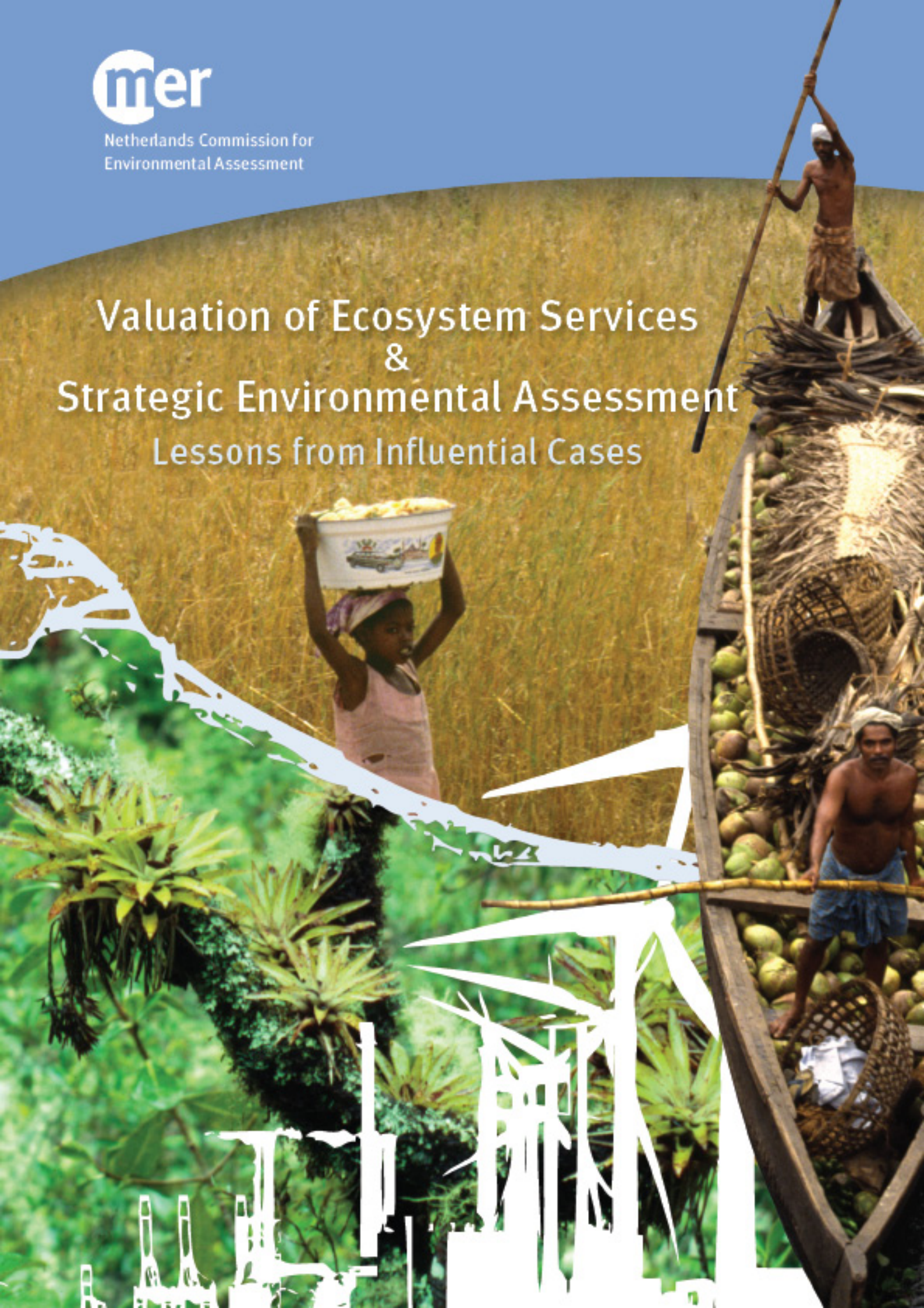
Netherlands Commission for Environmental Assessment

# Valuation of Ecosystem Services & Strategic Environmental Assessment

## Lessons from Influential Cases



# Valuation of Ecosystem Services and Strategic Environmental Assessment

## Lessons from Influential Cases

ISBN 978-90-421-2537-7

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September, 2008

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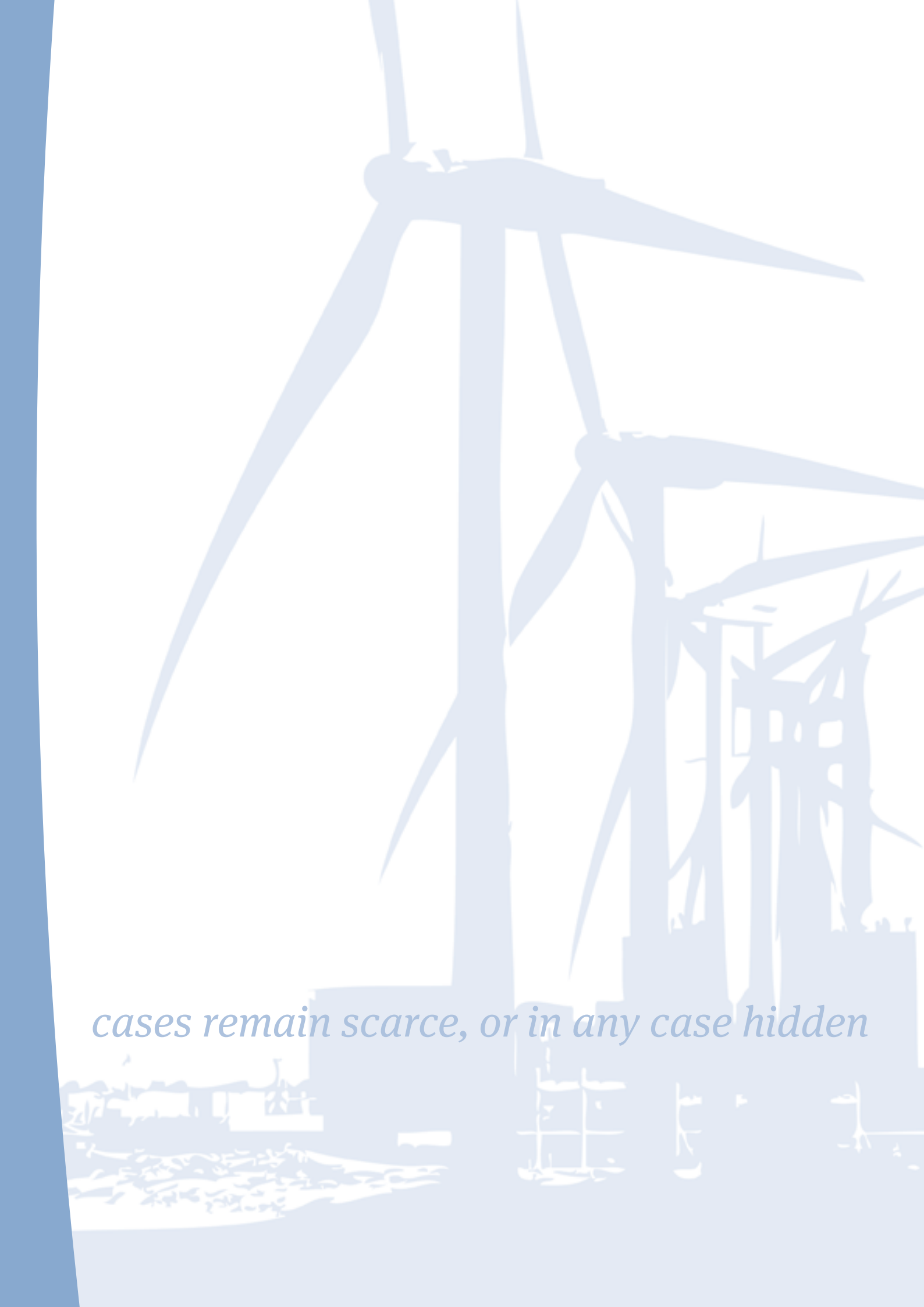


*cases remain scarce, or in any case hidden*

# Summary of main messages

**Ecosystem services are the benefits people obtain from ecosystems. The concept of ecosystem services has received significant attention since the appearance of the Millennium Ecosystem Assessment. A growing body of knowledge is developing on ecosystem services and on the valuation of these services. Yet, cases where valuation of ecosystem services has actually made a difference in real-life policies or plans still remain scarce, or in any case hidden.**

So far, the SEA community has hardly used the opportunities provided by ecosystem services to translate environment into societal benefits. Despite serious efforts to identify good SEA case material, only few SEA cases are available with a clear recognition of ecosystem services. In other words, it is difficult to find good practical evidence that application of the ecosystem services concepts "works" in the context of SEA.

Therefore ten influential cases were documented, where the recognition, quantification and valuation of ecosystem services have significantly contributed to strategic decision making. In all cases, the use of the ecosystem services concept supported decision making by providing better information on the consequences of new policies or planned developments. In several cases SEA or a process similar to SEA was followed. Yet, in all cases valuation of ecosystem services, in one form or another, resulted in major policy changes or decision making on strategic plans or investment programmes. Ten additional cases have been analysed in less detail; these provide additional support to the main lessons learned.

The main messages derived from case-evidence presented in this report are directed to the three communities involved in SEA and strategic decision making:

## Main messages for decision makers (all levels of government)

### 1. Recognising ecosystem services enhances transparent and engaged decision making

It is generally accepted that quality of SEA and transparency of decision making is greatly enhanced if stakeholders are at least informed about, or preferably invited into a planning process. The recognition of ecosystem services facilitates the identification of relevant stakeholders – the word service by definition links an ecosystem (the supply side) to stakeholders representing the demand side.

Economic valuation increases the transparency of complex systems involving interactions between humans and ecosystems. It does not intend to prevent actual implementation of projects with impacts on ecosystem services, but it may affect the design of the intervention such that costs and benefits are traded off in a rational manner.

Valuation tools in the hand of opponents of obviously unsustainable projects can provide such power that plans have to be modified or cancelled.

### 2. Insight in the distribution of ecosystem service benefits highlights poverty and equity issues

In early planning stages, recognition of ecosystem services and identification of stakeholders can provide important clues on winners and losers of certain changes, and thus provides better understanding in poverty and equity issues.

