appliances such as air conditioners may be avoided.

Air quality

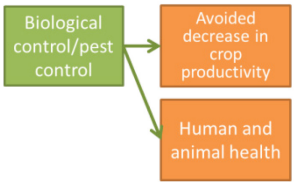
Trees help to regulate air quality by removing pollutants from the atmosphere. Clean air contributes to human health and well-being. Clean air may avoid health costs.

Protection from disasters - hazard regulation



Ecosystems may prevent natural hazards like floods, drought, storms and landslides. Ecosystems can be a buffer against natural disasters and can be useful to limit the potential damage. Examples are flood retention areas or public parks that increase the infiltration capacity in cities. The use of ecosystems in disaster prevention and climate change adaptation may increase human security regarding these risks. Avoided material costs may be used to estimate a monetary value and the impact on welfare.

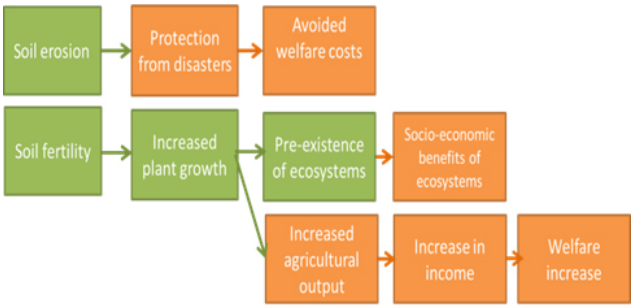
Biological control - pest control



Ecosystems are important for regulating pests and vector-borne diseases that attack plants, animals and people. The socio-economic benefit of pest control

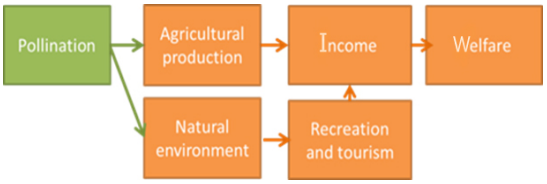
consists of the avoided costs of crop productivity decrease. Alternatively, it can be estimated as the avoided costs of insecticides. Biological control also contributes to human and animal health.

Soil erosion and fertility



Ecosystems play a prominent role in avoiding soil erosion, which can trigger landslides and desertification. In addition, a high quality ecosystem is important to soil fertility, since it provides nutrients that are required to plant growth in both agriculture and nature. This means that ecosystems contribute to its own pre-existence, and consequently also to all socio-economic benefits that ecosystems provide. In addition, ecosystems contribute to agricultural productivity, income in the agricultural sector and welfare in general.

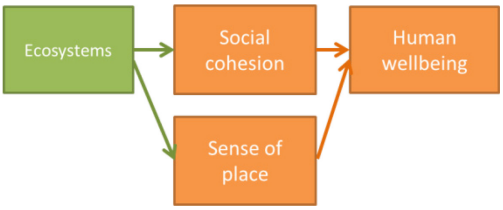
Pollination



Pollination is valuable to agriculture and nature. Mainly insects (and wind) that are responsible for pollination of plants. It is possible to estimate the production function value of biotic pollination as a contribution to crop market value (Gallai et al., 2009). A change in land use may decrease pollination, which may result in lower agricultural output. In this way, changing pollination affects income and welfare.

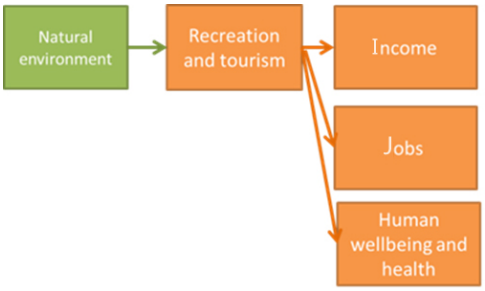
Cultural services

Social cohesion/ sense of place



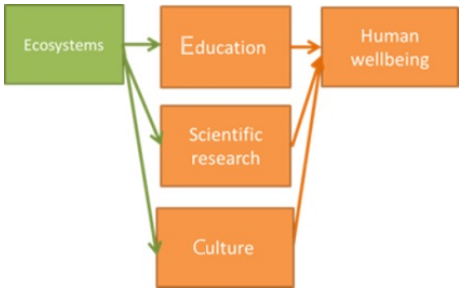
Ecosystems can bring communities together when events are organised. Depending on the way this is integrated into the surrounding municipalities, it can fiercely increase social cohesion between people. In addition, ecosystems and nearby natural parks contribute to a sense of place. It is part of a common historical tradition that connects people with each other. The sense of place may play a role in well-being.

Recreation and tourism

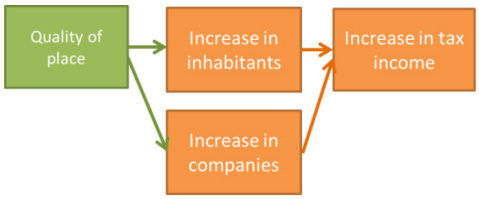


Quite a lot of people are attracted to green infrastructure for recreation or holidays (beach, forests, mountains). The green infrastructure provides a scene to relax from daily work. Recreational and touristic opportunities provide on the one hand jobs in the local area and generate an income flow from people visiting the area. On the other hand, people who live in the region enjoy the recreational facilities by walking, cycling or other activities. These activities may contribute to mental and physical health. In the end, this might increase life expectancy. This might even indirectly have an effect on labour productivity.

Education/culture Green infrastructure is one of the elements of local history and tradition. Its presence is a way to pass on the cultural history of the area by for instance education. The natural setting may also contribute to education, by teaching youth how biological systems work etc..., as well being the object of scientific research. Lastly, the natural setting may be a source of inspiration for artists.



Quality of place
Ecosystems provide for quality of place: opportunities for recreation, empowerment through community ownership, and visual amenity, contributing to the attractiveness of a region. Places with high visual quality - 'beautiful places' - attract new inhabitants, probably also new companies, in particular when used in regional branding of the area. Newly attracted residents and companies contribute to the economic prosperity in the area.



Supporting services/habitat services

Habitats for species
It is demonstrated that habitants are highly relevant to the pre-existence of plants and animals. A habitat is a living space for plants and animals. In this way, habitats provide supporting services to ecosystems, and therefore indirectly contribute to all above mentioned socio-economic benefits.

Maintenance of genetic diversity
The genetic diversity is the variety of genes between and within species populations. Genetic diversity is essential to ecosystem quality. In short, genetic diversity contributes to the pre-existence of ecosystems as well, and thus to the above-mentioned socio-economic benefits.

Nutrient cycling
Nutrients like nitrogen, sulphur, carbon and phosphorous are the basic elements of ecosystems and should be circulated. They play a crucial role in the processes of decomposition and absorption of organic materials.

Primary production
Primary production refers to the formation of biological material by plants through processes such as photosynthesis and nutrient assimilation

Water cycling
Water cycling is the supporting service that is provided by the flow of water through the ecosystems in the way that water is going from the air into the soil, is taken up by plants, which then release water back into the air.

Conclusion

Ecosystems, and consequently ecosystem goods and services, provide four types of benefits to society:

- Income and employment from the sale of natural resources or from recreation and tourism (direct return in euro's).
- Avoided costs related to purification or protection from flooding, or health care expenses (indirect return in euro's).
- Flourishing economy related to attractive living and working environment (indirect return in euro's).
- Increasing well-being, which is very important but can only partially be expressed in monetary terms.

3.2.2.2 Practice: Ecosystem goods and services in the Interreg partner regions

Step 2.1: determine which ecosystem goods and services are provided by the available ecosystems

To carry out Step 2.1, sheet 2 of the Excel sheet is used. This sheet provides the user with a list of ecosystem services, corresponding to Step 2. The list is not exhaustive and may of course be extended if other ecosystem services are identified.

The aim is to assess the available ecosystem goods and services provided by the elements - or combinations of various elements - within the ecosystems. The presence, the quality and the quantity of these ecosystem elements determining what type of goods and services are potentially available, are context-specific. Therefore it is impossible to construct a detailed, general classification that allows for the connection between the ecosystem categories and the categorisation of ecosystem goods and services. The question which ecosystem services are used or are potentially available for future use can only be answered taking the local context into account.

Given the importance of knowledge on the local context to assess ecosystem goods and services and given the valuation objective to increase awareness with local stakeholders, a workshop with local stakeholders turned out to be useful to determine which ecosystem goods and services are important in the partner regions. The ingredients of the workshop were:

- A representative of each stakeholder type that makes use of the natural heritage. Relevant stakeholders are stakeholders who own the land, who extract products from it, who live near the natural heritage, who enter/visit the natural heritage, who work with natural heritage, who gain knowledge from or about natural heritage, ...

Stakeholders to be invited
Recreation and tourism sector
Schools
Inhabitants from local areas
Local companies
Retail sector
Resource extraction industry
Forestry sector
Water extraction companies/drinking water companies
Health care companies
Farmers
Local organizations
Hunters and fishermen

- A presentation (see in Appendix 1) or information booklet to explain the way people benefit from natural heritage by means of the ecosystem goods and services of which these stakeholders make use of.
- A map of the land cover in the area, for instance the CORINE land cover map (see Step 1.1).
- An interactive discussion on the ecosystem goods and services that are used in the area by these stakeholders.

The outputs of the workshop are:

- An inventory of the used ecosystem goods and services.
- Increased awareness of the way the natural heritage contributes to the stakeholders' wealth and well-being.

