Deltares

Towards practical implementation of the ecosystem services (ES) concept in transboundary water management

Suzanne van der Meulen
Linda Neubauer
Jos Brils
Ilke Borowski-Maaser

Ministerie van Infrastructuur en Milieu

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Summary
Faced with the challenges of integrated (water) resources management and the increasing demand for (economical) valuation, the approach of ecosystem service (ES) gains more attention within domains dealing with natural resources management. However, there is a lack of experience how this approach can support actual water management. Therefore, the Dutch and German environmental ministries agreed with Deltares and Seeconsult to perform a pilot study to assess the practical application and value of an ecosystem services approach in regional/local water management in a transboundary study area.

The case study that is described in this report includes the first step of the approach in which an inventory of ecosystem services and management challenges has been conducted. The assessment of the relation between the ecosystem and societal needs in the study area is based on stakeholder interviews about ecosystem services. This resulted in a list of risks and opportunities for sustainable development of the region.

At a workshop at which the results of the project were discussed, local water managers recognized the identified challenges for water management and sustainable development of the study area. **The added value of the ecosystem services assessment** is expected to be to **find better integral solutions to the problems in the area,** new **funding** opportunities for measures and more **support** by land owners and the public. The ecosystem services approach was considered to better raise awareness on the benefits of ecosystems. Policy makers, administrators and water managers in the region aim to find integral solutions for development issues the study area. The ecosystem services approach is considered beneficial to this since it integrates the ecosystem with the social-economic system and is cross-sectoral.

To make full use of the approach, the workshops participants agreed that it would be beneficial to start a follow up on this project in which the approach will be linked to one or two specific sustainable development issues of transboundary relevance, The prevalent issue in the discussion during the workshop was on boating on the Vecht river (both in the Netherlands and Germany), which is an important topic in relation to the ambition to develop sustainable tourism. This issue has been debated between German and Dutch representatives for quite a while. It demands at first sight- from a ecosystems services perspective- a careful balance between the habitat function of the Vecht river and tourism. We propose to set up a process which combines a complete ecosystem services assessment and a mediation-like process. Besides the boating issue, the second issue could be identified in cooperation with the local water managers.

This report includes the results of the stakeholder interviews (D2), a system description (D3), the outcomes of the workshop in September and an outlook to phase 2 (D4).

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	14 October 2011	Suzanne van der Meulen		Gerald Jan Ellen		Hans Gehrels	
		Linda Neubauer					
		Jos Brils					
		Ilke Borowski-Maaser					

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Contents

1 Introduction

1.1 Background

Faced with the challenges of integrated (water) resources management and the increasing demand for (economical) valuation, the approach of ecosystem service (ES) gains more attention within domains dealing with natural resources management. However, there is a lack of experience how this approach can support actual water management. The concept is explained in box 1.

Box 1.1 The ecosystem services approach

Ecosystem Services

Ecosystem services are the benefits that people get from nature. These might be goods (provisioning services) or services (regulating services, cultural services and supporting services).
Examples of ecosystem services that have been identified during studies in river basins are: nutrient removal, temperature regulation, carbon sequestration, habitat, flood protection, food and goods, biomass for renewable energy, water supply, recreation, hydroelectric power, transportation, fish production, aesthetic, fiber and fuel, hydrological flows (groundwater recharge), pollution control, educational services (opportunities for formal and informal education and training), soil formation, pollination, nutrient cycling and biodiversity.

The importance of ecosystem services and their protection is being mentioned in several EC communications and strategies. Applying an ecosystem services approach in management and decision is expected (and to a limited extend demonstrated) to lead to:

- Raising awareness with public and policy makers about the value of nature conservation and sustainable use of the ecosystem and its services and the value of nature conservation.
- Involvement of stakeholders and knowledge owners from different blood groups
- Community spirit about ecosystem services values and conservation measures increases the likelihood that measures will be accepted and implemented in an effective manner.
- A better understanding of the value of ecosystem services will make it easier to raise funding for protection of the ecosystem and its services.
- Boundaries of sectors and ecosystems are crossed and integrated management is possible.
- Showing (unexpected or unintentional) consequences of policies and actions at different temporal, spatial and socioeconomic scales.
- Consider the complete system of biophysical and socio-economic factors and the many related processes and values within en between these systems. Hereby, prioritization and the development of effective protection measures is possible.
- A less static, defensive approach of ecosystem conservation.

From Van der Meulen and Brils, 2008: Ecosystem Services (ES) in river basin management – background information and discussion document.

Deltares in agreement with the Dutch and German environmental ministries, respectively Ministry of Infrastructure and the Environment (Waterdienst) and Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) proposed an approach for a pilot study at local/regional scale that can demonstrate a 'down to earth' and thus practical approach towards implementation of the ecosystem services (ES) concept in transboundary water management. Thus, Deltares and Seeconsult developed a case study to show the potential of the ES approach in the transboundary part of the Vecht basin. The case study that is described in this report includes the first step of the approach in which an inventory of ecosystem services and management challenges has been conducted. Based on this first step (phase 1), need for a next phase (phase 2) and the requirement for the next phase have been assessed.

For the place-based pilot study the river Vecht ('Vechte' in German) was proposed as case, because:

- For this case already contacts exist between Germany and the Netherlands on regional level;
- There is a vision document available for this case (Vechttal-Strategy / Vechtvisie);
- The case was studied in an INTERREG IVA project (see: www.devecht.eu and www.ruimtevoordevecht.nl);
- There have been, and are, many transboundary activities on regional level, which might be a good starting point for further application of the results of this case study.

Furthermore, it has been requested to specifically focus in this study on the practical opportunities and possibilities for payments for ecosystem services (PES). As source of inspiration for this the United Nations Economic Commission for Europe (UNECE) recommendations for PES in IWRM (UNECE, 2007) were indicated. For more information about PES, see box 1.2.

1.2 Objective

The objective of this study is to demonstrate the practical usefulness of the ES concept (opportunities, obstacles, etc) in water management in a transboundary, local/regional setting with the river Vecht as a case study.

1.3 Project team

The project was implemented under the lead of Deltares. Seeconsults role was to generate the data in the German part of the case study area, and to support Deltares in its analysis including the implementation of a key stakeholder workshop in the Vecht basin.

