PERCEPTIONS OF ENVIRONMENTAL COMPENSATION IN DIFFERENT SCIENTIFIC FIELDS

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Abstract

Environmental compensation is used worldwide, but remains a concept under development in many countries. The underlying idea is to maintain the overall quality of the environment in cases where environmental assets are damaged, for example by residential or industrial development or by road construction. This study aimed to investigate how environmental compensation is perceived in a number of scientific fields and what the differences, if any, are between those fields. The results showed that the respondents took a positive view of environmental compensation in general, of the inclusion of social aspects and of the role of NGOs, but that they also (implicitly) questioned the mitigation hierarchy. The study also revealed several differences between the scientific disciplines, though mainly in the differing strengths of the groups' convictions.

Keywords: offset, participation, perception, professional, attitudes.

1. Introduction

The purpose of providing environmental compensation for damage caused to nature through building and construction projects, for example relating to new residential or industrial areas or new roads, is to maintain the quality of the environment. This approach occurs in Europe and beyond; it has been used to a large extent in Germany and the United States since the 1970s, and the European Union has adopted several directives dealing with environmental compensation.

Environmental compensation can be considered justifiable on ethical grounds, and many people regard it as both a necessary and a natural part of the environmental impact assessment process. Some find the concept of environmental compensation to be provocative, however, and believe that it will increase the exploitation of nature. It is therefore important to investigate how different actors view the concept of environmental compensation, particularly in countries – including many EU countries – where this concept is under development and remains relatively unknown [1 - 3].

The international literature on environmental compensation uses near-synonymous terms, including 'offset', 'compensatory mitigation' and 'remedy'. The number of definitions of the concept almost equals the number of authors discussing the subject. Some authors make distinctions between the terms; for example, the Business and Biodiversity Offsets Programme [4] considers that 'offset' involves stricter requirements, such as an outcome representing no net loss or a net gain of biodiversity. In this study, 'environmental compensation' is seen as synonymous with 'environmental offsets' and understood as action taken to 'ensure that unavoidable adverse environmental impacts of development are

counterbalanced by environmental gains, with the overall aim of achieving a net neutral or beneficial outcome' [2:i].

The concept of compensation is associated with financial compensation further to legal obligations, such as for baggage lost during a flight, for injuries sustained by someone who has been assaulted or for a farmer's loss from damage to crops. In environmental contexts, the most commonly discussed type of compensation is climate compensation. Accordingly, the questionnaire used began with the following definition:

> Environmental compensation is here understood as the provision of positive environmental measures to correct, balance or otherwise make up for the loss of environmental resources, for example in connection with the construction of highways or industrial areas.

The aim of the study is to investigate how environmental compensation is perceived in a number of scientific fields and what the differences, if any, are between those fields. The findings from this study will not only allow us to compare the respondents' perceptions with those often expressed in the international literature, but they will also yield new knowledge about how perceptions of aspects such as public participation and the inclusion of social aspects may differ between scientific fields.

2. Ethics and scientific fields

A large number of [attitudes and] values underpin views on environmental compensation as a planning tool and the uses to which this tool is put. Environmental compensation 'forces' both outsiders and actual users to take a position on a series of ethical principles relating to the use or exploitation of nature. The most obvious of these is the Polluter Pays Principle. Others include the principle of equity and the principle of participation [5, 6]. To this should be added the question of the fundamental approach that we as human beings should take to nature: Is it possible to put a price tag on a natural asset such as fresh air, noise or an animal? Is it possible to 'trade' one habitat for another? [7] Ethical principles exist to help us choose good actions. A person's choice of, or preferences for, ethical principles reflect his or her attitudes and values.

Scholars such as Rohan [8] and Schwartz [9] assume that the human values system has a universal structure and consists of ten value types such as power, security and hedonism. These values are more comprehensive in nature, whereas attitudes are used only to evaluate specific entities. This means that a person has thousands of attitudes but only a small set of values. Keeney, considering values as something broader, states that 'value is what we care about' [10:3]. Similarly, Kempton, Boster *et al*. describe values as 'guiding principles of what is moral, desirable, or just' [11:87]. Yet others regard values as 'the entire constellation of a person's attitudes, beliefs, opinions, hopes, fears, prejudices, needs, desires and aspirations that, taken together, govern how one behaves' [12:viii]. The aim of this study is not to identify 'fundamental' values, but the questions and statements presented to the respondents test various attitudes which, in turn, reflect underlying values and ethics. In this respect, the study strives to shed light on the respondents' attitudes and views as regards methodological aspects, the prioritisation of social values, and democratic aspects, i.e. information and participation in decision-making.

