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# Final report on relationships between biodiversity, ecosystem services and values in case studies

## Part II: Q study of heterogeneous perceptions of the relationships between biodiversity, ecosystem services and values in national case studies

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# Q study of heterogeneous perceptions of the relationships between biodiversity, ecosystem services and values in national case studies

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## 1. Introduction

Part II of D4.1 follows on from the literature review and socio-economic analysis of ecosystem service - value linkages in Part I. Here we take a broader view, and analyse preferences or attitudes towards biodiversity and ecosystem services (ES), and rationales that people adhere to in their justification for prioritising biodiversity, ES or other aspects of human well-being. In this work we use the Q-method to characterise different perspectives in nine European case study countries. We investigate the heterogeneity in: (i) the rationale for biodiversity and ES conservation; and (ii) perspectives on the linkages between biodiversity and ES.

The Q-method was developed by William Stephenson in the 1950s, for the purpose of studying individuals' beliefs and attitudes (Stephenson, 1952; 1953). It has been applied in environmental research for a variety of purposes, for example, to analyse conservation professionals' underlying values (Sandbrook et al., 2011), to study conservationists' perceptions about markets and ES (Sandbrook et al., 2013; Fisher & Brown, in review), and to study alternative perspectives on the role of science in biodiversity conservation hotspots (Cairn, 2011). However, analysis of the understanding of the linkages between biodiversity and ES and their importance to multiple groups of stakeholders (researchers, NGOs and decision-makers) across Europe is new to the literature.

Conducting a Q study starts with the identification of a *concourse* defining the topic for which the analyst seeks to identify perspectives. We based the concourse on the literature review of the value of biodiversity and ES, conducted as a part of BESAFE WP1 (Howard et al., 2013).

Following the Q-method, we then selected *Q-statements* from the concourse. Each Q statement is a value statement, expressing a viewpoint on the importance or lack of importance of biodiversity and ES, and the interconnection between biodiversity and ES. *Q participants* were then identified who are experts in the field of biodiversity and ES. We selected participants representing researchers (from both the natural sciences and social sciences), decision-makers and NGO advocates whose work dealt directly with biodiversity conservation and ES. We asked the participants to sort the Q-statements depending on how similar or dissimilar the Q statements were to their own opinion and how dominant or rare they considered the statements to be in nature conservation decision-making and policy.

The *Q sorts* were analysed using statistical techniques of correlation and factor analysis to reveal patterns in the way opinions grouped together. Q participants were encouraged to think aloud while they sorted the Q statements, and their comments and reflections were used to gain information about more subtle differences between the distinct patterns identified in the perspectives. The results of the analysis were interpreted in the form of a description of the different perspectives and the underlying values, beliefs and attitudes expressed by the participants. Each comparative study was carried out by researchers in partner organisations of BESAFE to allow iteration at the interpretation stage. The report focuses on four distinct analyses of the data:

1. An overview of the results analysing the entire data set;
2. An analysis of the sub-sample of researchers to identify the extent to which their perspectives on biodiversity and ES was associated with their disciplinary training;
3. An in-depth study of biodiversity and ES among decision-makers and in decision-making;
4. An analysis of the perspectives of different stakeholder groups.

More specifically, the overview analysis studied the views of key individuals in the biodiversity and ES field across Europe to identify the main views that exist on biodiversity and ES priorities, and the understanding of the relationships between biodiversity, ES and values. This analysis formed the basis for the three further analyses, which addressed more specific questions in the biodiversity and

ES debate. The first of these analyses focused on the sub-group of researchers. Specifically, we studied the extent to which disciplinary training is associated with different perspectives held by the researchers. The second analysis aimed to explore the potential tension in how the value arguments that decision-makers identify with personally differ from the arguments that are perceived to dominate in biodiversity conservation decision-making. Finally, we explored in more depth the variation in views of groups of stakeholders (researchers, NGOs and decision-makers) in relation to biodiversity and ES conservation. Various authors (e.g. Hermelingmeier, 2013) have suggested that stakeholders will differ in their arguments for biodiversity and ES, as they act as different agents. However, an understanding of their views is important as it could affect whether and how they seek to deliver biodiversity and ES conservation.

Part II of the deliverable is structured as follows. Section 2 specifies the methods used and the data collected. This is followed by a presentation of the results, including the three individual analyses in Section 3. Finally, in Section 4 we synthesise the findings and present our overall conclusions from the Q-study.

## **2. Methods and Data**

### **2.1 Defining the concourse and selecting the statements:**

The BESAFE database on biodiversity and ES value arguments (Howard et al., 2013), consisting of 549 articles, was used to determine the area of literature defining the concourse. We identified 180 statements, representing views on the importance of biodiversity and ES and views on whether and how biodiversity underpins ES delivery. The statements were sorted into the following broad categories (in line with the database structure) to make sure that the final list of statements would represent the diversity in the literature:

- direct extractive economic use (production of food and fibre);
- non-extractive use values (such as recreation and tourism);
- aesthetic value (Carlson & Berleant, 2004);
- intrinsic value (Taylor, 1986);
- biophilia (Wilson, 1984);
- ecological value (Baumgärtner & Quaas, 2008; Holling, 1973); and
- ES reasoning (de Groot et al, 2003).

As these categories overlap to a large extent, and as each statement may relate to more than one type of rationale and/or have ambiguous meaning, many statements were difficult to place in one category or another. Nevertheless, the initial sort gave a rough overview of the pool of statements and made it possible to ensure that all relevant types of rationales were represented. Weblert et al. (2009) recommend that the final selection of statements should include an equal number of statements from each category used for the selection. However, as some of the categories used in this study are narrower than others, the diversity of statements within each category varies. Therefore, in order to enhance the diversity of statements in the final sample, it was deemed appropriate in this case to include more statements from the broader and more varied categories. Accordingly, each category of statements was reviewed and reduced to a selection of between two (biophilia) and nine (non-extractive use value) statements – 42 statements in total (see Box 1). Apart from the aim of maximum diversity, the criteria used for the selection were that statements should be:

- salient, i.e. something that people are likely to have an opinion about;
- understandable, i.e. meaningful to the people doing the sorts; and
- interpretable in slightly different ways by different people, i.e. not too narrow.

**Box 1: Q statements**

1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.
2. Protecting ecosystem service providers is important because they are a source of economic value.
3. The ecosystem service approach has potential to improve species conservation in Europe.
4. Biodiversity conservation is not a moral matter.
5. Some species are important symbols of human values, such as freedom.
6. Species are priceless.
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.
8. The extinction of a species is like the destruction of a great work of art
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.
11. Conserving genetic diversity is important to feed future human populations.
12. Countries can benefit from their conservation efforts through tourism.
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.
14. Losing its biological richness and diversity, the world loses its magic.
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.
16. We want to experience areas where humans are merely visitors and not inhabitants.
17. Most species are superfluous.
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.
20. All species have a right to exist, regardless of their ability to benefit humans.
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.
25. Pristine nature is valuable in itself.
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.
28. Destroying nature is like burning unread books.
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.
30. Nature produces works of grace which please the eye.
31. Species survival ultimately depends on large numbers of other species.
32. Nature provides the profoundest historical museum of all.
33. Species extinction reduces possibilities for future generations.
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them *in situ*.
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.
37. Humans are morally permitted to extinguish any species harmful to human survival.
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.
39. As nature is always changing there is no point in conserving a fixed ecosystem state.
40. Species extinctions are not necessarily bad.
41. Nature and its diversity make our lives meaningful.
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.

Furthermore, as far as possible, both positively and negatively worded statements were selected from each category. As the statements were taken out of context and sometimes consisted of rather long and complex sentences, some editing was deemed necessary for all statements to be understandable. The aim was to improve the readability of the statements without distorting their meaning. Some partner organisations translated the statements into the native language and provided both versions of the statements to the participants.