1.4 Deliverables

The following deliverables have been delivered:

- The kick-off meeting took place at 16 May 2011 (D1 in the project proposal);
- The workshop in which results of this first phase and the design of the next phase have been discussed took place at 12 September 2011 (D4).
- This report includes the results of the stakeholder interviews (D2), a system description (D3), the outcomes of the workshop in September and an outlook to phase 2 (D4).

Box 1.2 Payment for ecosystem services

Payment for ecosystem services: beneficiary pays

A broad range of measures to mitigate problems or to deal with inevitable changes in natural resources management is available, ranging from 'hard', like bans or permits to 'soft' such as education or agreements. Within the group of economic incentives, payment for ecosystem services (PES) is an instrument to balance the interests of land owners who need to invest in order to preserve ecosystem services and the beneficiaries.

Payments can be user-financed or financed by others (mostly government) finance on behalf of users. For example, a water fund collects payments from local industries who pay upstream communities for watershed conservation that will result in better water availability and water quality for downstream industrial users.

The payment can involve a subsidy for delivery of services or it can be a user fee. In most cases the party that delivers, preserves or enhances ecosystem services is not being paid by the buyer for a specific ecosystem service (output) but for a specific land use (input) that should contribute to the ecosystem services target. For example, a land owner is being paid for the plantation of a certain number of trees instead of being paid for a specific amount of ecosystem services those trees deliver such as air quality regulation. Another example is compensation for production loss at buffer strip (in favor of water quality regulation by the soil).

The payment can be a fixed price such as a national fixed price for delivery of a certain amount of services or the price can be case-specific since the value of ecosystem services is context dependant. Besides payment in cash, discounts on taxes or other benefits may be the currency.

In order to establish a payment scheme, it is necessary to quantify the flow of ecosystem services from a particular area to beneficiaries and to assign a value to this.

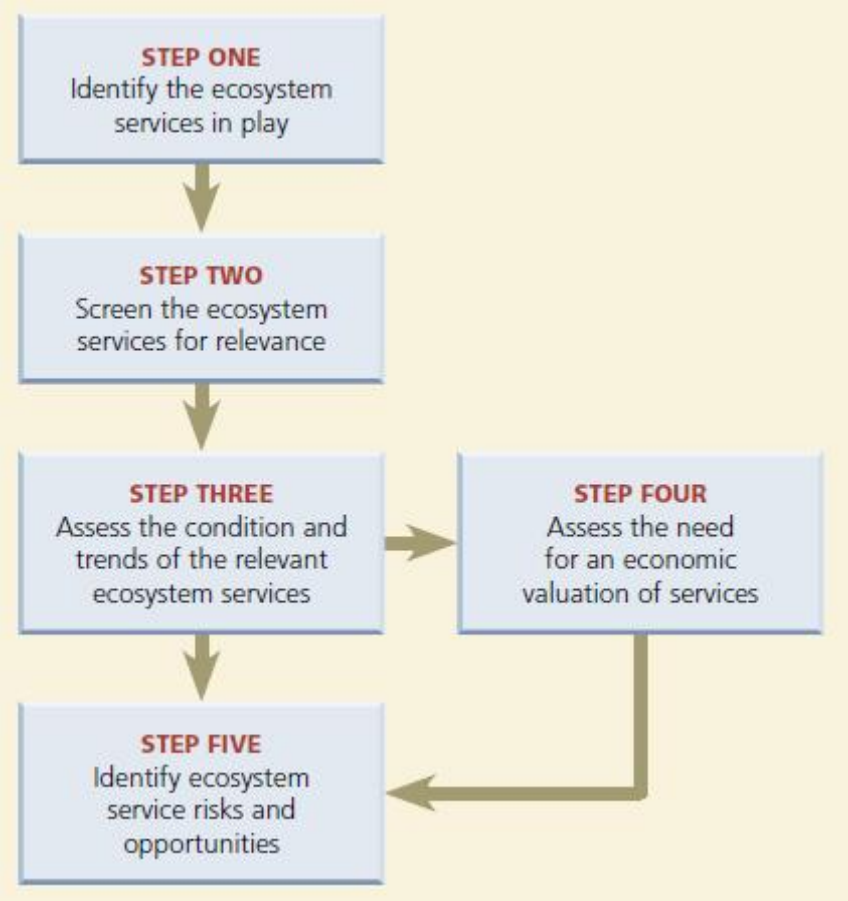
Wunder (2005), Greiber (2009), Engel et al. (2008), WWF.org

2 Methods

2.1 General approach

For the first phase of the project, step 1 and 2 from the generic approach to ecosystem services assessment as proposed by the World Resources Institute (WRI) has been applied (www.wri.org). The approach is summarized in figure 2.1.

Figure 2.1 Framework for an ecosystem services assessment (Ranganathan, 2008)



The first two steps of the WRI approach also cover the first and part of the second question from the UNECE 'process of establishing PES', i.e.:

1. Are there any significant water management problems in the river basin?
2. Can ES help to at least partly address these water management problems? Can these problems be solved or mitigated by means of a project such as change in land use or management practice?

In order to answer the second part of question 2, the phase of analyses of the ecosystem services in the case study area should be followed by an assessment of the opportunities to influence the ecosystem services through management practices.

For the first phase of the Vecht case study, interviews with stakeholders have been conducted within the framework of step 1 and 2. The interviews have been prepared during a

kick-off meeting in May 2011. The results of the interviews have been discussed in a workshop with water managers, policy makers and decision makers in September 2011. During the workshop, the next step has been designed.

2.2 Preparation of the interviews

2.2.1 General preparations

At May 16, 2011 during the kick-off meeting local and regional water managers and policy makers from the municipalities provided background information (maps, main management issues at stake etc.), defined the best geographical boundaries of the study area, and based on a local stakeholder analysis (based on relevant sectors and persons with local knowledge) we identified persons that could be interviewed.

Together with the local water managers, an introduction speech has been carefully formulated. All interviewers used this introduction speech to inform respondents about the purpose of the project and the interviews. It was also explained how the results of the interviews would be processed and which persons will have access to the recordings and notes of individual interviews.

2.2.2 Interview material

A map of the study area and its surroundings has been prepared; this map has been used during the interviews. The map is provided in Appendix A.

