

## Cost-effectiveness of managing Natura 2000 sites: an exploratory study for Finland, Germany, the Netherlands and Poland

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**Abstract** Natura 2000 sites are expected to assure the long-term survival of Europe's most valuable and threatened species and habitats. It follows that successful management of the sites is of great importance. Next to goal attainment, cost-effectiveness is increasingly recognised as a key requirement for gaining social and political acceptance for costly conservation measures. We identify and qualitatively examine issues of cost-effectiveness related to the design and implementation of management measures in Natura 2000 sites in Finland, Germany, the Netherlands and Poland. Given the wide variety of management design and implementation options within the four countries, our study is purely of an

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exploratory nature. We derive recommendations for improving the cost-effectiveness of management in Natura 2000 sites and for future research. Examples of policy recommendations include guaranteeing the availability of funds for longer periods, and ensuring the appropriate allocation of funds between the different tasks of designing and implementing management plans. Further research should examine the cost-effectiveness of controversial suggestions such as, for example, more tailored payment schemes for conservation measures that result in higher ecological outputs but are costly to administer. Moreover, more research is needed to better understand how rules for administrations, as well as rules and governance structures for tasks within administrations, should be designed.

**Keywords** Conservation · Cost-effectiveness · Exploratory study · Management · Natura 2000

## Introduction

Natura 2000 is a coherent network of protected areas established under the Habitats Directive (92/43/EEC) and comprises the Special Areas of Conservation of the Habitats Directive as well as the Special Protection Areas of the Birds Directive (79/409/EEC) ([http://ec.europa.eu/environment/nature/natura2000/index\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/index_en.htm)). Natura 2000 is one of the centrepieces of EU nature and biodiversity policy with the objective of assuring the long-term survival of Europe's most valuable and threatened species and habitats. Therefore, the management of Natura 2000 sites is of high political importance.

In recent debates on conservation policy it has been increasingly argued that next to goal attainment cost-effectiveness is a key requirement for gaining social and political acceptance for costly conservation measures (e.g. Millennium Ecosystem Assessment 2005; Wätzold and Schwerdtner 2005; Ferraro and Pattanayak 2006; Chmielewski 2007). This is no different for Natura 2000 with anticipated annual management costs of € 6.1 billion (COM 2004). Moreover, taking cost-effectiveness into account when designing and implementing conservation policies helps to save scarce resources that could be used for other purposes—including further conservation. Depending on the policy under review, the criterion of cost-effectiveness can be looked at in two different ways: First, a policy is more cost-effective than another if its conservation outcome is higher for given total costs. Alternatively, a policy is more cost-effective than another if an equal conservation outcome is attained at lower total costs.

The issue of cost-effectiveness has many different facets. The literature on cost-effective design of conservation policies focuses on the optimal spatial and temporal allocation of areas (e.g. Ando et al. 1998; Cabeza and Moilanen 2006; Drechsler 2005) and conservation measures (e.g. Johst et al. 2002; Drechsler et al. 2007b; Holzkämper and Seppelt 2007). However, some researchers (e.g. Whitby and Saunders 1996; Birner and Wittmer 2004; Buitelaar 2004) emphasise the importance of transaction costs when it comes to the design and implementation of conservation policies. In order to improve the cost-effectiveness of existing policies and direct research accordingly, it is important to understand which aspects of cost-effectiveness are empirically significant for which policies.

Against this background we carried out a study to identify and qualitatively examine cost-effectiveness issues related to the design and implementation of management measures in Natura 2000 sites in four EU Member States: Finland, Germany, the Netherlands and Poland. We focus on management measures as they constitute an important instrument of the European Birds and Habitats Directives (compare e.g. Article 6 (1) of the Habitats

Directive). Furthermore, the design and implementation of Natura 2000 related measures has only recently started, so thus far little is known about the approaches in the various countries. Given the decentralised approach to conservation and the resulting wide variety of management approaches within the four countries, our study cannot be considered a comprehensive review of the cost-effectiveness of management in Natura 2000 sites, but rather as an exploratory study. Nevertheless, we are able to derive recommendations regarding the improvement of the cost-effectiveness of management in Natura 2000 sites and the direction of future research.

In the following section we introduce the methodological approach of the study. In section three the country case studies are presented and in section four the findings are discussed and policy and research recommendations are derived.

## Methods

In order to systematically structure our research we used a framework for assessing the cost-effectiveness of conservation policies. The framework was originally developed by Birner and Wittmer (2004) for the cost-effectiveness analysis of natural resource management in developing countries, and extended by Wätzold and Schwerdtner (2005) to evaluate European conservation policies (see Lehmann et al. 2009 for an application of the framework to conservation policies in Germany). We only briefly summarise the framework here and refer the interested reader to the original sources (Birner and Wittmer 2004; Wätzold and Schwerdtner 2005). The framework sub-divides total costs (cp. the definition of cost-effectiveness in the Introduction) into *production costs*, *implementation costs*, and *decision-making costs*.

*Production costs* are the costs of the actual conservation measures that are carried out including foregone economic benefits due to restriction on economic activities. Examples of production costs are costs for setting up and maintaining fences to protect reserves and foregone profits of farmers due to restrictions on farming for reasons of conservation.

As many public policies, including those related to conservation, fail because individuals and firms do not comply with the law, proper implementation is crucial. *Implementation costs* include the costs of monitoring compliance with the law and—if necessary—of enforcement measures. Examples of compliance monitoring costs are costs for supervisory personnel and specialist equipment, while examples of enforcement costs are administrative costs for lawsuits and for collecting fines.

*Decision-making costs* arise from acquiring the information necessary for the successful design and implementation of conservation measures. This includes scientific and local knowledge about the effects of conservation measures on species as well as information needed for the cost-effective design of measures. It also includes activities to monitor the success of conservation measures. Land owners may incur private decision-making costs when seeking information about conservation measures. Decision-making costs also arise for co-ordinating the decision-making process, for example, the resources spent on meetings and solving conflicts.

It is important to note that a *trade-off* between the costs incurred for a decision and the quality of that decision may exist. A decision that has been reached with low decision-making costs, e.g. because of little scientific input, may well lead to a policy that is not cost-effective with regard to production costs.