Benefits and costs associated to ecosystem services can occur in geographically completely separate areas and affect different stakeholders, belonging to different divisions of society.

A manner to overcome distributional effects is provided by payments for ecosystem services (PES).

### 3. Valuing ecosystem services directly facilitates sustainability

In summary, this report provides evidence that the recognition and valuation of ecosystem services within the context of well-informed strategic decision making, facilitates a better representation of the three pillars of sustainability:

- **Financial sustainability** of environmental and resource management;
- **Social sustainability** by facilitating participation of stakeholders and by highlighting and addressing equity issues;
- **Environmental sustainability** by providing better insight in the long and short term trade offs of investment decisions.

## Main messages for SEA community
(competent authorities, consultants, and environmental agencies)

### 4. SEA and planning processes are enhanced by the identification and quantification of ecosystem services

Linking ecosystem services to stakeholders provides a good approach to involve relevant actors.

Identification and valuation of ecosystem services and identification of stakeholders puts biodiversity in the perspective of social and economic development needs. Some services may be under critical pressure and in need of conservation, not only because of biodiversity per se, but also because of essential services for human well being. Other services may perform well and may provide a development potential when underexploited. Such a constraints and opportunities approach results in an open and better platform for discussion.

### 5. Valuation of ecosystem services is more influential with decision makers

Monetisation of ecosystem services puts biodiversity considerations on the decision makers' agenda. Politicians may react negatively to the term "biodiversity", but more positively once they realise that environmental services have an economic value.

The one who conveys the message also makes a difference in the impact of the study. Boundary conditions such as timing, communication and ownership can be more important in terms of generating societal impact than the quality of the study only.

## Main messages for experts (ecologists and environmental economists in knowledge institutes and consultancies)

### 6. Methodological complexities do not necessarily hinder influential decision making

Due to the complex links between ecosystems and society, economic valuation of ecosystem services is often faced with methodological difficulties. However, for comparison of alternatives, absolute valuation figures are not necessarily needed; a relative value measure provides enough information for decision making.

In spite of methodological difficulties, economic valuation of ecosystem services provides acceptable clues for legal procedures and fines.

Sensitivity analysis is an important tool to avoid the risk of majors errors, and to focus efforts for further research on the most relevant issues.

Of course, in cases where uncertainty about the (impact on the) value of ecosystem services is significant and the service itself is considered of great societal importance, the precautionary principle should be applied.

### 7. SEA provides a platform to put valuation results in a societal context

There is a general lack of knowledge concerning the actual effects of valuation studies on planning and decision-making processes. Moreover, there is a general feeling that the great potential of such studies to have an impact is not used to the full benefit.

SEA supports decision making, and provides the platform to merge valuation results with the decision-making process. The SEA context guarantees the inclusion of stakeholders in the process and forces decision makers to take the information into account when coming to a decision.

# 1. Introduction

**The concept of ecosystem services has received significant attention since the appearance of the Millennium Ecosystem Assessment[1] (MA). Ecosystem services are the benefits people obtain from ecosystems. The MA has subdivided ecosystem services into four categories: provisioning such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits. Although not described as such by the MA, other categories have been recognised in scientific literature such as "carrying" services (providing a substrate or backdrop for human activities) or "preserving" services, which includes guarding against uncertainty through the maintenance of diversity.**

Knowledge institutes are creating a growing body of knowledge on the concept of ecosystem services. Environmental economics have produced an impressive collection of valuation studies (over 3000 have been reported by Environmental Valuation Reference Inventory (EVRI)[2], applying valuation techniques with ever increasing sophistication and reliability. Gradually the approach is being applied in practice, to support decision making and to guide development into a more sustainable direction. Yet, cases where economic valuation of ecosystem services has actually contributed to or exerted influence on strategic decision making on real-life policies, programmes or plans remain scarce.

So far, the SEA community has even less used the opportunities provided by ecosystem services as a means to translate environment into societal benefits, and link these to stakeholders. Even though we have seriously looked for good SEA case material, only few SEA cases were available with a clear recognition of ecosystem services. In other words, it is extremely difficult to find good practical evidence that application of the ecosystem services concepts "works" in the context of SEA. Yet, from personal experience, in a limited number of cases we know it does work well in SEA.

Therefore we have documented ten influential cases where the recognition, quantification and valuation of ecosystem services have significantly contributed to strategic decision making. Ten additional cases have been analysed in less detail and provide additional support to the main messages in this document. In all cases, the use of the ecosystem services concept supported decision making by providing better information on the consequences of new policies or planned developments. Valuation of ecosystem services, in one form or another, thus resulted in major policy changes or decision making on strategic plans or investment programmes. In several cases SEA or a process similar to SEA was followed, providing evidence that valuation of ecosystem services is an important tool to enhance the influence of SEA on decision making. The SEA community is therefore urged to make better use of this tool. Conversely, the academic community is urged to make better use of SEA as the vehicle to convey the messages coming from valuation studies. SEA has a legal basis in over 60 countries now and provides better guarantees that valuation studies are taken into account in decision-making processes.

1 More information at www.MAweb.org.
2 Environmental Valuation Reference Inventory (EVRI): http://www.evri.ca/

*... the concept of ecosystem services*

CASE 2 UZBEKISTAN Wetlands provide productive and regulatory services for the local economy. Wetland restoration has resulted in increased income for inhabitants.
© SevS/Slootweg

With this report we aim to contribute to closing the gaps between the three main communities targeted with this report: (i) the ecologists and environmental economists predominantly based within knowledge institutes, (ii) the strategic environmental assessment community, consisting of competent authorities, consultants, and environmental agencies, and (iii) the decision makers at all levels of government.

The report is structured as follows. Ten influential examples, demonstrating the strength of using valuation of ecosystem services in strategic decision making, are briefly introduced in chapter 2. These summaries refer to the full case descriptions available in a separate document[3]. Chapter 3 provides brief background information on valuation of ecosystem services. Based on the analysis of the case studies we have deliberately expanded the term valuation to non-economic quantification and societal valuation of ecosystem services. As this document will show, also simple quantification or non-economic valuation of ecosystem services can provide relevant information for decision making.

The main messages obtained from the cases are presented in chapter 4, followed by a "how-to" description in chapter 5, providing the minimal requirements for the implementation of a valuation study. This document is not a handbook on valuation studies, but simply summarises the logistics of the case studies which successfully applied ecosystem services assessment and valuation. For those interested to find out more, a list of helpful websites is attached.

In this report we will not go into detail with respect to the generalities of SEA; for this we refer to the OECD-DAC Guidelines document which provides an excellent description of what is considered good practice in SEA.

*... we aim to close the gaps ...*

3 Pieter J.H. van Beukering, Roel Slootweg and Desirée Immerzeel (2008). Valuation of Ecosystem Services and Strategic Environmental Assessments. Influential Case Studies. Report of the Netherlands Commission for Environmental Assessment, Utrecht, The Netherlands.

# 2. Influential cases

**Because of the unrecognised potential in the SEA community of using ecosystem services as a means to translate the environment into societal benefits, there is a need for convincing evidence that this paricular approach is the right way forward to go.**

In our search for influential examples of this approach, we started with the creation of a long list of 24 potentially relevant cases, all recognising ecosystem services, and all having resulted in concrete decision making at strategic level (i.e. above project level). From this long-list, ten cases were selected for further detailed analysis. This selection aimed at an even distribution over geographical regions and the various sectors, with a preference for cases from non-industrialised countries. As most relevant material comes from industrialised countries, these are still overrepresented. Cases linked to water or "wet" environments are very dominant in the list of cases. Apparently, the multifunctional character of water triggers the need for an ecosystem services assessment. And of course, the community of wetland experts has for long promoted the idea of the multifunctional character of wetlands; for two decades the Ramsar Wetlands Convention has promoted the notion of wise use of wetlands, even before sustainable use became a commonly used term.

Below a summarised description of the cases is provided. These summaries provide a minimum of background information in order to be able to position the studies. Full case descriptions, including sources of information, are provided in a separate document. In this separate document an additional ten cases appear in textboxes to provide reference of similar findings in other cases. Four categories of cases are presented below (see tables 1 & 2):

i. Six SEAs and SEA-like cases, commissioned to inform decision making, enhancing transparency by participatory processes and/or public disclosure, and dealing with strategic decisions setting boundaries for future activities;
ii. Two cases aimed at sustainable financing of ecosystem management through payment of ecosystem services;
iii. An advocacy case where valuation studies were successfully used to oppose a proposed plan;
iv. A damage assessment study to establish a damage payments scheme.

| # | Study | Ecosystem | Country | Type |
|---|---|---|---|---|
| 1 | Water Conservation & Irrigation Rehabilitation | Reclaimed desert & river delta | Egypt | Voluntary SEA |
| 2 | Wetland Restoration Strategy | Wetlands | Aral Sea | SEA-like |
| 3 | Strategic Catchment Assessment | Watersheds | South Africa | Part of SEA process |
| 4 | Making Space for Water in Wareham | Coastal wetlands | United Kingdom | Experimental SEA |
| 5 | Climate policies and the Stern Review | Global | Global | Inform policy making |
| 6 | Natural gas extraction in the Wadden Sea | Wetlands | Netherlands | Inform EIA and SEA process |
| 7 | Management of marine parks | Coral reefs | Dutch Antilles | Sustainable financing |
| 8 | Watershed rehabilitation & services provision | Forest | Costa Rica | Payments for Env. Services |
| 9 | Water scarcity & transfer | Rivers | Spain | Advocacy |
| 10 | Exxon Valdes oil spill in Alaska | Coastal resources | United States | Damage assessment |

Table 1 The case studies as presented in table 1 are explained in detail in a separate background document. In addition, this background document contains ten additional, summarised case studies (see table 2). Both documents are available online: http://news.eia.nl/www/ncea/products/publications.htm.