It is well known that everybody wears ‘cultural glasses’, i.e. that each individual’s perceptions and judgement are determined by his or her social and cultural context and life experiences. It can reasonably be assumed that this applies to different professions as well. For example, Morgan, in his book on environmental impact assessment (EIA), draws up a hypothetical list of how different professionals – developers, economists, environmentalists, etc. – will perceive EIA. He also claims that each profession or individual:

> is a product of looking at the complex system from a particular standpoint and seeing certain things but not others. A person’s perspectives of other parts of the system are influenced by their dealings with those parts; in addition, they have different immediate objectives and different criteria for judging what is a satisfactory outcome for the system as a whole. [13:20]

Studies comparing values or attitudes across groups of professionals, by contrast, are rare. No previous study specifically dealing with how different professional groups or scientific disciplines view planning tools has been found. Yet, there is a considerable amount of research on ‘experts’ and public administrations, often showing that public administrations generally tend to be controlled from the top, and to focus on technology and expertise while more collaborative forms of work involving the participation of the general public tend to be marginalised [14, 15]. There are also studies analysing stakeholders such as representatives of government agencies, universities, utility companies and expert consultancies [16].

In this study it was decided not to include the perceptions of the general public, which could also have been interesting, but to focus exclusively on four scientific disciplines (professional groups) that may be involved in compensation projects: civil engineering, landscape architecture, biology and economics. Since contacting active professionals would involve considerable practical problems, it was assumed that an effective and appropriate approach to investigating these groups would be to survey last-year students. The main argument in favour of this assumption is that universities, by socialising students into professional identities, create norms that are closely linked to specific scientific disciplines. This assumption is supported both by psychological anthropology [17] and by a discourse analysis performed on students’ scientific writings [18]. Further, it is reasonable to believe that the attitudes of students in a certain discipline will be in line with the attitudes commonly represented among practitioners in it: if, say, a person is fascinated by the aesthetic qualities of the landscape rather than its richness in species, he or she is more likely to train as a landscape architect than as a biologist. An emerging concept such as environmental compensation will probably be strongly influenced by the new generation of professionals about to enter the labour market.

3. Method

The questionnaire was created on the basis of an extensive review of national and international literature on environmental compensation/offset and focused on definitions, on arguments for and against environmental compensation and on methodological issues [6]. Databases such as Scopus and Libris (the union catalogue of Swedish university libraries) were searched, and more than 100 references (publications in Swedish and English: policy documents, NGO reports and academic writings) dealing extensively with environmental compensation/offset were identified. In addition, for purposes of comparability of findings, account was taken of items included in other questionnaire surveys. The questionnaire was pre-tested on a handful of doctoral and master’s students.

The study builds on pragmatic premises, where the focus is on people's needs and on highlighting the perspectives and values of various actors [19]. Based on the literature review carried out, three themes were included in the questionnaire: (1) methodological aspects; (2) prioritisation of social values; and (3) democratic aspects, i.e. information and participation in decisions. The methodological theme was divided into seven sub-themes, of which the following five are presented here (the two sub-themes, 'Knowledge about environmental compensation' and 'Compensation ratios', have been left out for brevity):

- Environmental compensation as good or bad;
- Views on the steps of the planning process and teleological ethics;
- Elements of eco-centrism and preservation discourse;
- On-site and in-kind;
- The right to expropriate land.

The sample chosen consisted of 518 students in their last year on one of four types of programmes – civil engineering, landscape architecture, biology and economics – at various Swedish universities. These groups are referred to below using their future professional labels: 'civil engineers', etc. The questionnaire was dispatched to them on 28 October 2010 and the deadline was 8 November 2010. Two reminders were sent. Since some of the students were Swedish and some were of other nationalities, the questionnaire was sent to them in both Swedish and English. They were asked to answer five questions and respond to nine statements. In all, 233 students returned the questionnaire, which gives a response rate of 43%. The rate was similar for all four types of programme.

Specifically, the questionnaire was sent to students on two civil engineering programmes (Luleå and Lund Universities), where 82 out of 224 answered it; two landscape architecture programmes (at Uppsala and Alnarp, both belonging to the Swedish University of Agricultural Sciences), where 49 out of 94 answered it; three biology programmes (Göteborg, Umeå and Lund Universities), where 61 out of 151 answered it; and two economics programmes (Uppsala and Lund Universities), where 31 out of 49 answered it. The programmes were chosen either because they constituted all existing ones in Sweden or to obtain an appropriate geographical distribution.

The results were analysed using the SPSS statistics software, version 19.0, by means of non-parametric tests: Kruskal–Wallis, Pearson Chi-square and Mann–Whitney. At the planning stage, it was assumed that age would not influence perceptions of environmental compensation. Since there are studies showing that age may influence the extent to which people are concerned about environmental problems [11, 20], an age variable was included in the questionnaire. Of all respondents, 61% were (25 or younger), 37% were between (26 and 40), and 2% were older than (40). No statistically significant differences were assumed or observed between either locations or age brackets, nor between Swedish- and English-speaking respondents.

4. Thematic analysis

The respondents' answers to the questions and their reactions to the statements within each theme and sub-theme will first be analysed. There will be some discussion in each section and then a further discussion. Overall conclusions end the article.

4.1 Attitudes towards environmental compensation

At present, public opinion about environmental compensation is divided: some people disapprove of it while others consider it to be a good tool for achieving sustainable development. Interestingly, the literature review carried out as part of the study showed that several points are used as arguments both for and against environmental compensation [6, 7, 21-24]. Three of those points will be highlighted here.