Going beyond the framework by Birner and Wittmer (2004) and Wätzold and Schwerdtner (2005) we consider that the implementation of conservation measures may

generate *societal benefits* additional to those from conservation (e.g. an improved ground water quality or a higher recreational value of an area). This is relevant for cost-effectiveness if a certain conservation measure costs the same and has the same conservation impact but generates differing additional benefits—depending on where it is carried out. Consider as an example a conservation measure which has a positive impact on the scenic beauty of a landscape and which may be carried out in two different areas for the same costs and generating the same conservation effect. However, one area may be more frequently visited by tourists. Implementing the measure in this area is then more cost-effective as it generates the same conservation impact but a higher recreation benefit without being more costly.

In accordance with Ostrom (2005, p. 36), we used our framework “[...] to identify the elements (and the relationships among these elements) that one needs to consider for [...] analysis.” Thus, the framework served as a diagnostic tool to structure our qualitative empirical research which was done through a literature review and interviews.

For the literature analysis, we screened articles in books and journals related to Natura 2000 management as well as reports, newsletters and guidance documents on management of Natura 2000 sites for relevant information with respect to cost-effectiveness issues. With the exception of an article by one of the authors of this study (Chmielewski 2006b) we found no literature source that directly deals with cost-effective management of Natura 2000 sites. However, we found a substantial amount of information that provided useful input for the cost-effectiveness analysis.

We complemented the information gathered by the literature analysis with two interviews per country. One interviewee was chosen because he or she had a good overview of Natura 2000 implementation in the country and the other interviewee because he or she had an intimate knowledge about actual implementation issues on specific sites. We carried out semi-structured, problem-centred interviews which are typically used to collect qualitative data (a semi-structured interview is like a conversation and an interview guide prepared in advance functions as a framework and helps to focus on the subject, cp. Witzel 2000; Lindlof and Taylor 2002). Our interview guide was developed on the basis of the framework described above but also contained some questions to identify novel cost-effectiveness issues specific to Natura 2000 implementation. Valuable information was also gained because one author of this study is a member of the Polish National Nature Conservation Council and has detailed knowledge about the management of Natura 2000 sites in Poland.

## Results of the exploratory study

Following a brief introduction of Natura 2000 management in the respective country we present the country-specific results of the analysis, focussing on management measures that have either led to a loss of cost-effectiveness or have been particularly successful in terms of cost-effectiveness. Within each country study we address the different elements of our framework in turn (production costs, implementation costs, decision-making costs, trade-offs between different costs and societal benefits other than conservation). Note that not all elements exist in each country and sometimes a certain management measure is related to two elements of the framework (e.g. an improved public tender process leads to production and decision-making cost savings). In such cases, we discuss the measure in relation to the element of our framework which seems to us the more important one in terms of cost-effectiveness improvement.

**Table 1** Natura 2000 sites in Finland, Germany, the Netherlands and Poland

		Finland	Germany	The Netherlands	Poland
Country area (km <sup>2</sup> )		338,145	357,031	41,526	312,685
Natura 2000 sites	HD	1,715	4,622	142	364
Total number	BD	468	734	77	124
% of total country terrestrial area	HD	12.7	9.9	8.4	8.1
	BD	7.5	12.2	12.6	14.1

*HD* Habitats directive, Sites of Community Importance, *BD* Birds Directive, Special Protection Areas

Source: update of December 2008, [http://ec.europa.eu/environment/nature/natura2000/barometer/index\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/barometer/index_en.htm). Cited 10 Feb 2010

To give an overview Table 1 shows the total number and the percentage of total terrestrial area designated as Sites of Community Importance (Habitats Directive) and Special Protection Areas (Birds Directive) in Finland, Germany, the Netherlands and Poland.

## Finland

In Finland, the Ministry of the Environment is responsible for environmental protection and nature conservation policies including the Natura 2000 planning process and the management of Natura 2000 sites. At regional level 13 Regional Environment Centres play an important role in planning and implementing nature conservation, one of their responsibilities being the management of protected areas (including Natura 2000 sites) on private land. In contrast, protected areas on state-owned land are managed by the Forest and Parks Service with six regional units. In Finland most of the protected areas are located on state-owned land resulting from the prevailing policy of buying the land on which protected areas will be designated (National Audit Office 2007). During the years 2003–2007 the annual costs of the acquisition and management of the nature conservation areas varied between 58 and 70 million euros (Statistics Finland 2006).

## Production costs

The process of planning and designating the Natura 2000 network in Finland was to a large extent a controversial top–down process which led to numerous complaints and court cases (for details see e.g. Hiedanpää 2002; Hiedanpää 2005; National Audit Office 2007). To mitigate future conflicts the Finnish approach to nature conservation—including the management of Natura 2000 sites—became more flexible (National Audit Office 2007). Prior to Natura 2000, conservation areas were clearly demarcated and then strictly protected (and bought by the state). The contrasting approach introduced with Natura 2000 pays less attention to the borders of protected areas and more to conservation results, affording additional protection outside strictly demarcated sites (National Audit Office 2007). Based on information from the interviews we conclude that the more flexible approach opened more—and to some extent less costly—opportunities for nature protection, increasing its overall cost-effectiveness.

Cost-effectiveness is not explicitly emphasised in any guidance document for site management (cp. e.g. Finnish Ministry of the Environment 2002, 2004; Ojala 2007), but an interviewee emphasised that the scarceness of financial resources forces managers to

carefully consider the costs and effectiveness of proposed measures when developing management plans in order to select those measures which generate the highest ecological benefits for given budgets.

Interviewees stressed the problem that the availability of funds is often not guaranteed for longer periods. It follows that restoration projects that require long-term maintenance are not carried out even though it is known that they would generate high ecological benefits. A related problem arises if the preparation of a management plan is based on project funding (e.g. from the EU Life programme) and funding for subsequent implementation of the plan can not be secured. According to an interviewee planners respond to this problem by developing plans with measures which do not require continuous maintenance. However, these measures are often less ecologically valuable. Moreover, an interviewee recalled a couple of cases in which no funds at all were found for the implementation, resulting in substantial planning costs without any conservation effects.