## 2.2 Defining the sorting chart

We followed Webler et al. (2009) and used a quasi-normal distribution of 9 categories (-4 to +4), where -4 represented “least like how the participant thinks” and +4 represented “most like how the participant thinks” (see Appendix 1.4 for the sorting charts). Similarly, for the sort according to the dominant way of thinking, -4 represents least like the dominant way of thinking, and +4 the most like the dominant way of thinking.

## 2.3 Conducting the survey

Each participant was asked to first read through all 42 statements and then sort them twice, according to different principles: first according to their own thoughts and beliefs about the value of biodiversity conservation (which statements corresponded least/most to how **they** thought); and second according to what they perceived as dominant ways of thinking about the value of biodiversity conservation in decision-making (which statements corresponded least/most to **dominant** ways of thinking). This double sorting exercise allowed for an examination of different perspectives not only on the rationale for biodiversity conservation *per se*, but also on the policy agendas surrounding biodiversity conservation efforts. The hypothesis was that participants were likely to sort the statements differently in the two sorts. If so, this could be interpreted in terms of perceived gaps of understanding between different actors involved in biodiversity conservation efforts – leading, for example, to a widespread use of biodiversity conservation arguments believed to be ‘effective’ in a policy/management context whether this was the case or not. The illumination of actual and perceived differences of perspective and understanding may thus be used to create a common understanding across perspectives and enhance the climate of co-operation among actors involved in biodiversity conservation efforts.

Each of the 42 statements in the final selection was typed into a cut-out sheet for easy preparation of Q-sort cards. As each participant was to sort the statements twice, two separate packs of cards were printed. This allowed participants to keep visible, and refer back to, their first sort when doing the second, and possibly to revise it based on this comparison. Similarly, charts for the layout of cards and for noting down completed Q-sorts were prepared to ensure accurate recording of the data. Although an effort was made to create as diverse a sample as possible, there was no guarantee that the participants would see the middle of the distribution as zero salience (= neither agree nor disagree), as indicated by ‘0’ on the prepared layout chart. Still, to encourage Q sorters to prioritise between statements, they were forced to conform to the normal distribution indicated on the chart. After Q-sort participants had completed the personal Q sorts, they were asked to draw a line that demarcated agree from disagree (see Webler et al., 2009: 18-22).

Where the participant agreed, audio-recordings of their comments during the sorting process and data on background information (age, gender, profession, educational background, involvement in biodiversity research, management and/or policy processes) were collected. For further details about the Q sort guidance for the interviewer and the recruitment letter, which were designed to ensure consistency in data collection across Member States, see Appendix 1.

## 2.4 Selecting Q participants

Q participants were selected among particularly knowledgeable individuals working with biodiversity conservation in each participating Member State (Table 1) – either within different scientific disciplines (biology, environmental economics, environmental law, philosophy, etc.) or at different levels of governance (national and, if relevant, regional/local level nature conservation, environmental protection and land management organisations) or non-governmental organisations (NGOs). The aim was to recruit approximately even numbers of interviews in each country and a requirement was for the participants to be familiar enough with biodiversity conservation and ES terminology to have formed an opinion and to be able to understand and relate to the Q statements.

**Table 1:** Data overview: number of conducted Q-sorts in the three groups of stakeholders in the individual countries.

Country	Researchers	Decision-makers	NGOs	Others	Total
Finland	8	4	2	0	14
Norway	6	3	4	2	15
UK	3	10	2	1	16
Denmark	10	2	3	0	15
Poland	7	4	5	0	16
Spain	5	3	4	6	18
Salzburg <sup>1</sup>	6	2	3	2	13
Hungary	7	5	3	0	15
Romania	4	11	2	1	18
<b>Total</b>	<b>56</b>	<b>44</b>	<b>28</b>	<b>12</b>	<b>140</b>

<sup>1</sup> Salzburg is considered as the same as the other country studies as this is the level at which biodiversity decision-making is undertaken.

## 2.5 Q analysis

We used the free software PQmethod 2.35, following the PQMethod Manual available at <http://schmolck.org/qmethod/pgmanual.htm>. Principal component analysis was conducted on the statement response matrix, and the resulting factors were rotated using the varimax rotation method. This aims to give a simple structure in the data, explaining a large proportion of the data and generating an outcome where each individual tends to be associated with one factor. It is not necessarily possible to identify one mathematically best solution (Watts & Stenner, 2005), and the final solution is also selected considering the simplicity, interpretability, distinctness, and stability of the factors (Webler et al., 2009). In this study, we aimed to maximise the variance explained while keeping the number and distinctness of factors to a manageable level and maximising the number of individuals whose sorts correlated only to one factor.

For each of the analyses we examined different aspects of the data. The first analysis gives an overview of the entire data set as well as exploring the more subtle differences among perspectives within the groups for natural and social science researchers. For the second analysis, the data was divided into three stakeholder groups - researcher, NGO's and decision-makers - and the perspectives within each group and between groups were compared and contrasted. The final analysis focused on the decision-makers, looking at both the sorts reflecting their personal views and the sorts reflecting their ideas about the dominant views in nature conservation and policy.



Individuals whose sorts correlate with a specific factor were called loaders. Sort loading  $> \pm 0.39$  for a given factor was considered significant at the  $P < 0.01$  level based on Brown (1980, p.283). The weighted averages of the loaders sort pattern were used to calculate the idealised sort pattern (i.e. -4 to +4) for the factor. For each of the analyses, the results were illustrated and interpreted from these idealised sorts for each of the selected factors and the characterising statement ratings were highlighted for each of the factors. Each idealised sort represents a particular perspective.

### 3. Results

Throughout the results section, numbers in square brackets are the identifying numbers of the Q statements (see Box 1 and Tables 2-8). The results tables (2-8) are presented at the end of section 3.4.

#### 3.1 Overview analysis of the full data set

Excluding the interviews where the sorts did not conform to the Q distribution chart, 133 sorts remained for analysis. Selecting four factors to illustrate the initial analysis of the full data set we see that most statements partly characterise one or more of the perspectives (Table 2), indicating that the participants did have different views about the opinions expressed in the statements. The four factors are characterised as follows:

**Factor 1** (30 people) is characterised by a positive rating of statements with natural scientific reasoning for biodiversity conservation, and does not tend to question the rationale for conservation but views conservation as of paramount priority. This is expressed through high ranking of statements arguing that “species are priceless” [6], that conservationists’ campaigns are worthwhile [9] and that biodiversity is an “unqualified good” [36], and disagreement that biodiversity is a second order priority compared to other values like freedom, equality, health and justice” [27]. Furthermore, this perspective has the highest rating of the statement that biodiversity is important for life in the same way as rivets are important for a plane [22], and emphasises species interdependence for survival [31] (See Table 2).

**Factor 2** (31 people) represents a perspective that rates functional human use reasoning for biodiversity conservation highly, while still placing high values on moral rationales. This is seen from the statements defining this factor being those placing high values on ES arguments [2, 3]. This perspective also objects most strongly to the idea that economic analysis of biodiversity conservation implies an acceptance of a negative impact on biodiversity [29]. However, this perspective also identifies with the statement that biodiversity conservation is a moral issue [4].

**Factor 3** (11 people) is defined by the more spiritual and non-use values associated with biodiversity, ranking highly statements which stress beauty [30], magic [14] and non-economic aspects of nature, such as providing a reflective, experimental space [23]. This group believes in the rights of non-human species [20], even if they are of no benefit to us, and believes that biodiversity conservation is a moral matter [4]. This perspective only places intermediate emphasis on the role of biodiversity in ecosystem functioning [22]. Fewer people load onto this perspective.