The first one is that environmental compensation puts a price tag on nature. According to the advocates of compensation, it is a good thing that destroying environmental assets costs something, because developers will be more likely to refrain from doing so if this would increase the cost of their project. Opponents instead claim that putting a price tag on nature entails that it will simply be viewed as capital, no different from goods in a warehouse or shares traded on the stock market: an economistic view of nature. Additional problems are that certain ecological assets are irreplaceable and that there is a risk that environmental compensation will become a way for developers to purchase the right to destroy nature and thus legitimise projects that would otherwise not have been carried out.

The second point is that compensation makes development more difficult. Advocates claim that the main idea underlying compensation is to increase the value of nature and thus raise the hurdles for development, while opponents point out that this may reduce tax revenue because developers can decide to carry out their project on the territory of a neighbouring municipality instead.

Finally, the third point relates to the amount of nature. Compensation advocates maintain that we should avoid losing even minor environmental assets because in the longer term, as a result of cumulative effects, this could add up to the loss of significant amounts of nature. Opponents, by contrast, think that there is enough nature to go around and that compensation is an issue of concern only to major cities.

Of the respondents, as many as 52% agreed strongly – and 93% strongly or mildly – with the statement ‘I regard environmental compensation as something positive’. This is interesting because the next statement – ‘I believe that environmental compensation will lead to increased exploitation of nature (because permits will more readily be granted for projects that include such compensation)’ – aroused widespread concern among the respondents that this tool would be abused or at least lead to increased exploitation of nature: 14% agreed strongly and 50% mildly with the statement. No statistically significant differences could be seen between groups in this context. Such concerns about increased exploitation are also represented in the international literature on environmental compensation.

4.2 Views on the steps of the planning process and teleological ethics

This brings us to the next issue, which concerns the order in which various types of actions should be considered and implemented. It is clear from the international literature – and also in line with the conclusions drawn by Norton [25] after reviewing a large selection of international literature on the principles of environmental compensation – that compensation should *never* be considered before attempts have been made to avoid and mitigate damage. The planning process usually consists of three steps, and environmental compensation always constitutes the last. This is referred to as the ‘mitigation hierarchy’ or ‘mitigation sequence’.

In ethical terms, it is clear that this approach is deontological: i.e., taking action as such is more important than the consequences of the action taken. Yet, a teleological perspective (i.e. the opposite of a deontological one) is the dominant one in present-day planning processes and could conceivably be applied to environmental compensation as well. In other words, it could be possible, for environmental reasons and/or reasons of cost-effectiveness, to choose to devote more resources to compensation rather than always spending money on mitigating damage as far as possible [26]. To investigate this issue, the following question was asked in the questionnaire:

> Now please consider a hypothetical case with two alternative routes for a new road to be built. In case A the road would pass through a spruce forest of no significant ecological value. In case B (which would be much cheaper to build), 1,000 metres of the road would pass through another forest of relatively high ecological value. Would you consider looking closer at option B if choosing it would result in the investment of EUR 5 million in local nature-conservation projects?

Of all respondents, 52% answered 'yes' (i.e. expressed the opinion that teleological ethics should apply to environmental compensation as well). Thirty percent said 'no' and 18% were unsure. There were no statistically significant differences between groups. This shows that many respondents would consider taking actions that violate the mitigation hierarchy, at least when presented with a question framed in this way. This is not really surprising, given the dominant position of teleological perspectives in most situations in society. The reason why the mitigation hierarchy is so strongly emphasised in the literature could be that garnering support for environmental compensation as a concept would be more difficult without it – perhaps in part because of the attitudes and perceptions dealt with by the next sub-theme.

4.3 Elements of eco-centrism

Eco-centrism can be seen as the view that there is no hierarchy of value among species and that each species has its value independently of human beings. According to O'Riordan [27], eco-centrism is, first, the belief that there is a natural order where all things obey the laws of nature and where nature attained a perfect balance which obtained until human ignorance and arrogance disturbed it; and, second, the belief that small-scaleness and self-sufficiency are good things. In a natural order where human intervention is seen as negative, compensatory measures are bad, too. To investigate the existence of elements of eco-centrism, the following statement was presented: 'I believe that environmental resources created by human beings (e.g. ponds or planted trees) *should not* be regarded as equivalent to naturally occurring environmental resources'. The underlying assumption is that a person who thinks that man-made nature is not real nature will take a positive view of eco-centrism.

Perhaps surprisingly, the results (see Table 1) showed that 10% agreed strongly, and 32% mildly, that man-made nature is not real nature. There also turned out to be large differences between groups. For example, 21% of the biologists and 26% of the economists claimed to agree strongly while 0% of the landscape architects did. On the basis of the statistical analysis, three groups can be identified:

- landscape architects (14% agreeing strongly or mildly);
- civil engineers and economists (39–45% agreeing strongly or mildly);
- biologists (67% agreeing strongly or mildly).

If interviews had been carried out with the respondents, perhaps they would have explained their responses by emphasising that man-made nature is younger and thus has not evolved

over as long a period of time, or that God originally created nature, which therefore has a higher value? Be that as it may, this issue deserves further study because it is crucial to all forms of environmental compensation, for two reasons. First, it is linked to the issue of legitimacy: is it right, in principle, to compensate for damage to nature? Second, it concerns the relative value of man-made nature and damaged nature, respectively. There is a more extensive discussion of differences between the groups at the end of the article.