#### *Decision-making costs*

Monitoring the effectiveness of management measures on Natura 2000 sites is conducted as much as possible during projects, but systematic long-term monitoring is only carried out in very few places. An interviewee argued that this is problematic, as managers do not have site-specific information about the effectiveness of measures and, hence, corrective action cannot be taken. However, he conceded that sharing experiences and knowledge about the effectiveness of measures among managers and using the scientific literature helps to improve the level of information. Although the lack of monitoring has obvious disadvantages, the costs of monitoring must be taken into account. The existing knowledge about the effects of measures may well suffice, rather than carrying out much more extensive and costly monitoring programmes that—under the assumption of fixed conservation budgets—would have to be financed at the expense of actual conservation measures.

#### *Trade-offs between different costs*

The ongoing implementation of an additional regional planning level is regarded as an instrument for enhancing the cost-effectiveness of managing Natura 2000 sites (Finnish Ministry of the Environment 2002, 2003). An interviewee explained that, in particular, it is hoped that a regional plan will help to avoid a situation in which the same conservation measures are carried out on each site leading to a lack of diversity of measures. For example, a general management plan was developed in the Uusimaa region in Southern Finland, and, because the selection of conservation measures was coordinated, conservation of several small swamp sites became more variable. Overall, general planning is expected to lead to more conservation output for a given budget because of better coordination. Still, additional coordination efforts lead to higher decision-making costs.

#### *Other societal benefits*

At one time conservation effects were the only criteria considered in the selection of conservation measures and their locations, but—according to an interviewee—today further benefits for society are taken into account in the planning process. For example,

certain conservation activities (e.g. mowing of grass to maintain an open landscape) are preferably selected in places where visitors can enjoy the resulting positive effects on the landscape. In this way the overall benefits of such measures increase. The interviewee who described this change of thinking in the nature conservation administration pointed out that it also results in fewer conflicts and, consequently, lower decision-making costs.

## Germany

In nature conservation, as in many other policy areas, Germany has a decentralised structure. The German federal government provides framework legislation and the sixteen federal states (Bundesländer) are responsible for the implementation of the federal laws, while retaining some degree of freedom on how to do this. This is also the case for the Natura 2000 network, resulting in a variety of different implementation approaches (BfN 2007a). Germany was one of the countries where the implementation of the Natura 2000 network was rather slow (BfN 2007b; European Commission 2008), but meanwhile the sites for the network have been selected and conservation managers have started to design and implement management measures. The federal states are responsible for the establishment of necessary conservation measures and to what extent this task is delegated to lower levels differs among the federal states. The financial resources for the development and implementation of the management plans come from regional budgets as well as EU co-financing (BfN 2008).

### *Production costs*

With the development of Natura 2000 management plans financial resources for conservation were being concentrated in Natura 2000 sites, including money that had previously been allocated to conservation in other areas. An interviewee pointed out that as a consequence of this reallocation, this money had been partly wasted. To be successful, many management measures need to be applied for some time and this money had not been spent long enough to generate the desired conservation effects. More conservation could have been achieved by leaving the former allocation of money rather than shifting all money to Natura 2000 sites.

Interviewees considered the MEKA programme of the German Federal State of Baden-Württemberg (Hartmann et al. 2006; MRL BW 2008) a positive example of cost-effective conservation. Here, payments are made for conservation results (if certain endangered plants appear on a farmer's meadow) and not for measures themselves. The advantage of the programme in terms of cost-effectiveness is that in contrast to payments for measures it is certain that the money spent actually generates conservation results (cp. Kleijn et al. 2001; Klimek et al. 2008). Furthermore, payments for results ensure that those land users provide conservation that can do so at low cost as the payments will not be sufficient to cover the costs of land users with high conservation costs (Zabel and Roe 2009). Several other federal states (e.g. Rhineland-Palatinate and Lower Saxony) are now working towards setting up programmes with payments for results (cp. Horn et al. 2008).

### *Implementation costs*

Most management measures in Natura 2000 sites are co-financed by the EU (cp. BfN 2008) which implies that they have to follow EU requirements related to monitoring and

enforcement. Although these requirements are expected to prevent non-compliance, an interviewee pointed out that they are costly, not always suited to nature conservation programmes, and sometimes prevent land users' participation in the scheme. For example, strict control is required regarding the size of the area managed according to the programme requirements. A contract is invalid and the land user has to repay all received funds if an area is found to be even marginally smaller than stated in the contract. This is a severe penalty given that land users may err on small margins without intent and, consequently, deters land users' participation. In contrast, very little monitoring is required and carried out on whether conservation measures generate the desired ecological result. According to the interviewee the overall performance of management measures could be improved if less money was spent on monitoring the correct area size and more on monitoring the ecological impacts of the measures.

### *Decision-making costs*

According to DVL (2005) there has been a tendency in some parts of Germany to make very detailed management plans for Natura 2000 areas and much money has been spent on surveying and mapping. This is a reasonable approach if there is a lack of knowledge for carrying out conservation measures or there are potential conflicts with other land users. However, DVL (2005) argues that these conditions were not met in many cases (e.g. when management plans already existed prior to Natura 2000) and it would have been better for conservation if more money had been spent on actual measures rather than on planning.

Also related to the issue of planning an interviewee mentioned that prior to Natura 2000 nature conservation was repeatedly confronted with the problem that management plans could not be implemented due to a lack of financial resources. The consequence was that money that had been spent on planning was wasted. To avoid this, the interviewee suggested that a financial plan should be part of the plan for Natura 2000 sites. The financial plan should state the costs of the proposed measures and evaluate options of how to receive the necessary financial resources to ensure that only measures are proposed for which funding is available.

In several federal states experience with selecting Natura 2000 sites has shown that costly conflicts may arise if stakeholders are not involved in conservation related decision-making processes (e.g. Eben 2006). The result of the top-down approach of Natura 2000 site selection is a negative attitude or a lack of interest on the part of local actors towards any further activities related to Natura 2000. As a result more (and costly) informational activities are needed to convince local actors to participate in management measures (Suda et al. 2005). To avoid such problems in the future DVL (2005) suggests that stakeholders should be integrated in decision-making processes about the management measures.