During the Interreg regional workshops, ecosystem goods and services in each of the partner regions were discussed in this way. The table below provides an overview of the relevance of the various types of ecosystem goods and services, as perceived by the participants of the workshops. It shows that the three regions are fairly similar in this respect.

Provisioning ecosystem goods and services	**Belgium**	**France**	**UK (Wales)**
Food	X	X	X
Fuel (including wood and dung)			
Timber, fibres and other raw materials			X
Fresh water	X	X	X
Biochemicals, natural medicine and medicinal resources			
Ornamental resources			
Regulating services			
Carbon sequestration	X	X	X
Climate regulation through control of temperature and rainfall patterns	X	X	X
Water regulating	X	X	X
Hazard regulating	X	X	X
Pollination	X	X	X
Regulation of pests and pathogens	X	X	X
Protection against noise and dust	X	X	X
Detoxification and purification	X	X	X
Cultural services			
Provision of cultural, historical and religious heritage	X	X	X
Scientific and educational information	X	X	X
Opportunities for recreation and tourism	X	X	X
Amenity service: provision of attractive housing and living conditions/aesthetic values	X		X
Social relations/social cohesion			X
Sense of place	X	X	X
Cultural identity/cultural diversity			

Step 2.2: determine which ecosystem goods and services are potentially available in the area for future use

If desired, it is also possible to determine potential ecosystem goods and services, additional to the inventory list of used ecosystem goods and services. Therefore, an expert judgement can be carried out to assess the potential of ecosystem goods and services for future use. An expert judgement means that a few experts come together for discussion on the potential current and future use of ecosystem goods and services. It might be useful to invite ecologists who know about ecological processes linking ecosystems and ecosystem goods and services and economists and sociologists who understand the way natural heritage contributes to regional development and social processes. Depending on the issues at stake, it may also be advisable to invite water, soil, agricultural or forestry experts. In addition to experts with profound knowledge of the area, the local communities and local, regional and national policy programs within the field of sustainable development can be invited to take part in the expert judgements. The results of the discussion are reported to the stakeholders which were invited during the workshop (in Step 1.2) to share knowledge on potentially available ecosystem goods and services.

Feedback on Step 2.1 and 2.2 from the Interreg regional workshops:

In the Interreg regional workshop the invited stakeholders indicated that they considered the concept of ecosystem goods and services useful to clarify the value of natural heritage for human well-being. The concept itself is relatively easy to understand, but the assessment of ecosystem services in the areas is considered to be complex. In addition, it was revealed that not all services are equally important for each of the stakeholders. This is an important finding to be considered when prioritising ecosystem goods and services. Ranking ecosystem goods and services should be carried out for each stakeholder category and not for the stakeholder group as a whole because in that case majority rules. It is advised to assess who benefits and who loses in case of changes in natural heritage. Furthermore, it was found that there might be a difference in prioritising when ranking is based on economic importance or on vital importance. These remarks should be considered when prioritising and valuing ecosystem goods and services.

3.2.3 Step 3: Demonstrating the values

3.2.3.1 Theory: Background information on valuation methods

As highlighted in the previous sections, various valuation methods can be used to demonstrate the economic value of the benefits. This section briefly discusses the main techniques for the valuation of ecosystem services, or the impact of change in environmental goods and services. Some goods and services, such as wood and water, have direct use values and are traded on markets. In these instances, market prices reflect the economic value of the goods and services.

However, most goods and services are of an intangible nature and are not traded in actual markets. In some cases, non-market goods and services provide indirect use values. These goods and services may be implicitly traded. In such instances, revealed preference methods can be used to reveal their values embedded in observed prices. For assessing impacts on non-market goods, the value of which cannot be uncovered using revealed preference methods, stated preference methods can be used. (See Table 3 for an overview of main valuation techniques).

Revealed preferences

These techniques include e.g. the travel cost method, hedonic price method, averting behaviour and defensive expenditures approach. Each of these approaches has different conceptual bases, is often applicable to valuing different environmental benefits and losses and has distinctive analytical problems. They all use market information and/or behaviour to infer the economic value of an associated non-market impact (Pearce et al., 2006). The unifying characteristic of revealed preference is the valuation of non-market impacts by observing actual behaviour and, in particular, purchases made in actual markets.

Avoided cost

Ecosystem services allow society to avoid costs that would have been incurred in the absence of those services (e.g. waste treatment by wetland habitats avoids health costs). These cost can be used as an estimate for the value of the services produced by an ecosystem.

Replacement cost

Services could be replaced with man-made systems, such as a water purification plant. Replacement costs, as represented by the construction cost of a water purification plant, can be used to estimate the value of services produced by ecosystems which purify water.

Change in productivity; factor income

This method can be used to trace the impact of change in environmental services on produced goods. It can be applied to any impact that affects produced goods; for example increases in soil quality affecting agricultural production. Services provide for the enhancement of incomes (e.g. increased soil quality increases agricultural production and improves the income of farmers; improved water quality increases the commercial take of a fishery and improves the income of fishers.

Travel cost method

The travel cost method has been developed to value geographical areas and locations used for recreational purposes. The basis of this method is the recognition that individuals produce recreational experiences through the input of a number of factor inputs. Amongst these factors are the recreational area itself, travel to and from the recreational area and, in some cases, staying overnight at a location and so on. Typically, the recreational area itself is an unprized good, many of the other factors employed in the generation of the recreational experience do command prices in markets. Two pieces of information are needed: a) the number of trips that an individual or household takes to a particular recreational area over the course of a year; and b) how much it costs that individual or household to travel to the recreational area. Such information is usually collected through surveys carried out at the recreational site. The costs of travelling to a recreational area include two elements: the monetary costs in return fares (or expenses related to a car trip) and the cost of time spent travelling, which is usually valued at somewhere between a third and a half of the wage rate. There are a number of problems in applying the method. For example, many recreational trips - in particularly international trips - are undertaken for more than one purpose.

Hedonic pricing

The hedonic pricing method estimates the value of a non-market good by observing behaviour in the market for a related good. It uses a market good via which the non-market good is implicitly traded. The starting point for the method is the observation that the price of a large number of market goods is a function of a bundle of characteristics. For instance, the price of a house is likely to reflect characteristics such as the qualities of its structure, the number of rooms, presence of a garden as well as location characteristics like nearby amenities. The method uses statistical techniques to isolate the implicit 'price' of each of these characteristics. There are no markets for amenities but they can be traded implicitly in the property market. The method involves unbundling the contributions of each significant determinant of house prices in order to identify marginal willingness to pay for each housing characteristic. Large amounts of data on prices and

characteristics of properties in an area are required to estimate the value-adding effect of each characteristic. There are several practical problems in the application of the method. For example, individuals may not have perfect information. Consequently their choices do not accurately reflect their true valuation of preferences. A problem with the estimation procedure is that of multicollinearity: nonmarket characteristics tend to move in tandem, e.g., properties near green areas have higher social status.

Averting behaviour
Individuals and households can insulate themselves from a non-market 'bad' by selecting more costly types of behaviour. An example is installing double glazed windows to decrease exposure to road traffic noise. Double-glazing is a market good which, in this example, acts as a substitute for a nonmarket good (peace and quiet in the sense of the absence of road traffic noise). Among the problems in the practical application of the method are underestimation (double glazed windows only help to keep the noise out of the window, but gardens remain noisy) and the creation of joint products (double-glazing also conserves energy).

Cost of illness; human capital
These methods can trace the impact of change in environmental services on human health. It can be applied to any impact that affects health, for example air or water pollution, or the stress reducing effect of access to nature. There are three mechanisms through which the impact on health can come about (Pearce et al., 2006). The first is the reduction of environmental risks to lives, it may 'save lives', i.e. reduce premature mortality. Second, it may improve the health of those living with a disease, e.g. a respiratory illness. This is a morbidity benefit. Third, it may reduce the stresses and strains of living and thus improve mental health. The valuation of the effect usually involves avoided cost (reduced medical expenditure) or stated preference methods (increased well-being or reduced risk).

Stated preferences
Stated preference techniques of valuation make use of questionnaires which ask respondents for their willingness to pay (accept), or offer them choices between 'bundles' of attributes and from which choices willingness to pay (or willingness to accept) can be inferred. This technique is particularly suitable for assessing impacts on non-market goods, the value of which cannot be uncovered using revealed preference methods.

Contingent valuation
Contingent valuation is a survey-based economic technique for the valuation of non-market resources, such as biodiversity or a beautiful view of a mountain. Typically the survey asks how much money people would be willing to pay (or willing to accept) to maintain the existence of (or be compensated for the loss of) an environmental feature. Many economists question the use of stated preference to determine willingness to pay for a good, preferring to rely on people's revealed preferences in binding market transactions. However, there has been a substantial evolution of techniques over the past ten to 1fifteen years and the method has become more widely accepted. Still, there remain concerns about the validity and reliability of the findings of contingent valuation studies.

Choice models
Many types of environmental impact are multidimensional in character. Hence an environmental asset that is affected by a proposed project or policy often will give rise to changes in component attributes each of which command distinct valuations. In a choice experiment, respondents are asked to choose their most preferred option from a choice set of at least two options, one of which is the status quo or current situation. Choice modelling is now routinely discussed alongside the arguably better-known contingent valuation method in state-of the-art manuals regarding the design, analysis and use of stated preference studies (Pearce et al., 2006).