| # | Study | Ecosystem | Country | Policy context |
|---|---|---|---|---|
| 1 | Impact of dams on wetlands & livelihoods | Wetlands | Mali | Investment decision |
| 2 | Livelihood & conservation of Korup National Park | Tropical forest | Cameroon | Nature conservation |
| 3 | Large scale wetland restoration | Wetlands | Everglades | Nature conservation |
| 4 | Management of Durban's open spaces | Open spaces | South Africa | Environmental planning |
| 5 | Cost of policy inaction for biodiversity | Biodiversity | Global | Awareness raising |
| 6 | Carbon offset investments in Iwokrama National Park | Tropical forest | Guyana | Investment decision |
| 7 | Mangrove rehabilitation | Mangroves | Philippines | Nature conservation |
| 8 | Voluntary user fee system for divers | Coral reefs | Hawaii | Sustainable financing |
| 9 | Watershed rehabilitation for drinking water | Rural areas | New York | Payments for Env. Services |
| 10 | Penalty system for coral reef injury | Coral reefs | Florida/Hawaii | Damage assessment |

Table 2 Case studies summarised in boxes in the background document

CASE 5 GLOBAL CLIMATE
The Stern Review's main message is that the benefits of strong, early action to combat climate change considerably outweigh the costs. © SevS/Slootweg

CASE 1 EGYPT, 2006

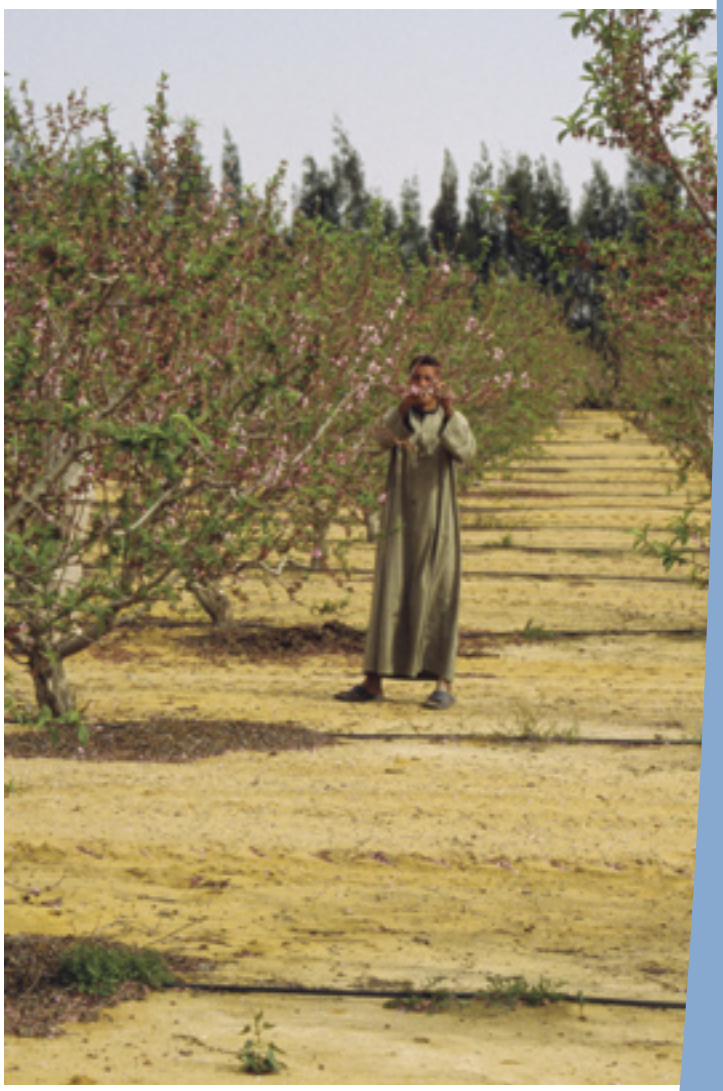
# West Delta Water Conservation and Irrigation Rehabilitation Project

| | |
|---|---|
| **Valuation context** | Voluntary SEA to support decision making |
| **Eco-services** | Multiple services related to ground and surface water in desert area, Nile delta, and coastal zone ( such as agri- and aquaculture, fisheries, public water supply, maintenance of coastal lagoons, etc.) |
| **Valuation** | Financial gains and losses linked to agricultural water supply quantified; other services quantified in terms of numbers of jobs or people affected |
| **Assessment** | SEA during planning phase of a public-private investment programme |
| **Decision** | Magnitude, technical design, and conditions for resulting projects influenced |
| **Scale** | West Delta region: investment initially planned for appr. 100,000 ha. |
| **Planning level** | Private-public investment programme |
| **Sector** | Water resources management and irrigation |

In the desert area west of the Nile Delta, groundwater based export-oriented agriculture has developed, with an annual turnover of approximately € 500 million (US$ 750 million). However, the rate of groundwater exploitation by far exceeds the rate of renewal. Groundwater is rapidly depleting and turning saline. To reverse this situation the Government of Egypt has proposed a plan to pump 1.6 billion cubic meters of fresh Nile water from the Rosetta Nile branch into an area of about 45,000 ha.

The use of strategic environmental assessment (SEA) at the earliest possible stage of the planning process has guaranteed that environmental and social issues beyond the boundaries of the project area were incorporated in the design process. Valuation of ecosystem services focussed on the services linked to water resources under influence of the major driver of change, i.e. transfer of water from the Nile to the desert area. Simple quantification techniques provided strong arguments for decision makers at the Ministry of Water Resources and Irrigation and the World Bank to significantly reduce the scale of the initial phase.

The diversion of water from relatively poor smallholder farmers in de Nile Delta to large investors in the desert west of the delta, poses unacceptable equity problems. It was decided to follow a phased implementation of the plan, providing time for the National Water Resources Management Plan to be implemented, including its water savings programme. Short-term measures can produce necessary water savings to allow for the first, relatively small pilot phase of the WDWCIRP plan. Further water saving measures will provide room for further expansion.



CASE 1 EGYPT Desert farming employs tens of thousands of workers. Additional water supply from the Nile is proposed, potentially affecting the ecosystem services in the entire Nile delta. © SevS/Slootweg

*... transfer of water from the Nile to the desert area ...*

## CASE 2 UZBEKISTAN, 1996

# Aral Sea wetland restoration project

| | |
|---|---|
| **Valuation context** | SEA-like process to support decision making |
| **Eco-services** | Restoration of wetland services for local livelihoods and health |
| **Valuation method** | Participatory MCA of strategy based on semi-quantified ecosystem services for 6 alternatives. Full CBA of pilot project based on provisioning services. |
| **Assessment** | SEA integrated in a water resources management strategy development process |
| **Decision** | Resulted in decision making by regional government and donor. One component successfully implemented |
| **Scale** | Regional: Amu Darya delta - appr. 12.000 km² |
| **Planning level** | Both plan (strategy) and project (pilot project) |
| **Sector** | Water resources and wetland management |

Intensification and expansion of irrigation activities in Central Asia led to the shrinking of the Aral Sea, and degradation of the Amu Darya delta south of the sea. Loss of biodiversity, loss of vegetation and fisheries, the occurrence of salt and dust-laden winds and salinisation of groundwater led to deteriorating living conditions. About 10% of the original wetlands remained in the delta, largely maintained by a mix of incid ental floodwaters and saline drainage water flowing into constructed water reservoirs.

The Interstate Committee on the Aral Sea in consultation with the World Bank requested the development of a coherent strategy for the restoration of the Amu Darya delta, broadly accepted by local stakeholders and government authorities, and an investment programme of priority pilot projects. One pilot project, the restoration of the Sudoche wetlands, was designed in detail, which at the time of writing has been successfully implemented.

Valuation of ecosystem services was used in an SEA-type approach, as a means to structure the decision-making process on a future development strategy of the delta. Valuation was instrumental in changing the course of development from technocratic and unsustainable interventions, towards the restoration of natural processes, which are much better equiped to create added value to inhabitants under the dynamic conditions of a water-stressed delta. The process created a strong coalition of local stakeholders and authorities, resulting in necessary pressure to convince national government and the donor community to invest in a pilot project.

CASE 2 UZBEKISTAN
The wetlands South of the Aral sea have been reduced to 10% of their original size, severely affecting living conditions and the local economy.
© SevS/Slootweg

## CASE 3 SOUTH AFRICA, 2006

# Strategic Catchment Planning at uMhlathuze municipality

| | |
|---|---|
| **Valuation context** | SEA-like process to inform decision making |
| **Eco-services** | Ecosystem services of sub-catchments in hilly region under urbanisation pressure |
| **Valuation method** | Annual value of key ecosystem services quantified at the level of the municipality |
| **Assessment** | Integrated Development Planning (legal requirement) must "contain a strategic assessment of the environmental impact of the spatial development framework" |
| **Decision** | Strategic Catchment Assessments were undertaken by the uMhlathuze Municipality to avoid conflict and time delays arising during EIAs |
| **Scale** | Municipality |
| **Planning level** | Plan |
| **Sector** | Spatial planning |

Biodiversity issues in the South African City of uMhlathuze have led to various conflict situations. The classic "development" versus "conservation" situation exists, with the local municipality mostly in favour of development as a result of the poor social-economic climate. The area has, however, been identified as a biodiversity hotspot, and in order to alleviate the conflict and time delays that arise during Environmental Impact Assessments, the uMhlathuze Municipality opted to undertake a Strategic Catchment Assessment.

Instead of identifying and declaring conservation-worthy as "no-go" areas, the study highlights the ecosystem services that the environment provides free of charge to this Municipality. Nutrient cycling and waste management, water supply, water regulation, flood and drought management are some of the most highly valued services. Wetlands have a particularly high value, relating to the high costs of trying to replace a vital but finite resource. The value of environmental services provided by all catchments was estimated at R1,7 billion (nearly US$ 200 million) per annum.

Politicians, known to be "biodiversity averse", reacted positively once they realized that ecosystem services have an economic value. The Municipality embarked upon a negotiating process to identify (1) sensitive ecosystems that should be conserved, (2) linkages between ecosystems, and (3) areas that could be developed without impacting on the area's ability to provide environmental services. More importantly, (4) it would identify the management actions that need to be implemented in the area in order to ensure not only the survival for key biodiversity assets, but also the sustainable use of biodiversity resources to benefit all residents of uMhlathuze.