Table 1

4.4 On-site and in-kind

The issues of 'where' and 'how' are crucial in the design of compensation measures and are frequently dealt with in various guidelines from different parts of the world. A Canadian study shows that actors involved in compensation for the loss of wetland areas agreed that the compensation measures should be taken near the site of the damage, and also that the functions damaged should be replaced with similar functions [28]. There are of course problems with these approaches since it may be difficult to find suitable sites for planned compensation measures, and since certain natural elements cannot be re-created [29]. Here is one example of a federal guidance document calling for greater flexibility as regards compensation for wetland areas in the United States:

> The agencies' preference for on-site mitigation, indicated in the 1990 Memorandum of Agreement on mitigation between the [Environmental Protection Agency] and the Department of the Army, should not preclude the use of a mitigation bank or in-lieu-fee mitigation when there is no practicable opportunity for on-site compensation, or when use of a bank or in-lieu-fee mitigation is environmentally preferable to on-site compensation. [30]

Accordingly, respondents were asked an abstract and hypothetical question intended to force them to weigh geographical closeness against social aspects and cost-effectiveness without having detailed information either about the nature of the damage and the measure or about the contexts of the various options.

It turned out that relatively few of them (14%) chose option A (giving priority to social aspects). Almost half chose option B (giving priority to cost-effectiveness/utility) (see Table 2). Comparison across groups shows that there were statistically significant differences between them – the economists preferred option C (giving priority to closeness), the landscape architects preferred B, and the civil engineers and the biologists (who were similar in statistical terms) positioned themselves between C and B; see Figure 1.

Table 2

Figure 1

4.5 Right to expropriate land

Finding land on which to create new ecological assets may be difficult, particularly in densely populated countries such as Germany and the Netherlands. Of all respondents, only 18% agreed strongly with the statement that government agencies should have the right to buy land for compensation measures in the same way as they do for land to build roads on (see Table 3). If those who agreed mildly are included, however, a total of 55% agreed with

the statement. The biologists differed also in a statistically significant way from the others; they took a more positive view of expropriation rights. This may be because biologists are more likely than the others to think that the possibility to create valuable ecological assets takes precedence over individual property rights.

Table 3

4.6 What should be compensated for – ecological assets only or social aspects as well?

The question whether social aspects should be included in environmental compensation is important. It has been dealt with, for example, in a Swedish study [6] and a Finnish one [31]. Further, the European Landscape Convention highlights the social dimension of the landscape and the importance of using and developing landscape resources. It is also established practice in the field of environmental impact assessment to include social aspects such as recreation [32, 33]. This is noted by the International Association for Impact Assessments: 'Our international membership promotes development of local and global capacity for the application of environmental, social, health and other forms of assessment in which sound science and full public participation provide a foundation for equitable and sustainable development.' [34].

The questionnaire therefore included the following statement:

> I believe that it is important to compensate for the loss of the following environmental resources (you may select several alternatives):
> - Fauna and flora;
> - Micro-climate;
> - Landscape and scenery;
> - Recreational opportunities;
> - Hydrological functions and water quality;
> - Cultural environments (e.g. old mill ponds).

Figure 2 shows the results. Of all respondents, about 90% thought that the fauna and the flora as well as hydrological functions should be compensated for. Almost 70% considered that there should be compensation for adverse effects on the micro-climate, the landscape and scenery. As regards these four aspects, there were no statistically significant differences between the groups. But, such a difference was found as regards recreation (see Table 4a): the civil engineers and the economists can be seen as one group while the landscape architects take a more positive view and the biologists a less positive one. The groups also differed in relation to cultural environments (see Table 4b), with the landscape architects standing out from all the others as more positive (see, further, the discussion of differences between the groups).

Figure 2

Table 4a-b

4.7 Concern for local recreational interests

To investigate further the respondents' views on the inclusion of social aspects, they were presented with a statement to the effect that representatives of local recreational interests (e.g. fishing or horseback riding) – i.e. purely social aspects – should be given the opportunity to

influence the design of compensation measures. Of all respondents, 70% agreed strongly or mildly while only 2% disagreed strongly (see Table 5). The landscape architects were statistically significantly more positive than the others, which is consistent with their general preference for considering social aspects (see Table 4). It may be noted that 66% of the biologists were either strongly or mildly positive. Those numbers do not correspond to the result in Table 4a in which only 30 % believed that it is important to compensate for loss of recreational opportunities.

