Research in Support of the High Level Panel on Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011-2020

Regional study: **Europe**

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Content

Glossary/Abbreviations

ABS	Access and Benefit Sharing
CAP	Common Agricultural Policy
CBA	Cost-Benefit Analysis
CBD	Convention for Biological Diversity
CC	Climate Change
CFP	Common Fisheries Policy
CITES	Convention on International Trade in Endangered Species
CMS	Bonn Convention on Migratory Species
COP	Conference of the Parties
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
EGS	Ecosystem Goods and Services
EP	European Parliament
ERDF	European Regional Development Fund
ES	Ecosystem Services
FTE	Full Time Employment
GAEC	Good Agricultural and Environmental Conditions
HLP	High Level Panel
HNV	High Nature Value (Farming)
IAS	Invasive Alien Species
IED	Industrial Emissions Directive
IMPEL	EU Network for the Implementation and Enforcement of Environmental Law
IPPC	Integrated Pollution Prevention and Control (Directive)
MDG	Millennium Development Goals
MS	Member State(s)
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
NBSAP	National Biodiversity Strategy and Action Plan
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
UWWT	Urban Wastewater Treatment (Directive)
WFD	Water Framework Directive
WTP	Willingness-To-Pay

EXECUTIVE SUMMARY

The objective of the present report is to support the second phase of the work of the High Level Panel on Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011-2020 through collecting local, regional and continent-wide evidence on benefits, investment needs and resource requirements, policy alignment and development issues, cost effectiveness and benefit-cost ratios of reaching the Aichi targets in Europe. Herein, the situation regarding the availability and quality of information presented the research team with significant challenges. Nevertheless, evidence could be collected that sheds light onto the benefits and costs that are connected to reaching or approaching Aichi targets in Europe.

From the evidence collected regarding the **benefits** of reaching the Aichi targets in Europe, there remains no doubt that increased biodiversity protection and sustainable use of resources would benefit all spheres of European (human) societies: private and public life, rural and urban populations, richer and poorer people, corporations and most economic sectors - some to a higher, some to a lesser degree, and not necessarily distributed equally (across the pan-European region, and across societies). It is furthermore clear from the evidence that these benefits are not only "nice to have", but represent significant components and functions of the socio-economic systems in Europe, with a real value existing in terms of Ecosystem Service provision, indirect and direct income (e.g. visitor spending in protected areas), and as a basis for jobs and job creation. The most significant monetary values, as identified by this report, stem from conservation and restoration activities. In terms of non-monetized benefits, the provision of jobs and the creation of new jobs are of great importance, as estimations speak of up to 200.000 new FTE jobs being created through the EU Biodiversity Strategy, and up to 16% of all jobs in the EU being dependent on the environment.

Although no comprehensive and "self-contained" overview of necessary **measures and investments** to reach the Aichi targets in Europe (EU and non-EU) exists, several priorities for actions - i.e. actions most important for reaching biodiversity targets (see, for example, table 1 for a list of the EU biodiversity targets) - are identified, mainly for the EU:

- Ensure a better uptake and distribution of existing funds for biodiversity: reform of agricultural (and fishery) subsidies; longer timeframes for biodiversity funding; clearer targeting of funds for biodiversity, also at the national level; capacity building and decrease of administrative burdens.
- The latter point is of special concern for new Member States in Eastern Europe, lacking the experience in applying for EU funds.
- Reforming the agricultural subsidy system ("Greening" the CAP), and e.g. reallocating funds from the first to the second Pillar (the CAP reform 2014-2010 has been agreed, but the final text is not available as of December 2013).
- Completing the Natura 2000 network, and establishing management plans or similar instruments onsite, also to obtain data on the impacts and effectiveness of financing.
- Increase knowledge and awareness.

In the new EU Member States as well as in non-EU countries, the focus should be more on capacity building with regard to the uptake of financing opportunities, awareness raising and on measures

towards conservation instead of restoration (given the large undisturbed/unfragmented areas left in many parts of Eastern Europe and Russia). Additionally, in the non-EU Eastern European countries (i.e. Belarus, Ukraine, the Russian Federation, Moldova, but to a certain degree also Serbia, Albania), much more basic activities are necessary: studies and surveys about the state of ecosystems and ES, the designation of protected areas (e.g. for inclusion into the Emerald Network); and many legal and compliance issues.

Similarly to the expected benefits, overall **costs or resource needs** are also not documented in a comprehensive and self-contained manner (i.e. directed towards reaching the Aichi targets). Estimations exist, however, for aspects of biodiversity protection and sustainable use of resources, and range in the tens of billions of € (or US$) per annum for the EU, although the data is not fully compatible: if the sectoral estimations were to be added up, the resulting sum would easily exceed the more general calculations. With regard to non-EU countries, no estimation of the resource needs can be provided, as no information is available covering Belarus, Ukraine, Moldova, Russia or the Balkans. At the same time, due to less fragmented or disturbed ecosystems that still exist in some parts of Eastern Europe, the costs could be significantly lower in these countries, as less restoration measures would be necessary. Regarding Western European non-EU countries (Switzerland, Norway, Iceland), the dimensions of the resources necessary will be similar to those in the EU Member States.

Additionally, there are **significant overlaps with other policy fields**, especially in the EU. The implementation of the various environmental Directives - to which the EU Member States are legally obliged - would mean a significant step towards the Aichi (and EU) targets. This, naturally, does not reduce the costs for a better protection of the environment in Europe (or improve the cost-effectiveness of measures), but these significant overlaps certainly reduce the additional funds necessary for reaching the Aichi targets. Nevertheless, it has to be stated that the implementation of the (legally binding) EU Directives also very much depends on political will - there are many exemptions included in the most important Directives (such as WFD and MSFD), prolonging the respective timeframe and thus potentially greatly decreasing the importance of the Directives for reaching the Aichi targets (for example, if the timeframe extends over 2020).

Several EU Member States argue that the overall costs for reaching the WFD´s goals will be significantly less in case there was more time available. This argument could not be verified in the context of this study, but the general statement that postponing action will increase costs seems to be disputable, at least among policy makers. Postponing action is certainly much more costly with regard to conservation of ecosystems or habitats (while for restoration in some cases the costs are lower if more time is available) - conservation measures are generally more cost-effective than restoration measures, as the latter are usually associated with very high costs (CBD 2012). Another very important, or even crucial, point for **cost-effective actions** is the reduction of negative incentives: on the one hand, these increase the pressure on ecosystems (and species), not only hindering, but actively contradicting the achievement of the Aichi (and EU) targets; on the other hand, they can (in case of spatially explicit subsidies) greatly increase the cost for conservation and restoration, because the entitlements connected to a certain lot of land will be priced into prices for land acquisition or compensation payments.

The evidence also demonstrates that the **benefits of measures** to protect biodiversity in Europe (both EU and non-EU) **certainly exceed the costs** associated with them if all environmental and societal benefits are taken into account. Furthermore, in some cases (especially the reform of subsidies), the raising of new funds would be necessary only to a limited extent, because a simple re-allocation of subsidies from harmful to biodiversity-friendly purposes could already make a significant difference.

1. INTRODUCTION

The objective of the present report is to support the second phase of the work of the High Level Panel on Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011-2020. The first phase, i.e. the HLP's report to COP-11, included an assessment of the financial resources required to deliver the Aichi Targets on the global level. The second, present phase involves a bottom-up analysis of the benefits and costs of meeting the targets, based on a review of evidence at different geographical scales - regional, national and local - which will supplement the global level assessment. As far as possible, evidence was gathered to support an analysis of the inter-linkages between targets and with broader policy agendas, as well as the costs and benefits of meeting individual targets at the different levels.

The region covered by this report is Europe according to the UN Statistics Division[1], i.e. including the Russian Federation - together forming a huge and diverse landmass. Although Europe as a continent is considered to be relatively species-poor compared with equivalent regions in Asia and America, it covers several bio-geographical and climatic regions from the Mediterranean to the Arctic, leading to a multitude of ecosystems and species covered by the European Aichi obligations.

The status of biodiversity in Europe is, given the dense population levels, heavy industrialization and intensive agricultural activities, generally of concern, although certain populations and distributions of wildlife species are showing positive trends - i.e. some large carnivore species have recovered in Europe and are even migrating to countries or regions where they have been extinct for centuries. But, also in recent decades, the loss of biodiversity in Europe continues: farmbird populations, for example, decreased by 25% from 1990 to 2006, European common bird populations by 10%, and forest birds by 18%. The conservation status of over 40% of European bird species remains unfavourable, and the risk of extinction for birds has increased almost everywhere in Europe. Such trends are similar for many species of flora and fauna, and for many habitat types (EC 2009: 3 et seqq.; EC 2011: 6).

The pressures on biodiversity originate from intense economic development and connected land-use changes; overfishing, eutrophication, alien invasive species and climate change are additional major threats to European biodiversity. Although forest cover has generally increased in recent decades, the increased quantity does not necessarily mean an increase in the quality of habitats. At the same time, extensive agricultural land, grasslands and wetlands give way to a continued expansion of artificial surfaces and abandoned land - the loss of wetlands has slowed down to 3% in the last two decades or so, but Europe had already lost half its wetlands before 1990. Positive trends are generally recorded regarding freshwater pollution, which has decreased due to strict regulation, especially in the EU (EC 2009: 3 et seqq.; EC 2011: 6).

Due to its economic predominance in Europe, the European Union represents the most important individual player regarding biodiversity protection and sustainable use of resources in the pan-European region. To address the threats to biodiversity, the EU is committed to an "EU Biodiversity Strategy", called "Our life insurance, our natural capital: an EU biodiversity strategy to 2020", which

[1] See http://unstats.un.org/unsd/methods/m49/m49regin.htm.

outlines how the CBD's Strategic Plan for Biodiversity is - or should be - implemented by the EU. The Strategy is also the EU´s "National" Biodiversity Strategy and Action Plan (NBSAP) in the CBD framework. The general objective of the EU´s strategy is the "EU 2020 biodiversity headline target", which has three components:

- To halt biodiversity loss and the degradation of ecosystem services by 2020.
- To restore them in so far as feasible.
- To step up the EU contribution to averting global biodiversity loss.

In addition to the EU Biodiversity Strategy, the EU Member States have also developed their own NBSAPs, further adding to the implementation of the CBD and related international agreements at national level through a wide range of national and sub-national policies and measures.

The second, equally important environmental policy of the EU with a distinct regard to biodiversity are the "Nature Directives", i.e. the Birds and Habitats Directives, which provide the legal basis for the Natura 2000 network of protected areas - a policy that directly addresses several of the more difficult-to-achieve Aichi targets (e.g. regarding conservation and restoration). Since 2004, the network has been extended to all 13 new Member States and now comprises more than 26.000 sites, covering 751.150 km² (terrestrial), or an area representing nearly 18% of the EU27 terrestrial territory. Beside the "Nature Directives", several other Directives also tackle problems addressed by the Aichi targets, especially regarding the sustainable management of agriculture, forestry and fisheries, the rehabilitation of ecosystems, and regarding pressure reduction (such as pollution control and prevention) (EC 2009: 3 et seqq.).

In the non-EU countries, such regionally coordinated (and mandatory) policies or Directives, naturally, do not exist (although the EU regulations exert a certain influence over possible future accession countries). Nevertheless, a similar endeavour as the Natura 2000 network exists in European non-EU countries as well, with similar goals and the future objective of creating a pan-European network of protected areas. This network is called the "Emerald Network", launched by the Council of Europe as part of its work under the Bern Convention (and regarded as one of the main tools for the Contracting Parties to comply with their obligations under the Bern Convention).

In order to describe the benefits and costs of reaching the Aichi targets in Europe - or to present the gathered evidence - the report is structured as follows: in the section directly below (Section 2), the methodology is shortly explained, along with main data sources, reflections on data limitations and other methodological issues, and a table summarizing the "translation" between EU Biodiversity targets and policies, and the Aichi targets. Section 3 describes the benefits of reaching the Aichi targets, first in a qualitative, then in a quantitative manner. The section on benefits is followed by two sections on necessary investments (Section 4) and the resources required to meet them (Section 5). Then, evidence on the possible overlaps of meeting the Aichi targets with other policy agendas is presented (Section 6), as well as on cost-effectiveness (Section 7) and cost-benefit comparisons (Section 8). The report is closed by general and specific conclusions, which also highlight implications of the data availability for research priorities.

2. METHODOLOGY

2.1 Research methods and sources of evidence consulted

To find evidence to answer the research questions (chapters 3 to 8), the research team followed a bottom-up approach, i.e. collecting evidence on local, national or regional (e.g. EU27, or a Regional Sea Convention) scales. The collected information was not aggregated but summarised, integrating case studies, to provide insights against the research questions posed.

The basic approach to answering the research questions was through a desktop research into current literature, the most recent (research) project reports, and national/regional reports under the Convention on Biological Diversity (e.g. Biodiversity Strategies and Action Plans). The most important sources covered were:

- The information submitted by EU Member States or published by the European Commission regarding the implementation of the program of work on protected areas (i.e. under the Birds and Habitats Directives).
- Both selected national reports under the CBD (updated National Biodiversity Strategies and Actions Plans of EU and non-EU countries), as well as the comprehensive reporting undertaken by the EC with regard to the EU´s biodiversity targets.
- EU documents regarding the implementation of relevant environmental legislation (e.g. on the Water Framework Directive, Nitrates Directive etc.).
- CBD Documents regarding financing issues, also with regard to the GEF.

  Reports from independent research institutes, covering a wide variety of specific questions such as:

- Several Reports by the IEEP (Kettunen et al. 2009; Gantioler et al. 2010; Hart et al. 2011; Tucker et al. 2013) with regard to costs and benefits of the Natura 2000 network and other land-use policies.
- UK National Ecosystem Assessment (2011). The UK National Ecosystem Assessment. UNEP-WCMC, Cambridge.
- ACTeon Environment (2012).Comparative study of pressures and measures in the major river basin management plans in the EU - Task 4b: Costs & Benefits of WFD implementation. Final Report to the European Commission.
- ARCADIS (2011). Recognizing Natura 2000 Benefits and demonstrating the Economic Benefits of Conservation Measures - Development of a Tool for Valuing Conservation Measures. Report to the European Commission.
- Reports from the BalticSTERN Research Network.
- The TEEB Reports.

2.2 Overview of availability and robustness of evidence, methodological issues, evidence gaps, variations in extent and quality of evidence between questions

The main aim of the report has been to gather evidence on the research questions below, in terms of:

- Summarizing key findings and supporting evidence for each question, drawing on the range of evidence available for different countries and targets.
- Presenting case studies of the most interesting examples – both as short boxes of 1-2 paragraphs and/or longer case studies of 1-2 pages.
- Commenting on the extent, quality, sources and coverage of the available evidence and highlight key gaps.

In this regard, comprehensive answers have not been possible for all questions due to the fragmentary information available. Instead, the best evidence and examples available were identified, and gaps highlighted, in order to gain good evidence, examples, insights and different regional perspectives that will inform the global assessment.

Availability and Robustness of Evidence

Overall, the most reliable and comprehensive information available was information covering the EU27, mainly assessments (in the form of Impact Assessments, research reports, or policy/planning documents) on effects, costs and benefits of measures for implementing EU environmental legislation (including the EU Biodiversity Strategy and related targets), or on effects, costs and benefits of the legislation itself. Such information is issued mostly by the EC and research institutes/organizations. Information from non-EU countries was generally not readily available, especially regarding quantitative information on benefits and costs of reaching the Aichi targets.

National Biodiversity Strategies and Action Plans have mostly been less relevant, as in most cases, concrete, quantitative information on reaching the Aichi targets was not included in these plans. Instead, the strategies mostly consist of national objectives and planned actions to reach these (with "translations" of the national targets/objectives to the Aichi targets). Clear statements on costs - i.e. "reaching the Aichi targets in country Y/reaching the Aichi target 11 in country Y would cost X Euro" - or benefits were not found in any of the plans.

However, there was ample information available regarding local or regional examples and case studies - rarely in the context of reaching a certain Aichi target, but covering costs and benefits of certain actions or measures, on different scales of governance. Herein, the difficulty lay not in finding case study examples, but in selecting the ones most reliant and appropriate, and in "translating" the actions into the Aichi framework (see below).

Hence, the information available can roughly be categorized into the following categories, according to the governance level:

- EU-level data on reaching certain targets/objectives (either EU environmental legislation or EU Biodiversity Strategy and related targets).

- Regional level data on costs and benefits of certain policies or measures (not related to reaching certain targets).
- National level data on reaching certain targets/objectives (in EU MS either EU environmental legislation or EU Biodiversity Strategy and related targets).
- Local level data on costs and benefits of certain policies or measures.

Therefore, one major task in the context of this report was the "translation" of either different targets (mostly related to the EU Biodiversity Strategy and related targets, and EU environmental legislation) - or certain policies/measures - to the respective Aichi target(s). A matrix providing some hints in this regard is provided below.

Regarding the robustness of data, many assessments of costs and, especially, benefits rely on methodologies that evaluate the monetary value of benefits provided by "ecosystem services" (ES, or "ecosystem goods and services", EGS). These methodologies vary in reliability, and all have minor or major methodological issues associated with their application, which have to be kept in mind when using the results of such studies for various purposes[2].

Methodological Issues - "Translation" of targets

As mentioned above, one major issue in the context of the present study was the "translation" of various targets, policies and measures to the respective Aichi target(s). This is most relevant for the EU MS and esp. the EU Biodiversity Strategy and related targets, and the major EU environmental policies (of which most information was available on the Water Framework Directive and the Natura 2000 network/the Nature Directives). The following matrix provides an overview of the interpretation of the different policies in terms of reaching the respective Aichi target(s), in full knowledge that many topics and targets could be interconnected in a multitude of ways. The table focuses on key linkages only and is intended to give a summary overview rather than definitive analysis of all potential links[3].

[2] For further information, see for example Brouwer et al. (2013).

[3] For a comprehensive overview of the Aichi targets, specific actions to reach these, and the possible linkages between targets and actions, see CBD 2012 (pages 141 et seqq.).

Table 1:

	EU target 1	EU target 2	EU target 3	EU target 4	EU target 5	EU target 6	EU Horizontal Issues	WFD and MSFD	Natura 2000
	Fully implement the Birds and Habitats Directives	Maintain and restore ecosystems and their services	Increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity	Ensure the sustainable use of fisheries resources	Help combat Invasive Alien Species	Help avert global biodiversity loss	Partnerships and Knowledge Base	GES of fresh-water and marine ecosystems, through RBMP/PoMs	Creation of a network of PAs
Aichi target 1	x								
Aichi target 2						x			
Aichi target 3						x			
Aichi target 4							x	x	
Aichi target 5			x					(x)	x
Aichi target 6				x				x	
Aichi target 7			x	x				x	x
Aichi target 8		x						x	
Aichi target 9					x			x (MSFD)	
Aichi target 10		x		x				x (MSFD)	x
Aichi target 11	x							(x)	x
Aichi target 12	x							x	x
Aichi target 13			x						x
Aichi target 14		x						x	x
Aichi target		x						x	x

15									
Aichi target 16						x			
Aichi target 17						x			
Aichi target 18							x		
Aichi target 19							x	x (monitoring)	
Aichi target 20						x		x (spending as legal obligation)	x (spending as legal obligation)

Sources: Biodiversity Information System for Europe; DEFRA 2011: 43 et seqq.

A point to note is the spatial coverage of the study. Usually, Europe is understood to be bordered in the East by the Ural mountains (i.e. including only a small part of the Russian Federation). In the current study, however, and due to practical reasons, the researchers also assessed information from the whole of the Russian Federation, which means an immense increase in spatial size, and a significant increase in population of the areas covered by the study. The point is mentioned here to assist in aggregating the evidence from the study (also with regard to the differences in size and population between Europe as a whole and the EU27). Table 2 contains the relevant information.

Table 2: Inhabitants and size of different parts of Europe

	Size (thousand km²)	**Population (thousand inhabitants)**
EU27*	4.324	503.605
Europe (Ural)	Approx. 10.180**	739.000
Europe and Russian Federation	Approx. 23.295**	772.000

Sources: CIA Factbook.

*Since 1st of July, 2013, Croatia is member to the EU (forming, effectively, the EU28). However, all assessed documents refer to the EU27 and the table lists the according figures.
**Different sources state different spatial sizes for Europe, due to the unclear geographical borders.

Methodological Issues - Currency Conversion

All monetary information in the current study has been converted to current US$ (as of 2013) in order to allow for better comparability. Based on the options laid out by UNDP (2013: 49) regarding this issue, currencies are converted using the conversion rate of the "baseline year", which in this case is the year in which the assessment/study was conducted. The conversion to 2013 dollars follows the Inflation Calculator provided by the US Bureau of Labour Statistics (http://www.bls.gov/data/inflation_calculator.html), which is based on the Consumer Price Index.

Evidence Gaps

Beside the issues named above - i.e. the lack of quantitative data regarding benefits and costs in the NBSAPs, and the general lack of "links" between specific actions/measures/investments and the Aichi (or EU) targets - the following evidence gaps are of the greatest importance:

- The missing link between the effects of an action, and the change this action will result in, in terms of reaching the Aichi or EU targets.
- The information regarding quantitative benefits of reaching the targets is very sketchy, i.e. an overall estimation does not exist. No report has been found that clearly addresses the economic implications of reaching the Aichi targets, neither on the European, the EU, nor the national level.
- Regarding investment needs, the evidence gaps lie in the difficult translation of environmental policies at the EU or national levels to the Aichi targets (so, the existing evidence is focussed on other targets/policy objectives than the Aichi targets, and often does not establish the link).

- The evidence gaps regarding resource needs are relatively manageable in Western Europe, although uncertainties evolve when local, case study-like evidence is upscaled to the national or EU-scale. In Eastern European countries, mostly non-EU, the data gaps regarding costs are very significant (i.e. there is almost no data available).
- Information on the contributions and negative effects of the EU development, coherence and accession policies on biodiversity was not available, as well as information on cost-effectiveness. In the latter field - i.e. regarding the sequencing of measures - there is a lot of general information available, but no source that assesses the consequences of different approaches in a quantitative way (e.g. "measures a and b implemented before measures c and d lead to additional costs...").
- The evidence gaps regarding the ratio between costs and benefits mainly concerns the uncertainties of upscaling local level evidence to the whole of Europe.

Variations in Extent and Quality of Evidence between Questions

Naturally, evidence supporting the qualitative aspects of the questions - i.e. regarding the benefits probably connected to reaching the Aichi targets, or the necessary actions/measures/investments - is much more easily obtainable than quantitative data. This, however, does not necessarily mean that the qualitative data is also "better" or "more accurate" - long lists of necessary actions/measures/investments without any information on the degree to which these will suffice for reaching certain objectives are often provided, but not very helpful. On the contrary, even if quantitative information might be more difficult to generate and might have generally more uncertainties attached to it, the links with the effects (of the actions/measures/investments investigated) are mostly included and at least allow for further conclusions.

The evidence is fairly strong with regard to investment needs and resource requirements (except for the non-EU Eastern European countries, see above); and the evidence situation for benefits is also quite good, although more reliant on anecdotal/case study-based evidence.

Relations between costs and benefits are treated in Cost-Benefit Analyses for the most part, conducted on a local or regional (e.g. sub-national) scale. Besides the challenge of transferring the results of such studies to a greater scale, CBA often involve methodologies that evaluate the monetary value of benefits provided by ES, which can, as mentioned above, include significant uncertainties. Not much data is available to better understand policy alignments and overlaps between environmental policies, and with regard to cost-effective combinations of measures, or "sequences".

3. BENEFITS OF DELIVERING THE AICHI TARGETS

SUMMARY BOX

From the evidence collected regarding the "benefits of reaching the Aichi targets", there remains no doubt that increased biodiversity protection and sustainable use of resources would benefit all spheres of European (human) societies: private and public life, rural and urban populations, richer and poorer people, corporations, most economic sectors - some to a higher, some to a lesser degree, and not necessarily distributed equally (across the pan-European region, and across societies). It is furthermore clear from the evidence that these benefits are not only "nice to have", but represent significant components and functions of the socio-economic systems in Europe, with a real value existing in terms of ES provision (mostly slightly "abstract" monetary benefits), indirect and direct income (e.g. visitor spending in protected areas), and as a basis for jobs and job creation. Additionally, biodiversity protection, especially green infrastructure projects, have a great potential for increasing ecosystem resilience to predicted climate change impacts.