A list of ecosystem services has been customized for the study area. The list should be extended enough in order to prevent overlooking relevant ecosystem services but services that are certainly not present in the study are can be removed. The list that has been used for the interviews is provided in Appendix B.

2.2.3 Respondents

Based on the size and complexity of the study area and the time required, it has been decided to interview a maximum of five stakeholders on each side of the border. The selected respondents were contacted by the interviewer. The duration of the interviews was about 1,5 hours per interview.

Both in Germany and the Netherlands, stakeholders from the sectors or groups below have been interviewed:

- Local water management (water managers)
- Industry (managers)
- Agriculture (cattle farmers in this case)
- Tourism / leisure (entrepreneurs)
- Nature protection (NGO and nature education)
- Inhabitants (fishermen)

The location of the respondents is indicated at the map in figure 3.1

2.3 Interview method

The interviews on the Dutch and German side have been conducted in exactly the same way. The same procedure had been applied – and proved to be successful for gathering information about the social-ecological system– in a Dutch case study. The interviews on the Dutch side (Vecht) have been conducted in the Dutch language by Deltares. The interviews on the German side have been conducted in German by Seeconsult. The results of the stakeholder analyses (by the water managers) will suggest who should be interviewed.

Interview procedure

1. Introduction

The Interviewer provided information about the background and aim of the interview and the role of the interviewer.

2. Open questions

The interviewer asked:
- Could you please describe the Vecht area?
- What are functions of this area? (at different scales)
- Which changes do you expect for the near or long term future?
- Where should I make pictures if I want to show the characteristics of the area? This information has been used for the description of the character of the area.

During the interview, the map was on the table.

3. Ecosystem services list

Using the list (see Appendix B) with ecosystem services, the interviewer asked for every ecosystem service:
- Is this function important to you or others? (who and how important)
- Is this function present/provided in the area? Which landscape elements provide or influence this function?
- Finally the respondent could add functions to the list and point out which landscape elements provide or influence this function.

2.4 Processing of results and product

The information about the Vecht region that was provided by all respondents was collected. Based on this information a description of the social-ecological system was formulated. The description is divided into three sections for which the results are presented in Chapter 3:

1. Character of the area

A very short text and some images.

2. Functions of the area

Societal functions for the area itself and outside; short descriptions including prioritization and images.

3. Natural system and link to societal needs

Including extensive description of ecosystem services provided by the natural system, interrelations and ecosystem features of importance for the ecosystem services delivery.

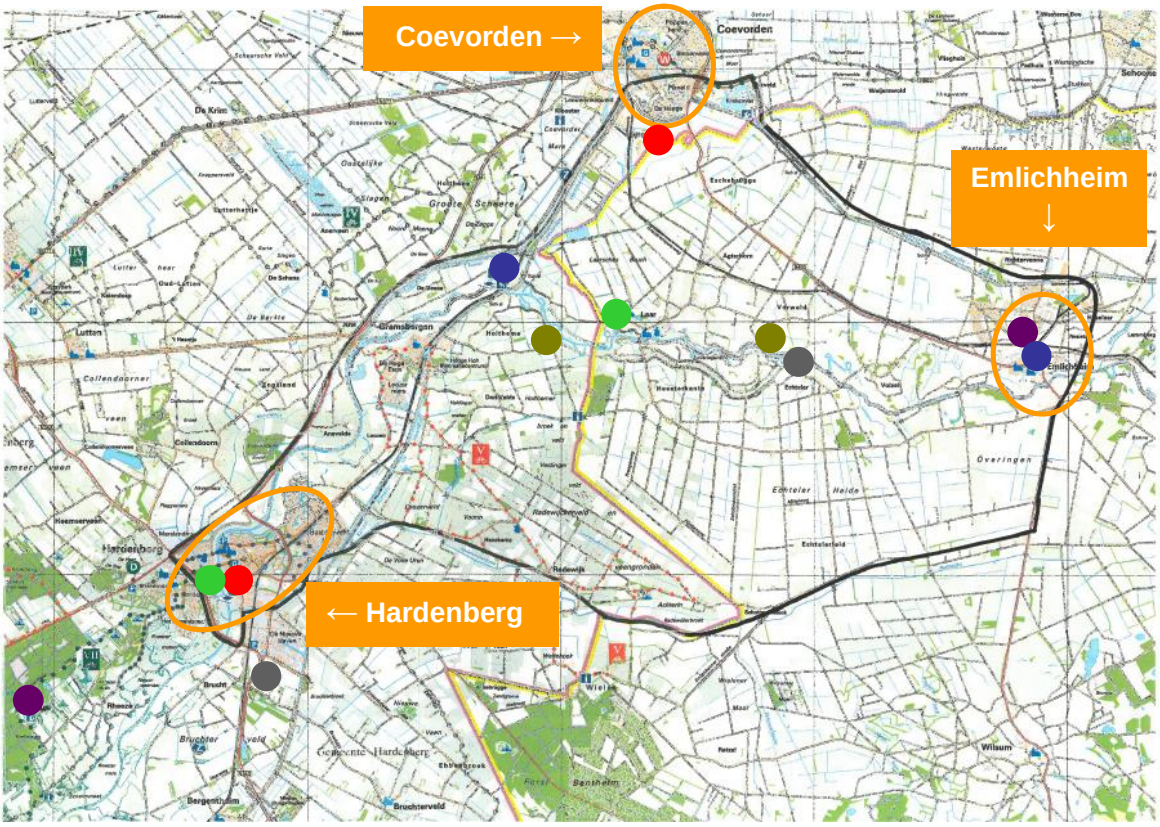
3 Description of the social-ecological system

As explained in chapter 2, the information gathered during the interviews has been used to develop a description of the social-ecological system of the Vecht basin between Hardenberg and Emlichheim. The result is presented in this chapter.

> *Note:*
> *All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.*
>
> *Information in paragraph 3.3.3 originates from the Vecht vision document. This document has been consulted because it provides important background information for the process of linking water management to regional development.*

The study area was defined as the area at both sides of the Vecht, between Hardenberg and Emlichheim and between Coevorden and Raderwijkerbeek/Radewijke as the southern border (See figure 3.1). The transect of the Vecht within the area is approximately 20 km long.