Table 5

4.8 Can ecological assets be compensated for by social or economic assets?

The respondents were asked a final question about the prioritisation of social aspects by means of a statement as to whether damage to environmental resources can be compensated for through the provision of other resources such as social or economic ones (see Table 6a–c). The results can be interpreted to mean that there is an overwhelming view that damaged environmental resources should be replaced with identical or other environmental resources; 94% of the respondents strongly or mildly agreed with this. Yet, surprisingly large proportions of them also took a positive view of alternative compensation in the form of financial measures in favour of public activities (27% agreeing strongly or mildly) or in favour of social activities (25% agreeing strongly or mildly) (see Table 6b–c). Based on the international literature survey, it seemed more reasonable to assume that only a negligible percentage would be in favour of replacing ecological assets with social or economic ones. Here it may be added that a survey conducted in Nigeria obtained the result that 78% of 'community members' preferring monetary compensation to ecosystem restoration [35]. The authors explain that this could be due to the high level of poverty in the area where the survey was carried out.

Table 6a-c

As regards differences between the groups, there were statistically significant ones in relation to compensation through financial support for public activities and through financial support for social activities: the civil engineers and the landscape architects were more likely to oppose such compensation than the others.

4.9. Local influence on decision-making

As a general principle, it can be said that both democracy and the idea of public participation in decision-making are based on the recognition that society is made up of individuals who have different interests and values. The issue of participation and the right to be involved in the development of one's local community have been highlighted in a great many works on democracy and communicative planning [36, 37]. This is also an issue of how much influence local actors and experts, respectively, should exert over the development of society [38, 39]. For decades, physical planning researchers have been expressing critical opinions about how government agencies fail to take account of the values of the general public in their planning and how the principal aim of planning processes is to provide information and build support for a decision or a proposed plan [14, 40, 41]. It is worth pointing out that not

all those involved in physical planning see participation by the general public as desirable, instead viewing this only as a nuisance – because experts are deemed best able to analyse and prioritise the various interests involved. Snell and Cowell found such views to be widespread among consultants and civil servants. The public were often excluded to avoid delays or confusion, or – to quote from one of the interviewed consultants' perception of his job – to 'expedite decision-making processes as far as possible, protect client relationship and manage objections' [42:374]. Thomas [43] presents a more extensive compilation of arguments commonly put forward against public participation in environmental impact assessment processes. Since environmental compensation affects environmental assets of interest to the general public, it is useful to investigate how the various groups of professionals view the issues of information (see Table 7a–c) and participation (see Table 8). The relevant items were designed with reference to the description drawn up by the International Association for Impact Assessment [34] of various forms of public participation, ranging from information over consultation, involvement and collaboration to empowerment.

Table 7a-c

Table 8

The results show an overwhelming consensus that the grounds for decisions relating to compensation measures should be well documented and solid (79% of the respondents agreeing strongly) and that the documentation should be available to the public (75% agreeing strongly). There was less strong support for the idea of including a summary which is accessible to non-specialists, but even so fairly large proportions of the respondents agreed with this statement as well (38% strongly and 32% mildly). The statistical analysis showed that there were no significant differences between the groups about the statement that the proposal for compensation measures should be available to the public, but that there were such differences in relation to the quality of documentation and the existence of a summary for non-specialists: the civil engineers deemed both to be less important, and the landscape architects agreed with them in the latter case.

The questionnaire also included a statement about the involvement of NGOs in the decision-making process. Of all respondents, 40% agreed strongly and 38% mildly with the statement that NGOs should be given the opportunity to participate in decisions concerning compensation measures. The biologists and the economists took the most positive view, followed by the landscape architects, while the civil engineers were the least positive (see Table 8).

5. Discussion of differences between the groups

5.1 Inclusion of social values

Three questions concerned preferences on the inclusion of social aspects, above all recreation. One question addressed this directly: 'I believe that representatives of local recreational interests (e.g. fishing or horseback riding) should be given the opportunity to influence the design of compensation measures' (see Table 5). Here the landscape architects differed significantly from the other groups by taking a more positive view. Another question asked respondents to indicate which aspects should be compensated for, and recreation was among the options listed (see Figure 1). Here the landscape architects considered recreation to be as important as the other aspects (84% of them indicated recreation) – unlike the others,

especially the biologists (only 30% of them did). The third question was more indirect and more hypothetical in nature, letting respondents prioritise among social/recreational values (A), cost-effectiveness (B) and geographical closeness (C). It turned out that A was the least preferred option in all groups of respondents, but even so a difference between them can be seen in that 24% of the landscape architects chose A whereas only 5% of the biologists did. To sum up, on all three questions the landscape architects were the most positive and the biologists were generally the least positive. One possible explanation for this is that landscape architects, but none of the others, learn to work with recreational and similar issues as part of their training programme. Another could be that biologists have a more eco-centric attitude towards nature (an assumption that is supported by the results on the question about the value of man-made nature; see Table 1). It could also be that biologists do not actually assign a low priority to social values as such, but only wish to protect natural assets in a world which is otherwise dominated by economic and social issues such as growth and unemployment.