Information on benefits is readily available regarding qualitative information on benefits associated with biodiversity protection and sustainable use of resources. Quantitative information, however, was almost exclusively available from Western European countries, mostly from the EU MS, or the EU itself. Additionally, information is not "connected" to the Aichi targets, i.e. does not establish a link between reaching the targets and certain benefits provided.

The most significant monetary values, as identified by this report, stem from conservation and restoration activities, represented by the EU´s and other countries´ initiatives to establish a network of protected areas (Natura 2000 and Emerald Network, corresponding mainly to the Aichi targets 5, 10, 11, 12, 13 [protection/conservation], 14, 15 [restoration], 7 [use/management]), and to improve the conservation status of such areas - several studies estimate the annual value to range between 200 and 450 billion €/a [280 to 650 billion US$/a]. These values naturally include tourism and recreation, which could probably be identified as the most important private activity to possibly "fund" biodiversity protection. In terms of not-monetized benefits, the provision of jobs and the creation of new jobs is be of great importance, as it is estimated that up to 200.000 new FTE jobs would be created through the EU Biodiversity Strategy, and state that up to 16% of all jobs in the EU are dependent on the environment.

Other high and important values are provided through insect pollination (14-15 billion € or 19,4 to 20,9 billion US$/a) and the avoided damage costs of fighting IAS (12,5 billion € or 17,3 billion US$/a); sea defence and protection against natural hazards also score pretty high with regard to the value attributed to them - these are all examples calculated with some sort of an avoided damage cost approach. This, however, raises a significant point: evidence is fragmented and available mostly on a case study basis (meaning that often only a single estimation is available), which also lacks the relation to either the Aichi or the EU Biodiversity targets. This means that the methodologies with which values in an individual study have been generated are very crucial - benefits that have been evaluated on the basis of more than one study, with different methodologies, promise to be much more reliable.

3.1 What will be the economic benefits of delivering the Aichi Targets?

This section presents the benefits - also in terms of costs of inaction and incurred damages through inaction - on a qualitative basis; evidence is subdivided into general information on benefits linked to biodiversity conservation, target-specific information (i.e. benefits of reaching a certain EU or Aichi target), and sector-specific information (i.e. linkage between biodiversity and job creation, or innovation potential).

"Benefits" consist of benefits provided (i.e. services that contribute directly and indirectly to human well-being), but also of damages (e.g. economic losses) that will be prevented through biodiversity protection and sustainable use of resources (i.e. reaching the Aichi targets). The loss of biodiversity, though, is not as simply identified as the loss of whole ecosystems - instead, it forms "vital components" of ecosystems, and its loss/degradation can have far-reaching consequences at the local, regional and global level (EC 2011: 7 et seqq.). Some business sectors are especially affected, as they depend on biodiversity and/or ecosystem services. This includes fisheries, forestry (wood products), agriculture (dependent on services such as pollination, biological control, soil formation, water availability and genetic diversity), water supply, pharmaceuticals and cosmetics, chemicals, agro-food, and growing parts of the tourism sector (EC 2011: 8).

General Benefits of Biodiversity Conservation

"Biodiversity" - of species and ecosystems - is linked to most ecosystem services. The following table provides an overview of evidence found in the present survey (i.e. the table is not representative - if more sources on local examples were assessed, the amount of sources mentioning individual services could be different).

Table 3: Overview of ecosystem services and benefits linked to biodiversity (categorization of ES according to the TEEB Report).

	Example of benefit provided/lost	**Number of sources mentioning the service/benefit**	**Quantitative evidence included in the report (Y/N)**
Provisioning Services			
Food	Fisheries	>20	Y (cheese production in Croatia; Swiss forests; section 3.2)
Raw Materials		>20	N
Genetic Resources	Input for numerous industries (e.g. food/medicines).	1	N
Medicinal Resources		5	N
Ornamental Resources		1	N
Regulating Services			

Influence on air quality	Improvement of air quality (e.g. through forests).	2	N
Climate regulation	Mitigation of GHG emissions; carbon sequestration; temperature and precipitation.	10	Y (carbon sequestration by forests in the UK; section 3.2)
Moderation of extreme events	Flood and drought mitigation.	8	Y (Swiss Alpine forests; section 3.2)
Waste treatment/water purification		11	Y (drinking water provision in Vienna, the UK; sections 3.1 and 3.2)
Erosion prevention		13	Y (Muntanya de Montserrat Natura 2000 site; section 3.2)
Nutrient cycling		7	Y (water purification and nutrient cycling in Anne Valley, Ireland; section 3.2)
Biological Control	Pollination; pest control.	19	Y (pollination in the EU, UK and Switzerland; section 3.2)
Habitat Services*			
Lifecycle maintenance	Nursery service.	3	N
Gene pool protection (conservation)	Adapted species (drought/flood resistance)	1	N
Cultural Services			
Aesthetic information		>20	Cultural services are closely interlinked (Kettunen et al. 2009), and difficult to distinguish from another. However, tourism and recreational benefits are without doubt strongly connected to undisturbed natural ecosystems (such as provided by Natura 2000 and the Emerald Network).
Opportunities for recreation and tourism	Nature/Green tourism.	>20	
Inspiration for culture, are and design		>20	
Spiritual experience		>20	
Cognitive information (education and science)		>20	

Sources: Kettunen/ten Brink 2006: 1 et seqq.; TEEB 2009; UNDP 2013: 6; EP 2012; EU 2013: 2; EC - DG Environment[4].
*Habitat Services were not included in Kettunen/ten Brink 2006. Hence, the number of sources is lower.

Target-specific benefits

Besides the evidence from European sources, the CBD High Level Panel lists the benefits associated with reaching the individual Aichi targets from a global perspective (HLP 2011: 46 et seqq.).

For reaching the EU Biodiversity Targets, the European Commission also provides a qualitative overview, depicted in the table below.

Table 4: Benefits of reaching the EU Biodiversity Targets

EU target	Corresponding Aichi target(s)	Environmental benefits	Economic benefits	Social benefits
1	1, 11, 12	Increased biodiversity and ES from Natura 2000 sites, better resilience to stressors such as CC. Synergies with WFD and MSFD.	Increased benefits from ES.	Increased employment in rural areas in the medium term.
2	8, 10, 14, 15	Maintained and enhanced ecosystem and ES, such as clean air and water, carbon storage and natural disaster control. Increased ecosystem resilience and reduced vulnerability to CC. Synergies with WFD and MSFD.	Increased benefits from ES. New investment opportunities for businesses and innovation potential. Climate mitigation benefits.	Multiple social benefits, both in urban and rural areas, such as positive impacts on health and quality of life, aesthetical and psychological benefits, reduced exposure to natural disasters, new job opportunities in restoration and conservation.
3	5, 7, 13	Maintaining and enhancing agriculture and forest ecosystems and their services, including carbon storage, erosions prevention, pollution control and water purification. Synergies with WFD.	New possibilities created for agricultural sector diversification; improving farmers income in Natura 2000 and HNV areas; increased competitiveness and diversification of the forestry sector.	Contribution to rural development in less favoured areas; new jobs.

[4] A good overview of ES provided specifically by Natura 2000 sites can be found in an IEEP Report (Kettunen et al. 2009: 16 et seqq.).

4	6 ,7, 10	Increased and more sustainable levels of fish populations, maintained and enhanced marine ecosystems and ES. Synergies with MSFD.	Positive long-term impact on fisheries income. Increased efficiency of public spending.	Prevent negative effects on employment in case of a collapse in fish stocks.
5	9	Reduced pressure on species and habitats from IAS. Strong synergy effects with other targets, e.g. ecosystem restoration.	Reduced economic damage.	Reduced adverse impacts on human health, avoided negative employment consequences, enhanced cultural services and recreational activities.
6	2, 3, 16, 17, 20	Improved global biodiversity especially in developing countries. Increased ES such as carbon storage, water provision, purification and retention.	Economic benefits from biodiversity and ES, e.g. climate mitigation, increased crop yields through pollination in developing countries. Genetic biodiversity benefits in EU and developing countries (cosmetics and medication). Legal security for companies through ABS protocol.	Poverty alleviation. Decreased risk of social impacts of natural disasters. Health benefits. Improved livelihood of indigenous communities through sharing of traditional knowledge benefits.

Source: EC 2011d: 3 et seqq., Biodiversity Information System for Europe (adapted).

CASE STUDY - DRINKING WATER PROVISION IN THE CITY OF VIENNA

The per capita consumption of water in Vienna is 150 liters per day - at 1,7 million inhabitants, an annual consumption of 93.075 million liters. About 95% of the annual water supply is derived from springs in the Rax, Schneeberg and Schneealpe mountains and from the Hochschwab mountain massif, requiring no or very little treatment before it can be used as drinking water. The Vienna City Constitution put Vienna's water and the forests surrounding the springs under protection orders to provide pure drinking water at any time (now comprised of 32.000 hectares of forest, pastures and meadows in which water protection has the highest priority).

The value of the clean drinking water provided by the ecosystems surrounding Vienna is not monetized, but establishing a technical infrastructure able to provide the same amount would certainly cost millions of Euro.

Source: EC 2011a: 56.

It is important to note the "wider" understanding of benefits in the table above, i.e. the inclusion of synergies with other policy fields (such as the Water or Marine Strategy Framework Directives) as

"benefits". The EC expands on this analysis by also depicting the spatial scales on which the benefits are realized - using, however, a "narrower" understanding of benefits:

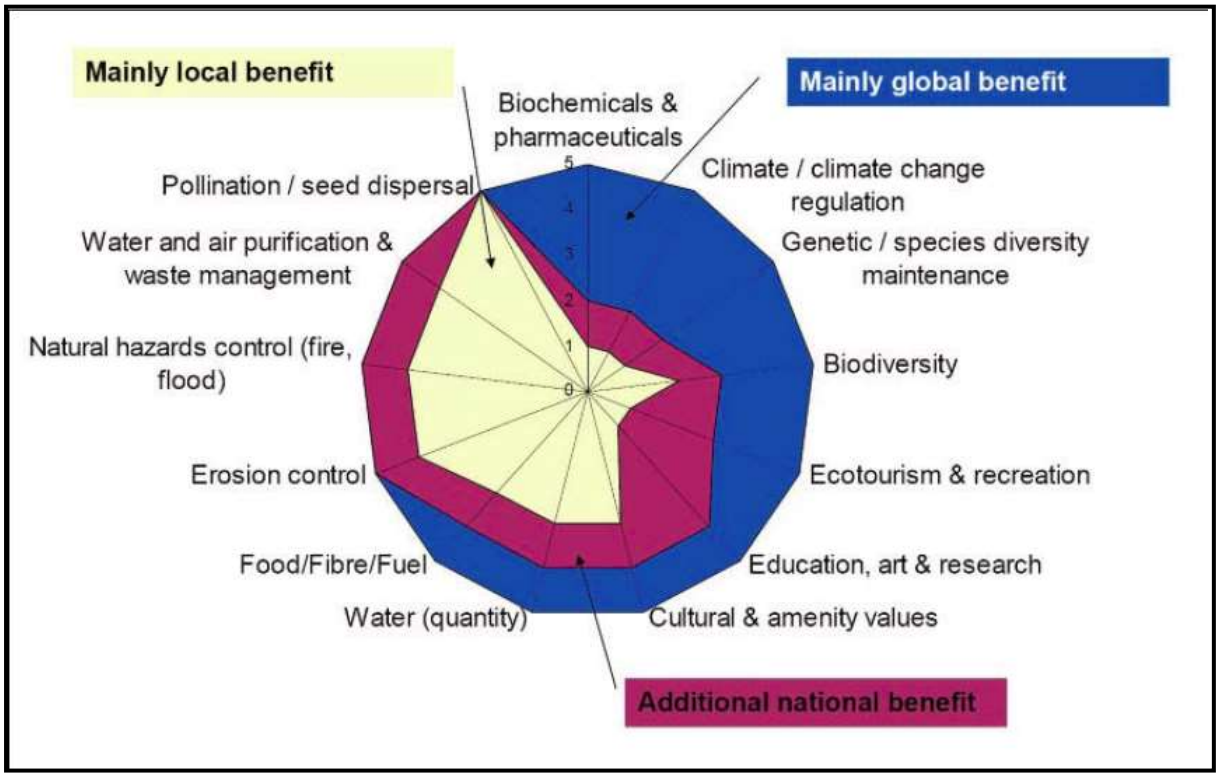

Figure 1: Spatial scales of benefits provided by biodiversity. Source: EC 2011: 9.

Impacts of biodiversity conservation on jobs:

According to estimations, 2,5% to around 16% (depending on the definition of job sectoral allocation) of all jobs in the EU (probably EU27 in this case) are dependant on the environment, whether directly or indirectly (TEEB 2009: 24). A further loss/degradation could therefore seriously impact the European labour market.

The Natura 2000 network alone is estimated to support a total of 4,5 to 8 million full-time equivalent (FTE) jobs through visitor´s expenditures only (EP 2012).

An overall assessment of jobs (and "job skills") affected by the EU Biodiversity Strategy and its targets has been conducted by ICF GHK and several other research institutes (Jurado et al. 2012). The authors, although stating that the overall impact was difficult to assess due to overlaps between targets, estimate the number of FTE jobs that would be newly created at 200.000, and the number of "generally affected" jobs much higher. The table below depicts the results from this study:

Table 5: Impacts of EU Biodiversity targets on EU labor market.

EU target	Corresponding Aichi target(s)	Number of jobs created or sustained	Number of wider existing jobs affected
1	1, 11, 12	104.000 FTE jobs directly supported in Natura 2000 network. 174.000 FTE jobs including multiplier effects. 122.000 additional jobs compared to existing levels.	Existing jobs supported by Natura 2000 management estimated are 30% of total estimate.
2	8, 10, 14, 15	110.000 jobs supported in restoration of ecosystems/green infrastructure. Additional new jobs created in biodiversity offsetting.	Small proportion of the estimated restoration jobs are existing jobs. Implications for larger number of jobs in planning authorities through offsets and restoration activities.
3	5, 7, 13	11.250 additional FTE jobs through increased agri-environment activity. 3.000 additional FTE jobs in forest management planning.	A large proportion of existing 10,8 million FTE jobs in agriculture and 490.000 FTE forestry jobs will be affected, with implications for skills.
4	6, 7, 10	Up to 30.000 FTE fishing jobs lost by 2022. Net loss of 10.000 - 17.000 FTE jobs compared to a no-reform scenario. Opportunity for growth in employment after 2020. Broadly neutral effect on overall levels of employment in wider coastal communities.	130.000 existing FTE jobs in fishing will be affected by Strategy, with implications for skills.
5	9	Between 520 and 2.520 FTE jobs supported by IAS control programmes in total, including existing jobs. 250 - 2.250 new FTE jobs estimated.	Larger number of other existing jobs affected, including border and customs officers and pest control sectors, with implications for skills.
6	2, 3, 16, 17, 20	New jobs created in policy development and implementation.	Implications for skills requirements for larger numbers of existing jobs, including borders and customs officials, administrators in organisations dealing with genetic resources.

Source: Jurado et al. 2012: 98 et seqq.

CASE STUDY - NEW JOBS THROUGH BIODIVERSITY IN FRANCE
In France, it is estimated that restoration and green infrastructure would provide significant new job opportunities: the number of jobs (unclear whether FTE or not) that contribute to knowledge, management, protection and restoration of biodiversity would raise from currently 20.000 to 40.000 in 2020 "as a result of newly established biodiversity priorities". Also, it is estimated that many jobs for "biodiversity specialists" will be created in the near future in large private companies like Autoroutes du Sud de la France.
Source: EC 2011: 60

Other sources describe other (qualitative) benefits in more detail:

- Impacts (of biodiversity conservation) on innovation potential, in terms of "man-made elements (such as green roofs, porous pavement, rain absorbing gardens, eco-ducts for wildlife crossings), innovative planning approaches, the design and application of urban elements enhancing biodiversity, all combinations of technologies enhancing ecosystem services, or finally the development of new organization methods, products, services and system innovations to better protect ecosystems" (EC 2011: 58 et seqq.; similarly: EP 2012).
- Increasing general resilience to climate change and enhancing adaptation: examples mentioned are wetlands and flood management, dune systems and coastal protection and upland forests and erosion/landslide prevention (see section 6.1 for more details) (EC 2011c: 4 et seqq.; UNDP 2013: 6; EU 2013: 2).
- Nature-based tourism is becoming an increasingly important subsector in many countries/areas. In Georgia, for example, there has been a progressive increase in visitation rates to Georgian protected areas over the last few years (from 5.669 people in 2005 to 303.686 people in 2011) (TEEB 2013: 25).

Regarding the social impacts of biodiversity policies, in this case green infrastructure, it is reported that urban green infrastructure would (beside the benefits already listed in table 4 above) "mitigate urban heat islands by cooling the air and shading buildings and surfaces", would have positive impacts on "social activity, improving community cohesion, developing local attachment and lowering crime levels, particularly in deprived communities" and increase urban air quality through capturing or filtering substances and pollutants such as PM1095, O3, SO2 and NOx (EC 2011: 59 et seqq.).

3.2 What evidence is there of the nature, scale and value of these benefits, at national and international levels?

This section presents the benefits - also in terms of costs of inaction/damages through inaction - on a quantitative basis, as far as possible; evidence is, however, fragmented and available mostly on a case study basis (i.e. without relation to either the Aichi or the EU Biodiversity targets). The most comprehensive information relates to the creation of an European network of protected areas (i.e. Natura 2000 and Emerald Network), and is depicted as a case study; further information on benefits is presented below, categorized per ES.

Global level estimations of the benefits of protecting biodiversity (or the damages due to the failure of protecting biodiversity) reach into the hundreds of billions (Balmford et al. 2002/HLP 2011: 44 et seqq.) or trillions of Dollars per year (Braat/ten Brink 2008)[5].

CASE STUDY - BENEFITS OF CREATING AN EUROPEAN NETWORK OF PROTECTED AREAS (NATURA 2000/EMERALD NETWORK)

Related to Aichi target(s): 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management).

Ecosystem Services and corresponding benefits provided by the current or future (i.e. fully implemented) Natura 2000 network are considerable, although estimations vary. Whereas an IEEP Report (Gantioler et al. 2010), the European Parliament (EP 2012) and the most recent study by IEEP (Tucker et al. 2013: 471 et seqq.) place the value at 200-300 billion €/a [around 280 - 430 billion US$/a] (i.e. 1,7 to 2,5% of EU GDP), other sources estimate a value of up to 450 billion €/a [around 650 billion US$/a] (EC - DG Environment).

Other estimations aim at individual services/benefits of the network: IEEP (Tucker et al. 2013: 471 et seqq.) estimate the value of stored carbon (i.e. mitigated emissions of CO_2) between 607 and 1.130 billion € [around 812 - 1.513 billion US$] (stock value 2010). The Natura 2000 network is also very important for tourism and recreation: 1,2 to 2,2 billion "visitor days" per year are counted in the EU27, with direct and indirect economic impacts reaching 50 to 85 billion €/a[6] [70 - 118 billion US$/a] (EC 2011c: 4 et seqq.).

Based on WTP estimations, the benefits surrounding the recreational quality of the network are situated between 5 and 9 billion €/a [6,9 - 12,5 billion US$/a] (EC 2011c: 4 et seqq.).

Other estimations cover regional or national levels: The installation of the Lower Danube Green Corridor, spanning four countries (Bulgaria, Romania, Moldova and Ukraine) and 2.236 km^2, has made significant improvements to water quality, increased biodiversity, lowered risks from flooding and improved local livelihoods. These benefits are valued at 500 €/ha/a [697 US$/ha/a], and future earnings are estimated at 85,6 million €/a [119,2 million US$/a] (EC 2011a: 50). A 2006 assessment by the Dutch Institute for Environmental Studies estimated the benefits provided by Natura 2000 in the Netherlands to be around € 4.000/ha/a [6.223 US$/ha/a]. Recreation and tourism as well as wider ecosystem functions were important components of this value, as well as non-use benefits, whereas provisioning of raw materials was of lesser importance. The authors extrapolated the gross welfare benefits of all Natura 2000 areas in the Netherlands (1,1 million ha), deriving an estimate of around 4.5 billion €/a [around 6 billion US$/a] (EC 2011a: 50; Kuik et al. 2006). In France, as part of a wider economic and institutional assessment of the Natura 2000 network, several studies were carried out to determine the benefits arising from Natura 2000 across a range of sites. At the Natura 2000 site "Plaine de la Crau", the overall benefits were calculated to be around 142 €/ha/a [around 190 US$/ha/a] (EU 2013: 6).

Plenty of examples stem from studies at the local level: in Belgium, in the Kalkense Meersen Natural 2000 site (around 1.000 hectares of grasslands, marshes, intertidal mudflats, river dunes and forests), the benefits associated with restoring the floodplain and extensifying grassland usage (improved water regulation and genetic/species diversity) are estimated to reach 15 million €/a

[5] Further information on global level estimations can be found in the reports of the High Level Panel.

[6] From the sources assessed, it is unclear if this last figure is already included in the estimation issued by IEEP and others (i.e. the 200-300 billion €/a) above.

[21,5 million US$/a]. In Croatia, the Telascica site (7.050 hectares of coastal lagoons, *Posidonia* beds, large shallow inlets and bays, reefs and even submerged sea caves, quiet beaches and a mixture of shallow coastline and rough cliffs) provides significant tourism benefits (2 - 5 million €/a, or 2,9 - 7,2 million US$/a), but functions also as carbon sink (4,4 - 8,2 million €/a, or 6,3 - 11,8 million US$/a) and centre for regional cheese production (valued 44 million €/a, or 63,3 US$/a). The Muntanya de Montserrat site (7.270 hectares of cliffs and rock formations close to Barcelona) attracts up to 3 million visitors annually, despite its small size. The estimated annual values, hence, are significant: 9-20 million € in carbon sequestration services [12,9 - 28,8 million US$/a] (forest cover 25%), 22-29 million € in erosion control [31,6 - 41,6 million US$/a], and 33,7 million € [48,4 million US$/a] in amenity and cultural values (probably closely connected to tourism and recreation) (all local examples: Arcadis 2011: 81 et seqq.).

Other estimations are targeted either at individual (local or national) projects (e.g. "Wetland restoration in Northern Wales"), at specific ecosystems (in a regional or national context, e.g. "the Swiss national forests"), or specific policies (e.g. "implementing the WFD"). These are listed below, categorized per ES or per ecosystem, and with the respective Aichi target(s) most closely related to the projects/benefits identified. Remarks regarding distributional effects are to be found at the end of the section.

Ecosystems: Forests and woodlands

Related to Aichi target(s): 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management).

The Swiss forests are especially attractive for sports and leisure activities; the Federal Office for the Environment conducted a study on their monetary recreational value. Based on data from an opinion poll in the whole of Switzerland, the study "provides information on the appreciation of recreation services by the Swiss population in the entire Swiss forest, using the travel cost method", resulting in a recreation value of CHF 10 billion/a [11,6 billion US$/a] (FOEN 2010: 90). Furthermore, the forests provide provisioning services, like game, mushrooms and berries. Even though these forest products are marginal for Switzerland's economy, they may be of local importance. For instance, the value of mushrooms collected in Switzerland's forests is estimated to be CHF 8 million/a [9,3 million US$/a] (FOEN 2010: 32).

According to another, more specific study, the Swiss Alpine forests (17% of forest area) provide a value of 2 to 3,5 billion US$/a in avalanche, rock fall and landslide protection (Tucker et al. 2013: 471 et seqq.).

Woodlands cover 12% of the UK´s area, increasing carbon sequestration, which is valued 680 million £/a [1.109 million US$/a] (UK NEA 2011: 34). These are furthermore highly valued by people for social and cultural services (approximately 250–300 million day visits to UK woodlands per year), estimated to exceed a value of 1,2 billion £/a [around 2 billion US$/a], with the landscape value of woodland estimated at 185 million £ [318 million US$/a], and recreational visits valued at 484 million £ [830 million US$/a] (UK NEA 2011: 73).

Ecosystems: Wetlands, moorlands, bogs and fens

Related to Aichi target(s): 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration).