Figure 3.1The study area and the location of the respondents from the following sectors: Local water management, Business / industry, Agriculture, Tourism / leisure, Nature protection, Inhabitants



3.1 Character of the area

The entire study area is an agricultural landscape in which the Vecht river represents a very important landscape feature (figure 3.2). The Vecht is strongly regulated and straightened (channelled). Oxbow lakes show the original stream channel of the Vecht. There are some small forest parcels in the area. At the Dutch side of the study area, the landscape is characterized by small scale agricultural activities, wooded banks divide the landscape in relatively small elements, while at the German side intensive agricultural production takes place.

Figure 3.2 The entire study area is an agricultural landscape in which the Vecht river represents a very important landscape feature. There are some small forest parcels in the area.

Some differences were found between the description of the character of the study area at both sides of the border; those differences might be the result of personal differences and not necessarily be related to the nationality of the respondents.

- In the description of the character of the area, German respondents mentioned the institutional features of the area; this was not mentioned by Dutch respondents. The German part of the study area is part of the Kreis Grafschaft Bentheim (Niedergrafschaf), located in Lower Saxony. Approximately 40 % of the river and its riparian zone are in owned by the state Lower Saxony, 60 % is owned by private persons.
- The entire study area is flat which is only mentioned as a typical feature by German respondents.
- Dutch respondents mention the peaceful and open character of the area.

Note: All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.

3.2 Current societal functions of the study area

Main societal function of the area is agriculture. In the German part of study area, agricultural production includes both food products and crops for industrial purposes. Production is concentrated on maize and starch potatoes, as well as dairy farms and increasingly factory farming (poultry farming and pig breeding). Starch potato production is of great economic importance, since it is the main raw material for the Emsland Group (slogan: „using nature to create“), a large starch production company located in Emlichheim. Maize is mainly produced as feeding stuff for dairy farms and increasingly for biogas plants. In the Netherlands, agricultural activities are focused on food production, mainly live stock (cattle and pasture). Besides, a small area is being used for production of beet, potatoes, maize etc. In the Dutch area, some farmers have developed sidelines like day-care farms in Loozen (at Loozensche Linie) and Holtheme.

Recreation activities are mainly cycling and hiking; several transboundary routes exist. The long distance hiking trail ‘Pieterpad’ crosses the study area, along the Vecht. Water sports mainly consist of fishing and boating with small boats. A center with recreation houses is present in Gramsbergen, a small village with a nice historic centre; camp sites are situated outside the study area, southwest of Hardenberg. Recreational hunting focuses on rabbits and hare (puss).

Concerning housing it is relevant to notice that people from the west of the Netherlands move to the study area because of the peace and the space. People from Hardenberg move across the border to Germany because of the fact that housing prices are significantly lower than in the Netherlands.

The main function of the Vecht is drainage. According to bi-lateral agreement, the Netherlands is obliged to accept a certain amount of water from Germany.

Nature is - described by the respondents to be - limited in the study area, although during the discussion of the ecosystem service *habitat*, they provided information about many different landscapes elements that provide habitat to fauna. The German natural reserve „Denne“, is a compensation area for farmers and industry.

Industrial activity is situated south of Coevorden at the Europark and outside the study area, south of Hardenberg.

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3.3 Development (history and future)

3.3.1 The Vecht

From transport on a natural, regularly flooding river…
In the past (at least until the 50-ies), the river used to have gradual sand banks. Annually, the river used to overflow its banks locally during Spring or Autumn. In 1947, high river discharge caused flooding of the land at Ane with water depths up to 1,5 meter. Until the 70's or 80's the Vecht acted as waterway for ships that transported munition. The river has been used for transport of other goods as well. In the course of time, transport reduced due to the low water level of the Vecht and the increase in land transport. Nowadays, there is no commercial transport at the Vecht.

...to water regulation in favour of agriculture and inhabitants…
In order to establish faster discharge and to control water levels in favour of agriculture and water safety for villages close to the Vecht, the river has been partly channelled and sandy river banks have been replaced by stone river banks. The German part of the Vecht was straightened and regulated first in the 30ies and again in the 60ies. Until then, efficient agricultural land use was not developed in the region, mainly due to its landscape features, characterized by the predominance of bog land. In 1950 the German federal government approved the „Emslandplan", an economic development plan which aimed to adjust the standard of living in the whole Ems region and also parts of the Grafschaft Bentheim to the German mean standard. This development policy had a great impact on the Vecht River, since its goals were to make the bog land usable for agriculture (Vecht river basin management plan).

The construction of dams created a relative constant river depth; while this used to be lower in summer under natural circumstances. The current situation hampers accessibility of the water for swimming (which is also forbidden) and according to the respondents it decreases the landscape beauty.

…to a semi-natural river in favour or water safety in combination with nature and recreation.
Nowadays, the meandering course of the Vecht and the river banks are being restored at the Dutch side by removal of the stone river bank protection. This future situation will result in wetland nature and more diverse flora due to fluctuating river depths. River restoration will also involve a lower water depth and creation of a multilevel waterbed. A lower water depth with more fluctuation will create habitat for water plants.

The need for control over the water system remains, the old sluice 'De Haandrik' north of Gramsbergen will be restored in 2011.

At the former defence site of Napoleon, Loozensche Linie, the old meander curve has been reconnected to the Vecht recently; thereby contributing to renaturalization of the Vecht and making the site better accessible for the public.

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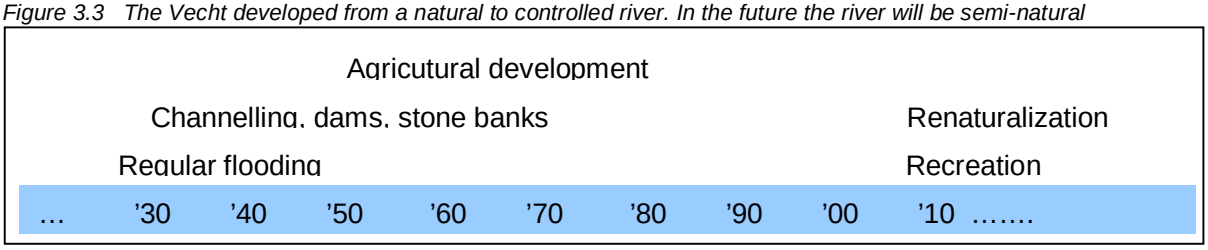
In Hardenberg, the area along the Vecht will be redeveloped into a park (Vechtpark). The park will include a promenade and water storage capacity by means of inundation zones. These zones will also function as a spawning area for fish.