**Factor 4** (20 people) ranks pristine nature highly [25], agrees with the statement that species are priceless [6] and objects most strongly to arguments questioning the point of conservation. This is expressed through disagreement with the statement stating that the point of conservationists’ campaigns are unclear [9], the argument that “we can’t aim to conserve all aspects of biodiversity” but have to make choices [38], and the view that “there is no point conserving a fixed ecosystem state” [39].

A large part of the information is not revealed when lumping all the data together in this initial analysis, i.e. 41 of the individuals do not load significantly onto any of the four perspectives. In the following sections, results of analysis of sub-samples of the data set are presented.

### **3.2 Researchers' perspectives**

The sorts for 52 researchers are available for this analysis and three factors generate interpretable perspectives on the issues (Table 3):

**Factor 1** (21 people) is characterised by placing a high emphasis on the ethical value basis of biodiversity [20] and on a precautionary perspective [22, 33]. Compared to the other perspectives there is a higher emphasis on the importance of interdependency of species for survival [31], the existence value of species [34], that biodiversity is an unqualified good [36], and biodiversity conservation is seen as a moral matter [4].

**Factor 2** (10 people) is positively associated with the role of biodiversity in a functional sense, for example, in the development of new drugs [42], and also with valuing the ES framework [3] and recognising that humanity needs to consider a variety of benefits and may even decide not to conserve biodiversity in some situations [38]. This group also agrees least with the argument that species are priceless [6] and with some of the more spiritual and emotional statements, such as those equating biodiversity loss to “loss of magic” [14] and “burning of unread books” [28], and that biodiversity gives our lives meaning [41].

**Factor 3** (14 people) ranks highly statements concerning the importance of biodiversity for our future, emphasising biodiversity as insurance [24], in terms of protecting future possibilities [33] and future food production [11], and seeing the ES approach as having potential to improve species conservation in Europe [3]. This perspective has little emphasis on non-use [8] and ethical values, in contrast to the first perspective.

All the groups found the statement that most species are superfluous [17] is least like they think. Those loaded on Factor 1 and 3 both think that the conservation of biodiversity is a moral matter [4] and that species extinction reduces possibilities for future generations [33], but do not think that there is a lack of clarity about the reasons why species targeted by environmentalists should be saved [9]. Comparing these two, those loaded on Factor 1 give more weight to the fundamental importance of conservation [e.g. 22, 31, 36] and ethical [20] and existence values [34], while those associated with Factor 3 are stronger on statements related to the precautionary principle [e.g. 11, 24]. The second group, is more distinctive in its pragmatic approach to conservation [38], recognising a value to ES [3] but having little association with the more spiritual and emotive statements [14, 18, 28, 41].

#### **3.2.1 Analysis of natural and social science underpinning of argumentation**

To explore the sub-group of researchers, we distinguish between researchers according to the discipline in which they hold a research position.

##### *Natural scientist perspectives*

Analysing the sub-sample of academics holding positions within the natural sciences generates three distinct groups with a reasonable number in each group (Table 4):

**Factor 1** (12 people) is characterised by ranking a range of different aspects of biodiversity and ES highly, i.e. protection against future uncertainties [15, 24], tourism to boost earnings [12], human

experiences of nature [13], but they also value the rights of species to exist [20]. This view could, therefore, be characterised as a multiple-value perspective.

**Factor 2** (6 people) is characterised by rationales which are non-economic or even anti-economic. Statements [29] expressing a very critical view on the economic analysis of environmental issues are highly supported by this perspective. The ideal sort from this perspective also gives support to the notion that “species are priceless” [6] and that values are “not in the wallet” [7]. Furthermore, this perspective is highly critical towards the idea that compromises are necessary in biodiversity conservation [38]. This perspective could therefore be termed “critical of economics”.

**Factor 3** (12 people) ranks highly statements about the role of biodiversity [22] and species interactions [31] in ecological systems, evolutionary processes [35] and protection of future possibilities [33]. This could, therefore, be characterised as a “natural science academic perspective”.

The analysis highlights that many diverse views exist even among natural science academics within the biodiversity and ecology field: their views are shaped by aspects central to their disciplines, but many other aspects also inform their perspectives on biodiversity and ES, illustrated by the diverse dimensions of the multiple-value perspective (Factor 1) and the perspectives that were mainly distinguished by being in opposition to alternative disciplinary views (e.g. economics) (Factor 2).

#### *Social science perspectives*

This sub-group of academics holding a social science position can also be characterised by three sub-groups with distinct interpretable views on biodiversity and ES (Table 5):

**Factor 1** (7 people) agrees with statements valuing biodiversity in itself and giving rights to non-human species, by agreeing with the statement that biodiversity is an unqualified good [36], and disagreeing strongly that humans are morally permitted to extinguish species harmful to humans [37], or that species extinction is not necessarily bad [40]. Furthermore, this view strongly supports the classical notion from Erlich & Erlich about the rivets on an airplane [22]. On the contrary, the statements supporting ES [3], the future development of drugs [42] and the importance of human experiences [13] only get intermediate ranks. This perspective can, therefore, be interpreted as subscribing to an ethical value of biodiversity in itself and for its role in contributing to the functioning of ecosystems for their own good.

**Factor 2** (8 people) supports an ES rationale for biodiversity conservation, protecting ecosystem service providers for economic value [2], believing that the ES framework has potential to improve biodiversity conservation [3], prioritising biodiversity conservation to secure development of new drugs [42], and opposing the more spiritual and emotional statements referring to “magic” [14] or the informational value of biodiversity through the objection to “the destruction of unread books” [28]. This perspective also objects to statements suggesting that biodiversity-related issues are beyond economic analysis and reasoning [6, 29]. Overall, this perspective can, therefore, be characterised as shaped by economic rationales.

**Factor 3** (3 people) emphasises the importance of non-material values associated with biodiversity. The more highly ranked statements are those associating biodiversity with symbolic values [5], beauty [18] or grace [30], and placing importance on co-evolution of ecosystems and humans [26]. This perspective objects to the notion of biodiversity having an important role in the functioning of ecosystems [22, 24], but still finds that most species were not superfluous [17]. This perspective is therefore non-economic and critical of natural science arguments for biodiversity conservation.

The perspectives among social scientists are therefore also diverse: some seem shaped by economic disciplinary perspectives; some are critical to natural scientific views. However, association of value to biodiversity itself and the role of biodiversity in Earth's support system, as rivets in a plane, is also distinguishable in the sub-group of social scientists.

#### *Researchers' perspectives overall*

It is clear from the results described above that insight was missed when analysing researchers as one common group. Many of the more subtle nuances distinguishing the disciplinary perspectives, and objections to these perspectives, were lost from the analysis.

### **3.3 Decision-makers' perspectives**

Analysis of the decision-maker sub-sample results in three distinct factors (Table 6):

**Factor 1** (18 people), puts the rights of species highest compared to the other statements and to the other perspectives among the decision-makers. This is expressed by high agreement with the statement that "species are priceless" [6] and agreement with the rights of non-human species [20]. They disagree with a number of statements about species loss, such as the view that species extinctions as not necessarily bad [40] and that conservation cannot hope to save everything [38], but also disagree that valuing species in economic terms implies a justification for the destruction of the biosphere [29]. This perspective could be termed a rights-based perspective.

**Factor 2** (13 people) emphasises the use value of biodiversity for food provision [11], support of economic gain [2], tourism [12] and as being particularly important for poverty alleviation in developing countries [10], which could be seen as embodying an ES-providing perspective. They view the conservation of biodiversity as a moral matter [4] and oppose the destruction of species that are of harm to us [37]. Like Factor 2 of the social researchers, they disagree with the more spiritual and emotional statements referring to extinction like the destruction of a great work of art [3] and "magic" [14]. This perspective could be termed the ES perspective.