Benefits provided by wetlands (in a general sense) are evaluated in the UK NEA and the UK´s Biodiversity Strategy, providing some figures for water purification/provision, storm buffering and erosion prevention. Latter are estimated to reach 1,5 billion £ [2,5 billion US$] annually in England´s coastal wetlands alone (DEFRA 2011: 8); other reports state a value of 4.600 £ per metre [9.567 US$/m] of coastal salt marshes "owing to reduced tide and wave impact, resulting in avoided costs for maintaining sea defences" (Tucker et al. 2013: 471 et seqq.; Rupp/Nicholls 2002). Other sources state that especially the benefits of the flood protection services that wetlands provide are very site-specific (i.e. depending very much on the population in the region - urbanization, income etc.). Locally, these benefits can be significant (for instance, the restoration of the original river landscape by means of wetlands and estuarine habitats restoration at the Kalkense Meersen Natura 2000 site in Belgium has been estimated to provide flood mitigation benefits of between 640.000 and 1.650.000 €/a) [892.000 to 2,3 million US$/a] (EU 2013: 3).

70% of the UK drinking water "comes from upland areas, moorlands and heaths, getting purified naturally" (Tucker et al. 2013: 471 et seqq.; UK NEA 2011) - no value is provided for this, although rough estimates extracted from IEEP (Tucker et al. 2013) place the value of natural treatment (of water) for big European cities (Berlin, Oslo, Vienna, Munich) at 7-16 million €/a [9,4 - 21,4 million US$/a] (EU 2013: 5).

CASE STUDY - WATER PURIFICATION THROUGH AN INTEGRATED CONSTRUCTED WETLAND IN ANNE VALLEY, IRELAND

Related to Aichi target(s): 14, 15 (restoration), 19 (knowledge).

In Anne Valley (Ireland) an integrated constructed wetland was created instead of installing a traditional treatment plant. Not only is the wetland more efficient in clearing (mostly livestock) wastewater than a comparable traditional sewage plant, it also offers multiple benefits through the ES the wetland provides: water purification, fresh water, climate regulation and carbon sequestration, flood control, recreational aspects, soil formation and nutrient cycling, habitat for wetland flora and fauna. Farmers are quoted that they are only keeping their farming business due to the installation of this wetland, and the aesthetical value of the area has considerably increased.

The (capital) costs for 1.750 population equivalents were 770.000 € + 165.000 € for scientific monitoring (over three years) [1, 3 million US$ in total]. This sum includes costs for tourism facilities of 220.000 €, and maintenance costs are lower than for a traditional plant. This favourably compares to estimated costs of 1.530.000 € [or ca. 2,1 million US$] for an equivalent traditional plant.

The direct benefits of the wetland (replacement cost approach) reach 595.000 €/a [830.000 US$/a] (size of wetland and benefitting population unknown); per unit cost of treatment (population equivalents), costs are 340 € [474 US$].

Source: EC 2011a: 56

Ecosystem Services: Opportunities for recreation and tourism

Related to Aichi target(s): no direct link; recreation and tourism in natural areas, however, is dependent on natural areas which are protected or restored; hence, indirect link to Aichi targets 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration).

The Swiss 4th National Report to the CBD (FOEN 2010: 65) states that the Swiss National Parks have - in addition to the "ecological benefits" - positive direct and indirect economic effects. For example, tourism revenues generated directly by the Swiss NP in Canton Grison average 10 million CHF/a [11,6 million US$/a], with an additional 7 million CHF [7,9 million US$] in indirect benefits (employment and incomes). In Georgia, the recreational value that Georgian city dwellers would derive from visiting National Parks was estimated at 2,7 million GEL [2,27 million US$/a], and, according to survey results from 2000, the average WTP for entering a Georgian National Park was 21.5 GEL [17,6 US$] (TEEB 2013: 48).

CASE STUDY - TOURISM AND RECREATION IN THE UK NATIONAL ECOSYSTEM ASSESSMENT
The UK NEA, published in 2011, provides a comprehensive overview of the state of the natural environment in the UK, and tries to evaluate the value of the countries´ ecosystems and ES.
The UK NEA also focuses on tourism and recreation, stating that "ES are clearly crucial to the more than 3.000 million outdoor recreational visits which UK residents make each year". It is estimated that these visits generate a social value in excess of 10 billion £ annually [16,6 billion US$] (UK NEA 2011: 42). Additionally, several local examples are presented: Nature-based tourism in Scotland, for example, is estimated to provide about 1,4 billion £ [2,29 billion US$] in income annually with about 39.000 full-time jobs (UK NEA 2011: 64); seaside tourism to the UK´s coasts - i.e. consisting of walking, birdwatching, boating and outdoor sports - is valued at 17 billion £/a [28,2 billion US$/a]; in Wales, seaside tourism accounted for 42% of domestic tourism spend (in 2005), supporting nearly 100.000 jobs and contributing 5 billion £ [8,3 billion US$] to income; the value of tourism to the Western Isles of Scotland is 49,9 million £ per year [83 million US$].
Source: UK NEA 2011: 76

Ecosystem Service: Pollination

Related to Aichi target(s): 7 (use/management), 8 (reduced pollution), 9 (IAS - threatening bee populations), 12 (species conservation).

Insect pollination in the EU27 has an estimated economic value of 14 to 15 billion €/a [19,4 to 20,9 billion US$/a] (EU 2013: 3; EC 2011b: 4). On a national level in the UK, the total value of pollination services is estimated at 430 million £/a [715 million US$/a] (UK NEA 2011: 33).

In Switzerland, the pollination of cultural and wild plants as well as the production of honey, pollen and wax by honeybees is regarded as an "important contribution to the national economy", with a "pollination value of a single bee colony for the harvest of fruits and berries" of 1.250 CHF/a [1.459 US$/a], and an average honey production of 10 kg/colony/a (19.000 beekeepers with 170.000 colonies exist in the whole country) (FOEN 2010: 21).

Target: Invasive Alien Species

Related to Aichi target: 9 (IAS), 12 (species conservation).

Around 11.000 alien species are recorded in Europe. Of these, however, only a small percentage, 10–15% , have become so common as to be considered "invasive", the others remain relatively restricted in range (Government of Finland 2011: 69). Nevertheless, in the EU27, annual damages through IAS are estimated to reach 12,5 billion € [17,3 billion US$/a] (EC 2011b: 6); other sources

state the same figure for the whole of Europe (DEFRA 2011: 32). On a national level, damages reach 1,7 billion £ [2,8 billion US$/a] (in the UK; DEFRA 2011: 32).

Other topics

Regarding green infrastructure (such as "bridges" for wildlife, "soft coasts", or green urban infrastructure), it is reported that these would reduce traffic accidents involving wildlife, with estimated values at 42 million €/a in Switzerland and 150 million €/a in France) [69,7 and 249,4 million US$/a, respectively] (EC 2011: 58 et seqq.). In 2007, sea defence services by sand dunes ("soft coasts") have been calculated to be worth between 53 and 199 million £/a [96,8 to 359 million US$/a] in Wales, and in England, the soft coasts provide an estimated 3,1–33,2 billion £/a [5,5 to 59,8 billion US$/a] worth of capital savings in sea-defence costs (UK NEA 2011: 66, 76).
Related to Aichi target(s): 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration).

The creation of Marine Protected Areas (MPAs) in Europe (including Natura 2000 sites) could generate 1,4 to 1,5 billion €/a [up to 2 billion US$/a] (specific benefits not specified) (EU 2013: 5). At the same time, several studies demonstrate the economic impacts of overfishing - in the Baltic in 2002, for example, cod fishing represented a cost (damage) of 128,6 million US$ (167,3 US$ present value) compared with what could have been harvested with sustainable yields. Similarly, the North Sea cod fishery lost 254,1 million US$[7] (WWF-Germany 2002)
Related to Aichi target(s): 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 6, 7 (use/management).

Freshwater Ecosystems: Depending on the percentage of water bodies in "good status", the benefits derived from reaching the WFD objectives are roughly estimated to range between 10 and 20 billion €/a [13 to 26 billion US$/a] in the EU27 (ACTeon Environment 2012: 46).
Related to Aichi target(s): 4 (planning - if RBMPs are included), 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management), 8 (pollution), 20 (resource mobilization).

Distributional Effects

Benefits of ES provision are not distributed evenly across societies (i.e. on a national scale), regionally (i.e. across Europe or the pan-European level) or sectoral (i.e. between economic sectors). However, there is no source specifically targeting this issue for Europe; the following section therefore represents a compilation of small bits of information and some overall conclusions based on them.

The TEEB Report (TEEB 2009: 25 et seqq.) primarily highlights the great importance of ES benefits for the rural poor, who "often rely directly on local ecosystem services and biodiversity for their food, shelter, income, fuel, health, quality of life and community" (TEEB 2009: 25). This is mentioned also explicitly in the TEEB Scoping Study for Georgia, which states that "nearly 47% of Georgia's population lives in rural areas and they are fully dependent on ecosystem services like water purification, erosion prevention, fuel wood provisioning" - 80% of Georgia´s rural households use fuel wood extracted from nearby forests for heating and cooking (TEEB 2013: 20, 34). This is true for

[7] Methodology could not be verified in detail.

other Eastern European countries or regions as well (i.e. Moldova, parts of Belarus and Ukraine, but also parts of EU countries such as Romania or Bulgaria), and across the pan-European region; without doubt, also countries with large grassland areas/pastures and great numbers of shepherds/sheep (also in Western Europe) are certainly more dependent on biodiversity ES than others. Any reduction in the provisioning of the ES the rural populations are dependent on implies measurable losses in social welfare, e.g. the need to purchase substitutes for timber and non-timber forest products (TEEB 2013: 34).

- First conclusion: the loss of biodiversity and related ES will affect the rather poor Eastern European countries and their populations more than the well-developed EU or non-EU (Norway, Switzerland) countries.

Looking at the distribution across societies (i.e. on a national scale), it is clear that many ES benefit the society as a whole: fresh air, rainfall and pollination, to name a few. Others provide their benefits to private entities or individuals, e.g. in case the drinking water (purified in surrounding ecosystems) is provided by a private company, which did not invest in water protection measures before (and is paid by water users). Also, as the EC Impact Assessment on the EU´s Biodiversity Strategy states, the "access to green spaces is unequally distributed across socio-economic groups, with poorer social groups having, in general, lower access, and given that green space could have positive influence on health conditions such as obesity, mental health, circulatory disease and asthma, more equal access to green space could also help reducing health inequalities between socio-economic groups" (EC 2011: 60). Similarly, green spaces or protected areas close to cities will benefit the urban population much more than the rural, as the latter has generally a more easy access to green areas in general. Also, the potential income from increased biodiversity protection and sustainable use of resources is not necessarily distributed evenly across societies. In the case of Georgia, for example, it is reported that the majority of local residents see little prospect that the development of tourism would improve their lives, as engaging in the tourism business requires capital investments which only already wealthy groups/families can afford. Hence, the development of tourism is associated with further wealth and income creation for those groups/families that are already wealthy, rather than the development of the region in general (TEEB 2013: 26).

- Second conclusion: ES provision in many cases benefit the society as a whole; however, in plenty of other cases, the distribution is uneven, and can both tend towards benefitting poorer or discriminated groups of society, and privileged individuals/groups or private entities (such as companies).

Finally, there are economic sectors which are much more dependent on ES provision than others, including fisheries, forestry (wood products), agriculture (dependent on services such as pollination, biological control, soil formation, water availability and genetic diversity), water supply, pharmaceuticals and cosmetics, chemicals, agro-food, and growing parts of the tourism sector (EC 2011: 8; TEEB 2013: 13). These will be affected more severely by biodiversity loss (or would benefit to a greater extent from biodiversity protection and sustainable use of resources) than other branches of industry and services, such as smelting, mining etc.

- Third conclusion: economic (and public) sectors more dependent on ES provision would benefit to a greater extent from biodiversity protection and sustainable use of resources than other economic sectors.

4. INVESTMENT NEEDS

SUMMARY BOX
Due to locally/regionally specific circumstances regarding the interpretation of individual targets (or: the interpretation of related, legally binding EU targets/objectives) and the individual conclusions in terms of the approach, no comprehensive overview of necessary investments/measures/activities to reach the Aichi targets in Europe (or: to implement other policies and measures that will result indirectly in reaching the Aichi targets) is available. In the NBSAPs from both Western and Eastern Europe, the information regarding necessary investments/actions/measures is often vaguely formulated, e.g. in terms of "targets" or "objectives". Only the EU has developed a comprehensive "long list" of actions necessary on a larger scale, although the actions are described on a general level. The EP (2012) provides a list of priority actions to reach or approach the EU Biodiversity targets, but the descriptions are also held on a general level: promotion of green infrastructure, eco-innovation and the adoption of innovative technologies in order to create a greener economy; increased assistance to public and private actors working to protect forest biodiversity in terms of species, habitats and ES under the new CAP; extended CAP eligibility for areas connecting Natura 2000 sites; minimum mandatory spending on environmental measures – such as agri-environmental measures, Natura 2000 and forest environment measures – and support for High Nature Value and organic farming; and fisheries reserves (areas in which fishing activities may be banned or restricted). Regarding the East European non-EU countries, conclusions for identifying priorities of investments had to be drawn from NBSAPs and other, more generic sources on necessary actions/investments/measures.

From the collected evidence, several "priorities for action" - i.e. actions most important for reaching biodiversity targets (see, for example, table 1 for a list of the EU biodiversity targets) - could be identified for the EU and its Member States:
- Ensure a better uptake and distribution of existing funds for biodiversity: reform of agricultural (and fishery) subsidies; longer timeframes for biodiversity funding; clearer targeting of funds for biodiversity, also at the national level; capacity building and decrease of administrative burdens. The latter point is of special concern for new Member States in Eastern Europe, lacking the capacity and experience in applying for EU funds.
- Reforming the agricultural subsidy system ("Greening" the CAP), and e.g. reallocating funds from the first to the second Pillar (the CAP reform 2014-2010 has been agreed, but the final text is not available as of December 2013).
- Completing the Natura 2000 network, and establishing management plans or similar instruments on site, also to obtain data on the impacts and effectiveness of financing.
- Increase knowledge and awareness.

Presently, the most important "actions" towards reaching the Aichi targets taking place in the EU are the different implementation processes regarding the most important environmental policies (namely WFD and MSFD, the "Nature Directives"/Natura 2000, as well as the Soil Strategy, Climate Change policies and the legislation surrounding pollution prevention), and the negotiations for CAP and CFP reforms. If these Directives and policies were fully and effectively implemented, tt is probable that the EU would not need much more resources to reach the Aichi targets over and

above the funds necessary for the implementation of the Directives and the CAP and CFP reforms; nevertheless, there is a lot to do, especially regarding the mobilization of political will/overcoming political resistance.

The focus in the new EU Member States should be more on capacity building with regard to the uptake of financing opportunities and awareness raising. There could be a higher focus on conservation instead of restoration measures in Eastern Europe, due to the larger undisturbed areas still intact - e.g. the important, unfragmented grassland areas in Eastern Europe, compared to the highly fragmented agrarian landscapes in Western Europe (e.g. Germany, Netherlands). At the same time, in Western Europe the focus could be more on restoration than conservation.

In the non-EU Eastern European countries (i.e. Belarus, Ukraine, the Russian Federation and other pan-European countries, Moldova, but to a certain degree also Serbia, Albania), the situation is completely different: much more fundamental activities are expected to be necessary here: basic studies and surveys about the state of ecosystems and ES, which are already existing in Western Europe, are mostly missing in non-EU Eastern Europe; the designation of protected areas (e.g. for inclusion into the Emerald Network); and many legal and compliance issues (see as an example the case study on the Russian Federation).

4.1 What types of investments and activities are needed to deliver the Aichi targets and to secure these benefits?

A general overview of globally necessary investments/measures, which is not further detailed in this study, is provided by the High Level Panel (including costs) (HLP 2011: 52 et seqq.). The following evidence is classified into EU-level and target-specific evidence.

EU level

On the EU level, the assessments of necessary investments/actions are focused on the EU Biodiversity Strategy (for a translation of EU targets to Aichi targets, see chapter 2). At a general level, the existing EU policies that are of the most importance for reaching the targets are listed in the EC´s Impact Assessment of the Biodiversity Strategy; these are the WFD and MSFD, CAP and CFP, the "Nature Directives", as well as the Soil Strategy, Climate Change policies and the legislation surrounding pollution prevention (EC 2011: 24).

The EP (2012) provides a general list of priority actions to reach or approach the EU Biodiversity targets: promotion of green infrastructure, eco-innovation and the adoption of innovative technologies in order to create a greener economy; increased assistance to public and private actors working to protect forest biodiversity in terms of species, habitats and ES under the new CAP; extended CAP eligibility for areas connecting Natura 2000 sites; minimum mandatory spending on environmental measures – such as agri-environmental measures, Natura 2000 and forest environment measures – and support for High Nature Value and organic farming; fisheries reserves (areas in which fishing activities may be banned or restricted) (EP 2012).

In the EC´s Impact Assessment, the six EU targets are broken down into 20 main actions and many specific actions, which provide a general overview of the necessary actions at the EU level (EC 2011: 40 et seqq.):

- Action 1: Complete the establishment of the Natura 2000 network and ensure good management - specific actions: full establishment of terrestrial and marine network by 2012; further integration of species and habitats protection and management requirements into key land and water use policies; development and implementation of management plans or equivalent instruments which set out conservation and restoration measures in the protected areas; sharing of experience and knowledge regarding the management of Natura 2000 sites.

Aichi target(s): 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management), 19 (knowledge).

- Action 2: Ensure adequate financing of Natura 2000 sites - specific actions: provision of the necessary funds and incentives for Natura 2000, including through EU funding instruments, under the next multiannual financial framework.

Aichi target(s): 3 (incentives), 20 (mobilize financial resources).

- Action 3. Increase stakeholder awareness and involvement and improve enforcement - specific actions: major communication campaign; improved cooperation with key sectors and development of guidance documents to improve their understanding of the requirements of the EU nature legislation and its value in promoting economic development; facilitation of law enforcement of the nature directives by the provision of specific training programs on Natura 2000 for judges and public prosecutors.

Aichi target(s): 1 (awareness).

- Action 4: Improve and streamline monitoring and reporting - specific actions: new EU bird reporting system, further development of the reporting system under Article 17 of the Habitats Directive and improvement of the flow, accessibility and relevance of Natura 2000 data; establishment of a dedicated tool as part of the Biodiversity Information System for Europe.

Aichi target(s): 19 (knowledge).

- Action 5: Improve knowledge of ecosystems and their services in the EU - specific actions: mapping and assessment of the state of ecosystems and their services in the national territories (by 2014), assessment of the economic value of such services, and promotion of the integration of these values into accounting and reporting systems at EU and national level by 2020.

Aichi target(s): 2 (accounting/reporting), 17 (NBSAPs), 19 (knowledge).

- Action 6: Set priorities to restore and promote the use of green infrastructure - specific actions: development of strategic frameworks by Member States to set priorities for ecosystem restoration at sub-national, national and EU level; development of a "Green Infrastructure Strategy" which includes incentives to encourage upfront investments in

green infrastructure projects and the maintenance of ES (examples: better targeted use of EU funding streams and Public Private Partnerships).

Aichi target(s): 3 (incentives), 11 (connectivity), 17 (NBSAPs).

- Action 7: Ensure no net loss of biodiversity and ecosystem services - specific actions: development of a methodology for assessing the impact of EU funded projects, plans and programs on biodiversity; to "carry out further work with a view to proposing by 2015 an initiative to ensure there is no net loss of ecosystems and their services" (examples: compensation or offsetting schemes).

Aichi target(s): 3 (incentives), 5 (loss of natural habitats), 12 (threatened species).

- Action 8: Enhance direct payments for environmental public goods under the EU CAP - specific actions: reform of CAP direct payments to reward the delivery of environmental public goods that go beyond cross-compliance (examples: permanent pasture, green cover, crop rotation, ecological set-aside, Natura 2000); improve and simplify the GAEC (Good Agricultural and Environmental Conditions) cross-compliance standards and consider including the WFD within the scope of cross-compliance.

Aichi target(s): 3 (incentives); probably several others indirectly.

- Action 9: Better target Rural Development to biodiversity conservation - specific actions: integration of quantified biodiversity targets into Rural Development strategies and programs; collaboration among farmers and foresters.

Aichi target(s): general protection and conservation targets; probably 3 (incentives), 7 (use/management).

- Action 10: Conserve Europe's agricultural genetic diversity - specific actions: uptake of agri-environmental measures to support genetic diversity in agriculture; development of a strategy for the conservation of genetic diversity.

Aichi target(s): 13 (genetic diversity); probably others.

- Action 11: Encourage forest holders to protect and enhance forest biodiversity - specific actions: management plans (also through incentives via rural development measures and the LIFE+ program); innovative mechanisms (e.g. Payments for Ecosystem Services) to finance the maintenance and restoration of ES provided by multifunctional forests.

Aichi target(s): 3 (incentives), 4 (plans), 7 (use/management); related also to protection and restoration strategies (targets 11-15).

- Action 12: Integrate Biodiversity measures in management plans - specific actions: inclusion of specific measures in forest management plans or similar instruments (examples: optimal levels of deadwood, wilderness areas, ecosystem-based measures to increase the resilience of forests against fires, specific measures developed for Natura 2000 forest sites and afforestation in accordance with diversity and climate change adaptation needs).

Aichi target(s): 4 (plans), 7 (use/management); related also to protection and restoration strategies (targets 11-15).

- Action 13: Improve the management of fished stocks - specific actions: maintenance and restoration of fish stocks to levels that can produce MSY in all areas in which EU fish fleets operate, including areas regulated by Regional Fisheries Management Organizations, and the waters of third countries with which the EU has concluded Fisheries Partnership Agreements; long-term management plans with harvest control rules based on the MSY approach; collect data to support implementation of MSY.
  In more detail, the EC´s Impact Assessment lists other specific actions related to fisheries and MSY: the "acquisition of additional information, planning and consultative decision-making processes involving a broader range of stakeholders/interest groups, and additional monitoring, control and surveillance". Also, communication of negative (short-term) impacts lower initial catches, and reduction of the size of the fleet) and positive (long-term) impacts (improvement of revenues for fishermen and significantly reduce the needs for government subsidies to the fishing industry) (EC 2011: 64).

Aichi target(s): 4 (plans), 6, 7 (use/management), 12 (species conservation).

- Action 14: Eliminate adverse impacts on fish stocks, species, habitats and ecosystems - specific actions: introduction of measures to gradually eliminate discards, to avoid the by-catch of unwanted species and to preserve vulnerable marine ecosystems in accordance with EU legislation and international obligations; implementation of the MSFD including financial incentives through the future financial instruments for fisheries and Maritime Policy for marine protected areas (including Natura 2000 areas and those established by international or regional agreements) (examples: restoring marine ecosystems, adapting fishing activities, promoting the involvement of the fishing sector in alternative activities, and combating marine litter).
  In addition, the FishSTERN Report (Blenckner et al. 2011) also states that more and more countries in the Baltic Sea area are "moving in the direction of more flexible quota management, where fishermen receive a certain share of the overall quota with the possibility to trade this share", which could also be an effective way of reducing pressure on fish stocks.

Aichi target(s): 3 (incentives), 6, 7 (use/management), 11, 12 (conservation); possibly 14 (restoration) and 8 (pollution).

- Action 15: Strengthen the EU Plant and Animal Health Regimes - specific actions: integration of additional biodiversity concerns into the Plant and Animal Health regimes.

Aichi target(s): 9 (IAS).

- Action 16: Establish a dedicated instrument on Invasive Alien Species - specific actions: fill policy gaps in combating IAS by developing a dedicated legislative instrument.

Aichi target(s): 9 (IAS).

- Action 17: Reduce indirect drivers of biodiversity loss - specific actions: introduction of demand and/or supply side measures to reduce the biodiversity impacts of EU consumption patterns, particularly for resources that have significant negative effects on biodiversity;

improvement of EU trade policy (integration of biodiversity concerns in trade negotiations and treaties); provision of "the right market signals" for biodiversity conservation, including work to reform, phase out and eliminate harmful subsidies at both EU and Member State level, and to provide positive incentives for biodiversity conservation and sustainable use.

Aichi target(s): 3 (incentives); probably all targets under Strategic Goal B (targets 5-10).

- Action 18: Mobilise additional resources for global biodiversity conservation - specific actions: significant increase of resources; improvement of the effectiveness of EU funding for global biodiversity by supporting natural capital assessments in recipient countries and the development and/or updating of National Biodiversity Strategies and Action Plans, and by improving coordination within the EU and with key non-EU donors in implementing biodiversity assistance/project.

Aichi target(s): 2 (integration into development), 17 (NBSAPs), 20 (resource mobilization).