5.2 Participation

Two questions, one consisting of three sub-questions, dealt with the issue of the importance of local influence and participation. On the question concerning the importance of information (Table 7), the results showed that the civil engineers did not take quite as positive [~~a~~] view as the others on the importance of documentation – but all groups did generally take a very positive view on this. There was also strong support for having a summary accessible to non-specialists. On the last sub-question, all groups agreed that the grounds for the decision should be available to the public. The second question took the issue one step further, asking whether NGOs should not only be informed but also be involved in decision-making. All groups took a positive view on this, but the biologists and economists were significantly more positive. One explanation for the biologists' stronger support for participation could be their own experience as active members of environmental organisations combined with the fact that the subject of ecology, and ecologists as a category of professionals, tend to be in a weak position relative to economists and civil engineers: they are the ones who initiate and manage exploitation and development projects, while the ecologists are given limited resources to take on the task of trying to protect natural assets. This would put the biologist respondents in a better position to understand the importance of participation – not only the participation of the general public, but also the involvement of ecological interests at an early stage of the planning process. This explanation is supported, for example, by Webler [44], who asked various players such as politicians, local government officials and representatives of the tourism and forestry sectors what characterises a good process for the involvement of the general public. Three different positions could be identified, one of which highlighted the importance of an equitable balance of power. Those who advocated this position stressed the importance of regular meetings and representativeness, placing a special emphasis on the need to ensure that decisions have broad support, i.e. that there should be a strong consensus. Many of these people were landowners. It is conceivable that they feel that there is a risk that others will ride roughshod over them and that they are therefore keen to stress issues of power and consensus (in other words, those who stand to gain from participation take a more positive view of it). Why economists responded in a similar way to biologists in this question is difficult to answer.

5.3 Reliability and validity

The reliability of the questionnaire survey is good for a series of reasons: the rate of response was 43%; respondents gave answers to all items; the questionnaires were sent out by a

reputable company (Synovate) and the University; relevant statistical analysis has been performed; the items are based on an extensive review of the literature; and some questions dealt with the same aspect to enhance internal consistency reliability. The validity of the survey is high for the group of young graduates, since they were the target group. But it is uncertain whether they are representative of active professionals, which would increase the value of the findings. It has been found to be a reasonable assumption, however, that the respondents are indeed representative of active professionals, and there is some support for that assumption in other research.

6. Conclusions

The survey showed that 50% of the respondents agreed strongly that environmental compensation is a positive thing and 93% agreed strongly or mildly. Still, by contrast, 64% strongly or mildly agreed that there is a risk of abuse.

The survey yielded both expected and unexpected answers. Below is a summary of the main findings, with overall ones discussed first and differences between groups dealt with afterwards.

One of the more expected findings was that only 39% thought that geographical closeness should be given priority over utility and social aspects. This is in line with trends in Germany, the United States and elsewhere to the effect that providing compensation on-site is good but not necessary. Almost all respondents believed that ecological losses of hydrological functions, fauna and flora, etc., should be compensated for. Interestingly, however, only about half believed that this should also be the case for cultural environments, recreational opportunities and landscape/scenery. This is in line with the international debate, where most participants consider ecological losses to be important whereas opinion is more divided about social and recreational opportunities. There was also non-surprising support for the view that damaged environmental resources ought to be compensated for with other environmental resources. The final aspect of the results that is in line with views commonly found internationally concerns information and participation. There was strong support for the idea that the grounds for decisions relating to environmental compensation should be well-documented and solid, should be available to the public and should contain a summary which is accessible to non-specialists. In addition, of all respondents, 40% agreed strongly and 38% mildly with a statement to the effect that NGOs should not only be informed, but should also be able to participate in decisions concerning compensation measures, while only 3% of the respondents disagreed strongly.

Some of the more surprising results relating to the respondents' overall views were that:

- about one-quarter of them agreed strongly or mildly with the statement that damage to environmental resources can be compensated for with other resources, such as financial support for recreational activities;
- 22% of the respondents agreed strongly and 49% mildly that representatives of local recreational interests should be able to influence the design of compensation measures;
- more than half of the respondents would consider providing compensation for damage that could have been avoided, i.e. violating the mitigation hierarchy;
- more than 40% agreed strongly or mildly that man-made nature is not real nature;

- 18% of the respondents agreed strongly, and 37% mildly, that government agencies should have a right to expropriate land to provide environmental compensation.

Among the four groups of respondents, the landscape architects stand out as the group that was most positive to the inclusion of social assets such as recreational opportunities. Overall, however, the results were more indicative of agreement than disagreement between the different scientific fields.