**Factor 3** (7 people) ranks the importance of human experiences of nature [13] higher than the other perspectives and associates strongly with emotional and spiritual values of biodiversity [14, 41], as well as the rights of species to exist [20]. This group places least importance on statements suggesting that biodiversity-related issues are beyond economic analysis and reasoning [6, 9], and view conservation as a moral matter [4]. This perspective could be termed the experimental and spiritual perspective.

For the groups of decision-makers there was a consensus view that "valuing species in economic terms implies a justification for the destruction of the biosphere" [29] is rated towards "least like they think" (-3 or -4), which could be viewed as recognising a role for species valuation in conservation, while also recognising the potential of the ES approach [3]. In addition there is consensus that "biodiversity conservation is not a moral matter" [4] is least like their thinking (-3 or -4). However, those loaded on Factor 1 are more species-focused and concerned about their rights and loss, in contrast to the Factor 2 group who are much stronger on the use value of biodiversity, through the ES they can provide, with the more emotional statements having less resonance for them. Those loaded on Factor 3 emphasis human use and spiritual and emotional value, therefore having an anthropocentric view but less emphasis on the indirect use value through ES provision.

### 3.3.1 Comparison of decision-makers' personal and perceived dominant views

Analysis of the decision-makers' second Q sorts indicates that two factors best describe the range of perspectives present within our sample (Table 7). The two perspectives reflect the views which the decision-makers perceived as dominating within decision-making about biodiversity and ES. In total, 39 of 41 Q sorts loaded significantly onto one of these two factors, which together would explain 39% of the total variance present within all the Q sorts. These two factors could be described as "conservation focused" and "management focused", potentially reflecting presumed approaches to decisions regarding biodiversity conservation and ES provision.

**Factor 1** (18 people, explaining 20% of the total variance) presumed that the dominant view was a **conservation approach**. For this factor, more important statements include a positive association with "conserving genetic diversity is important to feed future human populations" [11], "protecting ecosystem service providers is important because they are a source of economic value" [2], and "species extinction reduces possibilities for future generations" [11]. The factor was also negatively associated with the statements "most species are superfluous" [17], "valuing species in economic terms implies a justification for the destruction of the biosphere" [29], and "humans are morally permitted to extinguish any species harmful to human survival" [37].

**Factor 2** (21 people, explaining 19% of the total variance) presumed that the dominant view was a **management approach**. This factor is associated with statements that highlight use and choices that need to be made, and more important statements include a positive association with "we can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances" [38], and "any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice" [27]. The factor was also negatively associated with the statements "species are priceless" [6], "the extinction of a species is like the destruction of a great work of art" [8], and "all species have a right to exist, regardless of their ability to benefit humans" [20].

The different factors determined from the respondents' own sorts, representing the decision-makers' personal views, spread evenly across the two factors that represented the different dimensions assumed to prevail in decision-making. In other words, those who fell into the rights-based value dimension could presume that either a conservation orientation (9 respondents) or a management orientation (8) are dominant in decision-making. Similarly, those who identified with use value and an ES framework perceived both conservation (6) and management (8) dimensions in decision-making. Among the 6 respondents who highlighted emotional values, 4 assumed a management orientation to dominate in decision-making and 2 assumed a conservation orientation.

### 3.4 NGO perspectives

The analysis of the representatives of NGOs showed that this group can be distinguished by four separate perspectives (Table 8):

**Factor 1** (7 people) represents the view that pristine nature is highly valuable [25] and that biodiversity is good no matter what [36], while biodiversity concerns should be ranked higher than other policy objectives. The group objects strongly to statement [27], that biodiversity conservation must be limited by "other values such as freedom, equality, health, and justice". This view could therefore be termed a rights-based view.

**Factor 2** (6 people) ranks statements emphasising the precautionary principle [1, 24] highly, and agrees with the importance of co-evolved ecosystems [26] and that biodiversity is not a moral matter [4]. It does not think that most species are superfluous [17], the loss of a species is like the

destruction of a great work of art [8] or economic valuation justifies the destruction of the biosphere [29]. This perspective reflects a view that biodiversity conservation should follow a precautionary principle.

**Factor 3** (3 people) puts an emphasis on the spiritual, non-material aspects of biodiversity value; referring to biodiversity as a “great work of art” [8], “magic” [14], “grace” [30] and nature as a space for experience and reflection [23]. It disagrees with the view that biodiversity is not a moral matter [4] and is always good [36], as well as not thinking beauty is a particularly important basis for conservation [18] or that we should conserve genetic diversity in order to have a basis for breeding plants for new conditions [15]. This view represents a spiritual perspective on biodiversity and ES.

**Factor 4** (6 people) has an ES perspective, emphasising the importance of biodiversity for future food security [11, 15] and for poverty alleviation in developing countries [10]. It places less importance on symbolic values [5] and the idea that the economic valuation of species implies justification for biodiversity destruction. This perspective places its main emphasis on protecting future possibilities.

The NGO groups appear to be quite diverse, in that the statements that score highly differ, with some disagreement in the responses to particular statements too. Those loading on Factor 3 are particularly important in the latter case (Table 8). While this is a small group (3 people), nevertheless it represents a distinct perspective giving a greater importance to a moral imperative for conservation and to less tangible aspects of biodiversity.

**Table 2: Characterisation of total sample. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2	Factor 3	Factor 4
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	2	1	2	1
2. Protecting ecosystem service providers is important because they are a source of economic value.	-2	4 **	-1	1 **
3. The ecosystem service approach has potential to improve species conservation in Europe.	1 **	4 **	-1 **	3 **
4. Biodiversity conservation is not a moral matter.	-2	-4 **	-4 **	-2
5. Some species are important symbols of human values, such as freedom.	-2	-2	0 **	-2
6. Species are priceless.	3 **	-3 **	0 **	4 **
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	1 **	-1 **	3 **	0 **
8. The extinction of a species is like the destruction of a great work of art	1	-3 **	1	0
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-4 *	0 *	-1 *	-3 *
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	-1 **	2	-2 **	2
11. Conserving genetic diversity is important to feed future human populations.	0	4	0	4
12. Countries can benefit from their conservation efforts through tourism.	0	2 **	1	1
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	0	3	2	-1
14. Losing its biological richness and diversity, the world loses its magic.	0	-2 **	4 **	0
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	0	3 *	-1	2 *
16. We want to experience areas where humans are merely visitors and not inhabitants.	-2 **	-1 **	1 **	-1 **
17. Most species are superfluous.	-4	-4	-4	-4
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	2 *	1 *	-3 *	-2 *
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	1	-1 *	1	-1 *
20. All species have a right to exist, regardless of their ability to benefit humans.	4	-1 **	3 **	4
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	0 *	1	1	1
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	4 **	1 *	0 **	2 *
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	-1	0	4 **	-1
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	1	2 **	1	0 *
25. Pristine nature is valuable in itself.	2	0	1	3 *
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.	1 **	2 **	0	0
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	-3 *	0	0	-2 *
28. Destroying nature is like burning unread books.	-1 **	-2 **	0	1
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-3 **	-4 **	-3 **	-1 **
30. Nature produces works of grace which please the eye.	0 *	0	3 **	-1
31. Species survival ultimately depends on large numbers of other species.	4 **	0 **	-1	-1
32. Nature provides the profoundest historical museum of all.	-1	-1	0 *	1 *
33. Species extinction reduces possibilities for future generations.	3	1 **	4	3
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	2	0	2	1
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	1 **	0 **	-2 **	2 **
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	3 **	-2 **	-4 **	0 **
37. Humans are morally permitted to extinguish any species harmful to human survival.	-4	-3	-3	-4
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-1	1 **	-1	-4 **
39. As nature is always changing there is no point in conserving a fixed ecosystem state.	-1 **	1 **	-2 **	-3 **
40. Species extinctions are not necessarily bad.	-3	-1 *	-2 *	-3
41. Nature and its diversity make our lives meaningful.	0	-1 **	2 **	0
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	-1	3 **	-1 **	0
<b>Number of Loaders</b>	<b>30</b>	<b>31</b>	<b>11</b>	<b>20</b>