- Action 19: "Biodiversity proof" EU development cooperation - specific actions: screening of EU development cooperation action to minimize any negative impacts on biodiversity, and undertake Strategic Environmental Assessments and/or Environmental Impact Assessments for actions likely to have significant effects on biodiversity.

Aichi target(s): unclear; many.

- Action 20: Regulate access to genetic resources and the fair and equitable sharing of benefits arising from their use - specific actions: proposition of legislation to implement the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization in the EU.

Aichi target(s): 16 (Nagoya Protocol).

<u>Target-specific - Natura 2000/Emerald Network</u>

Aichi targets: 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management).
Various sources name specific actions necessary for fully implementing the Birds and Habitats Directives, and complete the Natura 2000 network (on a European scale). The named actions are: land acquisition; restoration of damaged habitats; infrastructure investments; designation of marine protected areas; management plans; better integration with CAP and CFP; minimum criteria for environmental inspections in the Member States; strengthening of the EU Network for the Implementation and Enforcement of Environmental Law (IMPEL); (legal) training programmes for regional and local authorities responsible for law enforcement and other administrative bodies responsible for implementation of the Birds and Habitats Directives; habitat management (EC 2011: 12, 22 et seqq.; EP 2012; EC 2011c: 4).

The Emerald Network, being in a much less developed state (only 37 designated areas in Switzerland; Council of Europe 2011), would additionally need more "basic" actions to get started. The Council of Europe lists several of these: adoption of guidelines on management for the Emerald sites and the monitoring of their implementation; update and amendment of the list of endangered natural habitats requiring specific conservation measures and of the list of species requiring specific habitat conservation measures for the whole pan-European region.

Target-specific - less negative incentives

Aichi targets: 3 (incentives).

Incentives consist of "negative" and "positive" incentives. "Negative" incentives - i.e. incentives harmful to biodiversity, or contradicting to EU/Aichi Biodiversity targets - are in the focus of European discussions since the failure of the first EU Biodiversity Strategy (the European Parliament states that "the inadequate degree to which biodiversity protection was integrated into other EU policies caused the failure of the first strategy"; EP 2012). Such incentives need to be greatly reduced, or reformed into providing "positive" incentives, especially since the latter type is presently much less "potent" (in terms of levels of funding)[8].

CASE STUDY - SUBSIDIES IN SWITZERLAND AND GERMANY

A study from 2001 (Rodewald/Neff 2001) comes to the conclusion that around "one third of all federal subsidies have a potentially degrading effect on biodiversity and the landscape". The authors therefore recommend to examine the whole Swiss system of taxes and subsidies.

Sources: Rodewald/Neff 2001; FOEN 2010.

A study commissioned in the context of the TEEB Report (Förster 2009) concludes that agricultural subsidies significantly increased the opportunity costs of peatland restoration in NE Germany - i.e. in some cases, the subsidies per hectare almost doubled the potential income derived from one hectare of arable land (in this case, meadows and fodder production worth 585 €/a [856 US$/a]; the direct payment per hectare adds another 300 €/489 US$ to that). This, in turn, significantly increased the price for acquiring the land (resulting in per hectare prices reaching 5.000 € (or 7.316 US$), which is very high for marginal agricultural land).

Especially the second study shows that such subsidies are clearly counteracting the Aichi targets (in this specific case the restoration strategies).

Source: Förster 2009.

On a general level, the following actions are recommended by the TEEB Report (TEEB 2009a: 259 et seqq.) regarding the reformation of subsidy systems: "Governments should, in the short run, establish transparent and comprehensive subsidy inventories and assess their effectiveness against stated objectives, their cost-efficiency and their environmental impacts – bearing in mind that the size of a subsidy does not necessarily reflect the extent of its harmful effect. Based on these assessments, governments should develop prioritized plans of action for subsidy removal or reform, for implementation in the medium term (up to 2020). Windows of opportunity for earlier subsidy reform, arising within the existing policy cycles, should be proactively and systematically seized".

[8] Detailed information on incentives and subsidies, and their possibly harmful consequences, are to be found in the TEEB Report for National and International Policy Makers, chapter 6 (pages 259 et seqq.).

CASE STUDY - AGRICULTURAL SUBSIDIES IN THE EU (CAP)

The CAP represents a policy that includes both "negative" (i.e. that are harmful to biodiversity, i.e. counteracting the Aichi targets) as well as "positive" incentives/subsidies. Without doubt, the CAP has resulted in widespread agricultural intensification in the EU, with well-documented (negative) impacts on biodiversity since the 1970ies (e.g. decline of the farmland bird index by 50% in the last 30 years or so, significant decline of non-crop plants and invertebrates) (TEEB 2009a: 273 et seqq.). At the same time, a great number of rare and vulnerable species of EU importance are associated with semi-natural habitats and agricultural landscapes (such as High Nature Value farming systems). These - threatened by intensification/competition and abandonment - are also supported by CAP payments designed to support farming in disadvantaged areas or to support environmentally beneficial practices.

Even after the "Agenda 2000" reform of the CAP, which included gradual reductions in market price support, a decoupling of payments from the production (reducing the incentives for environmental harmful production patterns), and increasing reliance on direct payments, coupled with rural development programs and agri-environmental measures under the CAP's "second pillar", the TEEB Report states that "the sheer magnitude of support under the first Pillar gives reason for concern, because of the limits to decoupling"(TEEB 2009a: 259). Besides setting the wrong incentives, such direct subsidies are a barrier to conservation, as they inflate land prices encourage land conversion (see, for example, Förster 2009).

In the present CAP negotiations for the period 2014-2020, a further "greening" of the CAP (especially Pillar 1 payments) was vehemently demanded by environmental and civil society NGO. The most significant changes originally proposed by the EC consist of linking the direct payments under Pillar 1 to the "environmental performance", the creation of "Ecological Focus Areas", extending to seven per cent of the eligible area of arable and permanent crops, increasing the ambition of agri-environment measures in rural development programmes in Pillar 2 and strengthening of cross-compliance standards. These changes could have significantly improved the environmental performance of the CAP, through shifting funds from "negative" to "positive" incentives. However, the opposition to these plans has been very influential, and successful in "watering down" the environmental provisions (Matthews 2012)[9].

Sources: TEEB 2009a: 259 et seqq.; Matthews 2012.

In the process of allocating CAP funds, the Member States have considerable flexibility in implementation, especially with regard to "moving" funds from Pillar 1 to Pillar 2 (and probably also the other way around - see footnote below). Although it could not be assessed in detail to which regard this happened in the individual Member States, in Germany, for example, the agricultural ministers at the "Länder" level[10] agreed to move 4,5% (220 million €/295 million US$) from Pillar 1 to Pillar 2 on 4th November 2013 (Agrarministerkonferenz 2013: 4).

Beside the CAP (see CS example above), the CFP provides significant subsidies, in this case to the fisheries sector. These are either issued as direct aid from the European Fisheries Fund, or indirect subsidies via e.g. the overall exemption from fuel taxes (EC 2011: 64). The payments offer no incentive to fish "sustainably", i.e. to MSY levels, avoiding by-catch and discards, etc., while at the

[9] As the negotiations were just coming to a close, the final agreed text was not available as of December 2013.
[10] I.e. the German Federal States.

same time creating or maintaining overcapacities and lower retail prices, artificially increasing potential revenue, thereby producing additional consumer demand for resources that are already under pressure (TEEB 2009a: 277 et seqq.; The Fish Site). A successful example of greatly reducing fishery subsidies is Norway (see case study example below)

CASE STUDY - REDUCTION OF SUBSIDIES IN THE NORWEGIAN FISHERIES SECTOR

The case study example from Norway demonstrates that it is feasible to drastically reduce subsidies to a crucial economic sector, without destroying it. In the 1980ies, the subsidies paid annually reached 150 million US$ (amounting to approximately 70% of the value added in the industry), and were reduced consecutively to 30 million US$/a in 1994. Besides a decline in the number of active fishermen, such reductions were made easier by external factors, timing and measures that smoothed the transition to a more self-supporting industry - resulting in a present fisheries sector that is economically more healthy than at the time when the highest subsidies were being paid. Such measures and factors included optional employment opportunities (which could be financially supported, as the reforms were undertaken during good economic times), other flanking social measures, and a slow transition, which helped fishermen to take steps to prepare for the changes. The political "window of opportunity" was the fall in oil prices in 1986 which convinced many of the need for significant reform.

Although the effect of the subsidy reform on fish stocks is difficult to ascertain (due to the natural variability of stocks, generally improved management regimes and the fact that Norway shares its stocks with its neighbors), it may have contributed to a increase in cod and herring stocks (+110% and +1.040%, respectively, from 1981 to 1996).

Source: TEEB 2009a: 281.

Concrete actions necessary to reform European incentive policy are named by the Parliament (EP 2012), and consist of:

- Mainstreaming biodiversity protection and conservation in the development, implementation and funding of all other EU policies – including those on agriculture, forestry, fisheries, regional development and cohesion, energy, industry, transport, tourism, development cooperation, research and innovation.
- A reorientation of the CAP towards the provision of compensation to farmers for the delivery of public goods (crop rotation and diversification, permanent pasture and a minimum "ecological focus area").
- Measures aimed at eliminating discards of juvenile and under-sized fish or catches beyond quota [...] designed in such a way as to avoid providing any perverse incentives for the landing and commercialization of discards.
- Clear guidelines under the CAP Rural Development Regulation in order to ensure that afforestation does not harm biodiversity and to prevent the provision of financial support for the planting of invasive alien species.

In addition to the actions listed above, the French NBSAP lists the "reform of the tax system" and "eco labelling" as necessary actions to reform subsidies and incentives (Ministère de l'Écologie, du Développement durable, des Transports et du Logement 2010: 19).

Target-specific - research

Aichi targets: 19 (knowledge).

As "biodiversity science is the necessary backbone for any kind of policy implementation" (EP 2012), improving knowledge is crucial for reaching the EU or Aichi Biodiversity targets. Specific actions consist of: better understanding and quantification of ecosystem restoration benefits; mapping and assessing ES in the EU; research into the state of marine ecosystems and fisheries resources (e.g. scientific data on fish populations) and on the sustainable management of ecosystems and natural resources (especially in the economically and socially vital sectors of agriculture, fisheries and forestry); improved monitoring and reporting; soil biodiversity and its importance in delivering ES (Tucker et al. 2013: 471 et seqq.; EP 2012; EC 2011b: 4).

The EEA (2010: 45 et seqq.) lists additional knowledge gaps (or research priorities): information on biodiversity (species, communities and genetic stock) in non-EU countries, on specific ecosystems (i.e. marine ecosystems. which are much less studied that their terrestrial counterparts); insight on adaptation strategies for specific ecosystems; optimal land-use strategies (consequences of habitat loss and land conversion); pan-European sustainable management indicators; benefits of green infrastructure.

Target-specific - awareness raising

Aichi targets: 1 (awareness).

The European Parliament (EP 2012) lists concrete actions to be taken: a more comprehensive communication strategy in line with Aichi Target 1; organise biodiversity awareness and information campaigns for all ages and social categories, on the understanding that awareness campaigns for children and adolescents who are deeply concerned about this topic should be organized first and foremost in the school setting; education and professional training, particularly in farming, forestry and related sectors; available scientific data on biodiversity, examples of best practices for halting biodiversity loss and restoring biodiversity, and information on nature-based innovation and development potential be more widely known and shared among policy-makers and key stakeholders; expand and intensify training for beneficiaries of the EU Structural and Cohesion Funds, and for local, regional and national governments, in dealing with the complex European and national legislation aimed at protecting nature and increasing awareness of the importance of biodiversity loss.

Target-specific - pollution reduction

Aichi targets: 8 (pollution).

A good overview of the actions necessary to prevent nutrient pollution is provided by the Nitrates Directive: use of crop rotations, soil winter cover and "catch crops" – fast-growing crops grown between successive planting of other crops in order to prevent flushing of nutrients from the soil; limiting application of fertilizers and manures to what is required by the crop, based on regular soil analysis; proper storage facilities for manure, so that it is made available only when the crops need nutrients; the use of the "buffer" effect of maintaining non-fertilized grass strips and hedges along watercourses and ditches; good management and restriction of cultivation on steeply sloping soils, and of irrigation (Secretariat of the Convention on Biological Diversity 2010: 61).

4.2 Where would these investments be best directed or focused?

In this section, the "priorities for action" are identified on the basis of the identified investment needs, under consideration of regional differences (mainly EU/non-EU).

In the EU, the necessary actions - "investment" - to reach the EU/Aichi Biodiversity targets are relatively clear and specified (see lists above), and financing instruments exist to address these. Nevertheless, the uptake of financial assistance to implement several of these measures is limited - for example, by the end of September 2009, the uptake of EU Cohesion funds allocated to biodiversity was lower than for other spending categories. At that time, the uptake for the two categories directly related to biodiversity ("promotion of biodiversity and nature" and "promotion of natural assets") was 18,1% and 22% respectively, compared to an average of 27,1% for all EU Cohesion Policy funding (CBD 2013c). Other problems related to financing or the uptake of financing possibilities include short timeframes of funding that do not allow for the continuity that is often needed to enable biodiversity-related projects to succeed, the lack of clear targeting of funds for biodiversity, the management of most EU funds at the national level (according to sectoral priorities, which do not always include biodiversity conservation as a primary concern) and limited capacity/knowledge in some Member States to apply for funds, as well as high administrative burdens in some cases (EC 2011: 15 et seqq., Kettunen et al. 2009).

Closely related to these financing issues is the reform of the subsidy systems for agriculture and fisheries, and the relocation of EAFRD[11] funding towards biodiversity protection (especially Natura 2000 sites) - as an example: the share of the EAFRD funding allocated to the protection of Natura 2000 between 2007 and 2013 sites was only 0.62%, although Natura 2000 agriculture and forest sites are also financed under agri-environmental schemes (EC 2011a: 17). A "greening" CAP reform seems especially important considering the timeline: the next CAP will determine agricultural and rural development funding until 2020, the target year for both EU and Aichi Biodiversity targets. Also, as a report by IEEP (Tucker et al. 2013: 465 et seqq.) states, the EU target 2 (consisting mainly of protection and restoration) will probably not be achieved if "certain regulations (CAP cross-compliance, WFD) are not implemented as intended", highlighting the importance of reforming the subsidies system.

There is furthermore no doubt about the linkages and overlaps between reaching the Aichi Biodiversity targets and the completion of the Natura 2000 network in the EU (Natura 2000 addresses the protection and restoration strategies of the Aichi targets, as well as management and sustainable use targets). Due to a slow development of Natura 2000 management plans or equivalent instruments, there is a lack of concrete data on the impacts of funding, and a weak evidence base for financial planning (EC 2011: 15 et seqq.).

As "biodiversity science is the necessary backbone for any kind of policy implementation" (EP 2012), improving knowledge is crucial for reaching the EU or Aichi Biodiversity targets. The same holds true for awareness raising, especially in education. Both the increase of knowledge and the raising of

[11] European Agricultural Fund for Rural Development.

awareness are also relatively low cost measures (in comparison to restoration and land acquirement, for example), and facilitate the later implementation of other measures.

From these points, several "priorities for action" - i.e. actions most important for reaching biodiversity targets (see, for example, table 1 for a list of the EU biodiversity targets) - are identified for the EU and its Member States:

- Ensure a better uptake and distribution of existing funds for biodiversity: reform of agricultural (and fishery) subsidies; longer timeframes for biodiversity funding; clearer targeting of funds for biodiversity, also at the national level; capacity building and decrease of administrative burdens.
  The latter point is of special concern for new Member States in Eastern Europe, lacking the experience in applying for EU funds.
- Reforming the agricultural subsidy system ("Greening" the CAP), and e.g. reallocating funds from the first to the second Pillar (the CAP reform 2014-2010 has been agreed, but the final text is not available as of December 2013).
- Completing the Natura 2000 network, and establishing management plans or similar instruments in the sites, also to obtain data on the impacts and effectiveness of financing.
- Increase knowledge and awareness.

As stated above, the focus in the new EU Member States will be more on capacity building with regard to the uptake of financing opportunities; awareness of the values of biodiversity for society, and knowledge about ecosystems and ES is generally slightly lower in Eastern than in Western Europe (FotE 2013). There could be a higher focus on conservation instead of restoration measures in Eastern Europe (and in countries belonging to the pan-European region, i.e. Russia, the Caucasus etc.; see TEEB 2013), due to the larger undisturbed areas still intact - e.g. the important, unfragmented grassland areas in Eastern Europe, compared to the highly fragmented agrarian landscapes in Western Europe (e.g. Germany, Netherlands). At the same time, in Western Europe the focus could be more on restoration than conservation.

For the whole of Europe, Friends of the Earth Europe (FotE 2013) assessed the progress of European states towards several Aichi targets, drawing conclusions regarding priority actions:

- Aichi target 1: Although all EU Member States are working on awareness raising, only a few states have a comprehensive awareness raising strategy. Hence, a priority identified consists of comprehensive actions towards awareness raising, especially in Switzerland, Norway, Bosnia and Herzegovina, Serbia and Ukraine, and in Albania in terms of practical implementation.
- Aichi target 3: In spite of the importance of this target, which is recognized by CBD Member States, there is not a single assessed country in which negative incentives have been phased out (the document goes so far as stating that this target "needs the most attention").
- Aichi target 5: the conservation status of protected areas is still not in favorable condition in many PAs in most European states (56-100% in unfavorable condition), and more effort is needed "to stop the loss of habitats and achieve FCS for all these habitats".

- Aichi target 7: An expansion of organic farming and sustainable forestry with undisturbed forests is needed in all of Europe. Organic farming is not yet widespread in South-Eastern Europe, although much traditional agriculture still exists there (with positive effects on biodiversity).
- Aichi target 11: Regarding protected areas and the Pan-European network of protected areas, the fields in which action is most direly needed are the Emerald Network (no designation of any sites except in Switzerland; Council of Europe 2011, 2012), improved funding, and the establishment of management plans for protected areas (finalized only in the UK).
- Aichi target 16: Only Norway ratified the Nagoya Protocol (in August 2013), Switzerland will follow at the end of 2013. The EU MS will ratify once the EU has formulated a community regulation, whose quality will be decisive for the question of whether target 16 will be reached.
- Aichi target 17: Implementation of the NBSAPs also "leaves a lot to be desired", according to the document.
- Aichi target 20: For most countries, there is no data available on how biodiversity spending relates to GDP per capita, but in most countries where data is available, the share is well below 0,1%. The document states that "given importance of stopping biodiversity loss, these small numbers are very worrying".

With regard to non-EU countries, there is little information about investment needs or priorities for action available - a comprehensive assessment of the most important investments/actions/ measures does not exist, and the NBSAPs do not contain any information on prioritizing measures, resource needs, a timeline, or other data which could be of use in the course of this study (this is true for the more important countries in Eastern Europe: Russia, Belarus, Ukraine; see below for the information that could be extracted from the Russian NBSAP). Basically, however, it can be stated that the situation surrounding biodiversity protection and sustainable use of resources is at a similar level in the Western European non-EU countries (i.e. Switzerland, Iceland, Norway) - Switzerland, for example, is part of the Emerald Network (see chapter 1), and the only country partaking which has designated it´s protected areas. The major problems and priorities in these countries will probably be similar to the EU Member States, only lacking the EU-specific financial coordination mechanisms. In the non-EU Eastern (and pan-) European countries (i.e. Belarus, Ukraine, the Russian Federation, the Caucasian countries, Moldova, but to a certain degree also Serbia, Albania), the situation is completely different: much more basic activities are foreseen to be necessary here: basic studies and surveys about the state of ecosystems and ES, which are already existing in Western Europe, are mostly missing in non-EU Eastern Europe; the designation of protected areas (e.g. for inclusion into the Emerald Network); and many legal and compliance issues (see as an example the case study on the Russian Federation) (UNEP 2011).

CASE STUDY - NECESSARY "ACTIONS" IN THE RUSSIAN FEDERATION

The "National Strategy of Biodiversity Conservation in Russia" (Russian Academy of Sciences/Ministry of Natural Resources of the Russian Federation 2001) emphasizes the importance of the huge Russian territory for international biodiversity conservation. Around 65% of the territory is still virtually unchanged by economic or other human activities - a fact which signals the importance of conservation measures in relatively undisturbed countries/areas (the huge undisturbed areas are situated in the Asian part of Russia, the European part being more densely populated, urbanized and industrialized). The strategy also emphasizes that the Russian Federation is in a state of transition, and formulates the need to integrate the Biodiversity Strategy into the countries´ development strategies towards sustainable development, and in other policy fields: economy, law, social insurance, culture, education etc.

Five major "fields of action" are named in the strategy, which highlight the difference to the status of biodiversity protection and sustainable use of resources in, for example, the EU Member States or Switzerland.

- Legislation: the document describes the general situation as being "characterized by fairly well-developed legislation and poor implementation of the existing law". Hence, the a) improvement and systemization of existing legislation, the b) practical application of legislation and especially the c) enforcement of the law (compliance) are identified as priorities for action in this field.
- Economic Mechanisms: being in a state of transition, the strategy states that the Russian economy needs to "ecologize", i.e. grow less dependent on resource-intensive industries, get more efficient (in terms of resource use per unit of production), and reform the taxation system towards a "unit taxation", establish markets for environmental friendly products etc.; at the same time, very advanced propositions for including biodiversity values/ES into national accounting etc. are named.
- Management of Exploitation and Conservation of Biodiversity: the "orientation of the state management systems towards biodiversity" is described as a strategically most important "component of national wealth and security"; the point consists of priority actions like the establishment of state management bodies for nature protection at all levels of government (and other institutional changes); more public participation and cooperation with the private sector; transparency; integration of biodiversity issues into territorial planning, and adoption of river basin (or similar non-administrative) management approaches.
- Formation of Public Consciousness - Education and Propaganda: as stated above - the general level of awareness and knowledge in the general population is pretty low; the priority actions are not much different from EU awareness raising measures (at least on the paper).
- Finally, Research: knowledge gaps in biodiversity sciences are recognized as concern for immediate actions, which include an "Inventory of Biodiversity", studies on the evolution and dynamics of biodiversity in Russia, the development of a scientifically sound basis for monitoring and the protection of threatened species, and the elaboration of the scientific base for "sustainable use of biodiversity", among others.

Unfortunately, the Strategy does not contain any information on resource needs, a timeline, or other data which could be of use in the course of this study - the same is true for the Biodiversity Strategies of Belarus and Ukraine.

Nevertheless, the prioritized actions described above highlight the differences in investment priorities in EU and Eastern European/pan-European non-EU countries.

Source: Russian Academy of Sciences/Ministry of Natural Resources of the Russian Federation (2001).

4.3 Which Targets will these investments help to meet, and what are the synergies and overlaps between Targets?

The targets the investments/actions help to meet are identified in section 4.1 above. However, the investments which impact many targets are outlined here, with short explanations, if deemed necessary.

- EU Biodiversity Strategy/Action 1: Complete the establishment of the Natura 2000 network and ensure good management (the same holds true for the Emerald Network): the underlying actions - full establishment of terrestrial and marine network by 2012, further integration of species and habitats protection and management requirements into key land and water use policies, the development and implementation of management plans or equivalent instruments which set out conservation and restoration measures in the protected areas, and the sharing of experience and knowledge regarding the management of Natura 2000 sites - help reaching the Aichi targets 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration: through the integration of "conservation and restoration measures" into the management plans), 7 (use/management), 19 (knowledge: though the sharing of experience).
- EU Biodiversity Strategy/Action 8: Enhance direct payments for environmental public goods under the EU CAP (also accurate for other schemes to reduce negative incentives and shift these to biodiversity conservation): the underlying actions - the reform of CAP direct payments to reward the delivery of environmental public goods that go beyond cross-compliance (examples: permanent pasture, green cover, crop rotation, ecological set-aside, Natura 2000),and to improve and simplify the GAEC (Good Agricultural and Environmental Conditions) cross-compliance standards and consider including the WFD within the scope of cross-compliance - help reaching the Aichi target 3 (incentives), but also several others indirectly, as the shifting of incentives could foster "Ecological Focus Areas" and organic farming, as well as water quality improvements (through the integration of WFD into cross compliance, or less fertilizer/pesticide application); hence, the protection/conservation goals could be supported indirectly, as well as the targets 7 (use/management), and 8 (pollution).
- Similarly, there is a number of EU Biodiversity Strategy Actions that are linked indirectly to several protection and conservation targets: Action 9 ("Better target Rural Development to biodiversity conservation"), Action 11 ("Encourage forest holders to protect and enhance forest biodiversity - specific actions: management plans"), Action 12 ("Integrate Biodiversity measures in management plans") and Action 17 ("Reduce indirect drivers of biodiversity loss") are among these.
- EU Biodiversity Strategy/Action 14: Eliminate adverse impacts on fish stocks, species, habitats and ecosystems: as one underlying action, the implementation of the MSFD is mentioned, which would have great consequences for Aichi targets related to protection/conservation, and sustainable use of marine resources; additionally, as "nutrient input" is also a major pressure to be tackled by the MSFD, and because most nutrient input

originates from terrestrial sources (mostly agriculture), the Aichi targets 7 (sustainably manage agriculture) and 8 (pollution) would also benefit.