### *Trade-offs between different costs*

Reiter et al. (2004) call for conservation programmes to be more tailored and thus more effective for conservation. For example, one common conservation programme in Germany demands from farmers that the first mowing of meadows be postponed until after June 15. However, it has been argued that there should be regional variations on when the first cut is allowed, due to differences in species composition, climate, altitude etc. (cp. Reiter et al. 2004; Drechsler et al. 2007a). Such demands, however, are usually rejected by the administration because of higher administrative costs (Reiter et al. 2004). Hence, there is a trade-off between saving administrative costs (which require simple

standardised conservation measures) and more tailored conservation measures (which in turn require higher administrative costs).

### *Other societal benefits*

An interviewee criticised that when selecting between different management measures benefits from these measures other than for conservation (e.g. eco-tourism) were often not sufficiently considered. Hence, for given budgets benefits to society were not generated to the extent that would have been possible with a more holistic approach that takes into account all benefits from conservation measures in the decision-making process.

### The Netherlands

The Ministry for Agriculture, Nature and Food Quality (ANFQ) is responsible for nature conservation in the Netherlands. State-owned Natura 2000 sites are managed by the Dutch State Forest Service (SBB), a quasi-autonomous non-governmental organisation. Further, private conservation organisations, 12 provincial nature protection societies and the Ministry for Defence also manage protected areas. The Ministry for Transport, Public Works and Water Management manages the coastal zone, large lakes, tidal waters etc. comprising about 70% of Natura 2000 sites. The SBB manages about 50% of the total terrestrial natural area of the country and presents yearly reports to the ministry about the management results. The ANFQ also spends money on contract-based nature management by private individuals like farmers. Costs related to the long-term management of the Natura 2000 sites have been estimated at the amount of 13–14 million euros per year including the money the ANFQ spends on contract-based management by private individuals (Netherlands Environmental Assessment Agency 2007). Single investments for Natura 2000 sites for restoration measures have been estimated to amount so far to a total of 16–27 million euros (De Jong et al. 2007).

### *Production costs*

An important restriction for implementing the Natura 2000 management was the decision of the ANFQ that the overall conservation budget should not be increased, i.e. no additional money was provided for Natura 2000 implementation (ANFQ 2006). Whereas many ecological objectives remain the same after the implementation of Natura 2000 (so management costs do not change much), for some sites new objectives have been established (ANFQ 2006). According to an interviewee the combination of a budget-neutral implementation and the establishment of new objectives led to two effects: First, the SBB was stimulated to implement improvements, which led to a higher level of cost-effectiveness. For example, the SBB and other management organisations coordinated and harmonised their monitoring systems. As a consequence, the systems are not only less costly but also more tailored to site objectives. However, cost-effectiveness improvements were not sufficient to achieve old as well as new conservation goals with the existing budget. Therefore, high management and investment costs that arose from new goals also negatively affected the attainment of existing goals. In some cases, this implied that financial resources that had been spent earlier were wasted because funding for the corresponding projects dried up.

A contribution to more cost-effectiveness is expected from regional plans that bring together the local Natura 2000 management plans. These regional plans allow the SBB to

identify areas where conservation goals can be reached at low cost (Netherlands Environmental Assessment Agency 2009). According to an interviewee the consultation processes to establish the regional plans shall also enable the SBB to identify stakeholders that are willing to share responsibilities to realise some ecological goals that can be linked to their own goals. For example, it is expected that together the SBB and water management bodies can achieve goals related to ground and surface water management at lower costs than if each party tries to achieve their goals independently. It is further hoped that identifying and working with stakeholders who have a positive attitude towards conservation is generating a smooth working atmosphere, reducing decision-making costs and increasing ecological effectiveness.

#### *Decision-making costs*

As a consequence of the Natura 2000 status of its sites, the SBB had to adjust its old monitoring system, to develop new inventory methods and techniques and to carry out new inventories of habitat types and species. An interviewee explained that the SBB is considering the alternative of outsourcing the maintenance of these biotic inventories to private companies or organisations of specialised volunteers based on cost-effectiveness arguments. Private companies and especially volunteers are less expensive than the SBB's own personnel.

Some schemes for compensating farmers for management measures in Natura 2000 sites are co-financed by the EU (Netherlands Environmental Assessment Agency 2007). To receive money under these schemes farmers had to follow a complex administrative procedure scheme which had been set up by the nature conservation administration. For example, to participate in mowing programmes directed at the protection of meadow birds farmers had to provide detailed information on the exact location of nests. Such high informational requirements caused farmers to complain and to threaten to withdraw their participation from the voluntary schemes. It has been concluded that the administrative requirements led to unnecessarily high decision-making costs on the side of the farmers which did not reap sufficient benefits and torpedoed the ecological success of the programme (Leneman and Graveland 2004).

#### *Trade-offs between different costs*

The evaluation of the Dutch payment system for nature management has identified a trade-off: tailored management measures are more ecologically effective than simple and standardised measures, but they do generate higher administrative costs. The evaluation report recommended paying more attention to local conditions that favour the realisation of ecological goals thus saving on production costs but accepting higher decision-making costs (Netherlands Environmental Assessment Agency 2007).

#### *Other societal benefits*

The SBB is aware of the possibility of time-consuming and expensive conflicts about Natura 2000 in some regions. It fears that farmers and tourism-related entrepreneurs will go to court and demand financial compensation for restrictions on their economic activities. These restrictions are imposed on them because their activities take place in the neighbourhood of Natura 2000 sites and may have partly a negative impact on

conservation in Natura 2000 sites. An interviewee explained that in order to reduce the risk of costly conflicts the SBB modified its Natura 2000 management in such a way that it generates higher financial benefits to farmers by paying them for restrictions resulting from conservation measures. Furthermore, the SBB takes into account aspects such as the generation of a more scenic landscape for the tourism industry when deciding about the allocation of management measures. This results not only in less decisions-making costs but also in additional benefits for society other than pure conservation benefits.