CASE 3 SOUTH AFRICA Ecosystem services provide development opportunities or constraints. Strategic catchment assessments provide guidance on development decisions. © Thea van der Wateren

CASE 3 SOUTH AFRICA A poster summarises the condition of ecosystem services for each catchment, thus providing an effective means of communication with decision makers. © Thea van der Wateren

CASE 4 U.K., 2007

# Wareham Managed Realignment

| | |
|---|---|
| **Valuation context** | Experimental study to support an SEA process |
| **Eco-services** | Estuarine tidal area: flood defence measures prevent flood damage or loss of land, and also create new habitats with multiple services |
| **Valuation method** | Quantification of services, followed by valuation: absolute value and relative differences between baseline and alternatives + sensitivity analysis |
| **Assessment** | Experimental, government initiated study to enhance initial policy appraisal |
| **Decision** | Need to decide on the cause of action in flood defences. Policy appraisal asked for changes in flood risk management regime (in progress). |
| **Scale** | Regional |
| **Planning level** | Policy |
| **Sector** | Flood defence |

This case study describes an analysis of the way ecosystem values are monetized, absolutely and relatively, in the Wareham Flood and Coastal Erosion Risk Management study. Economic values are applied to ecosystem service changes under different scenarios. The results (aimed to be practical guidance on how to conduct valuation of ecosystem services) will be used as input to a handbook on Economic Valuation of Environmental Effects (EVEE) in flood and coastal erosion risk management.

The main conclusion is that economic valuation of ecosystem services, even when a policy framework for incorporation of ecosystem services in a cost benefit analysis is present, in daily practice still is difficult. Many uncertainties exist concerning scientific data, human economic behaviour, values and methodological issues rising when transferring data from existing knowledge.

The case shows that even in situations with great potential for valuation of ecosystem services (a cost benefit analysis is required for all coastal defence projects), practical implementation is difficult. However, the case also shows that valuation contributes to identification of a most favourable option and to reject other options.

*valuation contributes to identification of a most favourable option*

CASE 5 U.K., 2007

# Climate policies and the "Stern" report

| | |
|---|---|
| **Valuation context** | Study commissioned to inform decision making |
| **Eco-services** | Climate regulation and impact of global warming on all ecosystem services |
| **Valuation method** | Cost of climate change to society as a whole. Excess of benefits over costs, in net present value terms, would be $2.5 trillion if strong mitigation policies were implemented this year |
| **Assessment** | UK government initiative (the Chancellor of the Exchequer) to solve the U.K.'s divide on the position regarding the Kyoto Protocol and the Intergovernmental Panel on Climate Change |
| **Decision** | The U.K. Climate Change Bill introduced in Parliament; contains legally binding target for a significant reduction on UK carbon dioxide emission. Large impact beyond |
| **Scale** | Global |
| **Planning level** | National climate policy, but study led to many new initiatives around the globe |
| **Sector** | Energy generation based on fossil fuels |

Changes in the global climate lead to fundamental changes throughout the world's ecosystems, and therefore also affect the economic sectors that depend on these ecosystems. The Stern Review is one of the best-known assessments to estimate the economic impact of climate change. The 700- page report was prepared by a team of economists at HM Treasury upon a request by the Chancellor of the Exchequer (the present PM Gordon Brown) to (i) address the lack of political consensus on climate change in the UK, (ii) to fill the gap in knowledge on the economics of climate change, and (iii) to resolve UK's divide on the position regarding the Kyoto Protocol and the Intergovernmental Panel on Climate Change (IPCC).

The main message of the Stern report is that what we do now, can have only a limited effect on the climate over the next 40 or 50 years, but what we do in the next 10-20 years can have a profound effect on the climate in the second half of this century. In other words: the benefits of strong, early action considerably outweigh the costs. Each tonne of $CO_2$ emitted causes damages worth at least $85. At the same time, emissions can be cut at a cost of less than $25 a tonne. Shifting the world onto a low-carbon path could eventually benefit the economy by $2.5 trillion a year.

Stern characterizes climate change as "the greatest and widest-ranging market failure ever seen". The Stern Review has been heavily criticized by some economists, but is supported by many others. The low discount rate, causing future economic losses to way heavy in net present values terms, was one of the main points of criticism.

The Stern Review attracted more attention than any other economic valuation study in history. Influential people from all over the world were inspired by the Review to stress the urgency of immediate action. The most significant impact of the Stern Review was seen in the policy arena. A number of governments responded by announcing expansion of their climate policies. In the UK, the Climate Change Bill was introduced in Parliament in 2007. It will shortly go to the House of Commons. The Bill contains provisions that will set a legally binding target for reducing UK carbon dioxide emission by at least 26 per cent by 2020 and at least 60 per cent by 2050, compared to 1990 levels.


CASE 5 GLOBAL CLIMATE
*left* Al Gore's film "An inconvenient truth" learns us that communication and ownership generates more societal impact than a comprehensive academic study only. (picture: www.climatecrisis.net).

*right:*
© SevS/Slootweg

## CASE 6 THE NETHERLANDS, 2006

# Extraction of natural gas from the Wadden Sea

| | |
|---|---|
| **Valuation context** | Study as an add-on to a formal EIA process (gas exploitation) and a planning SEA |
| **Eco-services** | Risks to nature conservation, fishery, recreation versus revenues from natural gas |
| **Valuation method** | Various CBAs, also using contingent valuation techniques |
| **Assessment** | CBA's, EIA for gas exploitation and SEA for planning decision |
| **Decision** | Gas can be extracted under strong precautionary conditions |
| **Scale** | National |
| **Planning level** | Mega project, within boundaries of planning process (key spatial planning decision) |
| **Sector** | Energy |

The Dutch Wadden Sea is a shallow, semi-enclosed tidal flat, part of the largest tidal wetland area in Europe and bordering the North Sea. An estimated 200 billion cubic meters of gas are located below the Wadden Sea. The Wadden Sea is a wetland of international importance under the Ramsar wetland convention, part of European Natura 2000 network.

Opponents to the exploitation of gas argued that the proponent in its EIA did not take into consideration the effects on ecosystem services such as water regulating, drinking water supply, tourism, fisheries, etc. They pointed out that the economic value of these services had been underestimated in previous studies. Therefore, they conducted an economic valuation study of the Wadden Sea, including a Cost-Benefit Analysis (CBA) of gas exploitation. Estimations of damage to ecosystem services, in case serious effects would occur as a result of gas exploitation, were estimated at € 1.1 billion.

In December 1999, the government eventually decided, based on the precautionary principle, not to give permission for gas exploitation. However, research and discussion on the effects of gas exploitation on soil subsidence continued. In 2003, the government appointed an advisory committee. The committee concluded that there are no ecological reasons to prohibit gas exploitation. Due to natural dynamics and the supply of sand and mud from the North Sea, the effect of the main driver of change, i.e. soil subsidence resulting from gas exploitation, will be balanced by increased sedimentation and soil accretion. The committee therefore recommended that gas exploitation from the Wadden Sea could take place under strict conditions. Since February 2007, gas is being extracted.

CASE 6 THE NETHERLANDS Soil subsidence caused by gas exploitation could threaten multiple tidal wetland services in the Wadden Sea. The precautionary approach resulted in strict conditions. © SevS/Slootweg

CASE 7 THE NETHERLANDS ANTILLES, 2005

# Self-financing of marine protected areas in the Netherlands Antilles

| | |
|---|---|
| **Valuation context** | Sustainable financing of ecosystem management |
| **Eco-services** | Supporting and cultural services of coral reefs |
| **Valuation method** | Inventory of willingness to pay (WTP) for conservation of marine areas among reef users |
| **Assessment** | Economic valuation study played crucial role in policy design decision making |
| **Decisions** | Establishment of self-funded management system for marine parks. |
| **Scale** | All Netherlands Antilles islands |
| **Planning level** | Policy |
| **Sector** | Tourism / nature conservation |

Bonaire and its marine park are representative of the issues facing many marine protected areas in the Caribbean. The case explicitly combines analysis of ecological and economic factors. Bonaire's coral reefs, humid elfin forests and semi-desert scrublands, represent an irreplaceable tourism resource – the most important source of income of the Caribbean island. Good management requires funds but funding has in the past been plagued by instability and deficits. Economic valuation studies helped to establish an effective and sustainable revenue generation system. Bonaire's marine park is now among the best managed in the region.

A contingent valuation survey was conducted to establish willingness to pay user fees for the marine park resulting in an average value for willingness to pay (WTP) of US$27.40. This exceeded the relatively modest US$10 fee instituted in 1992. The difference between what people would be willing to pay for an ecosystem service and what they actually paid amounted to $325,000 annually.

With the introduction of new legislation all the users of the Bonaire National Marine Park, not solely the divers, pay a user's fee. The most significant change includes admission fees to the Marine Park that also admit entrance to land-based Washington/Slagbaai National Park. Price tags for divers changed to US $25 for a year pass or $10 for a day pass. Swimmers, board sailors and all other users of the park are required to pay US$10 for a year pass. Recently, it was decided that tag receipts go directly to the park management organisation and are used entirely for the management of Bonaire's National Parks.

CASE 7 NETHERLANDS ANTILLES A diver survey revealed that the willingness to pay user fees for Bonaire marine parks was large enough to cover a substantial part of the management costs. © Van Beukering

*... a user's fee for the marine park*

## CASE 8 COSTA RICA, 1997

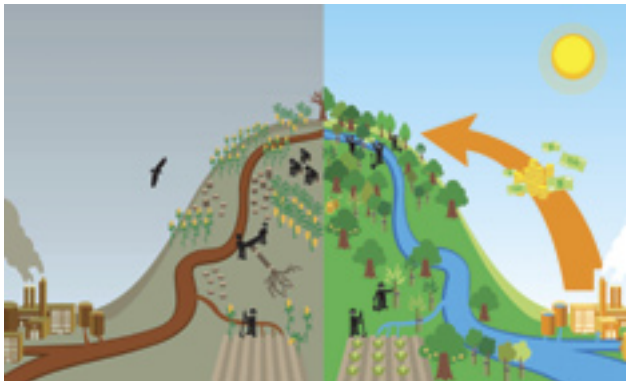
# Payments for Environmental Services in Costa Rica

| | |
|---|---|
| **Valuation context** | Sustainable financing of ecosystem management |
| **Eco-services** | Forests guaranteeing stable water supply (provisioning service) |
| **Valuation method** | Basic economic valuation techniques such as replacement cost method |
| **Assessment** | Valuation studies showed economic feasibility of a Payments for Ecosystem Services (PES) scheme through a change in tax policy |
| **Decisions** | Costa Rica pioneered the development of PES as formal government policy |
| **Scale** | National |
| **Planning level** | Tax policy |
| **Sector** | Forestry |

In the last two decades, Costa Rica transformed from one of the most rapidly deforesting countries in the world to one of the foremost pioneers in reforestation, forest management, and forest protection. One of the driving forces was the Payments for Environmental Services (PES) programme, initiated in 1997, becoming the first country-wide PES programmes in the world, and the first to adopt the terminology of environmental services and PES. Since its inception, it has become a point of reference for environmental authorities and practitioners around the world, as well as becoming one of the pillars of Costa Rica's image as a "green" country, a model for sustainable development.