CASE STUDY - AICHI TARGETS IN THE FishSTERN REPORT

The BalticSTERN Network´s report "FishSTERN" represents a first attempt at an ecological-economic evaluation of fishery management scenarios in the Baltic Sea region, and provides hints regarding the impacts of different fisheries management scenarios on the Aichi targets. Beside obvious reductions in fish landings (mainly of cod) in the "Ecosystem Health" scenario (benefitting Aichi targets 4, 6 and 12, if cod stocks are classified as threatened), the report also hints at the connections between healthy cod stocks, the food web and eutrophication (which is a serious ecological problem in the Baltic Sea). Via this link, a sustainable fisheries management (of cod) would benefit the Aichi targets 5 (prevent degradation of habitats), 8 (indirectly by tackling the consequences of nutrient pollution), and 10 (minimize pressures on vulnerable ecosystems).
Source: Blenckner et al. 2011.

Other investments/actions are more difficult to attribute to specific Aichi targets. The most important of these actions include the environmental legislation of the EU (especially WFD, MSFD and Natura 2000). Their possible contribution to the Aichi targets is summarized in section 2 on methodological issues.

CASE STUDY - FRESHWATER POLICIES IN THE EU (WATER FRAMEWORK DIRECTIVE)

The EU´s Water Framework Directive - WFD - is the core European legislation tackling inland and coastal water quality issues (several other Directives are aiming at specific aspects of inland waters, such as the Bathing Water, Drinking Water, or Groundwater Directives). Specifically, the Directive aims at reaching the "Good Status" in all surface and groundwater bodies, by tackling the following pressures:

- **Water scarcity**, leading to over-exploitation, reduced "ecological minimum flows", and sometimes to desertification and salt-water intrusion in coastal freshwater zones. Quality improvements in this field would certainly benefit the Aichi targets 5 (prevent degradation of habitats), 8 (pollution, i.e. salt-water intrusion and increased impacts from pollution due to low water tables), 10 (pressure reduction), and 11 (protection).
- **Pollution**, leading to degradation of ecosystems and populations, and eutrophication of inland and marine water bodies. Quality improvements in this field would certainly benefit - beside obviously target 8 - the Aichi targets 5 (prevent degradation of habitats), 7 (management of agriculture), 10 (pressure reduction), and 11 (protection).
- **Morphological changes**, such as the building of dams, reservoirs and irrigation systems, which cause damage by changing water levels, placing obstacles in the way of the natural flow of the rivers and thereby destroying ecosystems or cutting off natural flood plains from water courses. Quality improvements in this field would certainly benefit the Aichi targets 5 (prevent degradation of habitats), 10 (pressure reduction), and 11 (protection, and especially connecting habitats), 12 (species protection - e.g. European Eel), 14 and 15 (restoration).

Beside, the WFD obliges Member States to apply an integrated water-management planning system, based on natural river basin districts, crossing regional and national boundaries (Aichi target 4), and to comply with strict monitoring guidelines (Aichi target 19).

Source: EC 2010.

4.4 What types of on-going annual expenditures will be required?

Information on one-off and on-going annual expenditures is also contained in section 5 below.

Usually, "recurrent costs" (i.e. on-going annual expenditures) are mostly due to investments in conservation measures "for the maintenance and improvement of the conservation status of habitats of Community interest as well as the implementation of management schemes and agreements with owners and managers of land or water" (whereas the level of one-off costs depends pretty much on costs for infrastructure and land acquisition) (Hart et al. 2011: 28).

Other recurrent costs are due to training, education and awareness raising measures, as well as research/knowledge generation and sharing (EC 2011: 12, 22 et seqq.; EP 2012; EC 2011c: 4).

Hence, it can be concluded that the restoration and conservation targets (i.e. mostly 11-15) incur the highest levels of both recurrent and one-off costs, whereas the exact share between the two depends very much on specific circumstances (mainly how much land needs to be acquired, or on the level of infrastructure/technical measures necessary in case of restoring ecosystems). "Soft" measures - training, education and awareness raising measures, as well as research/knowledge generation and sharing - consist mainly of recurrent investments/costs.

The only comprehensive overview of one-off and recurrent costs that develop in a specific policy field was found with regard to Natura 2000. The following table provides an overview for the costs associated with establishing the network:

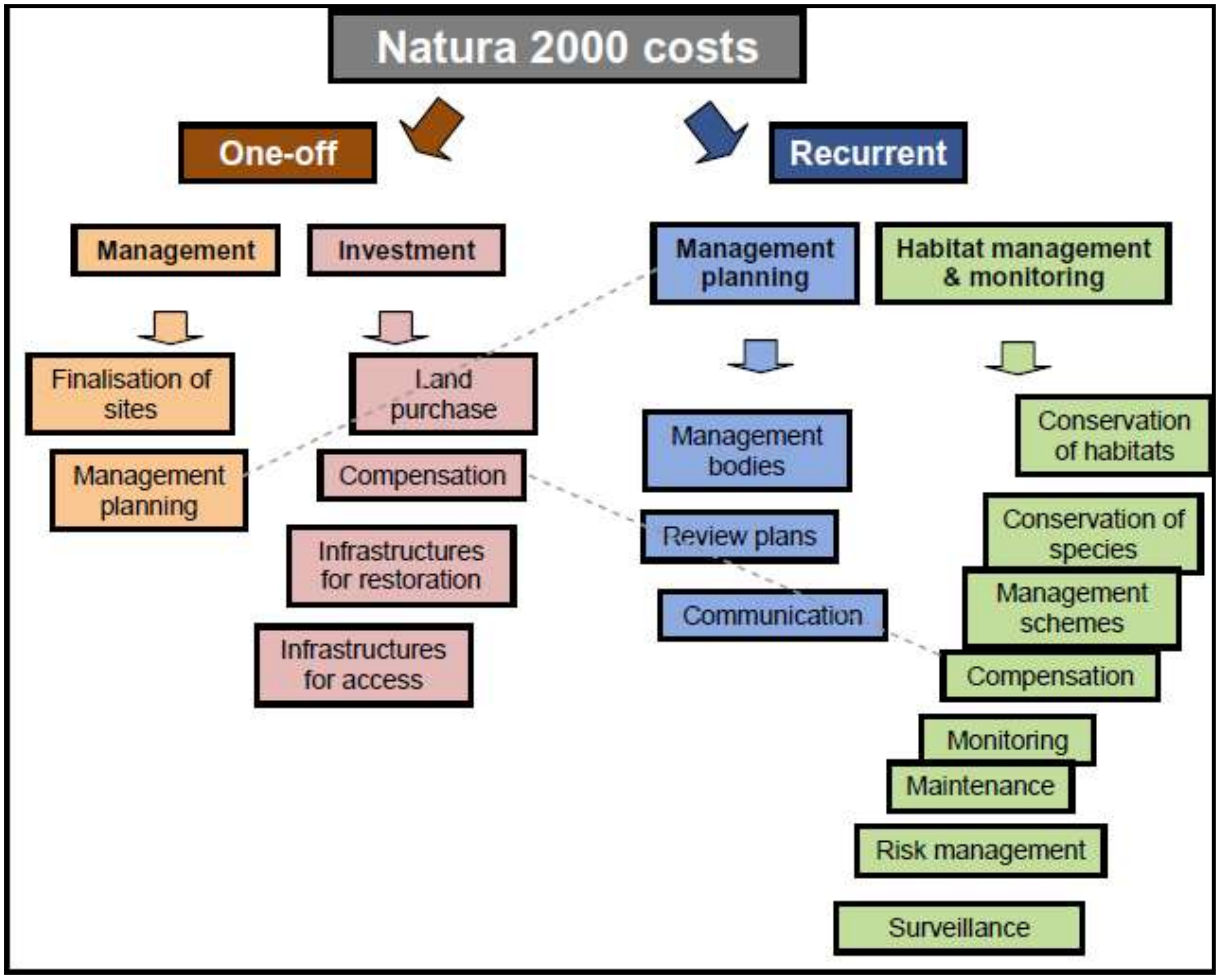

Figure 2: One-off and recurrent costs in Natura 2000 implementation. Source: Hart et al. 2011: 29.

4.5 How do the types of investments and ongoing expenditures identified compare to those identified in the first phase of the HLP research?

The above listed investment needs are to a large extent close to the needs the HLP set out in its first report at global level (as seen in HLP 2011). The key differences identified in this report are the following (based mainly on information from the EU, as other information was rarely sufficient to allow a comparison):

- Aichi target 3, corresponding to EU actions 8 and 14: the EU proposals for concrete actions are much more specific than the HLP´s, and targeted towards CAP and CFP; with regard to non-EU countries, in this case Russia, the reform of negative incentives is not mentioned; instead, it is stated that in the current phase of development, the country has to rely more on regulations that incentives.
- Aichi target 5 (forestry aspect): the HLP´s actions "law enforcement" and "training and education of professional officers" are actions mentioned in East European countries´ NSBAPs, and in the EU are issues only in the relatively new Member States (Romania, Bulgaria, for example); also, "financial incentives which counter illegality" seems not to be too much of a topic in the EU.

- Aichi target 7 (agricultural aspect), corresponding to EU actions 8, 9, 10 and 17: similarly as above, the establishment of property rights, as proposed by the HLP, is not an issue in the EU countries, and the global measures are also not mentioned.
- Aichi target 7 (forestry aspect), corresponding to EU actions 11 and 12: not in the focus of the EU specific actions is the HLP´s "creation of products", with the exception of PES - but, for example, to develop "tourism products" is not mentioned.
- Aichi target 8, corresponding to EU action 17 (but not 100% - a separate EU action to reduce pollution does not exist): the EU countries, at least the older Member States, all have sophisticated infrastructures regarding pollution control; as such, the HLP´s actions "investments in urban stormwater retrofits" or "installation of best available technologies for stationary and mobile sources of pollution" are not mentioned, although in some Eastern EU MS and non-EU countries certainly still an important topic.
- Aichi target 14, corresponding to EU action 17 (at least in parts): the HLP´s "removal of subsidies and public support for harmful infrastructure such as dams and new road construction that destroy, fragment, or degrade ecosystems" is not mentioned in the EU targets, and was not found in other NBSAPs.

With regard to the share of one-off vs. recurrent investments, the HLP (2011: 12) suggests that "upfront investment needs tend to be greater than the resources required to fund ongoing activities", estimating the share to reach 60 to 70% of overall (global) resource needs over the 2013 to 2020 period. There is not such specific information available on shares in Europe, except from the Natura 2000 policy field: IEEP (Hart et al. 2011: 28) estimate that recurrent costs represent two thirds of the estimated overall figure (for Natura 2000), i.e. exactly the opposite of the HLP estimation: naturally, Natura 2000 does not represent the total costs of reaching the Aichi targets in Europe/the EU - nevertheless, as protection, conservation and restoration measures tend to be the most cost-intensive measures, a significant share of overall costs could be represented by this figure; see chapter 5 for more details.

5. RESOURCE REQUIREMENTS

SUMMARY BOX

As the collection of expenditure data is incomplete in the EU Member States - and other European countries - the exact amount spent on biodiversity is difficult to assess. Besides, overlaps between targets influence the costs and render assessments difficult. Hence, overall cost estimations are scarce in both Eastern and Western Europe, and national or local assessments also do usually not evaluate the overall costs for reaching all (if any) targets.

One overall estimation exists regarding the funds needed (from sources on all levels) "to deliver the EU's environmental objectives using incentive-based measures": these are estimated to be 43 billion €/a (+/- 8.5 billion €) [60 billion +/- 11,9 billion US$/a] (Tucker et al. 2011: 3 et seqq.), but a link to either the EU or the Aichi Biodiversity targets is missing - however, it seems that environmentally friendly land management in agricultural and forestry areas are in the focus - which would correspond to many Aichi targets, especially 3 [which would be necessary to obtain the funding], 5, 7, 8, 10, and 11-15, and of course 20). Another study, by Ecologic Institute (Kaphengst et al. 2010), focuses on ten biodiversity policy areas, covering mostly the Aichi targets 5, 7, 9, 10, 11, 12, 14, 15 and 19, estimating the costs in the EU to reach these at10,6 billion €/a until 2020 [15,2 billion US$/a].

Other EU-wide estimations cover specific targets:
- Tucker et al. 2013: costs of reaching the EU Biodiversity target 2 in the EU27 - corresponding to the Aichi targets 8, 10, 14 and 15, but with important links to the protection targets as well, i.e. 11-13: 618 - 1.660 million €/a [829 - 2.226 million US$/a] in addition to the costs of existing measures and others that are expected to be taken up to 2020 under a reference scenario: CAP payments, and funding of WFD and MSFD measures.
- Hart et al. 2011: achieving EU target 2 in agricultural ecosystems, estimations for the total costs for maintenance, restoration and re-creation requirements on arable land, grassland and permanent crops are 29,2 billion €/a [40,7 billion US$/a] until 2020.

These figures can be compared to sectoral estimations, i.e. the full implementation of the Natura 2000 network (almost 6 billion € or 8,2 billion US$/a), the costs of all WFD-related measures in the EU27 (8 to 15 billion € or 10,9 to 20,5 US$/a), the costs of addressing soil organic matter decline (3,4 to 5,6 billion € or 4,7 to 7,8 billion US$/a) or to stop soil organic matter decline (12 billion €/a to 38 billion €/a [16,6 to 53 billion US$/a], depending on the content), and to the costs for maintaining HNV farmlands (up to 23 billion € or 32 billion US$/a).

If these sectoral estimations were to be added up, the resulting sum would easily exceed the more general calculations. However, the dimensions seem to be more or less clear: the costs for reaching the Aichi targets (or EU biodiversity targets) would probably be in the tens of billions € or US$/a. The most expensive actions, as far as the evidence suggests, are conservation and especially restoration measures (Aichi targets 11-15). But: a very important point in this regard is that many of these funds have to be allocated by EU Member States in any case for implementing other EU environmental legislation - independently of the biodiversity targets. The same is true for the reform of the subsidy

system (CAP and CFP): no or limited additional resources are required, as funds would mainly needed to be shifted between Pillars, or linked to more biodiversity-friendly management of the environment.

Regarding the EU, a possibility for estimating the costs for reaching the protection and restoration targets (i.e. Aichi targets 11-15, with links to targets 5 and 10, for example) could be to first separate the costs for terrestrial and aquatic ecosystems (as cost estimates from within the EU refer mostly to water management and terrestrial ecosystems - i.e. the WFD and Natura 2000, whereas the latter also covers some aquatic ecosystems), and add these. A prerequisite for such an approach is the assumption that the implementation of the WFD (and several related Directives, such as Nitrates and UWWT Directives) and Natura 2000 would be sufficient to reach the respective Aichi targets (see chapter 2 for the "translation"). For the water-related Directives, this seems to be the agreed opinion (i.e. Tucker et al. 2013: 466 states that no additional costs for water-related measures are necessary to reach EU target 2); for Natura 2000, there is no such evidence.

Only a single comprehensive study that addresses the full range of environmental needs - including synergies - of meeting an individual countries´ future environmental land management requirements exist on the national scale: Cao et al. (2009) estimate the costs for meeting the UK´s environmental targets on all 16,2 million hectares of agricultural and forestry land in the UK to reach 1,986 billion €/a [2,9 billion US$/a].

In Eastern European non-EU countries, the availability of quantifiable data on resources needs and costs is very weak - in the NBSAPs assessed, data stems mostly from the early 2000s (or even the 1990ies), and the newer ones (i.e. that refer to the Aichi targets) do not contain monetary estimations of resource needs.

5.1 What evidence is there of resource needs at the project and country level?

Evidence is presented separately for the EU27, national levels, and sectoral policies.

EU27 level

Overall, the Impact Assessment of the European Commission (EC 2011: 58) states that the "costs and benefits of establishing green infrastructure and restoration projects...(corresponding to Aichi targets 10, 11, 12, 14, 15)...have not yet been estimated at EU level". Instead, evidence is provided by citing case study examples. Other studies also tend to be site-specific, or focused on one particular environmental issue ("sector"), such as achieving favourable conservation status on Natura 2000 sites or meeting biodiversity targets in particular Member States, or treat more generic costs associated with maintaining High Nature Value (HNV) farming across the farmed landscape or addressing soil erosion and declines in soil organic matter (Hart et al. 2011: 1 et seqq.).

One overall estimation exists regarding the funds needed on all levels "to deliver the EU's environmental objectives using incentive-based measures": these are estimated to be 43 billion €/a (+/- 8.5 billion €) [60 billion +/- 11,9 billion US$/a] (Hart et al. 2011: 3 et seqq.). There is, however, no link established to either the EU or the Aichi Biodiversity targets (i.e. an explanation what the "EU´s environmental objectives" consist of - although it seems that environmentally friendly land

management in agricultural and forestry areas seem in the focus - which would correspond to many Aichi targets, especially 3 [which would be necessary to obtain the funding], 5, 7, 8, 10, and 11-15, and of course 20). However, the study also states that there is "very little literature on the anticipated costs of incentive policies to address these environmental needs" (Hart et al. 2011: 1), and only one study that analyzes the full range of environmental needs, that is for the UK (see below).

Another IEEP study (Tucker et al. 2013: 465 et seqq.) assesses the costs of reaching the EU Biodiversity target 2 in the EU27 (corresponding to the Aichi targets 8, 10, 14 and 15, but with important links to the protection targets as well, i.e. 11-13). The costs are depicted as "additional costs until 2020" (i.e. in addition to the costs of existing measures and others that are expected to be taken up until 2020 under a reference scenario: CAP payments, and funding of WFD and MSFD measures), and are broken down per "support action" or sectoral measures (see section 4.1):

- Support Actions 5 and 7[12] ("improving knowledge of ecosystems and their services" and "ensuring no-net loss of biodiversity"): tens of millions of €/US$ from 2010 to 2020.
- Measures that "treat the source of generic wide-scale pressures" (water/air pollution): WFD costs (but no additional ones), and of measures against air pollution and atmospheric deposition, which have not been estimated.
- Practical ecosystem management/restoration/re-creation measures (such as water management, grazing and removal of invasive species): 618 - 1.660 million €/a [829 - 2.226 million US$/a] in mainly arable and forest areas[13].

The report additionally notes, however, that if "certain regulations (CAP cross-compliance, WFD) are not implemented as intended, then either Target 2 will not be achieved or additional funding will be required".

Another study with a similar objective (Hart et al. 2011), but focussed on achieving EU target 2 in agricultural ecosystems only, estimates the total costs for maintenance, restoration and re-creation requirements on arable land, grassland and permanent crops to reach 29,2 billion €/a [40,7 billion US$/a] until 2020, a sum which exceeds the IEEP estimation by a factor of 3 (Tucker et al. 2013: 470).

Another source - Kaphengst et al. (2010) - focuses on ten policy areas "comprising the core aspects of biodiversity and ecosystem conservation within the EU" (Kaphengst et al. 2010: 113):

- Natura 2000, national (terrestrial) protected areas, species conservation, conservation and restoration of high nature value farmland, conservation and restoration of forest areas: roughly corresponding to Aichi targets 5, 7, 10, 11, 12, 14 and 15.

[12] Support Action 6 - promoting a green infrastructure - was not assessed due to double counting issues (IEEP 2013: 465).

[13] It is stated that this figure is probably an underestimation, due to not taking into account significant cost factors, such as general ecological research and monitoring, development of strategies, policies and legislation, site wardening, regulatory enforcement and awareness raising on biodiversity issues, species-specific measures, land purchase requirements, and marine ecosystem maintenance and restoration measures (IEEP 2013: 469).

- Wider environmental policy measures positively affecting biodiversity: impossible to attribute to specific Aichi targets, as the formulation is very vague.
- EU strategy to combat invasive alien species: Aichi target 9.
- EU research on biodiversity: Aichi target 19.

The costs for these activities are estimated to reach 10,6 billion €/a [15,2 billion US$/a], and are depicted in figure 3 (probably, according to the authors of the study, a significant underestimation):

Policy	Estimated Annual Costs (€m)	Estimated Opportunity Costs (€m)	Share of opportunity costs over total (%)
A. Natura 2000 Network	5,772	2,069	35.8
B. National Protected Areas	1,280	459	35.9
C. High Natural Value Farming	4,370	3,390	71.7
D. High Natural Value / Semi-natural Forestry	4,500+	4,500	n/a
E. Species Conservation	2,841	1,697	59.7
F. Marine Protected Areas	235	n/a	n/a
G. Biodiversity Research	648	n/a	n/a
H. Invasive Alien Species	193	Negative	n/a
I. Correction for Overlaps between above Estimates	-4722[1]	-3696	-
J. Total	**10,617**	**8,419**	**n/a**

Figure 3: Synthesis of costs incurred in EU biodiversity policy. Source: Kaphengst et al. 2010: 113.

In this study, the costs are hereby divided into financial costs - defined as "real payments and expenditures for biodiversity actions (e.g. compensatory payments and management costs) that also include payments/expenditures for activities that are only indirectly associated with the action, but also have to be taken into account (e.g. administrative and transaction costs)" - and opportunity costs. However, the latter, which are also depicted in the table above, are opportunity costs internalized in existing expenditures (such as compensation payments and land purchases). Other, non-compensated opportunity costs - loss of output as a result of foregone development opportunities and lost opportunity to a range of sectors, such as fisheries and natural resource-based industries - are not quantifiable (see also Tucker et al. 2013: 78), and therefore not included in the report. Hence, the table above depicts the financial costs, and the part of the financial costs that are classified as "opportunity costs", as a share of the total financial costs (i.e. the 8,4 billion € in opportunity costs are a part of the 10,6 billion € overall costs).

Anecdotic evidence regarding several Aichi targets or aspects of these were found in different studies:

- Aichi target 3 (incentives): The EU Impact Assessment (EC 2011: 62) states that no additional costs are expected reforming the CAP payments ("greening" the first Pillar and introducing

changes to the second Pillar), as only a redistribution of funds would be necessary. Furthermore, such redistributions would "also allow for a higher diversification of the agricultural sector, adding value to rural products and services associated with specific natural or landscape elements".

- The Impact Assessment also estimates the costs for aspects of Aichi targets 1 (awareness) and 19 (knowledge) - an EU-wide campaign to "strengthen recognition of the multiple ecosystem benefits that derive from the effective management of the Natura 2000 network" would cost 350.000 € [489.000 US$], while the EU-level coordination of a new bird reporting system would cost around 400.000 € [558.000 US$].

National level

Regarding the data situation on the national level, there is only a single comprehensive study that addresses the full range of environmental needs - including synergies - of meeting an individual countries´ future environmental land management requirements: Cao et al. (2009) assess the costs for meeting the UK´s environmental targets for "biodiversity, landscape, climate change mitigation, flood risk management, farmland historic environment, soil quality, water quality, resource protection and public access". The study is based on the established UK targets and current agri-environment payment rates, and assumes management on all 16,2 million hectares of agricultural and forestry land in the UK. The total costs are estimated to reach 1,986 billion €/a [2,906 billion US$/a], which is three times the existing annual agri-environment budget. It is stated, furthermore, that costs are probably significantly underestimated (Hart et al. 2011: 1 et seqq., 25 et seqq.).

A study in the Netherlands (Overmars/van Zeijts 2010) assessed the area and budgetary requirements to fulfill the needs for biodiversity protection and sustainable use of resources in agricultural areas, according to the National Biodiversity targets. The assessed management practices consisted of those needed for the conservation of meadow and other farmland birds, and for wild flora. Management would be applied on either 159.300 hectares (core areas) or 377.900 hectares (across the farmed countryside), resulting in costs of 76 million €/a (476 €/ha/a) [109,5 million US$/a or 685 US$/ha/a] in the first case, and 232 million (616 €/ha/a) [334 million US$/a or 887 US$/ha/a] in the second (Hart et al. 2011: 30 et seqq.).