## Poland

In Poland, the Minister of the Environment is responsible for nature conservation at the national level, and the Director of the Regional Environmental Protection Office at the provincial (Voivodship) level. In 2005, 32.5% of the total area of Poland was designated as protected areas like National Parks, Natura 2000 sites, landscape parks, etc. (cp. NCA 2004; Grzesiak and Domanska 2006). The national budget partly finances national and provincial nature conservation services. Financing of certain nature conservation tasks is augmented by pro-ecological special purpose funds: National, Province and District Funds for Environment Protection and Water Management and the EcoFund established in 1992 to administer financial resources resulting from the conversion of parts of Poland's external debts into investments for environmental improvements. However, expenditures for nature and landscape conservation constitute only 0.13% of the total amount spent on environmental protection and water management in Poland (Grzesiak and Domanska 2006). For Natura 2000 sites 10-year management plans have to be developed, the structure and content of which should be defined in compliance with the relevant enactments of the Minister for the Environment (Chmielewski 1994a, b; Olaczek 1996).

### *Production costs*

Analysis of various conservation measures is made primarily at the stage when management options are developed. The final management plan no longer contains these measures but is focused on one measure which has to be carried out. Interviewees suggested that the conservation planning system could be improved with a more flexible management approach. The first part of the plan should have a legally binding character and should define the general principles for achieving and maintaining the proper condition of habitats, species and landscapes within a specific area. The remaining part of the plan should have the character of a flexible operational document aimed at achieving the maximum ecological effects within the available budget. This part of the Nature Conservation Plan should contain a catalogue of management measures and offer the possibility to choose the best measure for the given budget depending on the ecological and economic situation at the time when the plan is carried out.

According to an interviewee the overall organisation of nature conservation financing can be improved by allocating budgets for a period of several years (3–5 years), instead for a period of 1 year only. This would permit secure implementation of ecologically valuable projects that require active conservation management over a certain period and whose implementation within the current system is associated with a high risk of failure due to possible budget cuts in later years.

Public tenders are used to select contractors for specific tasks in the process of setting up the management plan and to employ external contractors to complement conservation work by employees of the national parks and the National Forest Management. An interviewee

estimated that the tasks required by the nature conservation plans within the first 5 years were only implemented to approx. 70%. In his view, one of the main reasons for this implementation gap is the complexity of the tender procedures implying that conducting tenders in accordance with Polish law requires at least half a year. Furthermore, the tender process is inflexible, e.g. an identical tender procedure has to be carried out for developing a nature conservation plan for a landscape park with an area of 25,000 ha and for the conservation of a few trees (nature monuments) in the same park. Moreover, each of the participants of a tender can put forward an objection and, in that case, the whole process has to be repeated. Another problem is that the main criterion for evaluating tender offers is the price. As a result, the work of external contractors is cheap, but often of poor quality. The interviewee suggested that cost-effectiveness is likely to be enhanced if the tender procedure is simplified, made more flexible, and the quality of the proposed work is given more and the costs less weight in the selection procedure.

#### *Decision-making costs*

Until the year 2000 all national parks as well as 30% of nature reserves and 50% of landscape parks had nature conservation plans developed and approved. Total expenditure for these plans in the period of 1991–2000 amounted to over 50 million euros. However, in 2000 all nature conservation plans lost their validity due to changes to the Nature Protection Act (Chmielewski 2004). According to Chmielewski et al. (2006) this resulted in enormous financial losses, disorganisation of work, and a demotivated nature conservation staff.

In 2004, a new Nature Conservation Act was brought into force as well as new regulations concerning nature conservation plans. The new Act resulted in a situation of overlapping areas of competence and responsibility concerning the management of certain protected areas. For some areas it is now necessary to elaborate several different types of nature conservation and management plans, which leads to high decision-making costs. Due to those problems, since 2004 apart from three pilot programmes (cp. Chmielewski 2006a) no new nature conservation plan for national parks and no new management plan for Natura 2000 sites has been approved.

#### *Trade-offs between different costs*

The new regulations also require highly labour-intensive analyses directed primarily at a very detailed inventory of sites and species of all the systematic groups, while the proper planning of the protective tasks as well as monitoring of the success of conservation measures is given little attention. A better conservation outcome could be reached if less money was spent on inventories and more on planning of tasks and monitoring of measures (cp. Kostrzewski and Stach 1992; Kostrzewski 1993; Chmielewski 2008).

## **Discussions**

We carried out an exploratory analysis of issues related to the cost-effectiveness of designing and implementing management measures in Natura 2000 sites in four countries, and identified options for more cost-effective management as well as pitfalls that need to be avoided. Some of these options and pitfalls were identified in more than one country. We summarise and discuss them in the following and identify needs for further research.

Experiences in Finland, Germany and the Netherlands demonstrate that apart from conservation benefits other benefits (e.g. more scenic landscapes and improvements in water quality) need to be taken into account in the design of conservation measures. In this way, the overall benefits of the measures for society may increase without incurring higher costs. Furthermore, as additional stakeholders benefit from such an approach it is likely to mitigate possible conflicts arising from conservation.

Such conflicts may lead to costly disputes, lacking support from stakeholders for management measures and difficulties in enforcing them with the overall consequence of a lower conservation output. One possibility to reduce the likelihood of conflicts is stakeholder participation which, however, causes higher decision-making costs. This implies that a trade-off exists between better and less costly decisions. It is, therefore, difficult to give general recommendations on the desirable extent of stakeholder involvement, which depends on case-specific circumstances (see e.g. the contributions in Stoll-Kleemann and Welp 2006, for a discussion on conditions for successful stakeholder participation).

The case studies of Finland and Poland draw attention to the fact that significant improvements for conservation can be achieved without higher costs if the availability of funds is guaranteed for longer periods. If future funding for projects that require continuous financial support is uncertain, it is risky for conservation agencies to carry out such projects because if funding runs out the money already spent has been invested in vain. As a consequence, money will be increasingly directed at conservation measures which have a rapid impact rather than at ecologically valuable mid- to long-term projects that require continuous funding, even if such projects can achieve more conservation for a given budget. A further disadvantage of short-term funding is that frequent applications for funding and organisational adjustment measures in case the funding does not correspond to expectations are administratively costly. The described problems of short-term funding can easily be avoided if the government guarantees funding for longer periods.