The programme was fostered by the 1996 changes in the Forest Law that created the legal framework to pay landowners for the provision of four types of ecosystem services: (1) carbon sequestration; (2) watershed protection; (3) scenic beauty; and (4) nature conservation. Later public water supply was added to these. The primary funding source for the original PES programme was a 15% consumer tax on fossil fuels. Later, 3.5% of the tax revenue was directly assigned to the PES programme. As of 2003, such tax revenues provided an average of US$6.4 million per year to the PES programme.

In several studies the value of Costa Rican forests have been calculated. These studies showed that in the most pessimistic distribution of benefits (from the Costa Rican perspective) 66% of the environmental services are enjoyed by the global community (US$ 137 million) and only 34% by Costa Rica (US$ 71 million). Conclusion: the value of environmental services is high, the global community receives the major benefits of these services, and owners of the resources that provide these services are not compensated for their full value.



CASE 8 COSTA RICA A payment for environmental services scheme played a significant role in transforming Costa Rica into a pioneer in reforestation, and forest protection.

## CASE 9 SPAIN, 2006

# National Hydrological Plan / Ebro water transfer works

| | |
|---|---|
| **Valuation context** | Advocacy study to oppose government plan |
| **Eco-services** | Wetland conservation, fisheries, aquaculture, groundwater supply in Ebro delta |
| **Valuation method** | Various valuation techniques in an extended cost benefit analysis, comparing the proposed plan with an alternative, more sustainable scenario |
| **Assessment** | Independent valuation study, responding to serious societal concerns |
| **Decisions** | Financing by EU rejected; after elections alternative plan launched |
| **Scale** | Water transfer between river basins (national). |
| **Planning level** | mega infrastructure plan |
| **Sector** | Water / agriculture |

The Spanish National Hydrological Plan (SNHP) was passed into law in July 2001. The chief objective of this €4.2 billion (US$6.3 billion) plan was the transfer of water from the Ebro Basin to four other river basins in the east of Spain. These water transfers would lead to serious impacts on the river Ebro. Ecosystem services in the Ebro delta produce an annual turnover of €120 million (US$180 million) from fisheries, aquaculture, agriculture and tourism. A part of the Ebro Delta is an important wetland designated as Natura 2000 and Ramsar site. The Plan merely stated that the transfer would not have any impacts on the economic activities of the donor basin, nor would it have any negative consequences on population distribution in the regions within the donor basins.

The Plan claimed to comply with the requirements of the European Water Framework Directive. However, extensive analyses indicated that on economic and environmental terms the Plan was not compatible. Aragón and Cataluña, two regions of in the Ebro basin, strongly opposed the Plan. In terms of sustainability, numerous analyses indicated that the environmental and the economic principles were mostly ignored. The Plan was also questioned because of its lack of assessment of social issues. The University of Zaragoza showed the real costs of the SNHP were highly underestimated, in fact the SNHP made a negative contribution to economy of € 3.5 billion (US$ 5.3 billion).

The lack of proper estimates of the real costs and benefits associated to affected ecosystem services strongly influenced decision making with regard to the plan. Critics agreed that additional studies were needed for a proper economic evaluation of the impacts of the water transfer. Before the European Commission could take a (probably negative) final decision on its support, Spain's newly elected socialist government cancelled the SNHP and launched a new water policy, strongly recognising the economic value of ecosystem services of rivers and wetlands.


CASE 9 SPAIN Valuation of ecosystem services in the Ebro delta provided strong arguments to successfully oppose a river diversion plan.

CASE 10 ALASKA, U.S.A., 1991

# Compensation payments after Exxon Valdes oil spill

| | |
|---|---|
| **Valuation context** | Damage assessment for compensation payments |
| **Eco-services** | Services supporting the conservation of marine and coastal biodiversity, tourism and fisheries |
| **Valuation method** | Travel cost methods, hedonic pricing, contingent valuation methods |
| **Assessment** | The use of survey research (e.g. contingent valuation) became a well accepted appraisal method as a result of the complex valuation problems associated with contamination |
| **Decision (1991)** | Court awarded $287 million actual damages and $5 billion punitive damages |
| **Scale** | Considered one of the most devastating environmental disasters ever at sea |
| **Planning level** | State and national regulations |
| **Sector** | Nature conservation, tourism, fisheries |

On March 24, 1989, the oil tanker Exxon Valdez ran aground near the coast of Alaska. Approximately 38,800 metric tonnes of oil were spilled on 9,000 miles of shoreline. It is considered the number one spill in terms of damage to the environment. In addition, it is one of the most studied environmental tragedies in history and can be considered extremely influential in changing policies. The accident led to the ultimate recognition of the validity of economic valuation studies in environmental damage assessments.

Immediately after the oil spill the US and Alaskan government carried out a series of studies - the Natural Resource Damage Assessment - to determine the effects of the oil spill on the environment. The studies were designed to support: 1) the development of restoration plans to promote the long-term recovery of natural resources, and 2) the determination of damages to be claimed for the loss of services of the natural resources.

Ultimately, five ecosystem services were valued in economic terms: Replacement costs of birds and mammals, losses in recreational fishing, sport fishing losses, tourism industry, and contingent valuation of lost passive use values (i.e. values that people place on things without immediately exploiting it). The contingent valuation measured the loss of option values (maintaining the potential to obtain presently unknown, future benefits), existence values (knowing something exists without ever using or even seeing it), and other non-use values. Respondents were then asked their willingness to pay for a realistic programme that would prevent with certainty the damage a new oil spill would cause. The median household willingness to pay for the spill prevention plan was the amount of $31. Multiplying this number by an adjusted number of U.S. households resulted in a damage estimate of $2.8 billion dollars.

On October 8 1991, Exxon agreed to pay the United States and the State of Alaska $900 million over ten years to restore the damaged resources, and the reduced or lost services (human uses) they provide. Exxon was fined $150 million, the largest fine ever imposed for an environmental crime. The court forgave $125 million of that fine in recognition of Exxon's cooperation in cleaning up the spill and paying certain private claims.

# 3. Valuation of ecosystem services

**The case studies show a wide variety of forms in which ecosystem services can be recognised, quantified and valued. We created the following classification of ways in which ecosystem services are represented or valued in the cases. This list is merely derived from the cases and does not pretend any scientific exhaustiveness.**

## I. Identification and recognition

The simplest way of paying attention to ecosystem services is the qualitative listing of services in studies to support decision making. It raises awareness on issues that may not have been thought of before. Most studies paying attention to ecosystem services start with a listing of services. More often than not the actual quantification and valuation of services is done only for the easiest and/or the most important services. Others simply remain listed.

## II. Quantification of ecosystem services

Ecosystem services can be quantified in units of measurement directly linked to the service. Units of measurement have a very broad range. Some examples: quantity of renewable water supply for an aquifer, annual sustainably harvestable fish or timber or fruits in certain area, amount of agricultural produce per hectare, amount of carbon stored per hectare of forest, number of species occurring in certain area, etc. etc.

## III. Societal valuation

Society attaches a value to ecosystem services. The quantities in which ecosystem services are expressed can be translated into values for society. This does not necessarily mean values have to be directly expressed in monetary terms. Values can also be expressed in social or ecological terms. Examples of social values are: number of households depending on a service, number of jobs related to a service, number of people protected against forces of nature. Ecological values can relate to the number of threatened (red-listed) species in an area; the importance of an area as living repository of wild ancestors of agricultural crops; or the contribution certain area makes to the maintenance of other areas (e.g. marine fish reproducing in coastal wetlands; the importance of wetlands as stop-over locations for migratory birds). Some values may be difficult to quantify in their own terms; examples are the religious or historical value of certain ecosystem features. Contingent valuation may in such cases provide estimates of economic value (see next section).

SUPPORTING CASE GUYANA Financial markets will play a key role in safeguarding the fate of the Iwokrama forest in Guyana. © Van Beukering

# IV. Economic valuation

Advancements in environmental economics have provided tools to monetise the values of ecosystem services, even without a functional market for services. Below a very brief summary of the regularly applied methodologies[1]:

- **Market-based valuation**: goods traded in an open market have a price, which serves as the basis for valuation. Similarly, the effect of services can be priced in line with market prices. For example, coastal mangroves or dunes protect the inland and thus avoid damage to infrastructure and economy. Valuation techniques that commonly apply market values are replacement cost, net factor income approach and the production function approach.
- **Revealed preference methods**: people's behaviour can reveal the value attached to a service. For example, waterfront houses in the Netherlands are 1,4 times more expensive than similar houses elsewhere, or people spend money to travel to certain places of special interest, such as national parks. Examples of commonly used revealed preference techniques are hedonic pricing and travel cost.
- **Stated preference methods**: value non-market resources, such as environmental preservation or the impact of contamination. While these resources do give people utility, certain aspects do not have a market price as they are not directly sold. For example, people receive benefit from a beautiful mountain view. Contingent valuation and choice modelling are techniques used to measure these aspects.

1 Freeman, A.M. (1993) T*he measurement of environmental and resource values: theory and methods*. Resources for the Future, Washington DC.