CASE STUDY - "MORE NATURAL MANAGEMENT" OF AGRICULTURAL LAND IN GERMANY

A study by Hampicke (2009) investigated the costs of reaching the German Biodiversity targets in agricultural areas, hereby focussing on the measures deemed necessary to achieve a "more natural management" of agricultural land, while increasing the number of "characteristic species, habitats and landscape elements of traditional cultivated landscapes that are not endangered currently but considered to be under pressure". Such a management regime would include the following measures:

- Maintenance of semi-natural landscapes and extensive grassland (grazing with sheep on neglected calcareous grasslands, and with suckler cows/young cattle on neglected delicate grasslands, mowing and hay production, scrub removal).
- Extensification of 10 per cent of the land under intensive grassland management.
- Protection of arable flora on low yielding arable land.

- 7% of land to be "structural elements" (woodland, hedgerows, strips of grassland along roads, water bodies, hedgerows etc.).
The author estimates that the management practices identified need to be implemented on 2,3 million hectares (15% of Germany´s agricultural area), at annual cost of 1,5 to 1,8 billion € [2,19 to 2,63 billion US$] (including income foregone and additional costs, likely changes in productivity as well as the costs associated with additional labour, forage, built infrastructure etc.). Current funding available under EAFRD for similar management in Germany is €1.25 billion/a [1,83 billion US$] (regarding the uptake, however, see section 4.1 and 4.2).
Per hectare, the costs are as follows:
- Semi-cultivated landscapes and traditional grassland: 500 €/ha/a [731,5 US$/ha/a].
- Extensification of highly productive grassland: 1.000 €/ha/a [1.463 US$/ha/a].
- Protection of wild field flora: 300 €/ha/a [439 US$/ha/a].
- Structural elements, arable land: 700 €/ha/a [1.024 US$/ha/a].
Sources: Hampicke 2009.

Examples from other countries include Bulgaria, where the costs of implementing the "National Biodiversity Conservation Action Plan" (a set of activities carried out during the 1999-2003 period - i.e. no relation to the Aichi targets) were estimated to reach 44.355 million Lev (around 30 billion US$) (CBD 2013: 7). In Moldova, the implementation of the "Action Plan on Biodiversity Conservation" (implemented over a period of 10 years, from 2002 onwards) is estimated to cost 87 million Lei (18,7 million US$) in total, or 12 million Lei (2,6 million US$) per year, representing 0,14% of the national GDP. However, the expenditures on biodiversity conservation from all financing sources summed up to around 29 million lei (6,3 million US$), which represent 0,3% of the GDP (CBD 2013: 17 et seqq.).

In Spain, the budget requirements for proper implementation of the actions contained in the Strategic Plan (six years lifetime) are estimated to reach 750 million € [1.412 US$] - however, the underlying planning document seem to stem from 1999, and has no relation to the Aichi targets (CBD 2013a: 20 et seqq.; CBD 2013d: 65).

CASE STUDY - RESOURCE REQUIREMENTS IN ESTONIA
Estonia´s planning document (from 1999) approached the costs of implementation via the amount of labour needed: 1.936 years of human labour or 277 conditional full-time workers annually (over a period of six years). The resulting cost are presented as the lowest limit, and reach 2,15 billion Estonian kroons (around 322 million US$ in 2013 value), of which the biggest share is attributed towards industry (implementation of energy conservation program, installation of electric filters in power stations, completion of the Vaivara dangerous waste deposit and collection centre, and similar activities).
Sources: CBD 2013b: 3 et seqq.

With regard to development countries and countries with economies in transition (i.e. countries eligible for GEF funding[14]), a team of CBD experts estimated the costs for various activities to reach the individual Aichi targets for the sixth replenishment period of the trust fund of the Global Environment Facility (2014 to 2018). The results are presented in the following table 6.

Aichi Target	Amount (US$/country) in 2014-2018 (four year period)
1	800.000
2	700.000
3	10.000.000
4	700.000
5	Only global information.
6	Only global information.
7	Only global information.
8	No estimations.
9	10.000.000
10	Only coral reefs assessed.
11	For the establishment of PAs: Terrestrial: 6,4 per hectare in four years. Marine: 1.253 to 2.315 per km²*.
12	Only per project.
13	Only per project.
14	2.000.000**
15	For forest restoration: 300 US$/ha.
16	No estimations.
17	500.000
18	1.100.000
19	150.000
20	200.000

Source: CBD 2012.

*Depending on the size of MPA to be established, and other factors.
**For the development of sub-global assessments of ES in collaboration with indigenous and local knowledge holders.

The same document also presents figures for selected (GEF eligible) countries (in the pan-European region: Russian Federation and Belarus) and targets. It is estimated that the financial needs for implementing the programme of work on protected areas (Aichi target 11) in the Russian Federation and Belarus amount to 95 million US$/year and 4,5 million US$/year, respectively (CBD 2012: 182).

[14] In the pan-European region, these include several East European countries (e.g. Albania, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Serbia, Slovak Republic, Slovenia, Turkey, Ukraine) as well as the Malta and the Russian Federation, and countries in the Caucasus region (e.g. Armenia, Azerbaijan, Georgia) (GEF).

Sectoral policies

There are several studies estimating the resource requirements for completing (or otherwise improving) the Natura 2000 network in the EU27. For example, the EC appraises the costs to "reach favourable conservation status" in protected areas, and concludes that 5,8 billion € [8,1 billion US$] would be needed annually (comprised of one third one-off investments, two thirds recurring costs, a share which is highly influenced by spending for infrastructure and in some Member States by the budget allocated to land purchase) (EC 2011: 15; Hart et al. 2011: 28 et seqq.). This estimate is confirmed by Gantioler et al. (2010), setting the costs for all terrestrial Natura 2000 sites at 5,7 billion €/a [8,2 billion US$/a], or 63 €/ha/a [90,7 US$/ha/a] (Hart et al. 2011: 28 et seqq.). It is remarked, however, that this figure is probably an underestimation, as other studies assume much higher per hectare costs - 107 €/ha/a [186 US$/ha/a] based on the Markland Report (Markland 2002), or 128 €/ha/a [187,2 US$/ha/a] from BirdLife International (2009) (Hart et al. 2011: 28). However, per hectare values in assessed countries always vary significantly, e.g. from €14/ha/a in Poland to more than €800/ha/a in Cyprus, Luxembourg and Malta (Hart et al. 2011: 29).

Gantioler et al. (2010) break down the costs for the management of the Natura 2000 network by land use - the biggest share (of the 5,7 billion €/a or 8,2 billion US$, see above) is allotted to agricultural areas (35%, or 2,025 billion €), closely followed by forestry (33%, or 1,915 billion €), "other terrestrial" sites (11%), inland waters (7% or 430 million €), wetlands and coastal ecosystems (both 6%), and marine ecosystems (1%).

CASE STUDY - COSTS OF MSC CERTIFICATION

The Marine Stewardship Council (MSC) is an international non-for-profit organization "set up to help transform the seafood markets to a sustainable basis. The MSC runs the only certification and ecolabeling program for wild-capture fisheries consistent with the ISEAL Code of Good Practice for Setting Social and Environmental Standards and the FAO Guidelines for the Eco-labeling of Fish and Fishery Products from Marine Capture Fisheries" (based upon the FAO "Code of Conduct for Responsible Fishing") (Marine Stewardship Council 2013).

MSC is funded by a combination of philanthropic contributions and logo license revenue (revised in April 2013, reducing overall participation costs for companies, and making the program more accessible for small businesses), i.e. the only cost s paid to MSC are for voluntary use of the MSC logo on a product. These costs consist of

- a fixed royalty (applying to all voluntary logo uses using a scale depending on sales, with a maximum fee of 2.000 US$/a/company) and
- a volume royalty (applied "when a product is sold in a consumer-facing package bearing the MSC logo and is calculated on up to 0.5% of the net wholesale value" (Marine Stewardship Council 2013), with exceptions for small businesses, which do not have to pay the volume licensing fee).

Costs for certification/auditing are negotiated between the company wanting to achieve certification to the MSC standard and the independent certification company, so these vary. Typically, however, the consist of the following "stages" that have to be covered by the company:

- Pre-assessments: an optional step which could save money in the actual assessment, costing about 15.000 to 25.000 US$ per fishery depending upon the complexity of the fishery operation (number of stocks, gear types, jurisdictions, etc.).

- Full assessments: the initial full assessment is the core of the auditing, and, consequently, the most cost-intensive one - 75.000 to 150.000 US$ per fishery on average, but for highly complex fisheries this number can be higher.
- Annual surveillance audits: a monitoring exercise to ensure nothing significant has impacted the certification; costs are typically 15 to 20% of the price of the initial full assessment.
In addition to these costs, any company that handles fish in a way where there is opportunity for substitution or co-mingling also needs to perform audits of the traceability in the "chain of custody" - i.e. ensuring that products from a certified fishery sold as MSC-certified can be traced back to the exact fishery. These costs usually do not exceed 5.000 US$/year.
The MSC itself concludes that "the overall cost for most fisheries to become certified and maintain fishery certification ranges from fractions of a penny per pound to pennies per pound, when averaged over the five-year life of a fishery certificate (Marine Stewardship Council 2013).
Sources: Marine Stewardship Council 2013; MSC.

The estimates cited in the IEEP study (Hart et al. 2011) for the forestry sector are not entirely consistent, although the reason for this may lie in differences in definitions: in one place, a study by Kaphengst et al. (2010) is cited to have calculated the costs for "the management of semi-natural forests in the EU27", or "HNV forestry" (it is mentioned that the definitions are vague), based on Gantioler et al. (2010). The costs associated with HNV forestry in the EU27 are estimated to be 1,5 billion €/a [2,16 billion US$/a] for 40 million hectares (37 € or 53,2 US$/ha/a), and expanded to cover all public and private forests in the EU27 (150 million hectares), to reach 4,5 billion €/a [6,5 billion US$/a]. It is stated, however, that this figure is probably an overestimation (Hart et al. 2011: 27 et seqq.).

CASE STUDY - COSTS OF FORESTRY CERTIFICATION SCHEMES (FSC) IN GENERAL AND IN FINNISH FORESTS
There are both direct and indirect cost involved in setting up a certification program -large landowners may hold an individual FSC certificate and bear the costs themselves, or a group entity may address costs on behalf of group members. Regardless of the approach, the owner/organization must hire a third-party auditor and prepare for and participate in audits that occur every year (direct costs). The FSC Factsheet on Costs and Benefits (Forest Stewardship Council US 2013) state, direct (audit) costs "for an individual FSC certificate will typically start at about 10.000 US$ covering a five-year term for a relatively small owner with 2.500 acres and climb based on acreage and management intensity…" - up to around 35.000 US$ for forests 5.000 to 50.000 acres in size, or 120.000+ US$ for forests with sizes reaching millions of acres. These expenses then cover the certification body's time, travel and earnings for the initial audit and four annual checkups. The factsheet, moreover, also states that there are opportunities to get subsidies on the cost of certification audits, and that FSC certification costs are not higher than in other forestry certification schemes.
Indirect costs - or "compliance costs" - are more difficult to quantify, as they usually do not consist of direct payments "in cash". According to the Factsheet, they might consist of:
- retaining a percentage of trees to function for wildlife habitat rather than cutting everything that is salable;

- setting aside buffers along stream channels or wetlands to protect water quality or reserving some areas to protect endangered wildlife and plants;
- using fewer chemical pesticides and tolerating ingrowth of some natural herbs, shrubs or trees;
- fixing gullies so they don't wash out roads;
- communicating with neighbours about property boundaries or anticipated harvests;
- installing safety precautions like gates or signs when appropriate;
- getting a forest management plan and forest inventory;
- keeping records of harvests or a journal of management work.

An example from Finland can shed some light on some of these indirect costs: A review of the future of Finland's forest sector estimated the levels of funding needed annually for forest conservation within the administrative sector to reach 65 million € [87 million US$] (in 2005, the Ministry of the Environment spent a total of 49 million €/78 million US$ on the acquisition of land for protected areas and related compensation payments). An estimation from a different angle investigates the costs associated with PEFC forest certification *(Programme for the Endorsement of Forest Certification Schemes)* and FSC certification *(Forest Stewardship Council)*, promoting of forest biodiversity mainly through the conservation of features typical of valuable habitats, and retention trees and decaying wood left at forest regeneration sites (average number of retention and decaying trees left is at least 5 to 10 trees per hectare). The costs in privately owned forests in Finland (95% of commercially managed forests in Finland are certified under PEFC and FSC) amounted to 6,7 – 11,6 million € [10,7 - 18,6 million US$] annually, in the period 2005-2008.

Sources: CBD 2013b: 15; Government of Finland 2011: 75; Forest Stewardship Council US 2013.

A different aspect of forest management is the development of management plans. For a duration of ten years, the EC´s Impact Assessment estimates the costs to be in the order of 10 to 60 €/ha [13,7 to 83,7 US$/ha] (depending on the size of the area) (EC 2011: 63).

Several estimations exist also with regard to water management. As described above, it is generally assumed that no additional funds over and above the necessary spending for implementing the water legislation of the EU (mainly WFD, UWWT and Nitrates Directives) are needed to reach the water-related aspects of the Aichi and EU Biodiversity targets (Tucker et al. 2013: 466[15]).

One study, prepared in the context of the EC´s Blueprint, estimates the costs of all WFD-related measures in the EU27 to reach 8-15 billion €/a [10,9 to 20,5 billion US$/a] (ACTeon Environment 2012: 46). Other evidence exists only on the national or sub-national scale: in the Netherlands, implementing the measures contained in the Programs of Measures (for the WFD; i.e. which theoretically should be sufficient to reach Good Status/Potential) could cost 2,3 billion € [3,2 billion US$] until 2015, and additional 1,9 billion [2,6 billion US$] from 2015 to 2017; in the UK´s South West, South East and Anglian regions, the costs add up to 66/40/114 million £ annually [109/66,5/190 million US$/a]; in Belgium´s Scheldt river basin, 171 to 845 million €/a [238,5 to 1.179 million US$/a], and in Catalunya (Spain) 6,3 billion € until 2015 [8,8 billion US$] (Hart et al. 2011: 40). These national/sub-national figures, however, are difficult to "translate" into Aichi or EU Biodiversity

[15] The IEEP study refers to the EU target 2. The practical ecosystem management measures contained in this target, however, are probably the costliest water-related measures of the EU Biodiversity targets.

targets, as the degree to which the Programs of Measures reach the Good Status varies significantly across Member States.

Soil degradation is addressed as well, but cost appraisals vary in terms of necessary spending and definitions: the "annual costs of addressing soil organic matter decline" could sum up to 3,4 to 5,6 billion € [4,7 to 7,8 billion US$/a] (these costs were derived from regional studies scaled to the EU level and not from EU level assessments of soil organic matter decline; it is stated that these are probably an underestimation), other sources speak of 12 billion €/a [16,6 billion US$/a] to "halt soil organic matter decline", or up to 38 billion €/a [53 billion US$/a] to address erosion, soil organic matter decline, salinisation, landslides and contamination (Hart et al. 2011: 3 et seqq., 33, 44). The high variance is even more visible through the estimation of the Soil Thematic Strategy Impact Assessment (CEC 2006), providing figures to halt soil erosion: 0,7 to 14 billion €/a [1,09 to 21,8 billion US$/a].

Maintaining HNV farmland in all EU27 Member States is estimated to cost 16 billion €/a [22,3 billion US$/a] (assuming an average payment for HNV farming of 200 € or 279 US$/ha/a over an estimated HNV farmland area of 80 million hectares). Again, it is stated that this figure is probably an overestimation of the actual costs; other estimation are even higher, reaching 23 billion €/a [32 billion US$/a] (Hart et al. 2011: 3 et seqq.; 26), others lower, as the study by Kaphengst et al. (2010): 169 € or 243 US$/ha/a over an area of only 25,7 million hectares, to reach 4,37 billion €/a [6,24 billion US$/a] (Hart et al. 2011: 44).

Research activities are manifold, the best evidence regarding the costs of an assessment and mapping of ES on a national basis coming from the UK, whose National Ecosystem Assessment (UK NEA 2011) cost a total of 1,2 million £ [ca. 2 million US$] (but which relies on existing data) (EC 2011: 59).

The costs of effectively fighting invasive alien species in the EU27 are estimated to be in the range of 40 to 190 million €/a [55,8 to 265 million US$] (significantly less than the damages incurred by IAS) (EC 2011: 66).

CASE STUDY - COSTS OF MEASURES TO STOP THE DECLINE OF FARMBIRDS IN THE UK AND EU27
On the basis of a "Farmland Bird Package", containing measures that provide the key ecological requirements of the most common arable farmland birds, the EU27 costs for stopping the decline of farmbirds was calculated by Winspear et al. (2010). First, on the basis of a scenario analysis, the costs for the UK were estimated (between 51 to 96 million €/a, depending on the scenario; a scenario resulting in 59 million € or 84,8 US$/a [or 1.352 €/1.945 US$ per km^2/a] was deemed most realistic), and extrapolated to the total arable area in the EU27. However, it is estimated in the study that such a level of intervention is "unlikely to be required in many other Member States, and especially those in Southern and Eastern Europe that have more extensive arable farming systems at least in some regions and where farmland bird populations are healthier", reducing the overall EU27 estimation to 854 million € [1.229 US$] annually.
Sources: Hart et al. 2011: 64.

5.2 How does this evidence compare with the analysis presented in the HLP's report to COP-11?

Because of the lack of EU- or Europe-level estimates regarding the overall resource needs, the study extracted all unit costs that could be obtained, to allow for comparison with the HLP´s report to COP-11 (which is not presented here). The unit costs listed in table 7 below are mainly spatial (per hectare) values, but other "units" (such as "costs per study") were also included, to be compared with unit costs estimated, for example, from the report by the High Level Panel (2011: 5, 33 et seqq., 52 et seqq.) and ICF GHK (Rayment 2012; Conway 2012).

One aspect of the HLP´s estimation, however, should be highlighted here: in the High Level Panel report (HLP 2011: 5), the following dimensions of financing needs are appraised:

- *Significant investment required*: For those targets specifically aimed at addressing the drivers of biodiversity loss and ecosystem restoration, the required total global investment over the period 2013 to 2020 is in the order of several hundreds of billions of (US) dollars. Targets in this group fall under Strategic Goals B and D (excluding Target 16).
- *Moderate investment required*: Targets associated with required conservation work will require total global investment over the period 2013 to 2020 in the order of hundreds of billions of (US) dollars for Target 11 (i.e. establishing and maintaining protected areas) and in the order of tens of billions of (US) dollars for the other Targets of Strategic Goal C.
- *Low investment required*: Targets related to improving and creating necessary enabling conditions are likely to be much less resource-intensive. For these Targets, the total global investment needs over the period 2013 to 2020 will more likely be in the order of billions of (US) dollars. These Targets mostly relate to Strategic Goals A and E, as well as Target 16.

Generally, the evidence found in this report points in the same direction, i.e. that the restoration strategies as well the actions addressing the drivers of biodiversity loss are among the most costliest of all measures, and that the "enabling" strategies are less resource-intensive. However, two "fields of action" may differ from this assessment:

- Actions to address the drivers "agriculture" and "fisheries" (which are heavily subsidized in Europe, especially in the EU) will not be costly on a macro-economic scale, as principally already existing funds would have to be relocated (while at the same time approaching target 3).
- Targets associated with required conservation work (especially target 11) is assessed as also belonging to the highest cost categories in Europe, since the establishment of protected areas/a system of connected protected areas is associated with high costs (mostly for land acquirement), and conflict over land use (considering the dense population levels in Europe).

Table 7: Overview of unit costs obtained from various studies

Subject	Ecosystem/Type of costs (if available)	Unit costs	Source
Ecosystem Conservation in Germany	Forests/only financial costs	170 €/ha/a [228 US$]	Wustemann et al. 2013 (313)
Ecosystem Conservation in Germany	Arable land/only financial costs	230 €/ha/a [309 US$]	"
Ecosystem Conservation in Germany	Grassland/only financial costs	980 €/ha/a [1.317 US$]	"
Ecosystem Conservation in Germany	Peatland/only financial costs	200 €/ha/a [269 US$]	"
Ecosystem Conservation in Germany	Dry habitats/only financial costs	450 €/ha/a [605 US$]	"
Ecosystem Conservation in Germany	Wetland/only financial costs	360 €/ha/a [484 US$]	"
UK targets for biodiversity and other environmental issues	ALL UK ecosystems	122,6 €/ha/a [179,1 US$]	Cao at al. 2009
Biodiversity protection in agricultural areas	Agricultural areas/arable land	476 to 616 €/ha/a [685-887 US$]	Overmars/van Zeijts 2010
Biodiversity protection in agricultural areas	Semi-cultivated landscapes and traditional grassland/ALL costs	500 €/ha/a [731,5 US]	Hampicke 2009
Biodiversity protection in agricultural areas	Highly productive grasslands	1000 €/ha/a [1.463 US$]	Hampicke 2009
Favourable conservation status	All terrestrial Natura 2000 habitats	63 €/ha/a [90,7 US$]	Gantioler et al. 2010
Favourable conservation status	(Not entirely clear)	107 €/ha/a [186 US$]	Markland 2002
Favourable conservation status	(Not entirely clear)	128 €/ha/a [187,2 US$]	BirdLife International (2009)
Favourable conservation status in Poland	(Not entirely clear)	From 14 €/ha/a	Hart et al. 2011
Favourable conservation status in Malta, Cyprus, Luxembourg	(Not entirely clear)	Up to 800 €/ha/a	Hart et al. 2011
HNV forestry	Forests	37 €/ha/a [53,2 US$]	Kaphengst et al. (2010)
Maintaining HNV farmland	Arable land/grassland	200 €/ha/a [279 US$]	Hart et al. 2011
Maintaining HNV farmland	Arable land/grassland	169 €/ha/a [243 US$]	Kaphengst et al. (2010)
Restoration of forests in GEF eligible countries	Forests	300 US$ (one-off investment)	CBD 2012

EU Support Actions 5 and 7	n. a.	Tens of millions of € from 2010 to 2020	Tucker et al. 2013
EU-wide biodiversity awareness campaign	n. a.	350.000 € [489.000 US$]	EC 2011
Development of management plans in forestry sector	Forests	10 to 60 €/ha over ten years [13,7-83,7 US$]	EC 2011
Research into Ecosystem Services (National Study: UK NEA 2011)	ALL	1,2 million £ [ca. 2 million US$]	EC 2011

Sources: see table; own depiction.

5.3 What evidence is there for current allocations relative to needs?

As already stated above, the collection of expenditure data is incomplete in the EU Member States (no agreed methodologies as to how determine funding for biodiversity). Therefore, the exact amount spent on biodiversity remains difficult to assess (EC 2011: 15). The fourth CBD report of the EU exemplifies this by the following statement: "From the information received by the Member States, it is impossible to assess the level of direct financial contributions to national biodiversity conservation schemes (as a percentage of GDP)...The available information shows that substantial funding for national biodiversity in the EU is released through a range of European, national and sub-national programmes, ranging from dedicated nature protection schemes to rural development measures. It is not possible to ascertain whether financial support has increased since adoption of the BAP" (EC 2009: 48). For non-EU countries, the data situation is even weaker than in the EU (some information from Serbia and Russia was usable, see below).

Nevertheless, some data could be found regarding the EU level, which could be set in relation to the resource needs formulated above - the Rural Development Programme of the EAFRD allocated 20,3 billion € [ca. 30 billion US$] from 2007-2013 to agri-environment measures. In addition, 577 million € [872 million US$] were allocated specifically to Natura 2000 agriculture and forest areas. In the same time period, 2,7 billion € [4,07 billion US$] were allocated to the ERDF titles "the promotion of biodiversity and nature protection", 1,4 billion € [2,1 billion US$] to the protection of natural assets (which includes biodiversity projects), and 1,4 billion € [2,1 billion US$] to the protection and development of natural heritage (which also includes spending on biodiversity).

The estimated resources needed for completing the Natura 2000 network and reaching favourable conservation status are 5,8 billion €/a [8,1 billion US$/a]. The European Commission estimates that "if all financing instruments - i.e. all nature/biodiversity related funding under the cohesion policy as well as Natura 2000 payments and 20% of agri-environment funding under rural development policy - would be allocated to Natura 2000, then only 20% of financing needs would be covered" (EC 2011c: 7; EC 2011b: 9).