Experiences in Germany and Poland show another possibility to achieve more conservation for the same costs—if the money available is allocated properly between the different tasks related to the implementation of management measures in Natura 2000 sites. In Poland, conservation would have benefited from spending less money on species and site inventories and more on making management plans and implementing them. In Germany, less financial resources should have been spent on making plans and also more on actually implementing them.

Experiences related to reforms of the institutional framework for conservation differ in the countries under review. In Poland, a change in the Nature Protection Act rendered the work of several years of setting up and approving conservation plans useless. This demonstrates that legal reforms may have unintended high costs. Institutional reform in Poland also led to a situation of overlapping competences, which makes the setting up of management plans a tedious and bureaucratic task. In contrast, in Finland and the Netherlands it is hoped that the introduction of regional plans will generate benefits through coordination, better cooperation with stakeholders and more information about where to achieve conservation targets at low costs. Still, more planning may generate more and costly bureaucracy, implying that there is a trade-off between better and less costly decisions.

Different experiences also exist with respect to the allocation of management and planning tasks to private actors by responsible authorities. In the Netherlands, the allocation of monitoring tasks to volunteers and private companies is expected to improve cost-effectiveness. However, experiences with the public tender system in Poland show that whether this aim can be achieved depends on how the allocation to private actors is organised. In Poland, the public tender rules lead to high decision-making costs and a

preference for cheap but not necessarily cost-effective outsourcing options as the quality of the outsourced work is not given sufficient weight.

A controversy exists in the Netherlands and Germany related to the cost-effective design of schemes in which land owners are paid for carrying out conservation measures. The controversy revolves around whether to have tailored and more ecologically effective or rather simple and standardized measures. Tailored schemes generate a higher conservation output for given production costs, but this advantage comes at the expense of higher decision-making and implementation costs.

Our analysis indicates that legal compliance and related cost-effectiveness issues currently seem to be of minor relevance for managing Natura 2000 sites (only in the German case study inappropriate compliance rules were identified). This result may be taken as an indicator that compliance works rather well so far. However, it needs to be born in mind that the implementation of management measures has just started and, typically, compliance problems become evident only after a policy has been implemented for some time. Future research on Natura 2000 implementation, therefore, should not neglect compliance issues.

Results from our case studies suggest that future research in general should move in two directions: First, some of the above-mentioned policy recommendations are uncontroversial, but for others trade-offs exist between different costs (e.g. more public participation leads to higher decision-making costs but lower production costs, tailored payment schemes lead to a higher ecological output for given production costs but at the price of high decision-making costs, etc.). Research is required to better understand these trade-offs, to quantify them for selected case studies, and to develop options to mitigate them in order to provide better policy recommendations.

Second, cost-effectiveness analysis in the literature focuses on recommendations for the spatial and temporal allocation of conservation measures (see the references in the introduction). Such an approach implicitly assumes a benevolent optimiser of social welfare whose main problem is the lack of correct information on the optimum spatial and temporal design of conservation policies. Our analysis shows that other issues are at least equally important. We find that rules for administrations, as well as rules and governance structures prescribing tasks within administrations, are dominant factors influencing cost-effectiveness.

The change in Polish legislation that made the previously established conservation plans worthless, the introduction of a regional level for planning management measures in Finland and the Netherlands, the rules in Finland and Poland prescribing that budgets are approved only for short periods, the misallocation of funds between the different tasks related to the implementation of management measures in Germany and Poland, and the question of whether and how to allocate management and planning tasks to private actors are all issues related to the design of rules and governance structures. Such questions are neglected in the analysis of conservation policies (an example of an exception is Penker (2000) who analyses how public administration controlling ought to be designed to enable the administration to design and implement cost-effective conservation policies).

Therefore, research that relates rules and governance structures to outcomes of conservation policies in terms of cost-effectiveness is needed. Important elements of such analyses may be property rights on land use (e.g. Ostrom 2005), the type of actors involved (e.g. Hagedorn 2002), the levels of decision-making (e.g. Newig and Fritsch 2009) and the interplay between the three factors (e.g. Paavola et al. 2009). In terms of property rights, the cost-effectiveness of conservation measures is likely to depend on whether land is owned by the government, NGOs or private land users (e.g. in Finland, Germany and the

Netherlands pressure from private land users led to considering a variety of societal benefits in the design of conservation measures). Regarding actors it is certainly of relevance whether conservation measures are implemented by civil servants, land users, volunteers or private landscaping firms (e.g. the Dutch authorities expect cost-savings from giving monitoring tasks to volunteers and private companies). Finally, outcomes of conservation policies are likely to be influenced depending on whether decisions are being made at the local, regional, national or European level (e.g. in Finland and the Netherlands cost-effectiveness gains are expected from coordinating decisions at the regional level).