In the German part of the study area no measures for a renaturalization of the river have been implemented so far. The reconnection of the old meander near Volzel and Echteler proofed not to be cost-efficient (the authors of this document did not investigate the cause for this). The reconnection of oxbow lakes near Laar is still being discussed.

Figure 3.3 schematically demonstrates the development of the Vecht.

Figure 3.3 The Vecht developed from a natural to controlled river. In the future the river will be semi-natural



3.3.2 Societal developments

In the Netherlands, small cattle farms have been closed and replaced by residences (e.g. for new residents from the west). Existing farms will expand; large newcomers are not allowed based on the zoning scheme of the area. The reason for this is protection of the landscape. Today, agriculture in the region is confronted with serious changes, since it heavily depends on EU agricultural policy. Subsidies for starch potatoes will end in 2012 which implies changes for German farmers as well as for the biggest employer in the German part of the study area, the Emsland Group. Agricultural production is assumed to loose competitiveness. This trend is already visible through a growing number of empty farm houses. On the other hand, demand for land is increasing, at least at the German side, first for the production of energy crops, and second for impervious surfaces.

Both the German and the Dutch local authorities wish to expand tourism activities in order to support the local economy. Especially bicycle an canoe tourism are considered promising in Germany. Emlichheim has applied for the authorization for motor boats on the German site of the Vecht; while in the Netherlands, the water board has the intention to limit accessibility of the Vecht for boating at the Vecht to small boats with electric or no engines in order to preserve peace (in favour of nature) and prevent river bank erosion. In order to improve the navigability of the Vecht, dams on the Dutch side will be removed. German and Dutch entrepreneurs from the tourism sector try to bring the region to the notice of potential customers at both sides of the border.

Industry has been developed in the recent past. The Europark has led to an increased number of trucks passing Emlichheim and the study area. At the moment, a bypass road is being discussed, that might as well go through the preserve area „Denne“. The Europark is supposed to grow within the next years, thus promotion of industries builds another strategy to face structural change in the region. It is however difficult to say if expected labour market effects will be met, since the number of labour intensive industries is in general decreasing.

Note: All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.

Protest against a waste incineration plant at the Europark has demonstrated that Emlichheim´s citizen want to be involved in politcal decision making. For future decision making active citizenship should be considered as a challenge and an opportunity.

In the field of energy production, Emlichheim is supposed to get a new wind park.

The development of an ecological connection zone close to the southern border of the study area was cancelled due to a lack of money for the acquisition of required land.

3.3.3 Transboundary Vecht vision

The information in paragraph 3.3.3 is not obtained during the interviews but originates from the Vecht vision (2009)

In the transboundary Vecht vision, ambitions and measures for the transboundary Vecht basin have been described. This document has been consulted because it provides important background information for the process of linking water management to regional development.

Highlights from the Vecht vision:

1. Guarantee water safety at high discharge, but allow a natural river where possible.
2. Inhabitants feel connected with the river, supported by better accessibility of the Vecht and protection of cultural heritage.
3. Restoration of the Vecht as semi-natural river strengthens the socio-economic status of the Vecht basin.
4. In 2050 the Vecht is the central focal point in the area, people are aware of the river and its value.

Measures until 2015 are focused on:

- Remove River bank protection.
- Connect meander curves.
- Nature friendly maintenance.
- Create Inundation zones.

3.4 Main ecosystem services according to stakeholders

In this section, the information is presented that the respondents provided about ecosystem services in the study area, landscape/ecosystem features that are affecting them, interrelationships and the beneficiaries. The information is provided per ecosystem service (e.g. agricultural products). All information is this paragraph is provided by the respondents. For critical issues, additional expert judgment or data might be necessary.

3.4.1 Agricultural products

At the Dutch side, the land is mainly used for food production, especially livestock. The relatively moist parcels along the Vecht are mainly used as pasture land. In Germany, starch potatoes are not only being used for food production, but also for industrial purposes. Farmers and agricultural industries (like Emsland Group and others) profit. Maize is produced as feeding stuff and for biogas plants. Thus it is not possible to say if the broad population

Note: All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.

profits from food production in the study area. There is only a very small market for regional food products. These regional products (honey, sausage, bentheimer pig, liquor) are being sold for example in the “Grafschafter Korb”, but mainly as presents or to tourists and not for every day consumption, since they are relatively expensive. A baker uses locally produced wheat.

3.4.2 Fertilizer

Menure is being traded as fertilizer.

3.4.3 Nutrient cycle

The nutrient cycle is important for agricultural production, thus for the farmers. Intensive cultivation has led to an overuse of nutrients. Angler, farmers and Vechtverband say that farmers do not exceed the threshold value for nutrients. Nature conservationists talk about a high input of nutrients.

3.4.4 Energy production

Prunings, maize and manure are being used for the production of energy at some small production facilities. Bacteria play a major role in the fermentation of biomass. The region is supposed to be a high potential region for geothermal energy production. Until now it can only be found at a small scale. Several buildings in Coevorden (school, hospital, in the future the new town hall) are connected to a Aquifer Thermal Energy System (ATES). At the dam ‘Haandrik’, the fall of the Vecht water is being used to produce energy.

There is dispute about solar power and wind energy being ecosystem services or not. However, since these two sources of energy were brought up during the interviews as relevant issue in the region, they are mentioned here. Solar energy is being used to some extend by means of solar panels; in the Netherlands at the roofs of industrial and agricultural buildings and the municipality’s yard; in Germany to a larger extend, on huge farmhouses and on private houses. Wind mills are present in the German part of the area but not in the Dutch part where the mills are considered a blot on the landscape.

3.4.5 Genetic resources

Genetic resources: On a German farm in the study area endangered species are being raised (Bentheimer pig, Bentheimer sheep etc.)

3.4.6 Transport

The Coevorden -Vechtkanaal is being used for transport of goods from the Botlek area in the west of the Netherlands to Coevorden. In the German part of the area both the Vecht and canals are not being used for transport.