Benefits transfer

The benefit transfer method is used to estimate economic values for ecosystem services by transferring available information from studies already completed in another location and/or context. For example, values for recreational fishing in a particular region, may be estimated by applying measures of recreational fishing values from a study conducted in another region.

The basic goal of benefit transfer is to estimate benefits for one context by adapting an estimate of benefits from some other context. Benefit transfer is often used when it is too expensive and/or there is too little time available to conduct an original valuation study, yet some measure of benefits is needed. It is important to note that benefit transfers can only be as accurate as the initial study. Pearce at al. (2006) argue that benefits transfer is controversial in its own right and few practitioners adopt it without serious reservations. Study sites and policy sites may have different features such as socioeconomic and demographic characteristics of the respective populations. Almost inevitably, benefits transfer introduces subjectivity and greater uncertainty into appraisals in that analysts must make a number of additional assumptions and judgements to those contained in original studies. The key question is whether the added subjectivity and uncertainty surrounding the transfer is acceptable and whether the transfer is still, on balance, informative.

Table 4

Application of main economic valuation techniques.

Methodology	**Approach**	**Applications**
Change in productivity	Trace impact of change in environmental services on produced goods	Any impact that affects produced goods (e.g. declines in soil quality affecting agricultural production)
Cost of illness, human capital	Trace impact of change in environmental services on morbidity and mortality	Any impact that affects health (e.g. air or water pollution)
Replacement cost	Use cost of replacing the lost good or service	Any loss of goods or services (e.g. previously clean water that now has to be purified in a plant)
Travel cost method	Derive demand curve from data on actual travel costs	Recreation, tourism
Hedonic prices	Extract effect of environmental factors on price of goods that include those factors	Air quality, scenic beauty, cultural benefits (e.g. the higher market value of waterfront property, or houses next to green spaces)
Contingent valuation	Ask respondents directly their willingness to pay for a specified service	Any service (e.g. willingness to pay to keep a local forest intact)
Choice modelling	Ask respondents to choose their preferred option from a set of alternatives with particular attributes	Any service
Benefits transfer	Use results obtained in one context in a different context	Any service for which suitable comparison studies are available

Source: *eea.eionet.europa.eu/ (Chapter 2: Biodiversity Focus)*

3.2.3.2 Practice: Applying the valuation methods in the Interreg regions

Sheet 3 of the Excel, 'valuing ecosystem services' is the core of the tool. It provides for the listing of services (column A), it gives suggestions as to what services to include (column B), it specifies the physical units (column C) and the type of price (column E) which is required for the estimation of benefits (column H). The following table only includes columns A and B of the tool. It provides a guideline for data collection for each of the categories. Once the data are inserted in Sheet 3, Sheet 4 will show the impact on prosperity in terms of income, employment, avoided costs, well-being of people in the area and the value-increasing impact on property value.

PROVISIONING SERVICES	Helpdesk
What type of food is produced?	Think of food produced from animals (incl. fish, game), from plants, from microbes.
This category refers to food products harvested through gathering, fishing or hunting, such as meat, fish, berries, mushrooms and honey. The net benefits in economic terms are generally low or even negative, since costs are relatively high while returns from sales are relatively low. Recreational benefits (pleasure from fishing or collecting mushrooms) are considered as recreational services. Agricultural production is usually not included since its reliance on factors others than ecosystem services (technology, artificial inputs) is very high. Regional products are an exception. *Estimation of net benefits* There are two ways to estimate net benefits. The first is to do a survey among beneficiaries to take stock of their costs and benefits. The second is to use general estimates for costs and benefits per type of food category. A special category are regional products which derive part of their added value from a National Park. For example, honey may be sold for a higher price on account of a National Park label. The extra value added may be considered as a benefit from the ecosystem.	
Which raw materials are extracted from the area?	Think of raw materials extracted from the soil (clay, sand, gravel), minerals, wood, Christmas trees, biomaterials, wool, hemp
This category refers to two categories of materials extracted or harvested from the area: • non-renewables (sand, clay or gravel) • renewables (wood, reed, Christmas trees, biomass or wool). Estimation of benefits There are basically two ways to calculate the benefits of renewable materials. Firstly by collecting data on net value added directly from the management at the enterprise or organisation which sells the products. Secondly by estimating the benefits from general figures on harvest per hectare, multiplied by revenues per unit. Production costs have to be deducted from revenues to arrive at the net return.	
Fresh water: for what purpose?	! Beware of double counting with water purification!
A healthy, well-managed catchment produces clean water that requires minimal treatment. An approach to estimate the value of production of drinking water which can be assigned to nature is by estimating avoided costs: purification costs related to the use of surface water as drinking water or construction and maintenance costs of reservoirs (see example Cheddar Reservoir). Step 1 is to gather data on produced quantities and associated costs (from producers or regional or national data sources, if available). If these data are not available an alternative approach is to work with the estimated ground water replenishment in the area: water which is potentially available without harming ecological quality. Step 2 is to collect data on production costs and compare these with production costs for surface water. If these data are unavailable the alternative is to use a default value to arrive at a rough estimate. Water use by farmers and industry can be estimated using data from individual firms, or a branch organisation. If unavailable, the alternative is to use a general number to derive a very rough estimate.	
What type of ornamental resources are used?	Think of skins, shells, flowers or plants for landscaping
This category refers to animal and plant products, such as skins, shells and flowers which are used as ornaments, whole plants which are used for landscaping and ornaments, and ornamental fish. It refers to products collected through gathering, fishing or hunting; products which are grown in agriculture or aquaculture are usually not included since reliance on factors others than ecosystem services (technology, artificial inputs) is very high. The net benefits in economic terms are generally low or even negative, since costs are relatively high while revenues from sales are relatively low. In Europe this category is generally negligible in economic terms. The pleasure of finding shells and enjoying the beauty of animal products such as feathers contributes to leisure value.	

REGULATION SERVICES	
Mitigating local temperature (heat island)	Only applicable in or close to a city

There are various ways to approach the issue of climate change in relation to nature areas. One is to look at shelter from wind provided by trees. This may lead to reduced energy consumption for heating of buildings. This in turn may reduce carbon emissions on account of building energy saving for heating. Also there may be less damage from wind and storm (avoided costs).

A second issue is the reduction of the urban heat island effect. An urban heat island is a metropolitan area which is significantly warmer than its surrounding rural areas. Trees, green roofs or green walls may reduce peak summer surface temperatures, thereby reducing energy consumption for cooling which in turn may reduce carbon emissions on account of building energy saving for cooling.

Sequestration of greenhouse gasses	! Beware of the impact of land use change on other gasses than carbon !

Data on carbon sequestration are available per type of land cover (Corine maps). The value per ton carbon can be estimated using data on compensation, for example from the website: Trees for Travel (9 euro/ton).

Pest regulation and disease control	Particularly relevant for hedges etc. in relation to agricultural production

The avoided costs of insecticides or herbicides use can be accounted for. There are no general rules, so local knowledge would be the only source of information.

Air purification	How does the wind blow? where do the people live?

Particulate matter capture is associated with health benefits which accrue to people living close by. Trees are most effective if they are located in between a source of pollution (like a motorway) and an area where people live, and if the wind usually blows in the direction motorways - trees - people.

General estimates are available for particulate matter, as well as for NO_x absorption and SO_2 absorption. Needless to say, the benefits are only relevant if there is pollution in the area.

Water purification	Only applicable if there are problems with water pollution (EU Water Directive?)

Pollutants such as metals, viruses, oils, excess nutrients, and sediment are processed and filtered out as water moves through wetland areas, forests, and riparian zones. This purification process provides clean surface water and water suitable for industrial uses, recreation and wildlife habitat. Beware of double counting with water production!
The benefits only occur when there is (polluted) surface water in and around the nature area.
Estimation of net benefits
Net benefits are estimated by multiplying the weight of pollutants removed by removal cost per unit. Thus avoided costs for purification in a waste water treatment plant are estimated.

Pollination	Particularly relevant in case of fruit or vegetable production close to the park

If there are fruit trees or vegetable crops in or around the area which may benefit from pollination by insects in the nature area, this benefit may be applicable Its contribution to crop market value can be estimated using a tool developed by Gallai (2009). This tool requires local estimates for crop production, which can be derived from agricultural data or local farmers.

Hazard regulation

The impact of hazard regulation (flood risk protection, drought protection) can be estimated by estimating the probability of a particular hazard. For flood and drought the national water authorities can provide the required data.

Noise regulation	Relevant if trees function as a buffer against noise from motorways

Amenity value: this value may be relevant in particular instances, depending on the spatial configuration. It can be estimated by asking people's willingness to pay, or by estimating the costs of building artificial noise buffers. There are no general data available.

CULTURAL SERVICES	
What type of leisure activities are there?	Think of hunting, cycling, running, ...

These data are available from statistics on leisure behaviour; and probably also from the park management. This type of data gives numbers of visitors and the average spending amounts per type of activity. Data on hunting permits are available from the authorities which supply these permits.