The study by IEEP (Hart et al. 2011: 3 et seqq.) relates the resource needs "to deliver the EU's environmental objectives using incentive based measures" (43 billion €/a, +/- 8.5 billion; or 60 +/- 11,9 billion US$/a) to EU budgetary allocations:

- The predicted current expenditure under agri-environment and other relevant measures operated through rural development policy: 13,5 billion €/a [18,8 billion US$/a];
- LIFE+ and Structural Funds (other funds focused on meeting environmental objectives associated with agricultural and forestry management through other funding programs): ca. 1 billion €/a [1,38 billion US$/a].

These figures include national co-financing of ca. 5 billion €/a [6,9 billion US$/a], the yearly EU funds therefore sum up to around 9,5 billion €/a [13,1 billion US$/a]; if the same co-financing ratio would be applied (average 64 per cent EU to 36 per cent Member States), the "proportion of the cost estimates presented here that would need to be sourced from the EU budget would come to approximately 27 billion €/a" [37,3 billion US$/a] (Hart et al. 2011: 3 et seqq.).

In European research, 330 million € [481 million US$] are allocated in the 7th Framework Program of the EU for Environment Research, and 30 million € [43,8 million US$] for fisheries and aquaculture projects (EC 2009**:** 4 et seqq.).

Some further evidence comes from national level reports and studies. For example, in the UK the total cost of meeting the countries´ future environmental land management requirements (not including provision of advice for farmers) is estimated to be around three times the existing annual agri-environment budget (Hart et al. 2011: 1).

CASE STUDY - COSTS OF NATURE CONSERVATION IN SWITZERLAND
In Switzerland´s budgetary planning, "nature conservation" is a part of the superordinate expenditure category "environment and regional planning", covering expenses for "biotopes, landscape protection, conservation measures within agricultural landscapes, Switzerland's National Park and other protected areas", both investment/financial costs as well as administrative costs (maintenance and personnel, for example). A recent study estimated the financial resources required for the protection and maintenance of biotopes of national importance according to legal standards (which could be interpreted as Aichi requirements), and concluded that the yearly sum allotted presently by the Confederation and the cantons covers not even half the amount of funding necessary (the amount required would be CHF 148 - 183 million/a) [172,4 - 213,2 million US$/a]. In addition, a one-time investment in restoration measures would be needed (700 to 1.500 million CHF) [815 - 1.748 million US$].
The study concluded that it is impossible to satisfy legal requirements with the existing level of funding.
Source: FOEN 2010.

In Serbia, the funding allocated to managing the protected areas of the country are at only 25% of what is needed - a doubling of the spending would be necessary to cover basic functioning costs, a tripling for optimal functioning - in other words: the annual shortfall in protected areas financing in Serbia amounts to around 8,7 million US$ for basic costs (50% shortfall) and 24,7 million US$ for

optimal functioning (75% shortfall) (Ministry of Environment and Spatial Planning of the Republic of Serbia 2011: 66).

In Russia, the total budget of the countries´ actions addressed directly to the implementation of the CBD requirements amounts to no more than 270.300 billion rubles (4.5 billion US$) annually - 2,4 times less than required for maintaining the biodiversity conservation in the country, impacting mainly on protected areas, rare species conservation, practical implementation of information technologies, ecological education and setting up of the monitoring system for tracking the biodiversity status (i.e. several important enabling activities) (The State Committee of Russian Federation for Environment Protection 1997).

5.4 What are the implications for the resources required to deliver the targets, individually and collectively?

Although it was not possible to "paint the complete picture", the sections above made clear that most aspects of the various European biodiversity conservation policies (be it the overall EU´s Strategy, the sectoral policies, the non-EU initiatives like the Emerald Network, or national initiatives/strategies) are seriously underfunded (see also FotE 2013).

It exceeds the scope of this survey to analyze fund raising or funding strategies. Nevertheless, a few conclusions could be drawn from the evidence above:

- Resources are extremely tight across Europe, and there is a great need for cost-efficient and effective actions.
- In this regard, enabling activities (e.g. awareness raising and knowledge generation and sharing) can lower the implementation costs of costlier protection and restoration measures (and help raising funds).
- Similarly, the evidence suggests that conservation strategies are normally more cost-efficient than restoration strategies (i.e. funds should be primarily made available for protecting yet undisturbed areas, e.g. in Eastern Europe, instead of restoring small, fragmented habitats in, for example, Western Europe).
- The polluter pays principle should be applied in raising funds from e.g. the private sector.
- A very important topic in Europe, especially the EU, is the reform of (mainly agricultural) subsidies - this would, in theory, be an almost no-direct cost action (in terms of state or EU budgets), with huge impacts (i.e. reducing negative impacts of the subsidies while promoting positive impacts at the same time).

At the same time, the uptake of financial assistance to implement measures is limited - for example, by the end of September 2009, the uptake of EU Cohesion funds allocated to biodiversity was lower than for other spending categories. At that time, the uptake for the two categories directly related to biodiversity (“promotion of biodiversity and nature” and “promotion of natural assets”) was 18,1% and 22% respectively, compared to an average of 27,1% for all Cohesion Policy funding (CBD 2013c). Other problems related to financing or the uptake of financing possibilities include short timeframes of funding that do not allow for the continuity that is often needed to enable biodiversity related projects to succeed; the lack of clear targeting of funds for biodiversity; the management of most EU funds at the national level (according to sectoral priorities, which do not

always include biodiversity conservation as a primary concern); limited capacity/knowledge in some Member States to apply for funds, and high administrative burdens in some cases (EC 2011: 15 et seqq., Kettunen et al. 2009).

Hence, the problem lies not solely in underfunding, but also in the uptake of the available funds (although probably to a much lesser degree).

6. POLICY ALIGNMENT AND DEVELOPMENT

As the international development agenda - e.g. the MDGs - is not of the same importance in Europe than on other continents, the focus of this section is mainly on the alignment between reaching the Aichi targets and European strategies and policy objectives, and between the Aichi targets and relevant EU environmental Directives and obligations (such as WFD, Habitat and Birds Directives, and the establishment of the Natura 2000 network), and their national implementation.

Summary and conclusions from this section regarding the meaning of policy alignment for cost-effectiveness are to be found in the next section (7.3 below).

6.1 How do the identified investment needs and the benefits they will achieve align with other policy agendas, such as the Post-2015 UN Development Agenda and the Sustainable Development Goals?

The High Level Panel states, "expenditure to meet the Aichi Biodiversity Targets should be recognised as part of wider investment needs for promoting sustainable development" (HLP 2011: 5). This is - in the EU and non-EU countries - recognized in most biodiversity strategies and/or action plans.

For example, the EU Commission (EC 2011b: 3) states that biodiversity conservation, including full valuation of "nature´s potential", would contribute to a number of the EU´s strategic objectives, namely:

- A more resource-efficient economy ("...by conserving and enhancing its natural resource base and using its resources sustainably, the EU can improve the resource efficiency of its economy and reduce its dependence on natural resources from outside Europe").
- A more climate-resilient, low-carbon economy ("Ecosystem-based approaches to climate change mitigation and adaptation can offer cost-effective alternatives to technological solutions, while delivering multiple benefits beyond biodiversity conservation").
- Leadership in research and innovation ("Progress in many applied sciences depends on the long-term availability and diversity of natural assets ...the innovation potential of ecosystem restoration and green infrastructure is largely untapped").
- New skills, jobs and business opportunities ("Nature-based innovation, and action to restore ecosystems and conserve biodiversity, can create new skills, jobs and business opportunities").

As mentioned by the EC´s assessment of the contribution that biodiversity protection could administrate towards reaching other strategic objectives of the EU, there are important linkages between the climate and the biodiversity agendas, i.e. biodiversity protection contributes significantly to both climate change mitigation and adaptation policies or policy goals (EC 2011b: 3).

Furthermore, the EU is a party to several biodiversity-related international conventions, such as the Bonn Convention on Migratory Species (CMS), the Bern Convention on the Conservation of European Wildlife and Natural Habitats and the Convention on International Trade in Endangered

Species (CITES). Latter has significant overlaps with Aichi target 9 (IAS), whereas both the Bern and Bonn conventions overlap mainly with Aichi target 11 (and the other conservation-related targets), and are implemented mainly by the EU Habitats and Birds Directives (EC - DG Environment).

The overlaps between "biodiversity conservation" (protecting valuable ES at the same time) and global development policies (such as the MDG) are manifold, as people in less developed countries - especially the rural poor - rely on ecosystems and ES for means of livelihood, health provision, food security, protection against natural hazards etc. Hence, biodiversity protection and the sustainable use of resources are not only the environmental aspects of sustainable development, but broadly linked to development as a whole (TEEB 2009: 31 et seqq.). The European Parliament (EP 2012), for example, demands to mainstream "environmental sustainability" into all foreign relations, to contribute to the MDGs. In Europe, "development" is not of the same importance as on other continents. Nevertheless, several East European countries do face serious development challenges, which thus also align well with the objectives of biodiversity protection and sustainable use of resources. Some evidence on this was obtained from Serbia, and regarding Belgian economic relations with East and South European (non-EU) countries. These are depicted in the case studies below.

CASE STUDY - BELGIAN EXPORT CREDIT AGENCIES

A concrete operational objective of Belgium´s national planning document towards biodiversity protection (from 2006) is to take biodiversity concerns into account in providing financial support (loans, guarantees, insurance) for projects in Southern and Eastern Europe, through the Export Credit Agencies (which assist Belgian industries abroad). The projects supported by the Agencies - mainly infrastructure projects, such as dams and pipelines - can have very significant impacts on environment and biodiversity, which would need to be fully incorporated into any applications for support through the agencies - screening procedures "must ensure that activities that lead to irreversible damage to biodiversity are not promoted".

This issue is of relevance since also other EU countries maintain similar projects/agencies, such as the German Hermes export credit guarantees.

Source: CBD 2013c: 8.

CASE STUDY – INVESTMENTS IN ENVIRONMENTAL POLICES IN SERBIA

"Development policy" in the context of several East European non-EU countries is very close to the policies oriented towards future accession to the EU (policy alignment). In Serbia, the "National Strategy of Serbia for the EU Accession of Serbia and Montenegro", contains one whole chapter that focuses on social and economic development (in terms of GDP growth) through direct investments based on sustainable development principles, including priority actions.

Nevertheless, the level of environmental investments in the Republic of Serbia is currently low, also compared to the level of spending in other EU accession countries presently and in the past (in Serbia, the percentage rose from 0,3% of GDP in 2001-2005 to approximately 0,4% in 2008; in other Central European accession states, the investments in environmental policies ranged from 1,5 to 2,5% of GDP in their respective pre-accession periods). The Serbian government plans to increase the allocations for environmental investments up to 1,5% in 2014, and 2,5% in 2017 (% of GDP), in accordance with the Sustainable Development Strategy.

Regarding financing, the EC introduced a new financial instrument for pre-accession assistance – IPA – for the budgeting period 2007-2013, which merged the previous pre-accession funds. Serbia has access to two IPA components, which amounted to 190 million € [277,5 million US$] in 2009. Comparing the EU accession funds (190 million €/277,5 million US$ in 2009) to the level of spending for environmental issues that seem necessary for fulfilling the accession criteria (2% of GDP would amount to around 1,6 billion US$), and to the external debt, it is obvious that Serbia (and other countries in a similar position as well) would need much more substantial financial aid to be able to progress significantly in protecting their biodiversity (and reaching the Aichi targets).
Sources: CBD 2013a: 17; Ministry of Environment and Spatial Planning of the Republic of Serbia 2011: 43 et seqq., 50; CBD 2013d.

Some information on the level of spending for development/cohesion policies positively related to biodiversity protection and sustainable use of resources inside the EU can be found in the Annexes to the EC Impact Assessment (EC 2011a: 17). In the financial period 2007-2013, the funds available under the umbrella of the ERDF and the Cohesion Fund were:

- 2,689 billion € [4,06 billion US$] for the "promotion of biodiversity and nature protection".
- 1,137 billion € [1,72 billion US$] for the "promotion of natural assets".
- 1,406 billion € [2,12 billion US$] for the "protection and development of natural heritage".

6.2 Synergies between the Aichi targets and EU sectoral policies

Significant overlaps exist between EU sectoral (i.e. environmental) policies and the Aichi targets[16]. Among the most significant of these - which were already mentioned in several parts of the document above - are the Water Framework Directive and related water legislation (namely the "Daughter" Groundwater Directive, the Marine Strategy Framework Directive, the Nitrates and UWWT Directives, Drinking and Bathing Waters Directives).

Overall, if these Directives would be fully implemented, the water-related aspects of the Aichi targets would probably be reached (i.e. pressure reduction: targets 6, 7, 8, probably 9 [IAS, which are a topic in the MSFD], 10; restoration: targets 14 and 15; and enabling/enhancing implementation strategies: targets 19 and 20). Several other targets, however, are also related to these Directives, such as 4 (plans for sustainable production and consumption) and 5 (reduce degradation and fragmentation; the WFD, for example, covers "groundwater-dependent" ecosystems as well) (see, for example, Tucker et al. 2013: 466).

Of similar importance are the Birds and Habitats Directives, which primarily tackle the conservation and restoration targets, i.e. the targets 5, and 11 to 15; through planning (e.g. Natura 2000 management plans), monitoring and research, and the obligation to raise the necessary funds, the targets 4 (plans for sustainable production and consumption), 19 (knowledge) and 20 (mobilize resources) would also be approached.

[16] From non-EU countries, no information was available in a summarized manner; research on national policies and environmental legislation was not possible within the framework of the current report.

Other EU policies of importance are, of course, the CAP and CFP (target 3: incentives), as well as legislation that tackles pollution in a wider sense (e.g. IPPC/IED Directives, REACH; target 8), and the Soil Strategy and Climate Change policies.

With regard to the CAP, the issue is also not solely about aligning EU biodiversity and agricultural policies, but also ensuring policy coherence at the national levels. As Member States have great flexibility in implementing or allocating the CAP funds (e.g. moving funds from Pillar 1 to Pillar 2), it is also very much about aligning national biodiversity policies with agricultural policies, represented through the specification of the CAP payments at national/sub-national level.

It has to be noted here that the implementation of these (legally binding) Directives probably takes precedence over international obligations, even if legally binding, as the EU can start infringement procedures which can result in serious financial consequences for a non-complying EU Member State. It can be foreseen, however, that many Member States will fully exploit the given possibilities for exemptions and time prolongations (i.e. the WFD allows the objectives to be reached - or even permanently lowered - latest by 2027 for specific water bodies, and in some Member States, the conservation status is "unfavourable" in many Natura 2000 sites; FotE 2013).

Another very important issue regarding the synergies between biodiversity policy (in general) and other policy agendas is the contribution of the "protection of the environment" to general economic growth and job creation, highlighted in many publications and reports (e.g. the EC Impact Assessment, and Jurado et al. 2012). The special importance of this connection is that it is not about the direct benefits of meeting biodiversity targets themselves, but about the part biodiversity policies can play in reaching growth targets.

6.3 What are the implications for the overall resource requirements to meet the Aichi Targets, and the degree to which additional resources need to be targeted to them?

As said above, it can be expected that a full implementation of the said Directives will contribute greatly (or will even be sufficient) to reach the Aichi targets. Although there is no concrete evidence on this matter, it can be assumed that a large part of the costs for reaching the Aichi targets in the EU would be covered as well. One important point to note again, however, is that a significant share of the necessary resources is generally available, but needs to be allocated differently (for example CAP and CFP).

With regard to non-EU countries, although only scattered evidence is available, it seems that significant additional resources will be needed.

6.4 To what extent can improvements in governance, institutional and policy development at the country level contribute in a cost-efficient manner to deliver actions to achieve the Targets?

In many European countries, the governance structures are highly developed (which does not necessarily mean that they are fully effective and efficient); and there are, of course, some non-EU

countries in Eastern Europe that would probably significantly benefit from improvements in governance in terms of national biodiversity funding. There are examples in this report that demonstrate on a case study basis the need for improvements in governance - in EU and non-EU countries - and the possible impacts such improvements could lead to. These are listed below:

- Uptake of environmental funding possibilities (e.g. for agri-environmental measures and the EU Cohesion funds): short timeframes of funding; lack of clear targeting of funds for biodiversity; the management of most EU funds at the national level; limited capacity/knowledge in some Member States to apply for funds, and high administrative burdens in some cases.
- The "mainstreaming" of biodiversity protection and sustainable use of resources into wider policy realms (into development, implementation and funding), namely those on agriculture, forestry, fisheries, regional development and cohesion, energy, industry, transport, tourism, development cooperation, research and innovation: e.g. better integration into CAP and CFP, development of strategic frameworks by Member States to set priorities for ecosystem restoration at sub-national, national and EU level, integration of quantified biodiversity targets into Rural Development strategies and programs, integration of additional biodiversity concerns into the Plant and Animal Health regimes, and into development policies with non-European countries.
- Other governance improvements enhancing the effectiveness of funding: minimum mandatory spending on environmental measures, for example.
- The development and implementation of management plans or equivalent instruments which set out conservation and restoration measures in the protected areas/forests.
- Further development of the reporting system under Article 17 of the Habitats Directive and improvement of the flow, accessibility and relevance of Natura 2000 data.
- The development of a methodology for assessing the impact of EU funded projects, plans and programs on biodiversity.
- Improvement and simplification of the GAEC (Good Agricultural and Environmental Conditions) cross-compliance standards.
- More flexible management instruments in the fishery sector, such as flexible quota management.
- To reform and/or reduce "negative" incentives: more transparency in assessing the subsidies´ effectiveness against stated objectives, their cost-efficiency and their environmental impacts.
- Many legal and compliance issues, mostly in East European non-EU countries (see as an example the case study on the Russian Federation).

7. COST EFFECTIVENESS

7.1 How can the Aichi Targets be delivered at least cost, taking account of the synergies between the targets and the investments required, the sequencing of actions and the synergies with other policy agendas?

Synergies and overlaps with other European policy agendas - mainly in the EU, but also in non-EU countries (e.g. Emerald Network) - have been treated in section 6 above; conclusions from this chapter are to be found in this section (7.3 below). This section, therefore, is focussed mainly on the "sequencing" of measures, i.e. the sequence in which investments are made.

CASE STUDY - PEATLAND RESTORATION IN NORTH-EAST GERMANY

Up until the 1990ies, in Mecklenburg-Vorpommern, a state in north-eastern Germany, 97% of peatlands with an area of about 300.000 ha were drained for agricultural purposes. After this period, the demand for land for cattle ranching and fodder production decreased, reducing the need for draining. Also, the high costs of maintaining drainage infrastructure and equipment raised questions about its economic benefit; furthermore, climate change predictions foresaw reduced water availability in the future. In response, the Ministry of Agriculture, the Environment and Consumer Protection of the state of Mecklenburg-Vorpommern formulated a "Peatlands Restoration Strategy", commissioned a study to assess alternative land use options for peatlands, and let the University of Greifswald analyze the economic potential of different land use options, using a modeling approach (with a model called GEST).

As a result, until 2008 almost 30.000 hectares of drained peatlands have been restored - at quite high costs, however, and needing very high initial investments (initial cost of restoration vary between 3.000 and 5.000 €/ha [4.364,4 to 7.274 US$/ha], very much depending on the price paid for land acquirement). Nevertheless, the benefits from the avoided carbon emissions (an average of 10,4 tCO_2-equivalents per hectare) outweigh these costs after only a few years.

Sources: Förster 2009; MLUV MV 2009.

The case study supports two notions:

- The importance of upfront planning.
- The importance of reducing negative incentives (especially spatially explicit subsidies) before starting restoration or conservation action.

Other sources confirm the notion that upfront planning through studies or well-informed strategies greatly reduce the costs of later practical (i.e. restoration, conservation) measures, and will, given the fact that they are relatively cheap in comparison to practical measures, play a great role in distributing resources efficiently at a later stage (Tucker et al. 2013: 465; see case study above). Also, the second notion is supported by the High Level Panel (HLP 2011: 10, 14), stating that reforming "incentives in favour of sustainable use of biodiversity could greatly reduce the costs for halving the habitat loss".

The HLP similarly states that to "establish necessary frameworks and conditions (targets 1-4 and 16-20 under goals A and E) should reduce the costs for reaching other targets" - which is obvious with

regard to financing, and confirmed by other sources (see above) with regard to knowledge base and planning. Two further case study examples support the "knowledge and planning" notion:

CASE STUDY - EVIDENCE ON SEQUENCING FROM SERBIA AND ENGLAND

The Serbia NBSAP states that a "well-functioning biodiversity information system is a prerequisite for achieving a good nature protection paradigm", and the generation of basic knowledge about biodiversity and conservation status through a biodiversity information system is "an essential step towards increased and more effective biodiversity conservation". Hence, the development of an information system is crucial to supporting and informing the biodiversity policy and decision making.

Source: Ministry of Environment and Spatial Planning of the Republic of Serbia 2011: 78 et seqq.

Similarly, the UK´s NBSAP also assumes a good evidence base to be prerequisite for "delivering the strategy effectively". The authors state that such a base would "help us make sure we are doing the right thing in the right place, and using our resources effectively, focusing on action that will have the most impact". It is furthermore said that actions to reduce pressures on biodiversity may be targeted at habitats, but be beneficial for priority species as well- an obvious conclusion, but one that highlights the difficulties in choosing which measures or actions benefit exactly which target(s), and which not.

Source: DEFRA 2011: 7, 11.

7.2 What evidence is there of the cost effectiveness of different investments, taking account of biodiversity gain and contribution to the Targets relative to cost?

Limited evidence could be obtained regarding this question, mainly because of one significant reason: there is no source at all available that consistently appraises the progress certain actions would make towards reaching the Aichi targets.

One issue, however, could be confirmed over the course of the current research (see also case study below): that conservation measures - i.e. preventing the degradation of a natural or near-natural habitat - are generally more cost-effective than restoring an already degraded habitat to its natural state (see also CBD 2012). Evidence for this assumption comes from the implementation of the WFD (in which the restoration of regulated water bodies is extremely costly, or even "impossible" - in WFD terms: "disproportionate") and or mire/peatland restoration (restored peatlands also emit great amounts of methane for several years before the wetland starts to accumulate carbon again).

CASE STUDY - WETLAND CONSERVATION AND RESTORATION IN FINLAND

The Finnish NBSAP highlights that any new land use that would entail considerable changes to mires (such as peat extraction, drainage channels for forestry etc.) must be focused in mires and peatlands which have already been drained or whose natural state has otherwise been significantly changed (while conserving the not yet disturbed areas). At the same time, the plan states that the restoration of those mires in which "the natural state has been considerably degraded, but which are still considered most valuable in terms of nature conservation" is also vital to safeguarding the

biodiversity of mire ecosystems. This, however, has yet only been done in some protected areas, and not on land that is not profitable anymore for other uses.
Source: Government of Finland 2011: 23.

7.3 What are the implications for the sequencing and/or prioritisation of investments in moving towards achieving the Targets?

Several conclusions can be drawn regarding the cost-effective achievement of reaching the Aichi targets in Europe from the previous two sections.

Regarding policy alignment in the EU - and it potential accession countries in Eastern Europe - the implementation of the various environmental Directives of the EU would mean a significant step towards the Aichi (and EU) targets. This is not directly a cost-effectiveness issue - as the Member States and accession countries have to implement the Directives anyway - but these significant overlaps certainly reduce the additional funds necessary for reaching the Aichi targets. Nevertheless, it has to be stated that the implementation of the (obliging) EU Directives also very much depends on the political will - there are many exemptions possible in some of the most important Directives (such as WFD and MSFD), prolonging the timeframe and thus greatly decreasing the importance of the Directives for reaching the Aichi targets (for example, if the timeframe extends over 2020).

Prolonging the timeframe, however, is a point to note, as several Member States state that the overall costs for reaching the WFD´s goals will be significantly less in case there is more time available. This argument could not be verified in the context of this study, but the general statement that "postponing action will increase costs" seems disputable, at least for specific actions and among policy makers. Postponing action, however, is certainly much more costly with regard to conservation of ecosystems or habitats (while for restoration in some cases the costs are lower if more time is available, see river restoration measures) - as shown above, conservation measures are generally more cost-effective than restoration measures, due to the high costs associated with the latter (see, for example, CBD 2012, or Förster 2009).