3.4.7 Fresh water

Groundwater and surface water from the Radewijkerbeek, at the southern border of the study area, is being used as cooling water (for the plastic products industry in Coevorden) which is being discharged into this brook after use. Surface water, and to a smaller extend groundwater, is being used for irrigation. Wells seem to be a relatively expensive and not efficient alternative to rain or surface water use (extraction from the Vecht). German farmers are supposed to get a permission for the withdrawal, but it seems that they tend to avoid this bureaucratic step. However, until now there have not been seriously low water levels due to this practise and thus illegal water withdrawal does not cause conflicts until now. Surface

Note: All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.

water also provides drinking water for cattle. It is expected that the demand for water for bio-fermentation will increase. The industrial laundry at Gramsbergen uses groundwater as process water.

3.4.8 Water regulation

The water cycle seems to be out of balance; in Germany, during spring season groundwater levels decrease since the year 2000; in contrast, flooding occurs already in august. The water level depends on water management measures in the Netherlands. There is no possibility to regulate water levels in the German part of the study area. Flooding and drought affects especially farmers with land adjacent to the Vecht. German farmers in the region ask for more water management, since climate change (very dry spring season since 5 years in the study area) affects their crops. German farmers expect early floodings such as occurred in august 2010 to occur regularly in the future. The 2010 flooding affected farmers who cultivate intensively at the Vecht, since the Netherlands had already taken the internationally agreed amount of water in Gronau/Enschede from the Dinkel, so the dam was closed and the water stayed in the German part of the study area. There are no extensively used retention areas in the German part of the study area. The preserve area „Denne“ is within the flood plain. However, it is not directly connected to the Vecht. For the Dutch part, the river Vecht and some assigned retention areas play a major role in retention of water. For example, the (pasture) area of ‘De Meene’ will be assigned as water retention area that may flood periodically. About 4 million cubes of water can be stored here in times of peak flow. Old meanders of the Vecht are being reconnected in order to enlarge the water retention capacity of the river. The meandering of the river, together with the restoration of sandy river banks (in stead of stones), also improves the value of the river for the landscape. Besides, river bank restoration creates opportunities for nature. For example, at Uilenkamp just outside the study area, riverbank protection is absent; which enables habitat for the bird sand martins in the sandy river banks.

Land use, like the choice for specific vegetation, influences the water cycle, e.g. grass prevents fast evaporation of soil moisture.

Farmers are being paid for cutting the vegetation at the floodplains; this is beneficial to the fast discharge of water.

The water level of the Vecht influences the groundwater level.

The closure of a groundwater extraction has resulted in flooding in the past.

3.4.9 Water purification

Dutch respondents mention that soil purifies the groundwater by filtering. German respondents explain that water purification is conducted by sewage plants. Since there are no retention areas where soil can purify groundwater, this point is not considered relevant in the human controlled system.

The water quality has been improved as a result of the elimination of contaminated discharges and improvement of sewage systems. This improvement led to an increase in species richness of fish.

Note: All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.

3.4.10 Carrying capacity

The main soil type along the Vecht is loamy river sediments, the rest of the study area mainly consists of sand. Carrying capacity of the sandy soil is good. In the past this was less optimal due to high groundwater level.

3.4.11 Raw materials

Quartz sand is being exploited close to the Europark; West of Gramsbergen, past sand excavation created a pit that is now filled with water close to Gramsbergen. The Vecht is increasingly taking sand away by erosion, which increases the depth of the river. Inundation results in sedimentation, which creates new soil. The sediment also brings nutrients to the inundation zone and supports habitat for vegetation.

Farmers are being paid for maintenance of the wood banks that contribute to the landscape value. The toppings are being used as fire wood.

3.4.12 Cultural services (recreation, inspiration, relaxation)

The peaceful character of the area attracts tourists and habitants. Artists find inspiration at the banks of the Vecht. There is art work at the Kunstwege; which is not perceived positively by all of the population. The accessibility of the Vecht for recreation is considered limited, mainly due to limited hiking and bicycle trails, partly because of stone river banks. Land owners are being paid when they provide access to the land for hikers. Parts of the Vecht will remain inaccessible in order to preserve peace that is required for nature conservation.

Recreation at the Vecht consists of fishing and boating by means of small boats and canoes (a small harbor and canoe club are present in Gramsbergen). The latter is hampered by the dams and it is not possible at the moment to travel from Germany to the Netherlands (or the other way around). The dams also hamper boats from the north that would like to cross the study area on the Vecht. Locks enable small boats to cross dams.

A section of a bicycle trail next to the Vecht south of Hardenberg will be replaced from the dike to the river's summer bed. This will increase the perception of nature and since the path will be inaccessible due to inundation, this will create awareness of the river dynamics. Transboundary bicycle and hiking trails exist.

Fishing has a recreational character. Approximately 500 fishing permissions are sold by the angel association for the whole Grafschaft Bentheim. Some fishermen use the fish for consumption an one fisherman trades eel at a very small scale. Local restaurants sometimes use crayfish. Fishing is being hindered by the abundance of water plants; while the water plants affect the water quality in both negative and positive ways. Removal of dams and the construction of fish ladders are beneficial for fishing. German respondents state that there is no fish population without trimming fish; the Vecht in the study area is structurally very poor – and thus not a preferred nursery for fish or birds.

Besides recreational hunting, hunters also hunt on request of farmers when wild animals damage the crops.

3.4.13 Habitat

Pasture provides habitat for specific birds, e.g. gooses forage here in winter. Partridge live in open landscape; while deer needs the protection of a forest. Badgers find shelter in

Note: All information in sections 3.1 – 3.5, with the exception of paragraph 3.3.3, is derived from the interviews.

shrubbery. Heath land in Germany provides habitat to e.g. viper and lizard. Different fish species need different water depths for their habitat. The Vecht and it's cut off meander curves that are now present in the landscape as oxbow lakes provide habitat to birds like cormorants. One of the oxbow lakes is being leased by the local fish club. Floodplains provide habitat for flora and fauna, e.g. shrew.

3.4.14 Pollination

Fruit trees and other vegetation need pollination by insects such as bees. Pollination is also important for apiculturists (regional products).

3.4.15 Connectivity

The Vecht both contributes and hampers connectivity. The Vecht and it's related waterways connect habitats for birds. Connectivity has been improved at the Vecht. Fish passes have been installed and optimized with the help of the angler association. Three transverse structures still need to be transformed at the German site, although there have not been any structures in the study area itself. Connectivity of land habitats on land is reduced by infrastructure and water.