Environmental settings

Amenity value, as estimated by property values. The average property value is available from national data sources. The value-increasing effect of a nature area can be estimated by an hedonic price study. It is also possible to get an indication of the effect through benefits transfers from other studies. Alternatively, local estate managers can be asked to estimate the value-increasing effect. This is usually estimated at 3-6% of property value. Health benefits accrue to people living in or close to the park. They can be assessed by estimating the number of people, and multiplying it by a health-increasing effect. There are various estimates available, none of which is very reliable ('wild guesses') Data on park employment are available from the park management	
Social cohesion/sense of place/regional identity These values are important but hard to grasp in monetary terms.	
Events Participation in events related to the park: this information is best collected from the local organisers or municipalities. Employment in events related to the park: data available from the park management.	Festivals, concerts, or.....?
Education Educational activities: these data are available from local organisations, municipalities and the park.	

3.2.4 Pilots in the three regions

3.2.4.1 Belgium: Regionaal Landschap Kempen en Maasland

In National Park Hoge Kempen there are large pine plantations which are not very attractive from an ecological point of view, nor for recreation. Current policy is to cut pine trees selectively and replace them with broad-leaved trees. As a pilot case to test the instrument we assume that all pine tree plantations in the National Park are cut down completely (28,5 km²) and replaced by broad-leaved trees. The question is: what ecosystem services are affected? Which are the benefit gains and losses associated with this operation?

First, the sale of pinewood is a net benefit. On average 250 m^3 per hectare can be harvested; we assume that the wood is sold for an average price of 30 € per m^3 to a logging company that bears all costs for harvesting and transportation of the wood. Under these assumptions the estimated benefit for the one-off sale of pine wood would amount to just over 21 million €. Other ecosystem services which are affected by the transformation are the (potential) provision of fresh water. Net groundwater replenishment will increase, since it is higher for land covered with broad-leaved trees than pine trees. This implies that there is more groundwater available for the production of drinking water, without harming ecological quality. If this extra water were used for the production of drinking water it could replace water produced in a more expensive manner, such as river water which needs purification. Avoided costs are estimated at 0.40 ct per m^3. This results in estimated annual net benefits of 1,5 million €. Broad-leaved trees have a higher capacity for water purification than pine trees where nitrogen and phosphates are concerned, while for carbon it is the other way round. The proposed change in land use leads to a net benefit change on account of water purification 200.000 €. For air quality regulation there is a net benefit loss (of 1,5 million €) since pine trees are more effective in capturing particulate matter(PM_{10}) than broad-leaved trees.

Table 5

Overview benefits from transformation from pine trees to broad-leaved trees (from WECAN instrument).

(x 1.000€)

Total contribution to prosperity in the area	scenario 0 pine trees	scenario 1 broad-leaved trees	benefit change
provisioning services			
food	0	0	0
wood and other raw materials	0	21.375	21,375
fresh water	2,622	4.127	1,509
regulating services			
climate regulation	0	0	1.505
detoxification and purification	4.253	4.449	0.196
pollination	0	0	0
air quality regulating	3.620	2.081	-1.539
cultural services			
recreation and tourism	0	+	+
sense of place	0	-	-
cultural heritage values	0	-	-
sum: benefits in euros (x 1.000)	10.495	32.031	24.546

3.2.4.2 France: Parc Naturel Scarpe-Escaut

The wet grasslands of the regional Park Scarpe-Escaut are a strong feature in the Park territory because of its multiple interests like the ecological value (huge biodiversity) and its multiple functions like floods regulation, providing quality forage, reloading groundwater or self-filtration.

However, wet grasslands areas still decrease. The table below is showing the decline of the 'water issues areas' in the Scarpe-Escaut Park, since almost thirty years. So, these figures do not reflect the whole wet grasslands areas of the Park.

Table 6

Change in land cover 1971-2009 in Scarpe- Escaut Park (in hectares).

	1971	1983	1989	1998	2003	2009
Wet grasslands	3516	2664	2519	2131	2085	1774
Poplar plantations	733	1369	1355	1633	1509	1428

The lack of knowledge about economic potential of wet grasslands areas is seen as the main cause of their decline. They also are considered as 'not enough financially viable' by the agricultural world, compared to corn fields or other crop fields. Likewise, poplar plantations are usually seen as a financially viable solution, unfortunately, leading to modifications of landscapes, decline of biodiversity, etc. Both of these modification processes do not happen at the same time, it depends on the maturity and the level of intensification of the farming system (usually, the poplar plantations happen in the 'life-ending' farming system whereas crop fields appear in almost young and intensive farming system).

A better development of the image of the wet grasslands could be done by assessing their economic potential. It is also should be a good argument for their preservation.

That kind of studies has already been done by l'Agence de l'Eau Artois-Picardie in partnership with farmers associations, but not directly for the Scarpe-Escaut Park. Hereby, it will be very useful to complete these previous studies.

The table below summarises the results from the WECAN-instrument for a comparison of the situation in 1971 and in 2009, applied to net benefits for poplar wood sales, potential net benefits from net groundwater replenishments and potential net benefits from water purification. Firstly, the sale of poplar wood is a net benefit. On average 11 m^3 per hectare can be harvested on a yearly base; we assume that the wood is sold for an average price of 15 € per m^3 to a logging company that bears all costs for harvesting and transportation of the wood. Under these assumptions the estimated yearly benefits for the sale of poplar would amount to 115.000 €. Other ecosystem services which are affected by the transformation are the (potential) provision of fresh water. Net groundwater replenishment will be lower, since it is lower for poplar plantations than for wet grasslands. This implies that there is less groundwater available for the production of drinking water. If this water is replaced by water produced in a more expensive manner, such as river water which needs purification, extra costs ('negative avoided costs') for drinking water are estimated at 0.40 ct per m^3. This results in estimated annual net loss of 86.000 €. Wet grasslands have a higher capacity for water purification (Nitrogen, Phosphates and Carbon) than poplar plantations. Estimated net loss on this account is 925.000 € annually.

Table 7

Overview of benefits related to transformation from wet grasslands to poplar trees (from WECAN-tool).

(x 1.000 €)

Total contribution to prosperity in the area	**scenario 0 (1971)**	scenario 1 (2009)	change
provisioning services			
food	0	0	0
wood and other raw materials	121	236	115
fresh water	231	145	-86
regulating services			
carbon sequestration	0	0	0
disease and pest regulation	0	0	0
detoxification and purification	5.203	4.278	-925
pollination	0	0	0
air quality regulating	0	0	0
water regulating	0	0	0
hazard regulation	0	0	0
noise regulation	0	0	0
cultural ecosystem services			
recreation and tourism	0	0	0
sense of place	0	0	0
cultural heritage values	0	0	0
spiritual and religious values	0	0	0
knowledge and education	0	0	0
aesthetic values	0	0	0
social relations/social cohesion	0	0	0
sense of place	0	0	0
cultural identity/cultural diversity	0	0	0
sum: benefits (x 1.000 €)	5555	4659	146

3.2.4.3 Wales: Valleys Regional Park

Valleys Regional Park (VRP) proposes to carry out two pilot projects:

1) The development of a 'native tree nursery' as a community enterprise that will be used to provide trees of native provenance to reforest areas of the valleys. It will create a business model that makes the activity sustainable and train and engage local citizens with the skills needed to undertake development of the nursery whilst promoting biodiversity by creating and re-establishing local habitats.

2) Development of Sustainable Urban Drainage System (SUDS) in a pilot area - this will protect an area prone to flooding where a community is seeking to develop the natural environment as a community food resource without the need for 'hard' engineering and also the SUDS area will be used to develop the opportunities for promoting nature and biodiversity.

What are Sustainable Urban Drainage Systems?
Sustainable Urban Drainage Systems are an alternative to conventional urban drainage systems and are designed to reduce pollution and flood risk in watercourses and wetlands (including natural ponds and pools). SUDS are physical structures built to receive surface water runoff. They can include detention basins, retention ponds, constructed (storm water) wetlands, infiltration devices, swales and permeable surfaces. As well as dealing with water quality and flooding issues, SUDS can be designed to improve amenity and biodiversity in urban areas.

Table 8
Overview Benefits Native Tree Nursery and Sustainable Urban Drainage System (from WECAN-tool).

Total contribution to prosperity in the area	scenario 1 native tree nursery	scenario 1 SUDS
provisioning services		
Food	0	+
wood and other raw materials	+	0
fresh water	+	+
regulating services		
climate regulation	+	+
detoxification and purification	+	+
hazard regulation	0	++
noise regulation	+	+
Pollination	0	0
air quality regulating	+	+
cultural services		
recreation and tourism	+	+
sense of place	+	+
cultural heritage values	+	+
spiritual and religious values	+	+
knowledge and education	+	+
aesthetic values	+	+
social relations/social cohesion	+	+
sense of place	+	+
cultural identity	+	+

0 No impact
\+ Small positive impact
++ Large positive impact
\- Small negative impact
– Large negative impact

4 Interreg partners in action with the WECAN tool

The stakeholders in the three Interreg regions explored the WECAN tool during workshops, held in the month of May 2011. In each of the regions, the central focus of the workshop was on the WECAN tool; testing the tool to find out if it needed modification to meet local circumstances or regional culture. It turned out that each region aims to use the tool for a slightly different purpose. In Belgium, the WECAN tool will be used in raising awareness on the link between natural heritage and economic prosperity in policy making. In France, the tool will be used for the monetary valuation of natural heritage. The French partners are particularly interested in estimating the value of nature in monetary terms by scientifically sound methods. And the UK partner aims to use the WECAN tool to support the development of new projects that aim to increase economic prosperity based on natural heritage and to test the benefits of a ecosystems-based approach in community-led regeneration based on the natural environment.