**Table 3: Characterisation of researcher sub- sample. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2	Factor 3
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	2	1	3
2. Protecting ecosystem service providers is important because they are a source of economic value.	-1 **	3	2
3. The ecosystem service approach has potential to improve species conservation in Europe.	2 **	4 *	3 *
4. Biodiversity conservation is not a moral matter.	-3 **	-1 **	-4 **
5. Some species are important symbols of human values, such as freedom.	-2	-1	0 **
6. Species are priceless.	2 **	-3 **	0 **
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	0 **	-2 *	-2 *
8. The extinction of a species is like the destruction of a great work of art	1 **	-2 **	-1 **
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-4 **	0 **	-3 **
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	-1 **	1	1
11. Conserving genetic diversity is important to feed future human populations.	1	1	3 **
12. Countries can benefit from their conservation efforts through tourism.	0	0	2 **
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	0 **	2	2
14. Losing its biological richness and diversity, the world loses its magic.	1	-3 **	0
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	1 **	3	4
16. We want to experience areas where humans are merely visitors and not inhabitants.	-2	-1	1 **
17. Most species are superfluous.	-4 *	-4 **	-4 **
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	1 **	3 **	-1 **
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	2 *	1	0
20. All species have a right to exist, regardless of their ability to benefit humans.	4 **	-2 **	1 **
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	0	0 **	1
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	4 **	1 **	0 **
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	-2	-1	1 **
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	0 *	1 *	4 **
25. Pristine nature is valuable in itself.	1	-1 **	1
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.	1 **	2	2
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	-2	2 **	-2
28. Destroying nature is like burning unread books.	0	-4 **	0
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-3	-4	-4
30. Nature produces works of grace which please the eye.	-1	-1	0
31. Species survival ultimately depends on large numbers of other species.	3 **	1 **	-1 **
32. Nature provides the profoundest historical museum of all.	-1	-1	-1
33. Species extinction reduces possibilities for future generations.	4 *	0 **	4 *
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	3 **	0	-1
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	0	0	-1
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	3 **	-2	-2
37. Humans are morally permitted to extinguish any species harmful to human survival.	-4	0 **	-3
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-1 **	4 **	-2 **
39. As nature is always changing there is no point in conserving a fixed ecosystem state.	-1 *	2 **	-1 *
40. Species extinctions are not necessarily bad.	-3	0 **	-3
41. Nature and its diversity make our lives meaningful.	-1	-3 **	0
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	0	4 **	1
<b>Number of Loaders</b>	<b>21</b>	<b>10</b>	<b>14</b>



**Table 4: Characterisation of natural science researchers. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2	Factor 3
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	2	0 **	3
2. Protecting ecosystem service providers is important because they are a source of economic value.	1 **	-1	-1
3. The ecosystem service approach has potential to improve species conservation in Europe.	2 *	-1 **	1 *
4. Biodiversity conservation is not a moral matter.	-4 **	-4 *	-2 *
5. Some species are important symbols of human values, such as freedom.	-1	0	-3 **
6. Species are priceless.	0 **	4 **	2 **
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	-1	4 **	-1
8. The extinction of a species is like the destruction of a great work of art.	1 **	2 **	-1 **
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-3	-3	-3
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	0	-1	1
11. Conserving genetic diversity is important to feed future human populations.	2	1	1
12. Countries can benefit from their conservation efforts through tourism.	4 **	1	0
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	3 **	0	0
14. Losing its biological richness and diversity, the world loses its magic.	1 **	2 **	-1 **
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	4 **	0 **	1 **
16. We want to experience areas where humans are merely visitors and not inhabitants.	2 *	1	-1
17. Most species are superfluous.	-4	-1 **	-4
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	-1	0	0
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	1 *	-2 **	0 *
20. All species have a right to exist, regardless of their ability to benefit humans.	3 **	4	4
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	1	1	1
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	0	-1	4 **
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	1	0	-2 **
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	4 **	0 **	2 **
25. Pristine nature is valuable in itself.	0	1	2 **
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.	0	-3 **	1
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	-3	-2	-2
28. Destroying nature is like burning unread books.	0	2 **	0
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-4 **	3 **	-3 **
30. Nature produces works of grace which please the eye.	1 *	0	-1
31. Species survival ultimately depends on large numbers of other species.	0 **	-2 **	3 **
32. Nature provides the profoundest historical museum of all.	-2 **	1	0
33. Species extinction reduces possibilities for future generations.	3	3	4 **
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	-1 **	2	2
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	-1	-1	3 **
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	-2 **	1	1
37. Humans are morally permitted to extinguish any species harmful to human survival.	-3	-4	-4
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-1 **	-4 *	-2 *
39. As nature is always changing there is no point in conserving a fixed ecosystem state.	-2	-2	-1 *
40. Species extinctions are not necessarily bad.	-2	-1	-4 **
41. Nature and its diversity make our lives meaningful.	-1 *	3 **	0 *
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	0	-3 **	0
<b>Number of Loaders</b>	<b>12</b>	<b>6</b>	<b>12</b>

**Table 5: Characterisation of social science researchers. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2	Factor 3
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	2	2	1
2. Protecting ecosystem service providers is important because they are a source of economic value.	-1	4 **	-2
3. The ecosystem service approach has potential to improve species conservation in Europe.	0 *	4 **	2 *
4. Biodiversity conservation is not a moral matter.	-3	-3 *	-4
5. Some species are important symbols of human values, such as freedom.	-2	-1	3 **
6. Species are priceless.	1	-3 **	2
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	2	-1 **	3
8. The extinction of a species is like the destruction of a great work of art	3 **	-2	-1
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-4 **	0	0
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	0	2 **	0
11. Conserving genetic diversity is important to feed future human populations.	1	2 *	1
12. Countries can benefit from their conservation efforts through tourism.	-1	1 **	-1
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	0 **	3	4
14. Losing its biological richness and diversity, the world loses its magic.	1 *	-3 **	3 *
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	1	3 **	0
16. We want to experience areas where humans are merely visitors and not inhabitants.	-3	-1	-3
17. Most species are superfluous.	-4	-4	-3 **
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	1 **	3 **	-2 **
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	2 **	0 *	-1 *
20. All species have a right to exist, regardless of their ability to benefit humans.	4	0 **	2
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	0 *	-1 *	-2 *
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	4 **	0 **	-4 **
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	-2	-1	1 **
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	0	1	-4 **
25. Pristine nature is valuable in itself.	1	0	1
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.	1	1	4 **
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	-2	1 **	-1
28. Destroying nature is like burning unread books.	-1	-4 **	0
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-2	-4 **	-2
30. Nature produces works of grace which please the eye.	0	0	4 **
31. Species survival ultimately depends on large numbers of other species.	2	1	-1 **
32. Nature provides the profoundest historical museum of all.	-1	-2	0
33. Species extinction reduces possibilities for future generations.	3	0 **	2
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	3	1	1
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	0	-1	0
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	4 **	-2 *	0 *
37. Humans are morally permitted to extinguish any species harmful to human survival.	-4 **	-2	-3
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-1	1 **	0
39. As nature is always changing there is no point in conserving a fixed ecosystem state.	-1	2 *	1
40. Species extinctions are not necessarily bad.	-3 *	0	-1
41. Nature and its diversity make our lives meaningful.	-1	-1	1 *
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	0 *	4 **	-1 *
<b>Number of Loaders</b>	<b>7</b>	<b>8</b>	<b>3</b>