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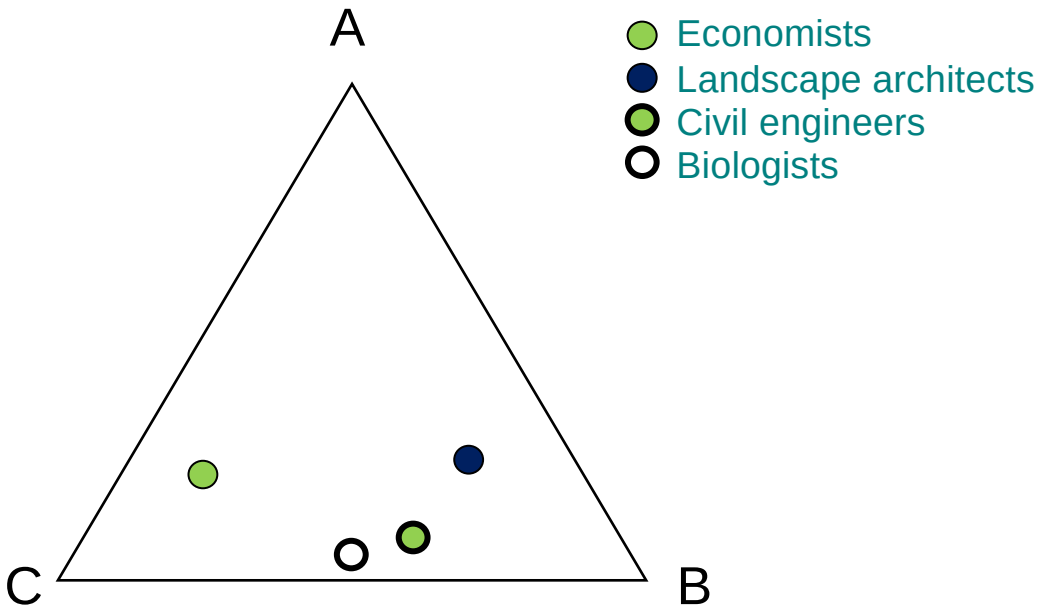


Figure 1. The triangular figure represents graphically how close the various groups are to the three options.

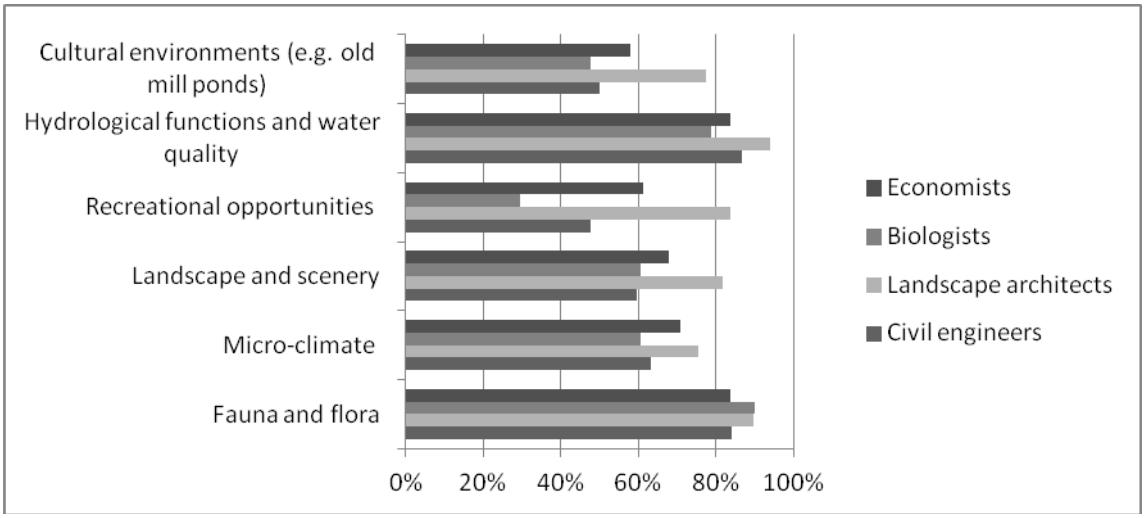


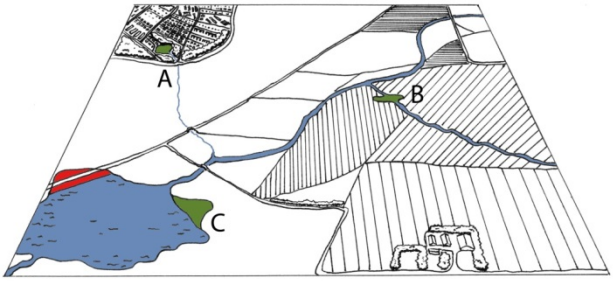
Figure 2. Various groups' views on the types of damaged assets for which compensation should be provided

Table 1. Value of environmental resources created by humans

	I believe that environmental resources created by humans (e.g. ponds or planted trees) *should not* be regarded as equivalent to naturally occurring environmental resources.						
	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree	Mean rank*	Grouping
Civil engineers	2%	37%	15%	29%	17%	116	b
Landscape architects	-	14%	8%	41%	37%	153	a
Biologists	21%	46%	5%	21%	7%	80	c
Economists	26%	19%	13%	26%	16%	100	bc
Total	**10%**	**32%**	**11%**	**29%**	**18%**		

* Scale: 1–5; 'Strongly agree' is set to 1.

Table 2. Deciding the relative priority of geographical closeness, social aspects and cost-effectiveness



If a wetland (part of a lake) is damaged, which compensation option would you prefer?

A. The creation of a wetland in an urban setting with few 'green' qualities, where it would considerably increase the inhabitants' opportunities to experience nature.

B. The creation of a wetland in an agricultural area with high levels of nutrient leaching, where it would have a greater impact on water quality.