Each region committed to testing the WECAN tool in a specific pilot. It soon became clear that the tool needed further elaboration, because the partners needed more guidance. Thus, it was decided to extend the WECAN instrument with a helpdesk which suggests an approach for the valuation of each ecosystem service, including examples and references (reference numbers as well as data sources).

The Belgian Workshop - Genk - May 10th 2011

In the Belgian region, the primary goal was to test the understanding of the concept of ecosystem services by stakeholders and to explore whether the WECAN tool is a suitable approach to communicate the way ecosystems could increase regional prosperity. Regional stakeholders from different backgrounds (policy makers, scientists, non-governmental organisations) were invited. Most participants were already familiar with the concept of ecosystem services. The participants were asked to estimate the value of a tree. After the presentation of the main elements in the WECAN tool, two group discussions were organised. One group assessed the consequences of the replacement of conifers in National Park Hoge Kempen by broad-leaved trees in terms of ecosystem goods and services. The second group considered the economic benefits of the introduction of new animals into the National Park Hoge Kempen.

It was observed that there are in general four ways to approach the question how to value a tree:
(1) The utilitarian discourse, which focusses on different utilities a tree has for people.
(2) The detailed discourse, which is based on the argument that the question could not be answered due to insufficient information on the location or the type of the tree.
(3) The discourse of the intrinsic value, which argues that the value of a tree cannot be expressed in monetary terms.
(4) The valuation discourse, which states that the question can be answered by using a valuation method, like the value of the tree equals the value of avoided costs.

The WECAN tool was tested in the two group discussions to find out whether the stakeholders clearly understood the way an ecosystem can provide economic value. The conclusion was that 'ecosystem services' is a rather complex concept. However, the stakeholders managed to work with the concept quite well. The stakeholders struggled with some aspects, for example the assessment of direct versus indirect benefits and the fact that the assessment of cultural services depends on the story-telling regarding the benefits; for

instance broad-leaved trees generate income since they attract tourists to the area, while conifers are valuable since they belong to the regional identity of the area. The issue who benefits from the ecosystem goods and services was considered as complicated. In particular, it is society as a whole that benefits from regulating services. In addition, the economic impacts are considered to be context- dependent. What provides economic benefits in one area, might result in economic losses in another area. And what about the time horizon? Some ecosystems can provide benefits in the near future, others in the far future. Clearly, everybody deals with the questions based on own knowledge, resulting in various frames regarding potential economic benefits.

In the second group discussion, it was found that it was more preferred to introduce large animals behind fences instead of animals into the wild since the positive effects are distributed equally and it is only the initiator who has to bear the costs, which is not the case when animals are introduced without placing fences.

The result of the discussion was that the ecosystem services approach in the WECAN tool is an interesting and workable way to deal with the issue of natural heritage in terms of economic prosperity. The suggestion was made that the WECAN tool could be improved by elaborating the process approach in order to increase the effectiveness of economic benefits communication of the ecosystem services.

The French workshop - May 20th 2011 - Lille

In Lille the objective was (i) to learn about ecosystem goods and services and (ii) to involve stakeholders in the WECAN project. A large group of people from different sectors (agriculture, industry, environment) and from different institutions (policy, NGO's and academics) attended the workshop. The level of knowledge on the ecosystem services approach was high. In two group discussions the WECAN tool was explored. The first group discussed the way natural heritage in Avesnois and Scarpe-Escaut is used in daily activities. Which ecosystem services are used and how important are these ecosystem services according to the stakeholders? The table below lists the most important ecosystem services in the area, as perceived by the participants:

List of important ecosystem services

Supporting services: - Habitat - Genetic diversity	Regulating services: - Water regulating services - Air purification - Soil fertility/soil quality - Pollination
Provisioning services: - Water production for domestic use - Agricultural production of food - Wood production - Production of animals	Cultural services: - Quality of the landscape - Biodiversity - intrinsic values - Leisure, sports and recreation

It was found that not all services are considered equally important by each of the stakeholders. This is an important conclusion, indicating that stakeholder selection should be done very carefully when prioritizing ecosystem services. In addition, it was acknowledged that some ecosystem services are not used yet, but could become more important in the future, like for instance wood production as an energy source in the transition towards a bio-based economy. Furthermore, the participants in the workshop made a distinction between economic importance of ecosystem services and vital importance, which resulted in different rankings of ecosystem services.

The following groups were identified as beneficiaries from ecosystem services in the area:

- Farmers
- Foresters
- Companies
- Extraction companies
- Drinking water services
- Citizens

It was noted that a distinction should be made between current users and future users (time scale) and between users within the study area and outside the area (spatial scale).

The group could easily follow the WECAN approach, but it also raised several fundamental issues. Participants stressed the anthropogenic point of view of the ecosystem services approach. They recognized the potential of the ecosystem approach to stimulate environmentally friendly or precautionary behaviour of citizens. They also pointed out that certain ecosystem services are related to each other (certain services are required conditions for the delivery of other services: cf. quality of landscape is required for certain leisure activities; water cycling is required to provide landscape quality). Furthermore, it was noticed that some ecosystem services require policy or activities: cf. patrimony requires policy; social cohesion requires events or community activities.

The second group discussed different methods of economic assessment of the benefits of ecosystem services. The conversation resulted in a discussion that has kept academics busy for about 30 years. It was clear that the ultimate method to express ecosystem benefits into monetary terms does not exist. Each method has its advantages and limitations.

- The limitations of contingency valuation are:
  - Danger of ambiguous interpretation of the questions.
  - Without a ranking scale there is the risk to get a wide range of values.
  - It is a stated preference method, which means that the respondent is not obliged to pay anything - makes the response questionable.
  - Socio-economic background of the respondents may affect the response.
  - Free rider problem - nobody wants to pay for common goods.
- Limitations of the transport cost method are:
  - Big car = large costs instead of using environmentally friendly transport means.
  - Does only include transport costs instead of other types of spending.

Criteria that are highly relevant when selecting between the different economic methods are available time and capacity. Finally, it is important to understand that not the figure prevails, but the message that underlies the figure. It is the reasoning about the figure that can serve as valuable input to decision-making processes.

The UK-Wales workshop - May 25th 2011 - Swansea

The last workshop was organised in Swansea with the aim to increase the awareness of the socio-economic potential of the natural environment in the area and to explore the WECAN tool. In this workshop, a large number of participants attended, many in the field of regional development, but also academic economists, representatives from the private sector and officials from Government-sponsored bodies including the Countryside Council for Wales. After the presentation of the WECAN tool, group work was carried out, aiming to develop a project that maximised the economic and social potential of the natural environment. Four projects were proposed by the participants.

Project 1: Exploring flood mitigation in the Valleys 'upstream"

- **Objective of the project:** to provide upstream attention and management of flood risk using soft engineering solutions whilst enhancing the natural environment.
- **Which ecosystem services will be maximised?** Regulating services, habitats, cultural services (recreation).
- **Project approach:**
- What? To identify cost-effective interventions (e.g. "soft" engineering or creation of wetlands (lakes) to
- prevent flooding downstream.

Why? To reduce costs of flood damage/.

How? Bringing landowners, private companies and communities together to invest in tree planting, lake creation, and whatever else required to mitigate flooding and optimise cultural and supporting services. Education process required upfront.

- **Project partners to be involved:**

Housing associations, Welsh Water, Environment Agency, insurance companies, forestry commission, landowners, local authorities.

- **Project output:**
- Hydrological solutions: appreciation of opportunities across valleys.
- Reduced costs of flood damage.
- Potential economic value of enhanced landscaped environment.

Project 2: Maximizing the opportunities of woodland

- **Objective:** to stimulate the local economy by increasing jobs related to woodland activities.
- **Which ecosystem services will be maximised?** Provisioning products (wood, fuel), regulating services (carbon absorption, air quality, protection from soil erosion, disaster protection) cultural services (social cohesion, recreation and tourism, education, quality of place) biodiversity.
- **Project approach:**
- What? Active management of woodland in a coordinated way for timber production and fuel supply plus recreation, all of which can create jobs. Supported by strong bottom up marketing campaign involving all
- Why? Increase in economic prosperity.
- How? Woodland event with private companies. Required cross sector and cross boundary involvement. Marketing campaign. So go and see how it is done elsewhere.
- **Project partners to be involved**: forestry commission, landowners, CCW, EAW, business sector, schools and colleges, visit Wales, local authorities, WCVA, Groundwork, Wildlife sports, RSPB, EU partners.
- **Project output?** Jobs crated, extra visitors, increase in percentage of woodland actually managed, changed attitudes in business sector, monetary value gains.

Project 3: Welcome Woodland Wales (www.www.uk)

- **Objective:** Maximising the potential of the Valleys Woodlands (the nation's land holdings).
- **Which ecosystem services will be maximised?** All services, but phased. Initially transition to broadleaves yields commercial gain through cropping conifers, but later the community benefits from cultural services provided by broadleaves.
- **Project approach:**
- What? Develop land use plan/community led/committed/strong links to the Natural Environment Framework.
- Why? To optimise the benefits to people of managing a particular land use (woodland and forestry) by shifting the purpose of it from commercial gain (uneconomic anyway) to community + other economic benefits.
- How? Review/appraise if it fits what you want to do.
- **Project partners to be involved:**
- Welsh Government.

– **Project output.** Timber/houses cabins and products/wood fuel/restructured woodlands designed and managed to benefit communities.