**Table 6: Characterisation of decision-makers. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2	Factor 3
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	2	2	1
2. Protecting ecosystem service providers is important because they are a source of economic value.	1*	4**	0*
3. The ecosystem service approach has potential to improve species conservation in Europe.	3	1	2
4. Biodiversity conservation is not a moral matter.	-1**	-4	-4
5. Some species are important symbols of human values, such as freedom.	-2	-2	-1
6. Species are priceless.	4**	-2	-2
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	0	-1*	1
8. The extinction of a species is like the destruction of a great work of art.	0**	-3**	-1**
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-4**	0**	-2**
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	2**	3**	-1**
11. Conserving genetic diversity is important to feed future human populations.	2**	4**	0**
12. Countries can benefit from their conservation efforts through tourism.	1	3**	1
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	-1**	2**	4**
14. Losing its biological richness and diversity, the world loses its magic.	-1**	-3**	4**
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	1	3	0**
16. We want to experience areas where humans are merely visitors and not inhabitants.	-1	-1	0
17. Most species are superfluous.	-4	-4	-4
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	0*	1**	-1*
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	-1**	-2**	2**
20. All species have a right to exist, regardless of their ability to benefit humans.	4**	0**	4**
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	1	1	-1**
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	4	2	2
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	-2	-1	1**
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	0	4**	0
25. Pristine nature is valuable in itself.	3	1**	3
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.	-1**	1	1
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	-2**	0	0
28. Destroying nature is like burning unread books.	-1	0	-2*
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-3	-4**	-2
30. Nature produces works of grace which please the eye.	0	0	1**
31. Species survival ultimately depends on large numbers of other species.	1	0	2
32. Nature provides the profoundest historical museum of all.	0**	-1	-3
33. Species extinction reduces possibilities for future generations.	3	1**	3
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	1	1	-1**
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	1*	0	-1
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	2**	-1	0
37. Humans are morally permitted to extinguish any species harmful to human survival.	-4	-3**	-4
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-3**	0	1
39. As nature is always changing there is no point in conserving a fixed ecosystem state.	-2**	-1	0
40. Species extinctions are not necessarily bad.	-3	-2*	-2
41. Nature and its diversity make our lives meaningful.	0	-1	3**
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	0**	2**	-3**
<b>Number of Loaders</b>	<b>18</b>	<b>13</b>	<b>7</b>

**Table 7: Characterisation of dominant views. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	2**	0
2. Protecting ecosystem service providers is important because they are a source of economic value.	4	3
3. The ecosystem service approach has potential to improve species conservation in Europe.	3**	2
4. Biodiversity conservation is not a moral matter.	-1	-1
5. Some species are important symbols of human values, such as freedom.	-2**	0
6. Species are priceless.	1**	-4
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	0*	-1
8. The extinction of a species is like the destruction of a great work of art.	-1**	-4
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-1**	2
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	2**	-1
11. Conserving genetic diversity is important to feed future human populations.	4**	1
12. Countries can benefit from their conservation efforts through tourism.	3	3
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	1**	4
14. Losing its biological richness and diversity, the world loses its magic.	-1*	-3
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	3**	1
16. We want to experience areas where humans are merely visitors and not inhabitants.	-3**	-1
17. Most species are superfluous.	-4**	0
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	0	0
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	-2	-2
20. All species have a right to exist, regardless of their ability to benefit humans.	2**	-4
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	0	1
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	1**	1
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	-2*	-1
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	2**	0
25. Pristine nature is valuable in itself.	0**	-1
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.	1	2
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	0**	4
28. Destroying nature is like burning unread books.	-3	-2
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-4**	-1
30. Nature produces works of grace which please the eye.	-1**	1
31. Species survival ultimately depends on large numbers of other species.	0	0
32. Nature provides the profoundest historical museum of all.	-2	-2
33. Species extinction reduces possibilities for future generations.	4**	0
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	0**	-2
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	0**	-3
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	1**	-3
37. Humans are morally permitted to extinguish any species harmful to human survival.	-4**	1
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	1**	4
39. As nature is always changing there is no point in conserving a fixed ecosystem state.	-1**	2
40. Species extinctions are not necessarily bad.	-3**	1
41. Nature and its diversity make our lives meaningful.	-1	0
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	1**	3
<b>Number of Loaders</b>	<b>18</b>	<b>21</b>

**Table 8: Characterisation of NGOs. Ideal factor sort; \* indicates significance level  $P < 0.05$ , \*\*  $P < 0.01$  of the distinguishing statements.**

Statements	Factor 1	Factor 2	Factor 3	Factor 4
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	0	4 *	1	1
2 Protecting ecosystem service providers is important because they are a source of economic value.	-1	0	0	-1
3 The ecosystem service approach has potential to improve species conservation in Europe.	1	2	0	2
4 Biodiversity conservation is not a moral matter.	-3	3 **	-4 *	-2
5 Some species are important symbols of human values, such as freedom.	-1	-1	2 **	-3 **
6 Species are priceless.	3	0	-1	4
7 The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.	0	-2*	1	1
8 The extinction of a species is like the destruction of a great work of art	0	-3 **	4 **	0
9 It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-3	-3	-1	-1
10 Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.	1 *	-2	-3	3 *
11 Conserving genetic diversity is important to feed future human populations.	0	0	-1	3 **
12 Countries can benefit from their conservation efforts through tourism.	-1 **	2	2	1
13 Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.	0	1	1	0
14 Losing its biological richness and diversity, the world loses its magic.	1	-2 *	4 **	0
15 It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.	-1**	1 **	-3 **	3 **
16 We want to experience areas where humans are merely visitors and not inhabitants.	-2	-1	1 *	-1
17 Most species are superfluous.	-4	-4 *	-4	-3
18 We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.	2	2	-3 **	-1 **
19 We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.	0	-1	3 **	0
20 All species have a right to exist, regardless of their ability to benefit humans.	2	4	2	4
21 Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.	-2 **	3	1 *	4
22 The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	3	1	-1 **	2
23 Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.	-1**	1	4 **	1
24 Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.	1	4 **	1	-1 **
25 Pristine nature is valuable in itself.	4 **	0 *	2	1
26 Ecosystems have co-evolved with humans creating landscapes of important cultural value.	0	3 **	-2 **	0
27 Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.	-4**	0	0	-2 **
28 Destroying nature is like burning unread books.	0	-1	0	2 *
29 Valuing species in economic terms implies a justification for the destruction of the biosphere.	-1	-4 *	-1	-3 *
30 Nature produces works of grace which please the eye.	1	0	3 **	-2 **
31 Species survival ultimately depends on large numbers of other species.	4	2	-2	-1
32 Nature provides the profoundest historical museum of all.	1	-2 **	0	1
33 Species extinction reduces possibilities for future generations.	3	1	1	1
34 The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them <i>in situ</i> .	2	1	3	0
35 Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.	2	-1	0	2
36 Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.	4 **	1 **	-4 **	0 **
37 Humans are morally permitted to extinguish any species harmful to human survival.	-4	-4	-2	-4
38 We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-3	-1	0	-2
39 As nature is always changing there is no point in conserving a fixed ecosystem state.	-2	0 **	-2	-4
40 Species extinctions are not necessarily bad.	-2	-3	-1	-4
41 Nature and its diversity make our lives meaningful.	1 **	-1	-1	-1
42 The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.	-1	0	-1	0
<b>Number of Loaders</b>	<b>7</b>	<b>6</b>	<b>3</b>	<b>6</b>

### 3.5 Comparison of different stakeholders' perspectives

Given the diversity of views exposed within the stakeholder groups, it is hard to make direct comparisons across the stakeholder types. There are, however, some perspectives that seem to be common across many of the groups. For example, there are some strong perspectives on the ethical basis for conservation in that statement [4] that "biodiversity conservation is not a moral matter" is disagreed with by all the researchers and decision-makers and all NGO respondents, except for the people associating with perspective no. 2. Most perspectives also agree with the statement that species have a right to exist regardless of their benefit to humans [20]; only one of the researchers perspectives disagreed with this view. All perspectives objected to the view that economic valuation of biodiversity is an indirect support for the destruction of biosphere [29]. Only a more in-depth analysis of the researchers sub-group revealed a support for this statement among the natural scientists.