3.4.16 Protection against natural forces

Forest trees act as wind breakers for adjacent land.

3.4.17 Education

There is a youth project at the preserve area „Denne", organized by the Jugendbildungsstätte Emlichheim. Conservationists and the angel association offer field trips to school classes and workshops for adults in other parts of the Vecht region. In the study area they have not conducted such activities yet. The Dutch nature education centre De Koppel organizers excursions in the study area, for example next to its facility along the Vecht.

3.4.18 Climate regulation

Climate regulation is not an issue. However, maize is said to have a high capacity to sequest CO_2.

3.5 Current economic incentives

Below, current economic incentives that came up during the interviews and that are applied in the study area are listed below. It needs to be stressed that not all economic incentives relate to payment for ecosystem services.

- The natural conservation foundation of the Grafschaft Bentheim buys compensation areas for farmers and industry. 'Ecological accounts' make the establishment of eco-pools possible. One compensation area is the natural reserve 'Denne', which is also part of the flood plain.
- Dutch farmers are being paid for cutting vegetation in the floodplains; this is beneficial to the fast discharge of water.
- Dutch farmers are being paid for maintenance of the wood banks that are part of the characteristic landscape; the toppings are being used as fire wood.
- A land owner is being paid for providing access to the land for hikers in order to enable use of the recreational value of the landscape.

Production subsidies:

- European subsidies for production of starch potatoes.
- German subsidy for biogas production.

4 Risks and opportunities related to ecosystem services

Based on the information that respondents provided during the interviews about the societal functions of the study area (see paragraph 3.2), the expected changes for the future (see paragraph 3.3) and about the relation between the social-economic system and the ecosystem (paragraph 3.4), risks and opportunities for society related to the ecosystem services in the study area are identified. They are presented in table 4.1. Opportunities also refer to solutions to deal with risks. In the next phase of the project, the relevance of the risks and opportunities should be assessed further and some information needs to be verified.

Table 4.1 Risks and opportunities for society related to the ecosystem. In case issues are specifically mentioned in the Dutch or the German part of the study area; this indicated by respectively ‘ NL’ or ‘ DE’ .

Ecosystem services	Risks	Opportunities
Food production	Competition for fertile soil with energy crops Changes in European policy (end of subsidies for starch potatoes in 2012) DE: Climate change will affect water regulation (farmers expect more frequent drought and flooding)	A new product might be local fish. However, there is only a (very small) market for regional food products.
Water regulation & Protection against natural disasters	DE: Intensive farming in the flood plain. Damage to crops if early flooding occurs. DE: Dry springs. Low groundwater level. No natural retention area in the study area. Dry springs make farmers withdraw more water from the Vecht. Low water levels imply higher water temperature and lower oxygen level with consequences for the habitat function of the river	Incentive for extensive land use in the floodplain. By land from the farmers in the Vecht area that could be used as retention area (compare projects BUND near Schüttorf) or pay for temporal water storage. Reconnection of old meanders enlarges the water retention capacity of the river. Together with the restoration of sandy river banks (in stead of stones), it also improves the value of the river for the landscape. Besides, river bank restoration creates opportunities for nature. Disconnect rainwater drainage from the sewage system in order to save sewage costs.
Biofuel crops and other energetic resources	Manure and stench, fermentation facilities are a blot on the landscape Competition for fertile soil with food crops	Maize can be used for biofuel without stench. Location at industrial site. New income possibility for the region

Continuing table 4.1:

Ecosystem services	Risks	Opportunities
Recreation	Increase in recreation at the Vecht might disturb nature. NL: the accessibility of the Vecht for recreation is considered limited.	Use tourism as an opportunity to let people get in touch with the natural system. Controlled tourism/ sustainable tourism (examples from other regions, Diemel in Hessen) will balance tourism and nature preservation e.g. by restricting boating to small electrical boats. Boating at the Vecht might support tourism which is considered as an important source of income.
Nutrient cycle	Intensive cultivation can lead to an overuse of nutrients. It is not really clear if eutrophication is still a problem.	Buffer strips can enable use of the water quality regulating function of the soil.
Connectivity	Development of the planned ecological connectivity zone in order to support nature is on hold due to financial constraints	
Nursery and habitat		Connection of oxbow lakes near Laar could improve structure of the river and thus improve conditions for biodiversity.
Hydropower		NL: improved technology increases effectiveness of hydropower production at the dams, even if the water level drop is limited. unexploited potential for energy production for energy production with relative low CO2-emissions;
ATES (Aquifer Thermal Energy Storage)/ geothermal energy		Opportunity to save energy for heating and cooling of buildings. NL: unexploited potential is being investigated. DE: High potential area.
Education		DE: Offers of BUND and angle association in schools - adapt concept from the Dutch environmental education center

5 Discussion

During a workshop (12 September 2011), the results of the interviews and the processing of the results have been discussed with the funders of the project (BMU and Waterdienst), local water managers, the major of Emlichheim and policy makers and project leaders at the municipality level. The outcomes of the workshop are presented in this chapter.

The participants indicated that they need an integrated approach for the sustainable development of the study area in which ecology and economy are coupled. Having the background of the Vecht vision, integrated regional planning has been a guiding principle in the case study region. However, to put this approach into practice, to transfer the integration to the process of measure implementation has been proven difficult. They also want to place water management in a broader context and communicate the positive benefits of water management (e.g. measures within the framework of the Water Framework Directive (WFD) for several beneficiaries. It was pointed out at the workshop, that Lower Saxony is not able in terms of personnel nor financial resources to keep pace with The Netherlands in terms of WFD measures. This is one of the reasons why it is difficult to motivate for measures to improve watercourses in Lower Saxony. A pilot project might help to change this.

5.1 Potential of the ES approach for transboundary water management

Water managers agreed with the identified management issues in the study area, although more specification and more detail was demanded for identifying the real hot issues.

In response to the question ‘What is the difference between the applied ecosystem services approach and current practice in transboundary water management?’ water managers stated that the solutions might be better. Solutions that are designed at a high level without involvement of people in at the local scale are not optimal. It is good that the ES approach combines the view of different people. The ESS might help to explain the aims of measures and to create more support for them in the region. The results of this project, especially the identified risks and opportunities provide a broad perspective in which ecology and economy are mingled, while usually projects focus on one aspect of sustainability.