Project 4: Connectivity

– **Which ecosystem services will be maximised?**
– Cultural services (social cohesion, wild swimming, wildlife tourism, waterways, old railway services for cycle traits, walking, horse riding), provisioning goods and services, supporting services (habitats for species, maintenance of genetic diversity).
– **Project approach:.**
– What? Improve infrastructure of waterways and cycling routes/behaviour change projects on health and well-being/climate impact.
– Why? Positive impact on the environment and behaviour change.
– How? Strategic funding that meet the needs of organisations and communities.
– **Project partners to be involved:**. Schools, LA, Groundwork Trusts, local tourism groups, local development trusts, social enterprises, rotary clubs, small business federation, E&C councils, NFU/YF.

5 Communicating the message

Valuation of ecosystem services substantiates the economic argument in the discussion on biodiversity. The economic argument is powerful, but also tricky. How to assign a financial value to a living creature or organism? This line of thinking may be troubling to people who deeply care about nature. Furthermore, emotions and rational arguments are often hard to reconcile. It is important to keep in mind that the economic argument does not tell the whole story, and other arguments may be more convincing for some groups of stakeholders. Basically, the economic argument is a rational argument; it is useful in political discussions and in discussions with businesses. This should be kept in mind when communicating the message.

Given the limitations of the approach and the methodologies for valuation the estimates can only be rough indications of the economic value. But it is not only the final outcome that matters, also the valuation process in itself is highly valuable. It structures thinking on the way ecosystem services 'produce' values and raises awareness of these values. Stakeholder participation in the valuation process is therefore highly effective in terms of communication.

6 Conclusion

There is a growing tendency to value the benefits ecosystem services and natural heritage bring to society. One of the main reasons underlying this trend is the need to improve the scope of policy support systems in order to avoid harmful decisions that induce biodiversity loss and nature degradation. Suboptimal decisions are often made due to the difficulty to express natural capital in economic or monetary terms. This difficulty is related to the fact that natural heritage is not a market commodity and is apparently free of charge; the benefits of nature are mostly indirect benefits which are the result of complex processes. It is within this context that the Interreg partners asked Alterra Wageningen UR to develop a pragmatic instrument that can assist them to value the benefits of the natural heritage for economic prosperity in their region. This instrument is embedded within the TEEB approach in which ecosystem goods and services are the central concept. It consists of a practical guidance (Chapter 3) and an Excel sheet.

The tool consists of three steps, and several sub-steps:

Step 1: Specifying the ecosystems.
- Step 1.1: Determine the ecosystem types and elements.

Step 2: Recognizing the values: identifying and assessing the full range of ecosystem services:
- Step 2.1: Determine the ecosystem goods and services currently provided by the ecosystems.
- Step 2.2: Determine the potential of ecosystem goods and services for future use.

Step 3: Demonstrating the value: estimating and calculating the values:
- Step 3.1: Select the ecosystems to be valued (in the Excel sheet).
- Step 3.2: Collect the data for the physical units for the calculation (in the Excel sheet).
- Step 3.3: Collect data on prices for the calculation and fill in the form (Excel sheet).

In workshops in each of the Interreg regions, the instrument was evaluated. As a result of the workshops the awareness of local stakeholders on the concept of ecosystem goods and services increased - as far as stakeholders where not already fully aware of the concept. One of the findings of the workshops is that the concept of ecosystem goods and services seems to help to raise awareness of the contribution of natural heritage to regional development. However, the participants consider economic valuation of ecosystem services as rather difficult and complex; it requires a certain level of expertise since the functioning of ecosystems is highly complex. This is why the instrument should be used in an interactive approach that relies on local stakeholders as well as academic experts for the valuation.

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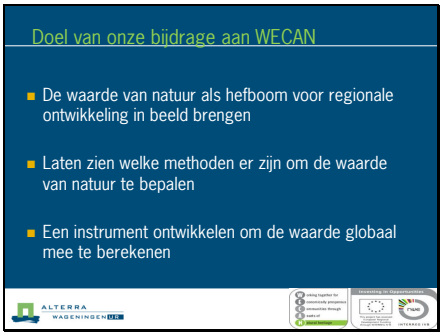
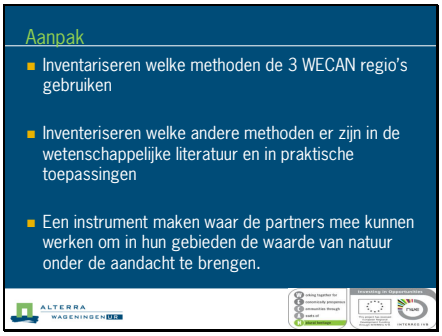
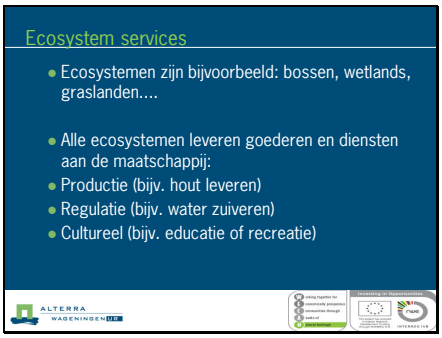
Appendix

Workshop Genk

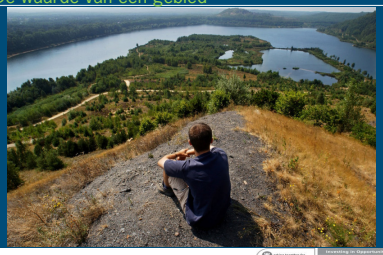






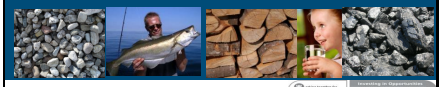
De waarde van een boom

De waarde van een gebied



Productie

- Oogst van hout, grind, water, wild.....
- Verkoop via de markt levert inkomen en werkgelegenheid
- Draagt bij aan regionale welvaart en welzijn



Regulatie

- Koolstofvastlegging – draagt bij aan klimaatregulatie op wereldschaal
- Klimaatregulatie lokaal (vooral hittebestrijding in steden)
- Watercyclus – waterzuivering en vasthouden van water lokaal

Regulatie

- Luchtkwaliteit – schone lucht is goed voor de gezondheid
- Bescherming tegen rampen zoals overstromingen
- Bescherming tegen ziekten en plagen – kostenbesparing

Regulatie

- Bescherming tegen bodemerosie en behoud van bodemvruchtbaarheid – draagt bij aan landbouw
- Afvalwaterzuivering – zo worden kosten vermeden, draagt bij aan gezondheid
- Bestuiving – draagt bij aan de landschap en aan aantrekkelijk landschap voor recreatie

Culturele diensten

- Sociale cohesie en identiteit (sense of place) – draagt bij aan welzijn
- Recreatie en toerisme – draagt bij aan de regionale economie en aan welzijn
- Educatie en inspiratie – draagt bij aan welzijn

Karakteristieke villa op toplocatie

Deze villa is prachtig gelegen in bosrijke omgeving…Uitstekende locatie op wandelafstand van "La Butte aux Bois" met aangrenzende bosgebieden "Nationaal Park Maasland Hoge Kempen"…..

Culturele diensten: kwaliteit leefomgeving

- Een aantrekkelijke woonomgeving draagt bij aan het welzijn van bewoners
- Trekt nieuwe bewoners aan: huizenprijzen blijven op peil
- Trekt nieuwe bedrijven aan: bedrijven vestigen zich waar mensen willen wonen

Hoe werkt het?

- **De aanwezigheid** van groen geeft opbrengsten: bijvoorbeeld een boom filtert fijnstof, en natuurgebied houdt water vast
- **Het gebruik** van het groen geeft opbrengsten: bijvoorbeeld erin wandelen is goed voor de gezondheid, een boom kan verkocht worden voor het hout.
- Het groen biedt mogelijkheden voor de **ondernemer**, bijvoorbeeld fietsverhuur of horeca.

Economische waarde van natuur

Verschillende categoriën:

- Inkomen en werkgelegenheid: via verkoop van natuurlijke hulpbronnen of via recreatie en toerisme (direct in euro's)
- Vermeden kosten voor zuivering of bescherming tegen overstromingen, of uitgaven aan medische zorg (indirect in euro's)
- Florerende economie via een aantrekkelijke woon- en werkomgeving (indirect in euro's)
- Via een groter welzijn (is dat wel in euro's uit te drukken?)

Culturele diensten: niet-gebruikswaarde

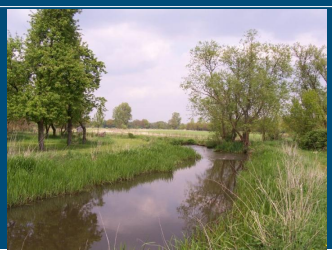
"Ik vind het belangrijk dat dit natuurgebied bestaat, ook al maak ik er nooit gebruik van"

Twee vragen voor de workshop

1. Wat betekent het vervangen van naaldbomen door loofbomen voor de waarde van Kempen-Maasland?

Twee vragen voor de workshop

2. Wat kan de introductie van nieuwe diersoorten betekenen voor de economie van Kempen-Maasland



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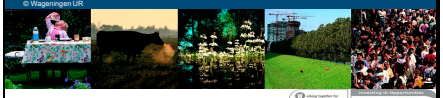


Workshop Lille

Contribution du patrimoine naturel au développement régional

Lille
Le 20 mai 2011

Joke Luttik
Ingrid Coninx

Qui sommes-nous?