Within each group we find support for scientific rationales, ethical or rights-based arguments, economic rationales emphasising the use value for humans, and emotional or spiritual perspectives. The stakeholder groups do, however, express these dimensions in different ways.

*Science dimension:* The researchers emphasise the protection of future possibilities and the respondents associating with this perspectives do not support emotional and spiritual arguments for conservation. This perspective is similar to the second perspective among the NGOs, however, the NGOs emphasise the precautionary principle rather than the opportunities related to biodiversity conservation. Decision-makers do not adopt a science-based perspective; instead they express their views in terms of ES provision.

*Ethical dimensions:* The researchers express ethical concerns in terms of the rights of species to exist regardless of their benefit to humans, and through existence value. This perspective is also prevalent among decision-makers. NGOs express this as a value of pristine nature. Among the NGOs this perspective is associated with a view that biodiversity conservation should overrule other policy concerns. This is to some extent also supported by the decision-makers as they disagree that conservation cannot hope to save everything. Among researchers, however, the ethical perspective is linked to a support of the precautionary principle.

*Economic dimensions:* The researcher group have a clear ES perspective. This perspective is linked to a pragmatic view on biodiversity conservation, emphasising the need to make "rational" choices. In the NGO group this is expressed as a concern for future food provision, particularly in developing countries. The perspective is also clearly expressed among the decision-makers. In all groups this perspective is associated with a low emphasis or objection to emotional and spiritual values of biodiversity.

*Emotional dimensions:* This dimension does not appear to exist among the researchers, when analysed as a common group. However, both the NGOs and the decision-maker group include this perspective.

## 4. Conclusions

Understanding different perspectives on the rationale for biodiversity conservation is potentially important for understanding different actors in the biodiversity and ES research, management and policy field. To understand potential divergence between perspectives across EU stakeholders we conducted nine comparative studies with national policy-makers, NGOs and researchers. We analysed the three stakeholder groups independently to reveal whether different views characterise the groups. The analysis shows a very complex pattern of perspectives. The emerging perspectives do

not uniquely associate with individual stakeholder groups; many aspects unite the stakeholders to a large degree, but we also find differences within the groups.

The stakeholders appear to agree on the ethical basis for conservation. The statement that “biodiversity conservation is not a moral matter” is disagreed with by all the researchers and decision-makers, and all NGO respondents except for one group. Most participants also agree with the statement that species have a right to exist regardless of their benefit to humans; only one of the researchers perspectives disagreed with this view. All perspectives objected to the view that economic valuation of biodiversity is an indirect support for the destruction of biosphere. Only a more in-depth analysis of the researcher sub-group revealed some support for this statement among the natural scientists. It is therefore generally accepted that economic analysis has a role to play in biodiversity conservation, but that ethical arguments are fundamental in biodiversity and ES decision-making.

The statistically derived factors associate the value arguments in logical clusters, allowing interpretation of distinct internally consistent perspectives. However, the data also give evidence of large individual respondent heterogeneity, leaving significant variation in the data unexplained. The differences in revealed perspectives appear to be larger within the stakeholder groups than between the stakeholder groups. We find evidence of perspectives expressed through scientific reasoning, ethical or rights-based arguments, economic rationales and emotional or spiritual value arguments in all stakeholder groups. There are, however, also evidence of differences between the groups.

The researchers emphasise scientific reasoning for biodiversity conservation, highlight ecosystem functioning, put highest emphasis on the protection of future possibilities and also express a disagreement with emotional and spiritual arguments for conservation. The perspective within the decision-maker group that resembles the science-based perspective is expressed in terms of support for a broader ES provision perspective, including services such as tourism. The NGO group also reveals a similar perspective, however, the NGOs emphasise the precautionary principle. Subdividing the researcher group into natural and social scientists reveals, not surprisingly, a strong support for science-based arguments among the natural scientists, but also a perspective among the social scientists that puts a strong emphasis on the functioning of ecosystems and the role of biodiversity in this respect. This analysis also reveals a science-critical perspective within the social scientist groups, expressing doubt about the claimed importance of the role of biodiversity in ecosystem functioning.

The researchers express ethical concerns as the rights of species to exist regardless of their benefit to humans, and through existence value. This perspective is also prevalent among decision-makers. NGOs express this as a value of pristine nature. Among the NGOs this perspective is associated with a view that biodiversity conservation should overrule other policy concerns. This is, to some extent, supported in the decision-maker group, as they disagree that conservation cannot hope to save everything. Among researchers, however, the ethical perspective is linked to a support of the precautionary principle.

Perspectives emphasising emotional and spiritual values exist both within the decision-makers and the NGOs. This dimension does not appear to exist among the researchers, when analysed as a common group. However, when analysing natural and social scientists separately, a perspective expressed through emotional values of biodiversity is revealed in the social scientist group.

An ES perspective exists in all groups. Among the researchers, the ES perspective is linked to a pragmatic view on biodiversity conservation, emphasising the need to make “rational” choices. In the NGO group this is expressed as a concern for future food provision, particularly in developing countries. The ES perspective is also clearly expressed in the decision-maker group. In all groups the

ES perspective is associated with placing little emphasis on less tangible values of biodiversity. The analysis shows that the ES framework is now prevalent across the EU Member States participating in this study. It also shows that many other perspectives are clearly expressed among stakeholders in the field. Many of the perspectives express conflicting views on priorities in biodiversity and ES conservation. The results illustrate that the conflicting views cannot be reduced to a conflict between stakeholder groups: while differences exist between stakeholder groups, each group also has a large variation in perspectives on the value of biodiversity.

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## Appendix 1: Material for interviews

### A1.1 Recruitment letter (translate to national language where relevant)

*“Mapping Perspectives on the Linkages Between Biodiversity, Ecosystem Services and Values”*

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information (contact details on reverse). Take time to decide whether or not you wish to take part.

Thank you for reading this.

*What is the project’s purpose?*

This study aims to uncover the different opinions, values and worldviews underlying the various environmental perspectives and attitudes towards biodiversity conservation. Ideally, results will help to establish a common understanding across different perspectives and thus help move forward the policy debate in Europe.

*Why have I been chosen?*

Participants for this study have all been purposely selected on the basis of being actively involved in, or affected by, biodiversity conservation initiatives, and are therefore assumed to have well formed (if potentially divergent) opinions about the topic in question. In all, the study aims to work with between 15 and 20 people each in 9 European Member States.

*Do I have to take part?*

Taking part in this research is entirely voluntary and if you do not wish to participate you do not need to do so. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form). You can still withdraw at any time. You do not have to give a reason.

*How do I take part?*

If you would like to be involved in this research you will be contacted to arrange a time to undertake an interview (at your convenience) that will last between 1 and 1 ½ hours. During this interview you will be asked to read a number of statements about biodiversity, ecosystem services and values, and to sort these statements twice: once according to whether you feel they represent *your thoughts and beliefs* and once according to whether you feel they represent *dominant ways of thinking* among decision-makers involved in biodiversity conservation. All statements are drawn from the biodiversity conservation literature and include statements such as “All species have a right to exist, regardless of their ability to benefit humanity”, “Species are priceless, as are human dignity and freedom” and “If countries do not take the steps necessary to conserve genetic diversity, they will find it increasingly difficult to feed their populations”. Whilst you are sorting these statements you will be asked to discuss your reasons for sorting the statements in the way that you do. Questions will be open ended, for example “why do you feel that this is an important issue?” or “why do you agree with this statement?” There are many different opinions about the rationale for biodiversity conservation, and this study is not looking to judge anyone as right or wrong, the research is simply interested in your opinion. If you do not wish to discuss your reasons for sorting any particular statements, you do not have to.