A special case of valuation is the value transfer. Values obtained from studies in comparable areas and/or comparable situations can be transferred to another situation. Although value transfer avoids time-consuming data collection efforts, the accuracy of the estimates is generally limited. Valuation transfer is typically applied to determine the value of particular ecosystems (e.g. wetlands, coral reefs), as well as the economic importance of specific ecosystem services (e.g. provision of drinking water provision, flood protection).

Generally speaking, there are four reasons to value ecosystem services[2]:

- **Advocacy**: economic valuation is often used to advocate the economic importance of the ecosystem services, with the ultimate purpose of encouraging sustainable development. For example, by demonstrating that the economic values of threatened ecosystem services have previously been underestimated, it can be argued that the ecosystem should receive more attention in public policy.
- **Decision making**: Valuation can assist the government to allocate scarce resources to achieve economic, environmental and social goals. Decision makers constantly operate within restricted time frames, their windows of opportunity are limited by the election cycle and they often have to take decisions in situations where not all of the information is available. Economic valuation studies are critical to assist decision makers in making fair and transparent decisions.
- **Damage assessment**: Valuation is increasingly used as a means of assessing damage inflicted on an ecosystem. Damage assessment has been used in many cases to asses the compensation owed after oil spills by large ships and after accidents in mining companies that lead to tailings dam leakages or other toxic waste spills.
- **Sustainable financing**: Valuation of ecosystem services can be used to set taxes or charges for the use of those goods and services. Setting taxes or charges, plays a double role in terms of environmental management. They help to control the exploitation environmental resources (i.e. the more a resource costs the less it is used) and simultaneously generate revenue that can be used to pay for management, protection and restoration of the ecosystem. Valuation results can be used to set taxes or charges at the most desirable level.

2 Van Beukering, P., Brander, L., Tompkins, E. and McKenzie, E. (2007) *Valuing the Environment in Small Islands - An Environmental Economics Toolkit*. Joint Nature Conservation Committee (JNCC), Peterborough, p.128 (ISBN 978 1 86107 5949)

# 4. Main messages from case studies

**The case studies presented in this report provide a rich source of information. We aim to highlight the messages from these cases by providing the main message and we then illustrate the message with prominent examples. Other cases may also provide the same lessons, but for presentation purposes we have chosen to link the messages to a few cases only, where the issue is most prominent.**

## Recognising ecosystem services: a first step towards more transparent and engaged decision making

It is generally accepted that quality of SEA and transparency of decision making is greatly enhanced if stakeholders are at least informed about, or preferably invited into a planning process. The recognition of ecosystem services facilitates the identification of relevant stakeholders – the word service by definition links an ecosystem (the supply side) to stakeholders representing the demand side. In the Aral Sea wetland restoration project an inventory of wetland related ecosystem services pointed towards the economic and social interests of these services and the associated groups in society. By inviting these stakeholders into the process of defining alternative restoration strategies it was possible to make an estimate of the former level of service delivery, its presently degraded state, and the desired future level of ecosystem service delivery. The assessment also revealed the geographical distribution of the ecosystem services. Similarly, in the West Delta irrigation project in Egypt, the identification of ecosystem services linked to surface water from the river Nile and to groundwater from the underlying aquifers facilitated the identification of relevant stakeholders to be invited into the SEA process.

When it is obvious that a plan leads to significant impacts on ecosystem services, ignoring such impacts may lead to opposition and ultimately the cancellation of the plan. Not studying (the impacts on) ecosystem services and their respective ecological, social and economic importance therefore can have serious repercussions. The case on planned water transfer from the Ebro river in Spain provides a clear example. The proposed water transfer would seriously affect water flow into the Ebro delta. The delta combines multiple ecosystem services, such as maintaining internationally important biological diversity, and providing suitable conditions for rice cultivation, aquaculture and fisheries. The protected status and the economic importance of the delta have been highlighted by independent studies. By ignoring the tangible ecosystem services and their beneficiaries, the authorities have contributed considerably to the failure of the water transfer plan to get approval.

Economic valuation increases the transparency of complex systems; the Stern Review provides one of the most convincing cases in this respect, addressing an issue with global consequences over a very long period of time. By explicitly highlighting the crucial uncertainties of certain economic activities, environmental conditionality for continuation of projects can be defined in the approval procedure. Economic valuation does not intend to prevent actual implementation of projects with impacts on ecosystem services, but it may affect the design of the intervention such that costs and benefits are traded off in a rational manner.

## Methodological complexities do not necessarily hinder influential decision making

Due to the complex links between ecosystems and society, economic valuation of ecosystem services is often faced with methodological difficulties. The Wareham study from the U.K. was specifically designed to make an inventory of such difficulties in a real-life case, a regional flood control plan. The conclusion of this study was that reliable monetary values of ecosystem services are difficult to establish when depending on meta-data or data transfer from other areas. Local data collection is needed, but is laborious. Nevertheless, the same study concluded that for comparison of alternatives, absolute valuation figures are not necessarily needed; a relative value measure provides enough information for decision making.

In spite of methodological difficulties, economic valuation of ecosystem services provides acceptable clues for legal procedures and fines. The Exxon Valdez oil spill is probably the most widely publicised case. Exxon was fined with the largest fine ever imposed for an environmental crime. Valuation studies covered various types of ecosystem services, most of these based on market prices. A significant part of the losses, however, was based on contingent valuation of lost passive use values linked to maintenance of biodiversity. The case shows that this technique based on stated preference of respondents is a legally accepted technique. The Exxon Valdez case set an example for liability claims for damage inflicted upon biodiversity. Some other examples are provided in the annex where fines are based on contingent valuation, relating to damage inflicted upon coral reefs.

Of course, in cases where uncertainty about the (impact on the) value of ecosystem services is significant and the service itself is considered of great societal importance, the precautionary principle should be applied. The SEA for gas exploitation under the Dutch Wadden Sea is a classical case. The Wadden Sea provides multiple ecosystem services of economic importance (fisheries, tourism), and is an internationally important biodiversity conservation area. The main driver of change was soil subsidence by gas exploitation. There was uncertainty about the rate of sediment accretion, which would counteract the subsidence. The combination of important ecosystem values and uncertainty led to significant further research on this theme before a decision could be reached. Gas exploitation now is subjected to strict monitoring and can be forced to stop if impacts are larger than expected.

The Stern Review also urges the world to take a precautionary approach, but in a very particular manner. Instead of doing more research before taking action, Stern advises to take action in response to potential climate change as soon as possible, and not wait for further evidence of climate change to emerge. In spite of the methodological complexities of calculating economic consequences of potential climate change, the Review presents a convincing case that action now will prevent considerably larger future costs. Acting now is the best precautionary measure.

Apart from the need to do additional research as a result of a precautionary approach, there may also be methodological reasons to do so. Sensitivity analysis is an important tool to avoid the risk on majors errors, and to focus efforts for further research on most relevant issues. The Wareham case highlighted the need for sensitivity analysis to identify those factors where small changes in values have great influence on the outcome.

## Insight in the distribution of ecosystem service benefits highlight poverty and equity issues

In early planning stages, recognition of ecosystem services and identification of stakeholders can provide important clues on winners and losers of certain changes, and thus provides better understanding in poverty and equity issues. In the Egypt case the diversion of Nile water is proposed to enhance agricultural output of a desert area where large investors have created an economy with annual value of € 500 million, producing agricultural outputs for the European market. If unmitigated, the withdrawal of water would go at the cost of ecosystem services in the downstream Nile delta where poor smallholder farmers and fishermen would suffer from deteriorating water quality and supply. Even though the investments would make economic sense, the social consequences were considered unacceptable. The SEA study thus recommended adjusting the timing of the water diversion plan to the implementation of the national water resources management plan, in order to avoid the equity problems.

SUPPORTING CASE MALI Benefits from new dams in the Upper Niger river will go at the cost of important ecosystem services in the Inner Niger Delta, downstream. © Van Beukering

Another lesson from the Egypt case is that benefits and costs associated to ecosystem services can occur in geographically completely separate areas and affect different stakeholders, belonging to different divisions of society. In the Egypt case the "winners" were large investors practising high-tech agriculture in the West Delta, while the potential "losers" were relatively poor inhabitants of the Nile delta living hundreds of kilometres away from the plan area. A similar spatial distribution effect was observed in the economic valuation study in Mali where the hydro-dams transferred welfare from the poor down-stream communities to the wealthier urban population in the capital.

A manner to overcome distributional effects as described above, is provided by payments for ecosystem services (PES). Costa Rica provides an example where the existing inequity in distribution of costs and benefits between providers of an ecosystem service and the ones benefiting is solved by a legally embedded PES scheme. PES facilitates market processes between individual landowners, urban water consumers and the world carbon market. For the protection of water resources the upstream landowners receive a payment if they leave their forest untouched, while the downstream urban inhabitants benefit from a secured source of drinking water. Similarly, the benefits of carbon sequestration accrue to the global community, while the opportunity cost of not converting a forest lies with local landowners.

## SEA and planning processes are enhanced by the identification and quantification of ecosystem services

The Aral case represents a strategy development process for a large region, where reliable quantitative data were scarce. After the collapse of the Soviet Union, research and data collection efforts in Uzbekistan came to a standstill. Yet, this did not hinder the effective comparison of alternative restoration strategies for the Amu Darya delta, based on ecosystem services assessment. The participatory multi-criteria analysis involving both local scientists and stakeholders was a guarantee that all relevant local knowledge was represented in the process. Linking ecosystem services to stakeholders provided a good approach to involve relevant actors. By using the MCA tool it was possible to compare the performance of ecosystem services under different alternatives in a semi-quantified manner. “Currencies” to compare values for different alternatives ranged from simple 5 point scales (much more, more, neutral, less, much less) to actual quantification of societal values (such as income, number of jobs, number of inhabitants receiving good drinking water). At higher strategic level this provided enough information for effective decision making. The Wareham case where different coastal flood management options were compared in terms of their impacts on ecosystem services came to a similar conclusion; relative difference in values provide a good basis for comparison. Full quantification and monetisation is not needed in early planning stages or at higher strategic levels.