Delegates at the workshop mentioned that ecosystem services are easy to understand and therefore the concept can support communication with stakeholders. In contrast, during the German interviews, it seemed to be difficult to appreciate the ecosystem services when those functions were traditionally considered human achievements. For example, water quantity regulation was considered a human task. To appreciate “natural water regulation” was sometimes difficult for respondents, since regulation of the Vecht and drainage of bog land were seen as important developments towards human control of these natural systems, enabling human development. The interviewers have explained that they did not explain the concept of ecosystem services to the respondents but that they discussed with them about specific ecosystem services. For the purpose of the interviews, it was not necessary to explain the concept and from previous experience we know that it is difficult for many stakeholders to understand the concept at an abstract level. Respondents did not add ecosystem services to the list that was prepared.

Another central issue at the workshop was the potential to apply the approach towards improvement of cost-effectiveness of measures.

Payments for ecosystem services (PES) were discussed as part of steering the sustainable use of ecosystem services. It was stressed that PES is not a goal but a measure that may be the solution to some issues. Practical implementation of PES could bring more responsibility to (the people in) the region The water managers face a lack of financial resources for river restoration projects and wonder if PES could be a solution for certain management issues.

5.2 The next phase

The results of this exploration of the opportunities of the ecosystem services approach for water management have demonstrated several interesting options for practical application.
Delegates showed interest to test the ecosystem services approach on one or two really specific issues in a next phase. One specific issue has already been identified during the workshop, namely transboundary boating in the Vecht (see also risks and opportunities in table 4.1). This issue has been debated between German and Dutch representatives for quite a while. It demands at first sight- from an ecosystems services perspective- a careful balance between the habitat function of the Vecht river and tourism.

BMU and the Dutch Ministry of Infrastructure and the Environment agreed with Deltares and Seeconsult that the latter two will make a proposal for the next phase. We propose to set up a process which combines a complete ecosystem services assessment and a mediation-like process. Quantification and (stakeholder) valuation of ecosystem services will be required during the next phase. In the assessment, the relation between boating and other ecosystem services of the Vecht, such as habitat for flora and fauna could be explored and changes in ecosystem services under several scenarios will be quantified. Besides the boating issue, the second issue could be identified in cooperation with the local water managers.

We propose to evaluate the value of the ecosystem approach with both the funders of the project and the stakeholders (including local water managers and other policy and decision makers). It will be assessed whether the ecosystem services approach supports to find better solutions, both in terms of acceptance, support and cost-effectiveness of measures.

A detailed description of the proposed activities and methods will be included in the proposal.

6 Conclusions

With the activities that were described in this report, the first steps of an ecosystem services assessment have been completed. The interviews about ecosystem services provided a lot of information about the societal functions of the area and about how the ecosystem is related to the social-economic system. Based on this information, risks and opportunities for society in relation to the ecosystem have been identified.

Societal challenges in the study area are related to the main current economic functions of the area: agriculture and tourism. Changes in EU agriculture policy are expected to have implications for agriculture, Emslandstärke and biogas production. Municipalities have the ambition to expand tourism in order to generate income, mainly by promoting water recreation. The challenge is to develop sustainable water recreation on the Vecht; tourism in combination with peace for nature. Besides, there is a desire to establish labor intensive industry at the Europark and a new bypass road to the Europark in Germany.

Main challenge for water management seems to be river restoration in favor of tourism, nature and water regulation. The region is searching for a sound socio-economic basis and sees the Vecht as the life line of the area. All measures in the Vecht vision are focused on this life line function of the Vecht. Changes in water quantity (groundwater and surface water) as a result of climate change are expected to be harmful to (German) farmers and there is a need to develop sustainable tourism with respect to nature.

Local water managers recognize the identified challenges for water management and sustainable development of the study area. **The added value of the ecosystem services assessment is expected to be to find better integral solutions to the problems in the area, new funding opportunities for measures and more support by land owners and the public**. Policy makers, administrators and water managers in the region aim to find integral solutions for development issues the study area. The ecosystem services approach is beneficial to this since it integrates the ecosystem with the social-economic system and is cross-sectoral.

Delegates of the final workshop showed interest to test the ecosystem services approach on one or two really specific issues in a next phase. BMU and the Dutch Ministry of Infrastructure and the Environment agreed with Deltares and Seeconsult that the latter two will make a proposal for this. One specific issue has already been identified during the workshop, namely transboundary boating on the Vecht, which is an important topic in relation to the ambition to develop sustainable tourism. We propose a process which combines a complete ecosystem services assessment and a mediation-like process. The relation between boating and other ecosystem services of the Vecht, such as habitat for flora and fauna could be explored and changes in ecosystem services under several scenarios will be quantified. Stakeholder valuation should also be included. Besides boating, a second issue could be identified in cooperation with the local water managers. It will be assessed whether the ecosystem services approach supports to find better solutions, both in terms of acceptance, support and cost-effectiveness of measures. A detailed description of the proposed activities and methods will be included in the proposal.

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A Appendix Map

B Appendix List of ecosystem services

Ecosystem services	
PRODUCTION	Food production (crops, fish aquaculture)
	ATES/geothermal energy
	Hydropower
	Biofuel crops and other energetic resources
	Fire wood
	Timber
	Pharmaceuticals
	Raw materials, fibers
	Fertilizer
	Genetic resources, medicine
	Mining
	Construction materials (sand, gravel, shells, clay)
	Irrigation water
	Drinking water
	Industrial processing water (/cooling water)
REGULATION	Protection to natural disasters (flooding, storms, surges)
	Climate regulation (e.g. greenhouse gas emission)
	Water regulation (storage, drainage)
	Water purification
	Erosion regulation
	Disease-regulation
	Pollination
CULTURAL	Recreational service (tourism and leisure)
	Aesthetic/inspirational services
	Education
SUPPORTING	Nutrient cycle
	Water cycle
	Connectivity
	Carrying capacity (e.g for building, infrastructure, plough)
	Transport
	Nursery
	Soil development (e.g. sedimentation)
	Habitat flora and fauna
	Primary production