*Will I be recorded, and how will the recorded media be used?*

Your interview will be recorded in order to help the researcher interpret the results. Transcripts of the audio recordings made during this research will be used only for analysis and for illustration in conference presentations and lectures. You will not be identifiable in the publication of these transcripts. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings.

*What are the possible disadvantages and risks of taking part?*

There are no foreseeable disadvantages to you as a result of taking part in the study.

*What are the possible benefits of taking part?*

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will provide insights into the different ways in which biodiversity practitioners, researchers and policy-makers understand the challenges facing European biodiversity conservation, and perhaps help to shed light on underlying causes of conflict, and point to common ground and potential solutions.

*Will my taking part in this project be kept confidential?*

All the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any reports or publications.

*What type of information will be sought from me, and why is the collection of this information relevant for achieving the research project's objectives?*

You will be asked to provide details about your age, gender, profession, and to describe your involvement with biodiversity research, management and policy processes. This information will be used in the analysis of the results.

*What will happen to the results of the research project?*

The results will form part of a EU research project (Biodiversity and Ecosystem Services: Arguments for our Future Environment; [www.besafe-project.net](http://www.besafe-project.net)). Additionally the researcher will seek to publish these results in academic journals. If you would like a copy of the published results to be sent to you, please tick the appropriate box on the consent form.

*Who is organising and funding the research?*

The research is funded by the European Commission 7<sup>th</sup> Framework Programme and is carried out as a collaboration between 15 European research institutes:

Alterra Wageningen UR (The Netherlands), University of Oxford (UK), Helmholtz Centre for Environmental Research (Germany), Natural Environment Research Council - Centre for Ecology and Hydrology (UK), Swedish University of Agricultural Sciences (Sweden), Aarhus University (Denmark), Economics For The Environment Consultancy Ltd (UK), Finnish Environment Institute (Finland), Szent István University (Hungary), Paris-Lodron University Salzburg (Austria), Pensoft Publishers Ltd (Bulgaria), Research Institute for Nature and Forest (Belgium), Joint Research Centre - European Commission (Italy), The Norwegian Institute for Nature Research (Norway), University of Bucharest (Romania).

### *Contact for further information*

If you have any queries or questions, or would like to discuss any aspect of this study (with no commitment to participate) please do not hesitate to contact us:

**Name**

**Institution**

**Email:**

**Tel:**

If you agree to take part you will be given a copy of this information sheet to keep along with a signed consent form.

Thank you for your time.

### **A1.2 Instructions for completing the Q sort (translate to national language when relevant)**

There are different opinions regarding the rationale for biodiversity conservation and which rationales dominate in policy and land management contexts.

You will be given two identical (but different coloured) packs of 42 cards, each with a statement referring to rationales regarding biodiversity conservation. These statements have been drawn from the literature about biodiversity conservation.

First, please read through all the statements.

Then take one pack of cards and place each statement on chart no. 1 according to how well it matches your own personal thoughts and beliefs about the value of biodiversity conservation, between - 4 (least like I think) and + 4 (most like I think). The question is not so much whether you think the statements are correct in a literal or scientific sense, but how the statements correspond to the way you think, personally, about the value of biodiversity conservation.

After this, please take the other pack of cards and place each statement on chart no. 2 according to how well it matches what you perceive to be dominant ways of thinking about biodiversity conservation among decision-makers, between - 4 (least dominant way of thinking) and + 4 (most dominant way of thinking).

There is no right or wrong answer – this study is interested in your personal opinions and perceptions. Please take the time to consider the position of the statements relative to one another. If you can, please ‘think aloud’ while you sort. Your thoughts about the statements and how they relate to each other will help us interpret the study’s results.

### **A1.3 Interviewer guidelines**

Please read through these guidelines while preparing for each interview.

#### *Arranging an interview*

- Keep the recruitment letter at hand when calling potential participants to arrange an interview. Be prepared to summarise and repeat from the letter if necessary.
- Specify that the interview is expected to last between 1 and 1 ½ hours and encourage the participant to suggest a convenient time and place.

- Mention that the sorting of statements ideally requires some table/desk space and ask if that can be arranged at the suggested location.
- Thank all potential participants, whether they still agree to participate or not, for their time and inconvenience.

#### *Conducting an interview*

- Use the instructions for completing the Q-sort (above) as introduction.
- During the sorts, participants are likely to need occasional reminders of the overall principles behind the sorts – that they are not meant to provide judgements of whether the statements are correct as such, but to score them according to how they correspond to their *personal thoughts and beliefs* about the value of biodiversity conservation and what they perceive as *dominant ways of thinking* about the value of biodiversity conservation among decision-makers.
- Ask questions such as: “Is this what *you* find most valuable about biodiversity?”; “Is this why *you* think it is important to preserve biodiversity?”; “Do you see this as a *dominant* argument for biodiversity conservation among decision-makers?”; “Is this how you think decision-makers *in general* tend to think about biodiversity conservation?”.
- Participants are also likely to need to be reminded to think aloud while sorting. Ask questions such as: “Why do you feel that this is an important issue?” or “Why do you agree with this statement?” If participants are uncomfortable about thinking aloud, do not insist, but encourage gently.
- If respondents have difficulties reading or understanding statements, offer translations of words or sentences, but not interpretations. If necessary, use explanations such as: “There is no right or wrong interpretation of these statements, and many of them can be interpreted in different ways. The idea is that you sort them according to how *you* choose to interpret them – but I am very interested in knowing how you interpret them, and why you sort them the way you do”.
- After both of the Q sorts are completed, ask the participant to draw a line that demarcates agree from disagree in the first sort (chart 1) – it makes little sense to draw such a line in the second sort. Note down this line in the prepared notes chart
- Also note the placement of each statement (numbered) in both sorts in the corresponding notes charts.
- At the end of the interview, ask for background information: age; gender; profession; educational background; involvement with biodiversity research, management and policy processes. Note down this information on notes chart 1.
- Remember to assign each participant a participant number and put it on both notes charts to make sure to be able to match the charts during the process of analysis.
- Thank the participants once again for their time. It may be a good idea to offer a small gift of appreciation as well.

#### *What to bring for interviews*

- Two packs of Q statement cards (in different colours)
- Two large layout sheets (layout sheet 1+2)
- Two notes charts (notes chart 1+2)
- Pen
- Notes paper
- Audio-recorder
- Extra batteries
- Gift of appreciation (optional)

## A1.4 The Q-sort charts

									<b>1</b>
Why invest in biodiversity conservation?									
<b>My personal thoughts and beliefs</b> about the value of biodiversity conservation									
			-1	0	+1				
			-1	0	+1				
			-1	0	+1				
		-2	-1	0	+1	+2			
-4	-3	-2	-1	0	+1	+2	+3	+4	
-4	-3	-2	-1	0	+1	+2	+3	+4	
-4	-3	-2	-1	0	+1	+2	+3	+4	
Least like <b>I</b> think...					Most like <b>I</b> think...				

									<b>2</b>
Why invest in biodiversity conservation?									
<b>Dominant beliefs among decision-makers</b> about the value of biodiversity conservation									
			-1	0	+1				
			-1	0	+1				
			-1	0	+1				
		-2	-1	0	+1	+2			
-4	-3	-2	-1	0	+1	+2	+3	+4	
-4	-3	-2	-1	0	+1	+2	+3	+4	
-4	-3	-2	-1	0	+1	+2	+3	+4	
Least <b>dominant</b> way of thinking...					Most <b>dominant</b> way of thinking...				