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## References

- Ando A, Camm J, Polasky S, Solow A (1998) Species distributions, land values, and efficient conservation. *Science* 279:126–2128
- ANFQ (Ministry of Agriculture, Nature, Food Quality) (2006) Natura 2000 targets document summary. Setting conservation objectives for the Natura 2000 network in the Netherlands. Ministry of Agriculture, Nature and Food Quality, The Hague
- BfN (Federal Nature Conservation Agency) (2007a) [http://www.bfn.de/0316\\_natura2000.html](http://www.bfn.de/0316_natura2000.html). Cited 10 Feb 2010
- BfN (Federal Nature Conservation Agency) (2007b) [http://www.bfn.de/0316\\_gebiete.html](http://www.bfn.de/0316_gebiete.html). Cited 10 Feb 2010
- BfN (Federal Nature Conservation Agency) (2008) [http://www.bfn.de/0316\\_finanzen.html](http://www.bfn.de/0316_finanzen.html), Finanzierung von Natura 2000 Leitfaden, also available in English (and 20 other EU member state languages), [http://ec.europa.eu/environment/nature/natura2000/financing/index\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/financing/index_en.htm). Cited 10 Feb 2010
- Birds Directive (1979) Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31979L0409:EN:HTML>. Cited 10 Feb 2010
- Birner R, Wittmer H (2004) On the efficient boundaries of the State—the contribution of transaction costs economics to the analysis of decentralization and devolution in Natural Resource Management. *Environment and Planning C: Government and Policy* 22(5):667–685
- Buitelaar E (2004) A transaction-cost analysis of the land development process. *Urban Studies* 41(13):2539–2553
- Cabeza M, Moilanen A (2006) Replacement cost: a practical measure of site value for cost-effective reserve planning. *Biol Conserv* 132:336–342
- Chmielewski TJ (1994a) Principles of developing nature conservation plans for landscape parks. Methodological and organisational recommendations (in Polish). Ministerstwo Ochrony Środowiska, Zasobów Naturalnych i Leśnictwa, Warszawa
- Chmielewski TJ (ed) (1994b) National park conservation plans. A manual (in Polish). Ministerstwo Ochrony Środowiska, Zasobów Naturalnych i Leśnictwa; Krajowy Zarząd Parków Narodowych, Warszawa
- Chmielewski TJ (ed) (2004) Problems with organization and function of Natura 2000 network in Poland. (in Polish, English summary) *Zeszyty Naukowe Komitetu “Człowiek i Środowisko” przy Prezydium PAN*, Nr 38; Warszawa-Lublin
- Chmielewski TJ (ed) (2006a) Nature resources management in Natura 2000 areas in Poland (in Polish, English summary). Wydawnictwo Akademii Rolniczej w Lublinie, Lublin
- Chmielewski TJ (2006b) The integrated cost-effectiveness analysis of nature conservation as an instrument of Natura 2000 sites management (in Polish, English summary). In: Chmielewski TJ (ed) *Nature resources management in Natura 2000 areas in Poland*. Wydawnictwo Akademii Rolniczej w Lublinie, Lublin, pp 32–40
- Chmielewski TJ (ed) (2007) Nature conservation management: from idea to practical results. European Commission 6th Framework Program: ALTER-Net. PWZN Print 6. Lublin-Lódz-Helsinki-Aarhus
- Chmielewski TJ (2008) Landscape and protected areas—Polish experiences. In: Schmidt M, Glasson J, Emmelin L, Helbron H (eds) *Standards and thresholds for impact assessment*. Series: environmental protection in the European Union, vol 3. Springer, Berlin, pp 315–326

- Chmielewski TJ, Gromadzki M, Jankowski W, Kistowski M (2006) The role of Natura 2000 areas network in the formation of the new nature conservation paradigm in Poland (in Polish, English summary). In: Chmielewski TJ (ed) Zarządzanie zasobami przyrody na obszarach Natura 2000 w Polsce. Wydawnictwo Akademii Rolniczej w Lublinie, Lublin, pp 6–12
- COM (2004) Communication from the Commission to the Council and the European Parliament. Financing Natura 2000. Commission of the European Communities: COM (2004) 431 final. Brussels
- De Jong JJ, Bouwma IM, Van Wijk MN (2007) Beheerskosten van Natura 2000-gebieden. Wageningen, Wettelijke Onderzoekstaken Natuur & milieu, Wot-werkdocument 56
- Drechsler M (2005) Probabilistic approaches to scheduling reserve selection. *Biol Conserv* 122:253–262
- Drechsler M, Johst K, Ohl C, Wätzold F (2007a) Designing cost-effective payments for conservation measures to generate spatiotemporal habitat heterogeneity. *Conserv Biol* 21(6):1475–1486
- Drechsler M, Wätzold F, Johst K, Bergmann H, Settele J (2007b) A model-based approach for designing cost-effective compensation payments for conservation of endangered species in real landscapes. *Biol Conserv* 140:174–186
- DVL (Deutscher Verband für Landschaftspflege) (2005) Managementpläne – Schlüssel für eine kooperative Umsetzung von Natura 2000. Vier Anforderungen aus Sicht des DVL, Ansbach
- Eben M (2006) Public Participation during Site Selections for Natura 2000 in Germany: The Bavarian Case. In: Stoll-Kleemann S, Welp M (eds) Stakeholder dialogues in natural resources management, Part III. Environmental Science and Engineering Subseries: Environmental Science, Springer, Berlin
- European Commission (2008) [http://ec.europa.eu/environment/nature/natura2000/barometer/index\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/barometer/index_en.htm). Cited 10 Feb 2010
- Ferraro P, Pattanayak SK (2006) Money for nothing? A call for empirical evaluation of biodiversity conservation investments. *PLOS Biol* 4(4):0482–0488
- Finnish Ministry of the Environment (2002) Natura 2000 – alueiden hoito ja käyttö (Management of Natura 2000 sites). Työryhmän mietintö. Suomen ympäristö 597. Ympäristöministeriö, Helsinki
- Finnish Ministry of the Environment (2003) National priorities in planning of management of Natura 2000 sites. Letter to the regional environmental centres
- Finnish Ministry of the Environment (2004) Natura 2000 – verkoston tavoitteet, oikeusvaikutukset ja toteuttaminen (Natura 2000 network – objectives, legal consequences and implementation). Ympäristöministeriö, Alueidenkäytön osasto. Helsinki. <http://www.ymparistokeskus.fi/download.asp?contentid=23493&lan=fi>. Cited 10 Feb 2010
- Grzesiak M, Domanska W (eds) (2006) Environment protection in Poland, 2006. Information and statistical analyses (in Polish). Główny Urząd Statystyczny, Warszawa
- Habitats Directive (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML>. Cited 10 Feb 2010
- Hagedorn K (ed) (2002) Environmental cooperation and institutional change: theories and policies for European agriculture. Edward Elgar, Cheltenham
- Hartmann E, Schekahn A, Luick R, Thomas F (2006) Kurzfassungen der Agrarumwelt- und Naturschutzprogramme – Darstellung und Analyse von Maßnahmen der Agrarumwelt- und Naturschutzprogramme in der Bundesrepublik Deutschland. BfN-Skripten 161, Bonn
- Hiedanpää J (2002) European-wide conservation versus local well-being: the reception of the Natura 2000 Reserve Network in Karvia, SW-Finland. *Landsc Urban Plan* 61:113–123
- Hiedanpää J (2005) The edges of conflict and consensus: a case for creativity in regional forest policy in Southwest Finland. *Ecol Econ* 55:485–498
- Holzämper A, Seppelt R (2007) Evaluating cost-effectiveness of conservation management actions in an agricultural landscape on a regional scale. *Biol Conserv* 136:117–127
- Horn R, Simon L, Ströger L, Unkel I (2008) Rheinland-Pfalz – Entwicklung der neuen Kennartenprogramme zur erfolgsorientierten Honorierung von Grünland. *Natur und Landschaft* 5:206
- Johst K, Drechsler M, Wätzold F (2002) An ecological-economic modelling procedure to design compensation payments for the efficient spatio-temporal allocation of species protection measures. *Ecol Econ* 41:37–49
- Kleijn D, Berendse F, Smit R, Gilissen N (2001) Agri-environment schemes do not effectively protect biodiversity in Dutch agricultural landscapes. *Nature* 413:723–725
- Klimek S, gen Richter, Kemmermann A, Steinmann HH, Freese J, Isselstein J (2008) Rewarding farmers for delivering vascular plant diversity in managed grasslands: a transdisciplinary case-study approach. *Biol Conserv* 141:2888–2897
- Kostrzewski A (ed) (1993) Integrated monitoring on natural environment in Poland (in Polish). Państwowa Inspekcja Ochrony Środowiska. Biblioteka Monitoringu Środowiska, Warszawa