In South Africa a spatial planning approach based on an SEA-like strategic catchment assessment provided a way out in a situation where biodiversity issues repeatedly caused discussion and delays in decision making at EIA/project level. Identification and valuation of ecosystem services and identification of stakeholders put biodiversity in the perspective of social and economic development needs of the municipality. Some services were under critical pressure and in need of conservation, not only because of biodiversity per se, but also because of essential services for human well being. Other services are performing well and may provide a development potential when underexploited. Such a constraints and opportunities approach resulted in an open and better platform for discussion.

## SEA provides a platform to put valuation results in a societal context

A general observation with regard to the available literature on ecosystem services valuation is the lack of knowledge on the actual effects of the studies in planning and decision-making processes. Moreover, there is a general feeling that the great potential of such studies to have an impact is not used to the full benefit. This is to a large extent caused by the divide between the worlds of environmental economy and environmental assessment. Economists often are not aware of the SEA instrument and the opportunities provided by this instrument to embed their methods and knowledge in a planning context and decision-making process.

The case studies in this document provide evidence that economic valuation tools can easily be integrated in the SEA process, providing information much wanted by decision makers. Of course, the cases also show that SEA is not necessarily needed to make effective use of valuation tools for decision making. In cases where money was the key issue, economic valuation was of course the most preferred tool available. Examples are the penalties in the Exxon Valdez case, compensation payments in the Costa Rica PES case, and management fees in the Antilles case. In other cases, the use of valuation tools was not the obvious choice but played an important role in final decision making. In the South Africa case valuation provided the necessary vocabulary to convince decision makers; in the Wadden Sea case, it contributed to the recognised need for a precautionary approach and a strict environmental management plan. In both cases, SEA or SEA-like processes supported decision making, and provided the platform to merge the valuation results with the decision-making process. The SEA context guarantees the inclusion of stakeholders in the process and forces decision makers to take the information into account when coming to a decision.

## Valuation of ecosystem services is more influential with decision makers

The authors of the South African case clearly state that monetisation of ecosystem services has put biodiversity considerations on the decision makers' agenda. Instead of identifying and declaring conservation-worthy "no-go" areas, the study emphasises the ecosystem services the environment provides free of charge to the Municipality. The use of ecosystems services and focus on the value of these services for society was of key importance to convince local councils that biodiversity conservation makes economic sense. Politicians reacted negatively to the term "biodiversity", but more positively once they realised that environmental services have an economic value.

Presentation of results is an important aspect of environmental assessment. All too often assessment reports are voluminous and filled with jargon, making these reports inaccessible for decision makers and the public at large. Some lessons can be drawn from the case studies. In the Aral case the construction of an "ecosystem services – values" table provides a good visualisation of the variety of services and their stakeholders. It served as a good communication tool. For the strategic catchment assessment in uMhlathuze Municipality, a status quo report on the condition of ecosystem services was presented in four poster-like pages for each catchment. This communication-oriented output was ideal to rapidly inform planners and decision makers. The thought behind this was that "planners are in the best position to influence sustainable development, so they should also be educated".

Similarly, the Stern Review case teaches us that the one who conveys the message also makes a difference in the impact of the study. This case shows that the most far-reaching policy changes for improving the functioning of ecosystem services can be achieved by making the Treasury the guardian of the economic valuation study. They have both the authority and the means to follow up the recommendations. In general, the case teaches us that boundary conditions such as timing, communication and ownership can be more important in terms of generating societal impact than the quality of the study only. The Stern Review was published shortly after the famous documentary 'An Inconvenient Truth' by former US vice-president Al Gore. The documentary paved the way for the more complex message of the economics of climate change.

CASE 7 NETHERLANDS ANTILLES Bonaire's marine park is now among the best managed in the region, with one of the most advanced systems of sustainable financing in the world. © Van Beukering

## Valuing ecosystem services directly facilitates sustainability

The Exxon Valdez case has confronted oil companies with severe financial consequences of oil spills. Undoubtedly, this has contributed to the ever-increasing safety norms for oil transport, thus reducing such mishaps in future. On the other hand it provides a mechanism for financing the clean-up operations of environmental damage for which a party can be hold accountable. In a strange manner this generates financial "sustainability" of clean-up operations; of course an environmental disaster can never be considered environmentally sustainable.

The introduction of a payment for the ecosystem services scheme (PES) in Costa Rica has played a major role in changing Costa Rican destructive and rapid deforestation into forest restoration efforts and more sustainable management, with tangible and convincing results.

Similarly, contingent valuation of coral reefs has effectively been applied in the Netherlands Antilles case where it has lead to the implementation of measures guaranteeing better management of national parks and financial sustainability of the management operations. In other cases valuation of ecosystem services has resulted in more sustainability oriented decision making (i.e. South Africa, Aral, Egypt, Wadden Sea), although it cannot be judged how decisions would otherwise have been taken.

The Ebro case shows the power of valuation tools in the hand of opponents of an obviously unsustainable project. Although environmental assessment never has the intention to hinder or to stop development, in this case the use of independent assessment and simultaneous pressure on the main funding agency has avoided great damage. In the end it resulted in a greatly improved plan, although a change of government was needed to realise this major step.

In summary, this report provides evidence that the recognition and valuation of ecosystem services within the context of well-informed strategic decision making, facilitates a better representation of the three pillars of sustainability:

- Financial sustainability of environmental and resource management;
- Social sustainability by facilitating participation of stakeholders and by highlighting and addressing equity issues;
- Environmental sustainability by providing better insight in the long and short term trade offs of investment decisions.

Supporting case Philippines: The private enterpise Mirant Philippines started a "Carbon Sink Initiative" to rehabilitate the Pagbilao mangroves, presently claimed to be the living proof of a successful rehabilitation effort.
© Van Beukering

# 5. Practical implications for ecosystem services assessment and valuation

**A major concern among planners and decision makers is the time and costs involved in environmental assessment; similarly so for valuation studies. Fully-fledged valuation studies are thought to be time consuming, as large amounts of data need to be collected. The practise of EIA and SEA has shown that environmental assessment can be done at any required level of detail, varying from a "back-of-an envelope" assessment to a comprehensive Stern-like evaluation.**

Moreover, approaches have been developed to be able to support decision making, even in cases where data are scarce or incomplete. More strongly stated, environmental assessment by definition has to deal with incomplete information, collected in a limited amount of time, within the limits of a budget more or less defined by the magnitude of the project under study.

The analysis of cases in this study has produced results similar to experiences from the field of environmental assessment. Valuation studies can be done in great detail and at great length and costs (such as the Exxon Valdez case and the Stern Review), but they can also be applied in a very rapid and cost effective manner (most of the other cases). Full information and knowledge is not always needed to be able to provide relevant information for decision making. When comparing alternatives it usually is sufficient to know relative values: what alternative performs better in comparison (qualitative); does an alternative perform much better, or only slightly better (= semi-quantitative). Absolute values are not always needed.

Following the order presented in chapter 3, from simple identification to full economic valuation, we have observed the following time and manpower requirements.

## I. Identification and recognition of ecosystem services

**How** Identification of ecosystem services involves experts with knowledge of the area. Preliminary identification of potential ecosystem services is checked with local stakeholders or representative bodies for these stakeholders.

**Who** Most important is to have people with the right "mind set" to recognise ecosystem services. More often than not, sector-oriented experts tend to overlook the effects their plans may have on ecosystem services linked to other sectors. A mix of natural resources management experts and ecologists with good local knowledge works well.

**Data needs** Maps indicating main ecosystems and types of land-use; overview of main economic activities in the area; population data; field reconnaissance.

**Time required** For the actual study only several days. The decision to actually give attention to ecosystem services may take longer as competent authorities or proponents need to be convinced of its usefulness (see Ebro case).

## II. Quantification of ecosystem services

Based on the ecosystem services identified in step 1, a selection of the relevant ecosystem services to be quantified can be made. The choice of selection highly depends on the purpose of the study and can be part of a scoping process, where also the required level of detail can be defined.
An impact oriented assessment will focus on the main drivers of change resulting from an activity and highlight potentially affected ecosystem services (see cases Wadden Sea, Egypt). A spatial planning oriented type of assessment may try to identify ecosystem services with opportunities for development or relevant services with major constraints (see cases South Africa and Aral Sea). Management planning focuses on the purpose of management (see cases Costa Rica – forest management for water supply, and Antilles – coral reef management for tourism).

**How** Quantify an ecosystem service in units of measurement relevant to the service. Some examples: the amount of sustainably harvestable fish from a water body; the number of scuba divers a coral reef can handle without unacceptable damage; the amount of renewable water to be extracted from an aquifer; the percentage of the world population of a threatened bird species making use of a wetland area; amount of agricultural produce per hectare; amount of carbon stored per hectare of forest, etc. etc.

**Who** Full quantification may involve experts supported by computer models (hydraulic, population, harvest, preferences). Proxies can be obtained from national or regional statistics, local stakeholders, narrative information, data from similar services elsewhere.

**Data needs** National or regional statistics often provide good information; remote sensing information may provide relevant information on surface areas and productivity. Research institutes may provide access to computerised models. A reality check with people on the ground is always recommended.

**Time required** From a week to several months, depending on the level of detail required, number and complexity of the services to be assessed, the surface area, availability and reliability of statistical data, and presence of local (scientific) information.

EXAMPLE 1

### Practical aspects of Egypt SEA

**Duration**
Three months
**Time expenditure**
Three expatriate and two local consultants for one month each + farm surveys by local agricultural extension workers
**Cost of SEA study**
Approximately US $ 80,000, on a total estimated plan budget of around US $ 100 million

As a result of good coordination the study was fully integrated in the planning process which did not experience any delays. Data were obtained from project planning documents, government statistics, farm surveys, two existing computational ground- and surface water models, with a number of additional field visits and on-farm interviews for verification. Two stakeholder workshops provided relevant scoping information and discussion on the outcome of the study. The level of detail and reliability of information was sufficient to guide the planning process. Where links between hydrological changes and impacts were very difficult to quantify in economic terms, the impact description was limited to the identification of numbers of affected people.
The subsequent detailed technical design was subject to a full fledged ESIA, which could at a later stage zoom in on a limited number of issues to provide more detailed information.