- Alterra, Wageningen UR
  - Centre de recherche Cadre de Vie Durable
  - Différentes disciplines scientifiques
  - Joke Luttik et Ingrid Coninx

Objectifs de recherche

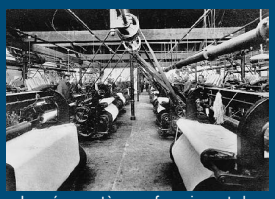
- Identification des valeurs de la nature pour le développement régional
- Illustration de méthodes pour estimer les valeurs de la nature
- Développement d'un instrument pour assister l'ENRx, d'autres partenaires WECAN et d'autres acteurs régionaux intéressés pour estimer et exprimer les valeurs de la nature de deux parcs (Avesnois & Scarpe-Escaut)

TEEB

The Economics of Ecosystems and Biodiversity (TEEB), une initiative qui:

- Demande de l'attention pour déterminer et communiquer la valeur économique de la nature et de la biodiversité et pour les coûts croissants causé par la perte des services écosystémiques et de la biodiversité
- Intégrer les valeurs dans les activités quotidiennes des élus, des entrepreneurs et des citoyens

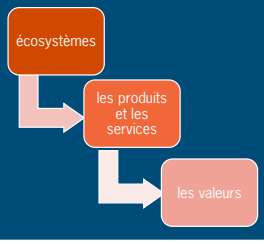
Les services écosystémiques – un concept central



usine textile

Les écosystèmes fournissent des produits et des services à la société

Comment ça marche?



Les écosystèmes d'Avesnois et Scarpe-Escaut

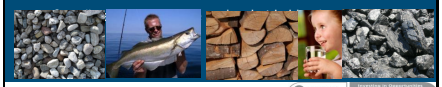
- Les forêts, les prairies et les pelouses
- Les vallées, les étangs
- Les sangliers, les oiseaux, les chats sauvages, la chauve-souris
- L'orchidée, les jacinthes
- Les sites protégés
- Le patrimoine minier, architectural rural, religieux, militaire, …
- Les paysages du pays de l'eau, ruraux

Quels types de service?

- Les services de soutien
- Les services d'approvisionnement
- Les services de régulation
- Les services culturels

Services d'approvisionnement

- Les produits de la nature:
  - Produits alimentaires (des plantes et de la viande)
  - Produits énergétiques (le bois, les charbons, le colza, ...)
  - Produits pour la production de fibres et d'autres matériaux (incl. le bois)
  - De l'eau pour usage domestique, agricole, industriel, production embouteillée
- La récolte exige de la main-d'oeuvre (créer des emplois)
- Les produits génèrent les revenus



Services de régulation

- La séquestration du carbone – régulation du climat planétaire
- Régulation du climat local

Services de régulation

- Purification de l'eau

PNR Scarpe-Escaut/ Samuel Dhote

- Retenir l'eau pour prevenir des crues et des inondations et pour atténuer l'effet des sécheresses

LE TÉLÉGRAMME

carrefour

Services de régulation

- La purification et maintien de la qualité de l'air

- Régulation de la dynamique des pathogènes et parasites

Services de régulation

- Régulation de l'érosion et des coulées de boues bodemerosie et maintien de la qualité des sols

- Maintien de la pollinisation

Services à caractère social

- Support de sports de nature

PNR Scarpe-escaut/ Samuel Dhote

- Support pour le tourisme et les loisirs de nature
- Source d'inspiration

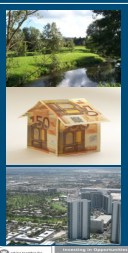
Services à caractère social

- Source de cohésion sociale des communautés

- Support pour le développement des savoirs éducatifs
- Support de travaux de recherche

Services culturels: qualité de l'environnement

- qualité du paysage (esthétique, sonore, olfactif, ...)
- Attire les nouveaux habitants: les maisons deviennent plus chères
- Attire les nouveaux entrepreneurs: créer des emplois



Les valeurs économiques

- **La présence de la nature** crée des revenus: par exemple des arbres filtrent les particules et la nature retient l'eau
- **L'usage** de la nature crée des revenus: par exemple se promener dans les parc régional est bon pour la santé, l'arbre peut être vendu pour le bois
- Le parc régional offre des possibilités pour les **entrepreneurs** comme la location des vélos ou la vente des produits ruraux

La valeur économique de la nature

Plusieurs types

- Les revenus et l'emploi: par la vente des resources naturelles ou par le tourisme (directement en euros)
- éviter des coûts de la purification ou des protection contre les inondations, ou des frais médicaux (indirectement en euros)
- Créer une économie florissante grâce aux paysages attractifs pour résider et travailler (indirectement en euros)
- Par augmenter le bien-être (est-ce qu'il est possible d'exprimer cela en euros?)

P

Services culturels: valeur de non-usage

Qui fait son profit des parc régionaux?

- Les touristes
- Les fermiers
- Les pêcheurs
- Les habitants
- ....

Discussion 1

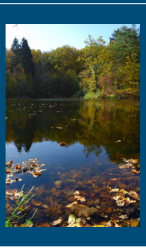
1. Discutez de quelle manière vous utilisez les sources naturelles des parc Avesnois et Scarpe-l'Escaut dans votre activités quotidienness – comment tirez-vous profit des parcs?
2. Indiquez quels écosystèmes pourvoient ces bénéfices.

sh

Outil d'évaluations économique

Trois phases essentielles:

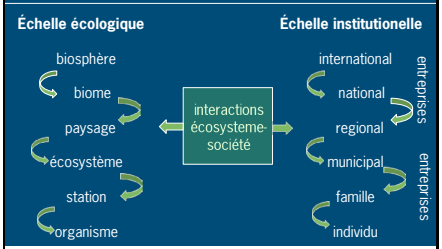
1. Identification des services ainsi que des niveaux écosystémiques
2. Evaluation biophysique des services sélectionnés
3. Evaluation économique des services sélectionnés



1. Identification des services et des niveaux écosystémiques

- Les services d'approvisionnement
- Les services de régulation
- Les services à caractère social

1. Identification des services ainsi que des niveaux écosystémiques



2. Évaluation biophysique des services de l'écosystème

- Sélection d'indicateurs des services écosystémiques
- Analyse quantitative des services écosystémiques
  - Services d'approvisionnement – les flux du produits sont exprimés en tonnes de bois, litres d'eau....
  - Services de régulation - par example, réduction de crues et d'augmentation des étages....
  - Services culturels – le type d'interaction ainsi que le nombre de personnes concernés....

Évaluation économique

- Types de valeurs
  - Valeur d'usage direct, par example la vente d'un fruit
  - Valeur d'usage indirect – la contribution au bien-être humain, en particulier le type d'avantages qui les services de régulation fournissent à la société
  - Valeur d'option – ne pas prendre de risque pour l'avenir
  - Valeur de non-usage – savoir qu'un ecosystème est préservé; aucune intention de l'utiliser

Évaluation économique

Évaluation économique

- Évaluation des biens privés: les biens ou les services échangés sur le marché
- Évaluation des biens publics. Deux types d'approches ont été dévelloppés en vue d'appricier la valeur:
  - Méthodes d'évaluation exprimée
  - Méthodes de révélation des préferences

Évaluation économique – des biens publics

Méthodes d'évaluation exprimée

- Évaluation contingente:
  - Déterminer les préférences des individus en les interrogeant directement sur leur consentement à payer
  - Valeurs évaluables: toutes

Évaluation économique – des biens publics

Méthodes d'évaluation exprimée

- Expérimentation des choix:
  - Déterminer les préférences des individus en leur demandant directement de choisir l'option qu'ils préfèrent parmi un ensemble d'options aux caractéristiques particulières
  - Valeurs évaluables: toutes

Évaluation économique – des biens publics

Méthodes de révélation des préferences

- Coûts de transport:
  - Estimer les dépenses de déplacement des individus par une enquête de fréquentation du site étudié
  - Valeurs évaluables: Valeurs d'usage effectifs: usage d'un site récréatif

Évaluation économique – des biens publics

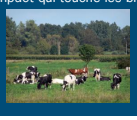
Méthodes de révélation des préferences

- Prix hédoniques:
  - Déterminer l'influence d'une caractéristique environnementale sur les prix sur un marché
  - Valeurs évaluables: Qualité de l'air, de l'eau, bénéfices culturels, beauté du paysage

Évaluation économique – des biens publics

Méthodes de révélation des préferences

- Fonction de production:
  - Établir l'impact du changement dans les services écologiques sur les biens produits
  - Valeurs évaluables:Tout impact qui touche les bien produits



Évaluation économique – des biens publics

Méthodes de révélation des préferences

- Dépenses de protection:
  - Déterminer les dépenses réelles ou potentielles engagées par les individus pour se protéger face à des externalités négatives
  - Valeurs évaluables: Externalités négatives (protection contre les inondations....)

Évaluation économique – des biens publics

Méthodes de révélation des préferences

- Coûts de remplacement:
  - Évaluer les coûts de remplacement du bien ou service perdu
  - Valeurs évaluables: Toute perte de bien ou service

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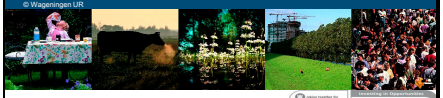


Workshop Swansea

Natural heritage for economic prosperity

May 25th 2011
Swansea

Joke Luttik
Ingrid Coninx

Who we are?