Another very important, or even crucial, point for cost-effective actions seems to be the reduction of negative incentives: on the one hand, these increase the pressure on ecosystems (and species), in cases not only hindering, but actively contradicting the achievement of the Aichi (and EU) targets; on the other hand, they can (in case of spatially explicit subsidies) greatly increase the cost for conservation and restoration, because the entitlements connected to a certain area/land will be priced into prices for potential/needed land acquisition or compensation payments.

8. BENEFITS AND COSTS

Generally, deriving a comparison of benefits and costs from the evidence listed in the previous sections is not possible in a methodologically sound and reliable way. The different assumptions regarding a specific measure, e.g. investment costs and which benefits it provides, the expected effect (impact) of the measure(s), etc. are too various and differ too much to allow for that. Instead, evidence for benefit-cost ratios is provided in the form of case studies that compare costs and benefits - mostly through Cost-Benefit Analyses - for a specific site or a specific, clearly defined package of measures.

However, it has to be mentioned here that most Cost-Benefit Analyses rely at least partly on surveys assessing the Willingness-To-Pay (WTP) of the concerned population, a methodology that has significant uncertainties attached, which can strongly bias the results of such assessments (see section 2 on methodology).

8.1 What does the evidence as identified above tell us about the balance between the benefits and costs of meeting the Targets?

EU level/Europe

Evidence on cost-benefit comparisons in the EU or Europe-wide is exclusively sectoral - but, as stated above, not provided in a single study comparing costs and benefits. However, for two policy fields, the dimensions of benefits and costs can be derived from the evidence described in the sections on benefits and resource needs.

The benefits of the Natura 2000 network of protected areas (and this is similarly true for the Emerald Network) "surely outweigh costs when taking all benefits into account" (Kettunen et al. 2009: 168). The latter, i.e. taking all benefits into account, seems important, however, as the study furthermore states that if only the benefits are taken into account for which monetary figures can be generated, the "overall socio-economic picture might not appear favourable to a site´s conservation" (Kettunen et al. 2009: 168). In quantitative terms: the estimations for annual monetary benefits of the network range from 200 to 450 billion € [280 to 650 billion US$], figures that do not seem unrealistically high considering the 1,2 to 2,2 billion "visitor days" per year in Natura 2000 sites, with direct and indirect economic impacts reaching 50 to 85 billion €/a [69,7 to 118,4 US$/a]. Cost estimations range around 6 billion €/a (around 8,2 billion US$/a], although some sources state that this figure is an underestimation - nevertheless, even if the costs were double as high as estimated, the benefits would surely outweigh costs by a factor of 20 to 30.
Natura 2000 - connected Aichi targets: 5, 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management).

Regarding freshwater ecosystems, i.e. the implementation of the WFD, the benefits derived from reaching the WFD objectives are roughly estimated to range between 10 and 20 billion €/a [13 to 26 billion US$/a] in the EU27 (although very much depending on the percentage of water bodies reaching "good status"). The costs of all WFD-related measures in the EU27 - calculated in the same study (Kaphengst et al. 2010) - sum up to 8-15 billion €/a [10,9 to 20,5 billion US$/a]; hence, the benefit-cost ratio is probably positive or neutral, but unlikely to be negative.

WFD - connected Aichi targets: 4 (planning - if RBMPs are included under this target), 10, 11, 12, 13 (protection/conservation), 14, 15 (restoration), 7 (use/management), 8 (pollution), 20 (resource mobilization).

Further evidence on the European or EU-level does not exist, except a statement from the European Commission (EC 2011d: 3 et seqq.) regarding benefit-cost ratios of measures to reach EU biodiversity target 2 ("Maintain and restore ecosystems and their services"), which says that "no aggregated estimates of benefits [are available], but project-based evidence of benefit-cost ratios in the range of 3 to 75 [exist]".

Further evidence - on regional, national and local scales - is presented as case study evidence below.

Regional level

CASE STUDY - BALTIC SEA ACTION PLAN

In 2010, the research network BalticSTERN conducted two Baltic Sea-wide surveys, called BalticSurvey and BalticSUN, coordinated studies in nine Baltic Sea countries regarding public use of the Baltic Sea and people's attitudes towards the marine environment and towards responsibilities for improving the environment (over 9.000 interviews were conducted). The latter study, BalticSUN, building upon the results of BalticSurvey, then assessed how the public evaluates improvements in environmental quality (namely nutrient reductions). This was done by describing the state of the Baltic Sea in 2050 if no new measures to reduce eutrophication were undertaken (Business-As-Usual scenario), compared to a state where the reduction targets of the Baltic Sea Action Plan (BSAP) were reached, and asking the people about their WTP for these improvements. The following Cost-Benefit Analysis demonstrates that combating eutrophication in the Baltic Sea would provide large welfare gains to the people living in the Baltic region: the people in the nine countries bordering the Baltic Sea are willing to pay approximately 3.800 million € [ca. 5,5 billion US$] annually for a less eutrophicated Baltic Sea, while the costs would only amount to around 2.300 million € [3,3 billion US$] annually.

Source: BalticSTERN Secretariat 2013.

National level

CASE STUDY - MARINE PROTECTED AREAS IN THE UK

A study conducted by DEFRA in 2009 assessed costs (to the government for implementing and maintaining the marine conservation network as well as the costs to business from restrictions on activity) and benefits (including food and raw materials, nutrient cycling, climate regulation, sea defense, cognitive values/research spending and expenditure for education) of marine conservation zones in UK waters. It concluded that the conservation of UK´s marine habitats has a positive net value (benefit-cost ratios ranging from 6,7 to 38,9), and that even after applying sensitivity analyses, the benefit-cost ratio would probably not drop below 1.

Source: EC 2011a: 52 et seqq.; Tinch et al. 2010.

CASE STUDY - COST-BENEFIT ASSESSMENTS FOR NATURA 2000 SITES IN SCOTLAND, FRANCE, GERMANY AND FINLAND

Cost and benefit estimates for 7 representative Natura 2000 areas in Scotland, based on assessments of direct (management and policy) and opportunity costs, and evaluations of both use values (e.g. recreational use) and non-use values (assessed via a WTP study), were extrapolated over the total number of Natura 2000 sites. In a Cost-Benefit Analysis, it was calculated that the net benefits significantly overweigh the costs, at a benefit-cost ratio of 7:1 (over a period of 25 years), not including several additional values not assessed (social, cultural, educational, research, environmental services and health values)[17].

In France, as part of a wider economic and institutional assessment of Natura 2000, similar cost-benefit ratios were calculated: at the Natura 2000 site "Plaine de la Crau", the net benefits were calculated to be around 142 € ha/a [around 200 US$/ha/a], i.e. around seven times higher than the costs associated with the Natura 2000 site. In the German National Park "Bayerischer Wald", the total annual costs (borne by the public) add up to 12 million € [17,5 million US$], directly and indirectly supporting 1.139 FTE jobs. Additionally, every Euro invested publicly in the National Park is returned more than doubly by the spending of visitors.

In the Finnish National Parks, a total annual revenue of 70 million € [98 million US$] is generated, creating 893 person-years in employment; it is estimated in the study done by the Finnish Natural Heritage Services and the Finnish Forest Institute that each Euro of public investment to protected areas provides 20 Euro in return.

Sources: EC 2011a (Annex 11); EU 2013: 6; Nationalparkverwaltung Bayerischer Wald 2008.

CASE STUDY - NATIONAL BIODIVERSITY STRATEGY, GERMANY

A study conducted by Wustemann et al. (2013) evaluated the financial costs and benefits of implementing a set of measures based on the National Strategy on Biological Diversity in Germany (NBS) and the Quality Status Reports of the EU Habitat Directive. The set of measures consisted of land use changes for six ecosystems/land use types: forests, arable land, grassland, peatlands, wetlands and dry habitats (a total area of 8,8 million hectares). Besides the financial costs, the benefits of the implementation were calculated for the "maintenance of biodiversity", water purification and climate change mitigation (the former via a WTP survey, the latter two based on abatement and damage costs). The results of the study indicate that the implementation of the NBS would lead to significant financial costs (reaching 3,26 billion € or 4,68 billion US$/a from 2010 to 2020), but the benefits would exceed the financial costs of measures: the benefits of biodiversity maintenance were estimated at 9,25 billion €/a [13,3 billion US$/a], climate protection benefits at 311,5 million €/a [447,8 million US$/a] and water purification benefits at 382,3 million €/a [550 million US$/a]. Therefore, the benefits would exceed the financial costs with a benefit–cost ratio of around 3.

Source: Wustemann et al. 2013.

[17] In the TEEB study (TEEB 2009: 20), the benefit-cost ratio for Scottish Natura 2000 sites is stated to be 3:1; no further information listed, however.

Local level

CASE STUDY - RIVER ELBE FLOODPLAIN RESTORATION
A study by Meyerhoff and Dehnhardt (2007) of the Technical University, Berlin, calculated the costs and benefits of restoration measures on the river Elbe (German part), through dike shifting, reducing agriculture impact and constructing fish ladders. The research combined a partial Cost-Benefit-Analysis based on a WTP study with avoidance cost approaches, engineering and land opportunity costs, and a statistical model of nitrogen retention. Several benefits - such as recreation and flood protection, climate change mitigation - were not valued. Eight scenarios were considered, and all benefit-cost ratios were above 1 (ranging from 2,5 to 4,1), even after applying separate sensitivity analyses.
Source: Meyerhoff/Dehnhardt 2007.

8.2 How can this evidence be used to make the case for the investments required?

As demonstrated, the benefits of measures to protect biodiversity in Europe (both EU and non-EU) certainly exceed the costs associated with them if all environmental and societal benefits are taken into account. This, however, is already known for some time, and large shares of necessary investments are still not being undertaken. Furthermore, in some cases (CAP and CFP, namely), raising additional funds wouldn´t even be necessary/only needed to a limited extent, because a re-allocation from harmful to positive purposes could already make a significant difference. The conclusion that can be drawn from this is the need for strong political will to allocate the funds (or relocate in case of CAP and CFP subsidies).

Hence, the question at hand is not solely about how to use this evidence to make the case for the investments required - this is constantly done, and seemingly benefits in the hundreds of billions of €/a, or the possible creation of e.g. 200.000 FTE jobs are so far not sufficient enough arguments in many cases. Rather, increased political will needs to be created, e.g. through political pressure via civil society as well as via legal instruments (i.e. the implementation of EU Directives is obligatory, and non-implementation can cause infringement procedures).

9. CONCLUSIONS

9.1 Overall conclusions

The resources assigned to compile the present study, and the availability of data - on the one hand, a multitude of information (at least from the Western European countries and EU Member States, which is almost never targeted towards the main research questions) as well as on the other hand limited information, especially regarding non-EU-countries - presented the research team with significant challenges. Although it was recognized at the outset of the task that the aim of the study was neither to aggregate the collected information, nor investigate it in more detail (i.e. interpret it), sorting through the heaps of information and discarding the non-relevant information was very time consuming. The result is a review of data best suited to shed light onto certain benefits and costs that are connected to reaching or approaching the Aichi targets in Europe. In the following, the conclusions that could be drawn from the evidence are collected[18].

Benefits: From the evidence collected regarding the benefits of reaching the Aichi targets, there remains no doubt that increased biodiversity protection and sustainable use of resources would benefit all spheres of European (human) societies: private and public life, rural and urban populations, richer and poorer people, corporations, most economic sectors - some to a higher, some to a lesser degree, and not necessarily distributed equally (across the pan-European region, and across societies). It is furthermore clear from the evidence that these benefits are not only "nice to have", but represent significant components and functions of the socio-economic systems in Europe, with a real value existing in terms of ES provision (mostly slightly "abstract" monetary benefits), indirect and direct income (e.g. visitor spending in protected areas), and as a basis for jobs and job creation. Additionally, biodiversity protection, especially green infrastructure projects, have a great potential for increasing ecosystem resilience to predicted climate change impacts.

The most significant monetary values, as identified by this report, stem from conservation and restoration activities (Natura 2000 and Emerald Network, corresponding mainly to the Aichi targets 5, 10, 11, 12, 13 [protection/conservation], 14, 15 [restoration], 7 [use/management]) - several studies estimate the annual value to range between 200 and 450 billion €/a [280 to 650 billion US$]. In terms of non-monetized benefits, the provision of jobs and the creation of new jobs is of great importance, as estimations speak of up to 200.000 new FTE jobs being created through the EU Biodiversity Strategy, and up to 16% of all jobs in the EU being dependent on the environment.

Thus, increased biodiversity protection and sustainable use of resources would benefit all spheres of European societies ,although, as highlighted in section 3, these benefits are not equally distributed across the pan-European region, and across societies.

Investments and Resource Requirements: Although no comprehensive and "self-contained" overview of necessary actions/investments to reach the Aichi targets in Europe (EU and non-EU) exists, several priorities for actions - i.e. actions most important for reaching biodiversity targets

[18] For reflections regarding data availability and -gaps, see 9.2 and section 2.

(see, for example, table 1 for a list of the EU biodiversity targets) - could be identified, mainly for the EU:

- Ensure a better uptake and distribution of existing funds for biodiversity: reform of agricultural (and fishery) subsidies; longer timeframes for biodiversity funding; clearer targeting of funds for biodiversity, also at the national level; capacity building and decrease of administrative burdens.
- The latter point is of special concern for new Member States in Eastern Europe, lacking the experience in applying for EU funds.
- Reforming the agricultural subsidy system ("Greening" the CAP), and e.g. reallocating funds from the first to the second Pillar (the CAP reform 2014-2010 has been agreed, but the final text is not available as of December 2013).
- Completing the Natura 2000 network, and establishing management plans or similar instruments onsite, also to obtain data on the impacts and effectiveness of financing.
- Increase knowledge and awareness.

Generally, it is assumed that the implementation of the EU´s sectoral policies, especially the environmental legislation, would be sufficient for reaching most Aichi targets, or at least approach them to a significant degree.

In the new EU Member States as well as in non-EU countries, the focus should be more on capacity building with regard to the uptake of financing opportunities, awareness raising and on measures towards conservation instead of restoration (given the large undisturbed/unfragmented areas left in many parts of Eastern Europe and Russia). Additionally, in the non-EU Eastern European countries (i.e. Belarus, Ukraine, the Russian Federation, Moldova, but to a certain degree also Serbia, Albania), much more basic activities are necessary: studies and surveys about the state of ecosystems and ES, the designation of protected areas (e.g. for inclusion into the Emerald Network); and many legal and compliance issues.

Similarly to the expected benefits, overall costs or resource needs are also not documented in a comprehensive and self-contained manner (i.e. directed towards reaching the Aichi targets). Estimations exist, however, for aspects of biodiversity protection and sustainable use of resources, and range in the tens of billions of € (or US$) per annum for the EU, although the data is not fully compatible: if the sectoral estimations were to be added up, the resulting sum would easily exceed the more general calculations. With regard to non-EU countries, no estimation of the resource needs can be provided, as no information is available covering Belarus, Ukraine, Moldova, Russia or the Balkans. At the same time, due to less fragmented or disturbed ecosystems that still exist in some parts of Eastern Europe, the costs could be significantly lower in these countries, as less restoration measures would be necessary. Regarding Western European non-EU countries (Switzerland, Norway, Iceland), the dimensions of the resources necessary will be similar to the ones in the EU Member States.

Nevertheless, the overall cost dimension seems to be more or less clear: the costs for reaching the Aichi targets (or EU biodiversity targets) would probably be in the tens of billions € or US$/a in the

EU alone. The most expensive actions, as far as the evidence suggests, are conservation and especially restoration measures (Aichi targets 11-15). A very important point in this regard is that many of these funds have to be allocated by EU Member States in any case for implementing other EU environmental legislation - independently of the biodiversity targets. The same is true for the reform of the subsidy system (CAP and CFP): basically no or only limited additional resources are required, as funds would mainly needed to be shifted between Pillars, or linked to more biodiversity-friendly management.

Hence, it can be concluded that reaching the Aichi targets in the EU is more an allocation challenge than a resource challenge.

Additionally, there are **significant overlaps with other policy fields**, especially in the EU - the implementation of the various environmental Directives of the EU - to which the Member States are legally obliged - would mean a significant step towards the Aichi (and EU) targets. This, naturally, does not reduce the costs for a better protection of the environment in Europe (or improve the cost-effectiveness of measures), but these significant overlaps certainly reduce the additional funds necessary for reaching the Aichi targets. Nevertheless, it has to be stated that the implementation of the (legally binding) EU Directives also very much depends on the political will - there are many exemptions possible in the most important Directives (such as WFD and MSFD), prolonging the timeframe and thus greatly decreasing the importance of the Directives for reaching the Aichi targets (for example, if the timeframe extends over 2020).

Prolonging the timeframe, however, is a point to note, as several EU Member States argue that the overall costs for reaching the WFD´s goals will be significantly less in case there is more time available. This argument could not be verified in the context of this study, but the general statement that "postponing action will increase costs" seems disputable, at least among policy makers. Postponing action, however, is certainly much more costly with regard to conservation of ecosystems or habitats (while for restoration in some cases the costs are lower if more time is available, see river restoration measures) - as shown above, conservation measures are generally more cost-effective than restoration measures, due to the high costs associated with the latter (see, for example, CBD 2012, or Förster 2009). Another very important, or even crucial, point for cost-effective actions seems to be the reduction of negative incentives: on the one hand, these increase the pressure on ecosystems (and species), in cases not only hindering, but actively contradicting the achievement of the Aichi (and EU) targets; on the other hand, they can (in case of spatially explicit subsidies) greatly increase the cost for conservation and restoration, because the entitlements connected to a certain lot of land will be priced into prices for land acquisition or compensation payments.

Hence, there are significant overlaps between other biodiversity-related policies (mostly in the EU), reducing the "additional costs" of reaching the Aichi targets significantly.

Although it is disputed that postponing action would increase costs, at least in some policy fields (such as "conservation vs. restoration") this seems evident.

The evidence also demonstrates that the benefits of measures to protect biodiversity in Europe (both EU and non-EU) certainly exceed the costs associated with them if all environmental and societal benefits are taken into account. This, however, is already known for some time, and large shares of necessary investments are still not being undertaken. Furthermore, in some cases (CAP and CFP, namely), the raising of new funds would be necessary only to a limited extent, because simple re-allocation from harmful to biodiversity-friendly purposes could already make a significant difference.

9.2 Commentary, including caveats and limitations of the approach

The major limitations and methodological issues of the approach to the present study are the following:

- First, the information basis: contrary to all other continents, Europe has a supranational organization - the EU - that covers biodiversity topics on its own, in addition to local and national initiatives. The EU has the power for obliging legal action, especially with regard to environmental protection, resulting in a multitude of (additional) studies and reports with regard to the consequences of implementation on this level. Hence, on the one hand the data situation in Europe is much better than on other continents. On the other hand, however, the EU adds an extra level of analysis to the assessment - a level that does not cover the whole of Europe, but only a part, with completely different policy targets that need to be "translated" to the proper Aichi target(s) - which complicates both the search for/the compilation of information as well as the proper interpretation of it.
- Second, and closely related to the point above, is the limited data situation in non-EU countries, especially in Eastern Europe, from where almost no quantitative information on the implementation of the Aichi targets could be obtained. Additionally, it was not possible to search individual websites for national documents, due to the language barrier (many websites and documents are in Russian, for example).
- A third point is related to the methodological issues surrounding CBA and other quantitative cost-benefit assessments (see section 2 on more details).
- A fourth point is the conversion of national currencies to present value US$. As stated in section 2, the conversion to 2013 dollars follows the Inflation Calculator provided by the US Bureau of Labour Statistics, which is based on the Consumer Price Index, using the year of the respective study as "baseline year" for the conversion. However, in some cases the definition of a baseline year was no easily possible, i.e. in cases in which a time span was being discussed (i.e. a source from 2010 stating that between 2007 and 2009 a certain amount of Euro has been invested). To cope with that, the original figures were not deleted but kept in the report.

9.2 Evidence gaps and future research priorities

Naturally, evidence supporting the qualitative aspects of the questions - i.e. regarding the benefits probably connected to reaching the Aichi targets, or the necessary actions/measures/investments - is much more easily obtainable than quantitative data. This, however, does not necessarily mean that the qualitative data is directly of use - long lists of necessary actions/measures/investments

without any information on the degree to which these will suffice for reaching certain objectives are often provided, but are not very helpful. On the contrary, even if quantitative information might be more difficult to generate and might have generally more uncertainties attached to it, the links with the effects (of the actions/measures/investments investigated) are mostly included and at least allow for further conclusions.

Besides, the evidence seems most robust and plenty with regard to investment needs and resource requirements; the evidence situation for benefits is also quite good, although more reliant on anecdotal/case study-based evidence ("sketchy" data situation).

Relations between costs and benefits are treated in Cost-Benefit Analyses for the most part, conducted on a local or regional (e.g. sub-national) scale. Besides the challenge of transferring the results of such studies to a greater scale, CBA often involve methodologies that evaluate the monetary value of benefits provided by ES, which can, as mentioned above, include significant uncertainties. Not much data is available to better understand policy alignments and overlaps between environmental policies, and with regard to cost-effective combinations of measures, or "sequencing".

National Biodiversity Strategies and Action Plans have mostly not been very relevant, as in most cases, concrete, quantitative information on reaching the Aichi targets was not included (instead, the strategies mostly consist of national objectives and planned actions to reach these, and "translations" of the national targets/objectives to the Aichi targets)). Clear statements on costs - i.e. "reaching the Aichi targets in country X/the Aichi target 11 in country Y would cost X Euro" - or benefits were not found in any of the plans.

However, there was ample information available regarding local or regional examples and case studies - rarely in the context of reaching a certain Aichi target, but covering costs and benefits of certain actions or measures, on different scales of governance. Herein, the difficulty lay not in finding case study examples, but in selecting the ones most reliant and appropriate, and in "translating" the actions into the Aichi framework.

Beside the issues raised above - i.e. the lack of quantitative data regarding benefits and costs in the NBSAPs, and the general lack of "links" between specific actions/measures/investments and the Aichi (or EU) targets - the following evidence gaps are of the greatest importance:

- The missing link between the effects of an action, and the change this action will result in terms of reaching the Aichi or EU targets.
- The information regarding quantitative benefits of reaching the targets is very "sketchy", i.e. an overall estimation does not exist. No report has been found that clearly addresses the economic implications of reaching the Aichi targets, neither on the European, the EU nor the national level.
- Regarding investment needs, the evidence gaps lie in the challenging translation of environmental policies at the EU or national levels to the Aichi targets (so, the existing

evidence is focused on other targets/policy objectives than the Aichi targets, and often does not establish the link).

- The evidence gaps regarding resource needs are relatively manageable in Western Europe, although uncertainties evolve when local, case study-like evidence is up-scaled to the national or EU-scale. In Eastern European countries, mostly non-EU, the data gaps regarding costs are very significant (i.e. there is almost no data available).
- Information on the contributions and negative effects of the EU development, coherence and accession policies on biodiversity was not available, as well as information on cost-effectiveness. In the latter field - i.e. regarding the sequencing of measures - there is a lot of general information available, but no source that assesses the consequences of different approaches in a quantitative way (e.g. "measures a and b implemented before measures c and d leads to additional costs...").

Reflecting on the evidence gaps, future research priorities to support the implementation of the Aichi targets are manifold - however, as only seven years are left until 2020, and considering the long time it usually takes for medium- or big-sized research projects to get started and finally deliver results, the research priorities proposed here are focused on short- or medium-term endeavors with a chance to deliver results in the next years. For example, research into the "links" between certain actions/measures/investments and the resulting progress towards the Aichi (or other biodiversity-related) targets is deemed to be a rather long-term project that would probably have little impact on the current implementation process.

Short- or medium-term research priorities include:

- In Eastern Europe non-EU countries, there is surely a great need for basic research into status and trends of biodiversity, in order to be able to identify and plan the most crucial conservation/protection measures.
- An improvement of the general data situation regarding costs and benefits of activities to protect biodiversity, i.e. in terms of pilot projects, would surely be helpful to convince policy makers and stakeholders of the economic benefits and necessities of biodiversity protection and a more sustainable use of resources.
- Of a similar effect could be the development of standards for CBA or other cost-benefit assessments, which would improve the reliability of such studies and possibly improve the acceptance of the results by policy makers.
- Research into the contributions and negative side-effects of the EU development, coherence and accession policies on biodiversity.
- Cost-effectiveness: Concrete (and quantitative) information on sequencing, for example, would certainly be helpful in progressing towards the Aichi targets.

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