## III. Societal valuation

Society adheres values to ecosystem services. The quantities in which ecosystem services are expressed can be translated into values for society. This does not necessarily mean values have to be directly expressed in monetary terms. Values can also be expressed in social or ecological terms. Some values may be difficult to quantify such as the religious or historical value of certain ecosystem features. In such cases a contingent valuation approach may be the best valuation option.

**How** Quantify the societal value of an ecosystem service in units of measurement relevant to the value. Examples of social values are: number of households depending on a service, number of jobs related to a service, number of people protected against forces of nature. Ecological values can relate to the number of threatened (red-listed) species in an area, or the number of wild ancestors of agricultural crops for which an area serve as living repository, or the contribution certain area makes to the maintenance of other areas (e.g. marine fish reproduce in coastal wetlands).

**Who** For full quantification detailed questionnaires may be needed, with significant time expenditure by interviewers. Sampling with good statistical analysis provides a means to reduce workload, but requires experts in statistical analysis.

**Data needs** Proxies can be obtained from national or regional statistics on population size, economic activities, agricultural outputs, fisheries and forestry productivity, etc.

**Time required** From a week to several months, depending on the level of detail required, number and complexity of the services to be assessed, the surface area, availability and reliability of statistical data, and presence of local (scientific) information.

EXAMPLE 2

### Aral Sea – practical aspects of an integrated SEA

**Duration**
Strategy development, including all preparatory studies, participatory process, and environmental assessment - 12 months.

**Time expenditure**
One permanent expatriate project leader; 3 permanent local experts; 6 expatriate experts - two visits of 1 month each; 12 hired local scientists 3 months each.

**Total costs**
US $1 million (impossible to separate the SEA components). Investment cost for the proposed programme of projects was US $ 20 million. The Sudoche pilot project was implemented at an approximate cost of US $ 4 million.

Ecosystem services were quantified in semi-quantified terms; some were valued in societal terms. Level of detail was sufficient for MCA exercise. Discussing values expressed in their own terms, and more importantly, recognising stakeholders for each ecosystem service did not distract the discussion to aggregated figures on money.
In a later stage, when concrete investment projects were proposed, cost benefit analysis was the proper tool to provide sufficient and convincing arguments that the investments are justified.

*recognising stakeholders for each ecosystem service*

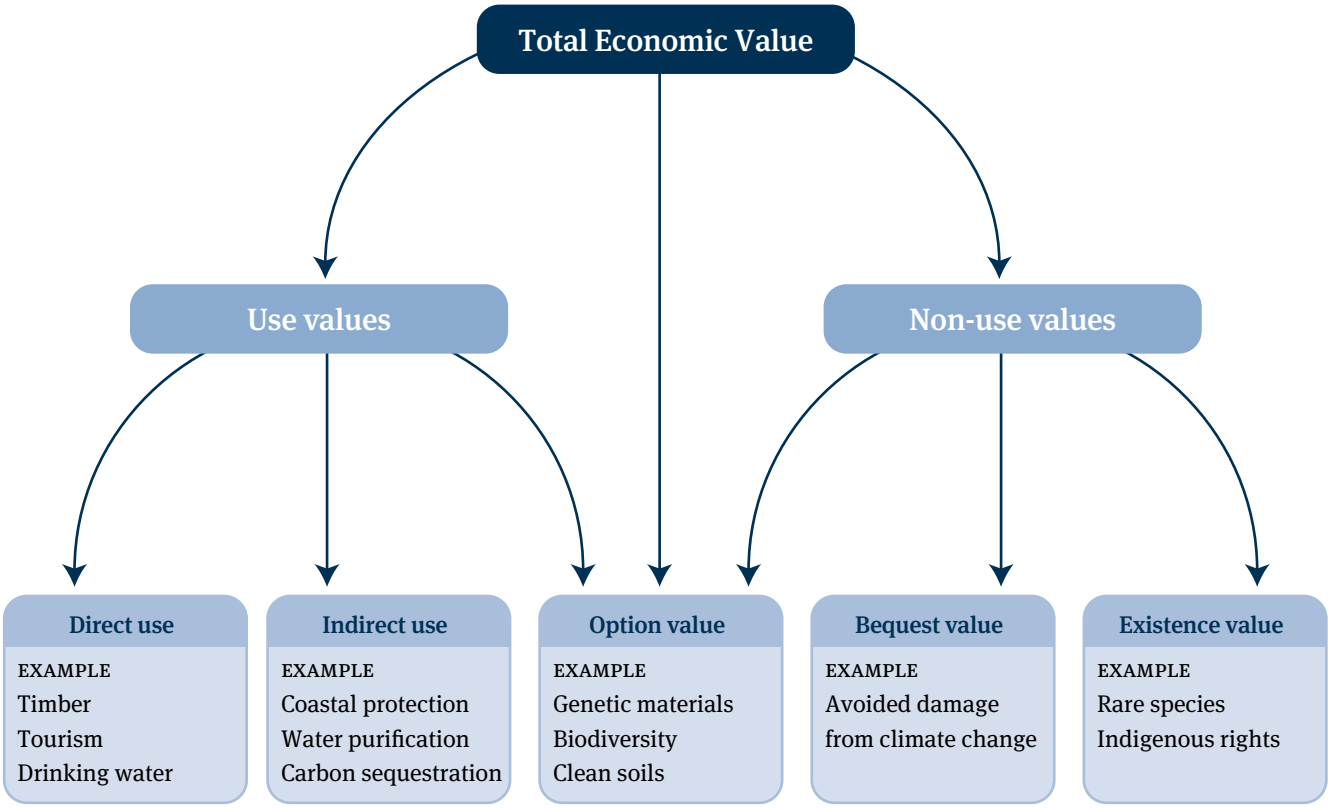
## IV. Economic valuation

Different economic valuation methods exist to value different ecosystem services. The selection of which method to use depends on a number of aspects. First, when planning a valuation study, it is necessary to balance the benefits of using the best scientific and analytic techniques with the financial, data, time and skills limitations to be faced.

Realise that no single method is necessarily the best; for each application it is necessary to consider which method(s) is the most appropriate. Sometimes a number of different methods is used in conjunction in order to estimate the value of different services from a single ecosystem.

**How** In the context of ecosystem services, it is crucial to start identifying the providers and the beneficiaries of the relevant ecosystem services. Next, valuation techniques need to be selected. This choice is context specific and dependent on a number of factors, including whether or not the environmental service is traded directly or indirectly in a market, the stakeholders that hold values for the service, the available budget for conducting a valuation study, and the availability of existing information on the value of similar resources.

**Who** It is advisable to have at least one environmental economist in the team who is properly trained to conduct economic valuation studies. The actual implementation of surveys and interviews can be conducted by non-economist as well. However, for the design and analysis of the data, thorough economic knowledge is essential.




Source: Beukering et al, 2007[1]

1 Van Beukering, P., Brander, L., Tompkins, E. and McKenzie, E. (2007)Valuing the Environment in Small Islands - An Environmental Economics Toolkit. Joint Nature Conservation Committee (JNCC), Peterborough, p.128 (ISBN 978 1 86107 5949)

**Data needs** In economic valuation, there are broadly three main types of data that will be used: (a) market prices that can be found from private sector sources, government statistics or international organisations; (b) local social, environmental and economic information that can be found through local surveys, or government statistics where they exist; and (c) preference data generated by asking people through questionnaire surveys. The categories are described in detail in Van Beukering et al. (2007).

**Time required** Depending on the comprehensiveness of the study, a valuation exercise may vary from a few months to two years or more. Obviously, the data availability present at the start of the study is a major factor in this regard. An illustration of the time and budget needed for economic valuation is provided in the box below.

SUPPORTING CASE HAWAI Converted to value per square meter, the economic value of Hawaii's coral reefs can be as high as US$2,600. © Van Beukering

EXAMPLE 3

## Examples of planning and budget for valuation studies

To provide a sense of how long studies can take (from the shortest to the longest) some of the time taken to complete a variety of studies and the resources used to complete them are shown below (from Van Beukering et al. 2007. page 113)

### Examples of case studies conducted for Hawaii and the Philippines

| | Case study 1 | Case study 2 |
|---|---|---|
| **Type of valuation exercise** | WTP for conservation among 750 visitors | TEV study on mangrove rehabilitation |
| **Location of valuation exercise** | Hawaii | Philippines |
| **Type of activities** | Survey at dive shops and on tour boats | Surveys, country statistics, scientific literature |
| **No. of people involved** | One economist, four interviewers, one data-enterer | Three economists, one social scientist, one biologist, four interviewers |
| **Total human resources used** | 80 man days | 300 man days |
| **Total cost (US$)** | Total $30,000 [a] | Total $100,000 [b] |
| **Time taken (Days)** | 4 months | 16 months |

a Questionnaire $5,000, Interviewers $8,000, Data-entry& cleaning $1,000, Analysis $7,000, Report writing $4,000, Travel costs $5,000.

b Questionnaires $7,500, Interviewers $20,000, Data-entry& cleaning $21,500, biodiversity assessment $10,000, Data purchase $2,000, Analysis $20,000, Report writing $15,000, Travel costs $15,000, Policy brief $5,000.

*no single method is necessarily the best*

CASE 1 EGYPT Overexploitation of groundwater in the reclaimed desert west of the Nile delta threatens export-oriented agriculture, worth US$ 500 million annually. © SevS/Slootweg

# Annex
# Useful websites

| | |
|---|---|
| Convention on Biological Diversity | **www.biodiv.org** |
| International Association for Impact assessment | **www.iaia.org** |
| Millennium Ecosystem Assessment | **www.maweb.org** |
| Natural Capital Project | **www.naturalcapitalproject.org** |
| Nature Valuation and Financing Network | w**ww.naturevaluation.org** |
| Netherlands Commission for Environmental Assessment | **www.eia.nl** |
| OECD-DAC SEA Task Team | **www.seataskteam.net** |
| Ramsar Wetlands Convention | **www.ramsar.org** |
| Valuing the Environment in Small Islands.<br>An Environmental Economics Toolkit<br>(with extensive list of relevant websites) | **www.jncc.gov.uk/page-4065** |
| ...many, many more links on valuation of nature: | **www.fsd.nl/naturevaluation/70995** |

# Colophon

ISBN 978-90-421-2537-7

September, 2008



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