- Alterra Wageningen UR
  - research institute for the green environment
  - multitude of disciplines
  - Joke Luttik and Ingrid Coninx

Research objectives

- Identification of the values of natural heritage for regional prosperity
- Identification of methods in the literature and in the WECAN regional partners
- Development of an instrument to assist the WECAN partners to estimate and communicate the values of natural heritage for economic prosperity Typology, reflection and advised method

Timeline of the project

TEEB

The Economics of Ecosystems and Biodiversity (TEEB), an international initiative that aims:

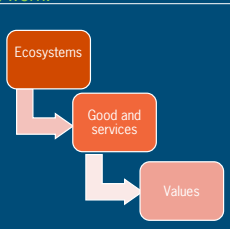
- to draw attention to the global economic benefits of biodiversity, to highlight the growing costs of biodiversity loss and ecosystem degradation
- to draw together expertise from the fields of science, economics and policy to enable practical actions moving forward.

Ecosystem services – a key concept

Ecosystems produce goods and services to society. Society relies on ecosystem goods and services

What kind of goods and services?

How does it work?

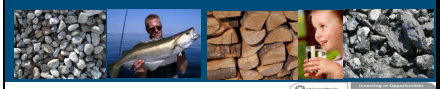


Ecosystem goods and services

- Provisioning goods and services
- Regulating services
- Cultural services
- Supporting services

Provisioning goods and services

- Products form the land, like food, raw materials, medicinal resources, fresh water, ...
- Exploitation of the products from lands provide jobs and income
- Contribute to regional prosperity and well-being



Regulating services

- Carbon absorption – contributes to climate change mitigation at global level
- Local climate regulation (to decrease the heat island effect in cities)
- Water cycling – water purification and local water retention

Regulating services

- Air quality – clean air contributes to healthy people
- Protection from disasters (floods and droughts)
- Biological control – pest control

Regulating services

- Soil erosion and fertility – contributes to agriculture
- Waste water treatment – contributes to well-being
- Pollination – contributes to attractive landscape, agriculture and recreational entrepreneurship

Cultural services

- Social cohesion and sense of place – contributes to well-being
- Recreation and tourism – contribute to regional prosperity and well-being
- Education, research and culture – contribute to well-being

Cultural services: quality of the environment

- An attractive environment contributes to the well-being of inhabitants
- Quality of the environment attracts new inhabitants: housing prices are maintained or will increase
- Attracts new companies

How does natural heritage contributes to regional prosperity?

- **The presence** of natural heritage generates returns: a tree removes pollutants, and a nature reserve contribute to water retention
- **The use** natural heritage generates returns: walking in the national park contributes to health, a tree can be sold as an energy source.
- Natural heritage generates possibilities to entrepreneurs, for instance bycicle rental or restaurants

Economic value of natural heritage

Different types:

- Income and employment: sale of natural resources or recreation and tourism (direct return in euro's)
- Avoided costs because of purification or protection from flooding, or health care expenses (indirect return in euro's)
- Blooming economy because of attractive living and working environment (indirect return in euro's)
- Increasing well-being (can we express this in monetary terms?)

Cultural services: non-use value

Economic valuation

Different methods:

- Revealed preferences
- Stated preferences
- Benefits transfers

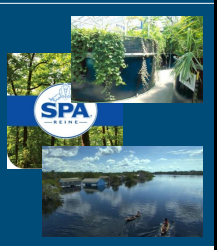
Develop projects: renewable energy

- Wood
- By-products of landscape management
  - Additional source of income for the agricultural & forestry sector
  - Technological challenge



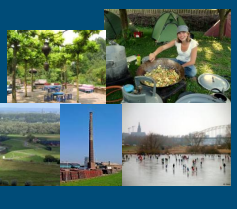

Develop projects: water

- Waste water treatment
- Water management
- Water production
- Input for industry and agriculture



Develop projects: recreation & tourism

- Post-industrial; Post-agricultural
  - Close to the city of Nijmegen
  - Strong marketing strategy
  - Political support



Develop projects: food

- Slow food
- Regional products
  - Branding
  - Community farming



Develop projects: education

Different approaches:

- Contact with nature
- Digital blackboard
- Smartphone
- *Objectif Nature*



Develop projects: nature & health

Different mechanisms:

- Physical exercise
- Stress reduction
- Healthy living conditions

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Develop projects: nature & health

Different mechanisms:

- Business development
- Regional development
- Healing environments
- New sources of income for farmers

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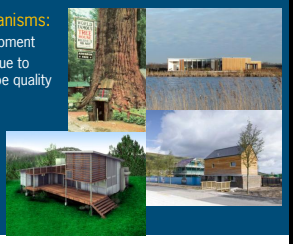
Develop projects: housing

Different mechanisms:

- Regional development
- Source of revenue to invest in landscape quality
- Eco-housing



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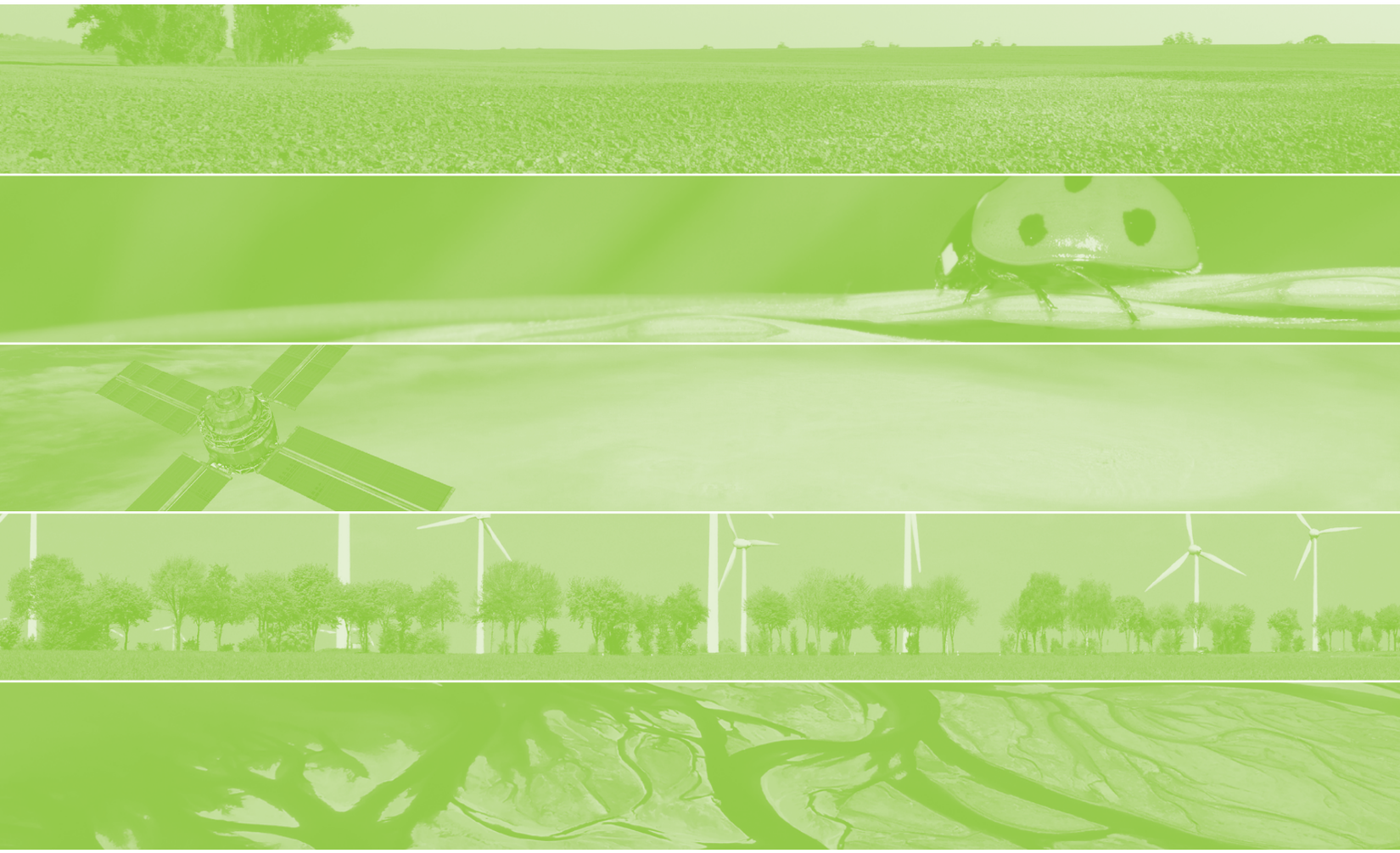

Alterra is part of the international expertise organisation Wageningen UR (University & Research centre). Our mission is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine research institutes – both specialised and applied – have joined forces with Wageningen University and Van Hall Larenstein University of Applied Sciences to help answer the most important questions in the domain of healthy food and living environment. With approximately 40 locations (in the Netherlands, Brazil and China), 6,500 members of staff and 10,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the exact sciences and the technological and social disciplines are at the heart of the Wageningen Approach.

Alterra is the research institute for our green living environment. We offer a combination of practical and scientific research in a multitude of disciplines related to the green world around us and the sustainable use of our living environment, such as flora and fauna, soil, water, the environment, geo-information and remote sensing, landscape and spatial planning, man and society.

More information:: www.wageningenUR.nl/en/alterra