C. The creation of a wetland close to the affected area.

	A	**B**	**C**
Civil engineers	11%	55%	34%
Landscape architects	24%	57%	18%
Biologists	5%	48%	48%
Economists	23%	13%	64%
Total	**14%**	**48%**	**39%**

Table 3. Government agencies' right to expropriate land

	I think government agencies should have the right to buy (expropriate) land from private individuals in order to implement a compensation measure, if this would result in a better solution from a nature-conservation point of view.						
	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree	Mean rank*	Grouping
Civil engineers	10%	31%	23%	28%	8%	129	a
Landscape architects	16%	39%	18%	20%	6%	111	a
Biologists	31%	43%	10%	8%	8%	87	b
Economists	13%	39%	26%	10%	13%	116	a
Total	**18%**	**37%**	**19%**	**18%**	**8%**		

* Scale: 1–5; 'Strongly agree' is set to 1.

Table 4. Importance of compensating for the loss of recreational opportunities and cultural environments

I believe that it is important to compensate for the loss of the following environmental resources (you may select several alternatives):			
(a)	Recreational opportunities	Mean rank*	Grouping
Civil engineers	48%	107	b
Landscape architects	84%	147	a
Biologists	30%	86	c
Economists	61%	122	b
(b)	Cultural environments (e.g. old mill ponds)		
Civil engineers	50%	105	b
Landscape architects	78%	136	a
Biologists	48%	102	b
Economists	58%	114	b

* Scale: 1–5; ‘Strongly agree’ is set to 1.

Table 5. Influence of local recreational interests on the design of compensation measures

	I believe that representatives of local recreational interests (e.g. fishing or horseback riding) should be given the opportunity to influence the design of compensation measures.						
	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree	Mean rank*	Grouping
Civil engineers	20%	43%	20%	15%	4%	122	b
Landscape architects	24%	67%	6%	2%	-	91	a
Biologists	25%	41%	15%	16%	3%	116	b
Economists	19%	52%	23%	6%	-	112	b
Total	**22%**	**49%**	**16%**	**11%**	**2%**		

* Scale: 1–5; 'Strongly agree' is set to 1.

Table 6. Possibility to compensate for loss of ecological resources with social or economic resources

I believe that damaged environmental resources should be compensated for …							
(a)	… by means of the creation of a similar or equivalent environmental resource.						
	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree	Mean rank*	Grouping
Civil engineers	55%	37%	6%	2%	-		
Landscape architects	71%	26%	-	2%	-		
Biologists	66%	28%	3%	3%	-		
Economists	64%	29%	6%	-	-		
Total	**63%**	**31%**	**4%**	**2%**	-		
(b)	… economically through public activities (e.g. health care).						
Civil engineers	-	21%	7%	33%	39%	126	a
Landscape architects	2%	4%	18%	35%	41%	134	a
Biologists	13%	26%	15%	20%	26%	95	b
Economists	16%	39%	10%	26%	10%	72	b
Total	**6%**	**21%**	**12%**	**29%**	**32%**		
(c)	… economically through social activities (e.g. subsidies for religious societies or NGOs).						
Civil engineers	1%	17%	13%	26%	43%	124	a
Landscape architects	4%	10%	16%	35%	35%	120	a
Biologists	8%	30%	16%	16%	30%	96	b
Economists	6%	26%	16%	26%	26%	98	b
Total	**4%**	**20%**	**15%**	**25%**	**35%**		

*) Scale: 1–5; ‘Strongly agree’ is set to 1.

Table 7. Importance of information

It is important that the grounds for a decision to take a compensation measure (whether those grounds are presented in an impact assessment or published as a separate report) should …							
(a)	… be well documented and solid.						
	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree	Mean rank*	Grouping
Civil engineers	68%	18%	14%	-	-	125	a
Landscape architects	86%	8%	6%	-	-	105	b
Biologists	85%	13%	-	2%	-	104	b
Economists	84%	16%	-	-	-	105	b
Total	**79%**	**14%**	**6%**	-	-		
(b)	… include a summary which is accessible to non-specialists.						
Civil engineers	18%	39%	26%	13%	4%	137	a
Landscape architects	26%	35%	31%	8%	-	125	a
Biologists	57%	28%	8%	5%	2%	86	b
Economists	68%	16%	16%	-	-	77	b
Total	**38%**	**32%**	**21%**	**8%**	**2%**		
(c)	… be available to the public.						
Civil engineers	70%	18%	10%	2%	-		
Landscape architects	82%	10%	8%	-	-		
Biologists	72%	16%	8%	3%	-		
Economists	84%	13%	-	3%	-		
Total	**75%**	**15%**	**8%**	**2%**	**-**		

*) Scale: 1–5; ‘Strongly agree’ is set to 1.

Table 8. Participation by NGOs and other associations in decisions on compensation measures

	NGOs (such as the Swedish Society for Nature Conservation) and other associations should not only be informed and given the opportunity to comment, but should also be able to participate in decisions concerning compensation measures.						
	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree	Mean rank*	Grouping
Civil engineers	17%	38%	23%	15%	7%	148	a
Landscape architects	33%	57%	10%	-	-	109	b
Biologists	62%	30%	7%	2%	-	82	c
Economists	64%	26%	6%	-	3%	82	c
Total	**40%**	**38%**	**14%**	**6%**	**3%**		

*) Scale: 1–5; 'Strongly agree' is set to 1.