- Kostrzewski A, Stach A (eds) (1992) Local (field) stations for natural environment monitoring in Poland (in Polish). Państwowa Inspekcja Ochrony Środowiska. Biblioteka Monitoringu Środowiska, Warszawa
- Lehmann P, Schleyer C, Wätzold F, Wüstemann H (2009) Promoting multifunctionality of agriculture: an economic analysis of new approaches in Germany. *J Environ Policy Plan* 11(4):315–332
- Leneman H, Graveland C (2004) Deelnamebereidheid en continuïteit van het Agrarisch Natuurbeheer. Report 7.04.06. LEI, Den Haag
- Lindlof TR, Taylor BC (2002) Qualitative communication research methods, 2nd edn. SAGE, Thousand Oaks
- Millennium Ecosystem Assessment (2005) Ecosystems and human well-being: policy responses: findings of the responses working group of the Millenium Ecosystem Assessment. Island Press, Washington (D.C.)
- MRL BW (Ministry of Nutrition and Rural Areas Baden-Wuerttemberg) (2008) [http://www.mlr.baden-wuerttemberg.de/content.pl?ARTIKEL\\_ID=11450](http://www.mlr.baden-wuerttemberg.de/content.pl?ARTIKEL_ID=11450). Cited 10 Feb 2010
- National Audit Office (2007) Natura 2000 verkon valmistelu (Preparation and designation of Natura 2000 network). Tarkastuskertomus 140/2007. Valtiontalouden tarkastusvirasto, Helsinki
- NCA (Nature Conservation Act of 16th April) (2004) Dziennik Ustaw 04.92.880, with subsequent revisions (in Polish)
- Netherlands Environmental Assessment Agency (2007) Executive summary: Ecological Evaluation of Nature Conservation Schemes run under the Stewardship Programme and the Dutch National Forest Service 2000–2006. Netherland Environmental Assessment Agency (MNP), Bilthoven
- Netherlands Environmental Assessment Agency (2009) Natuurbalans 2009. PBL publication 500402017, Bilthoven
- Newig J, Fritsch O (2009) Environmental governance: participatory, multi-level—and effective? *Environ Policy Gov* 19:197–214
- Ojala O (2007) Natura 2000 – alueiden hoidon ja käytön yleissuunnitelma. Uusimaa ja Itä-Uusimaa (Natura 2000 sites management in the counties of Uusimaa and Itä-Uusimaa). Uudenmaan ympäristökeskuksen raportteja 3/2007. <http://www.ymparisto.fi/download.asp?contentid=67868>. Cited 10 Feb 2010
- Olaczek R (1996) Instructions for the development of nature preserve management plans (in Polish). Ministerstwo Ochrony Środowiska. Zasobów Naturalnych i Leśnictwa, Warszawa
- Ostrom E (2005) Understanding institutional diversity. Princeton University Press, Princeton, New Jersey
- Paavola J, Gouldson A, Kluvánková-Oravská T (2009) Interplay of actors, scales, frameworks and regimes in the governance of biodiversity. *Environ Policy Gov* 19:148–158
- Penker M (2000) Vertragsnaturschutz in Österreich – Bestandsaufnahme seiner praktischen Handhabung sowie Maßnahmen des Verwaltungscontrollings für eine ökonomisch effiziente und ökologisch effektive Mittelallokation. Dissertation am Institut f. Agrarökonomik der Universität für Bodenkultur Wien
- Reiter K, Schmidt A, Stratmann U (2004) „... Grünlandnutzung nicht vor dem 15.Juni ...” Sinn und Unsinn von behördlich verordneten Fixterminen in der Landwirtschaft, BfN-Skripten 124, Bonn
- Statistics Finland (2006) Luonnonvarat ja ympäristö 2006 (Statistical report on environmental protection and natural resources 2006). Tilastokeskus, Helsinki
- Stoll-Kleemann S, Welp M (eds) (2006) Stakeholder dialogues in natural resources management. Springer, Berlin
- Suda M, Sauer A, Luz F, Dettweiler G, Beck R (2005) FFH – Schlüssel zur Kooperation oder Motor von Konflikten. BfN-Skripte 159, Bonn
- Wätzold F, Schwerdtner K (2005) Why be wasteful when preserving a valuable resource? A review article on the cost-effectiveness of European biodiversity conservation policy. *Biol Conserv* 123:327–338
- Whitby M, Saunders C (1996) Estimating the supply of conservation goods in Britain. *Land Econ* 72:313–325
- Witzel A (2000) Das problemzentrierte Interview. *Forum Qualitative Sozialforschung/Forum, Qualitative Social Research* 1(1)
- Zabel A, Roe B (2009) Optimal design of pro-conservation incentives. *Ecol Econ* 69(1):126–134