Qualitative methods to select choice experiment attributes: the importance of stakeholder participation in a protected area context

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Abstract. The process of selecting attributes for inclusion in choice experiments (CEs) frequently involves qualitative methods such as focus groups and interviews. In order for a CE to be successful and the results to be valid, this qualitative selection process is essential. It often lacks rigor and is poorly described, particularly in environmental CEs. To this end, we propose a meticulous attribute selection process in an environmental context, which includes the design of a discussion guide and a card set. This paper provides a case study describing how attributes were identified and selected for a protected area, the National Park Hoge Kempen (NPHK) in Belgium. We carried out four focus groups and fifteen interviews with various stakeholders of the NPHK to investigate their preferences towards ecosystem services (ES), biodiversity, tourism activities and infrastructure, land uses and management practices. Stakeholders demonstrated preferences for (i) more biodiversity, (ii) more natural forests, (iii) more peace and quiet, (iv) more environmental education, and (v) more clean air. These preferences contribute to the design of CEs. Thoroughly-described qualitative methods support the content validity of a CE, hence the support from future practitioners and decision makers.

1 Introduction

Stated preference surveys have proven to be the most versatile valuation techniques for estimating both use and non-use values (Bennett and Blamey, 2001, Bateman, 2002, Rolfe and Windle, 2015). Choice experiments (CEs), in particular, have been increasingly used in the ecosystem services (ES) and biodiversity domain to elicit public and stakeholder preferences for management interventions and policy changes (Birol and Koundouri, 2008). Survey respondents are presented with several choice tasks consisting of hypothetical alternatives (scenarios) framing an environmental good or service to be valued. These alternatives are composed of attributes and attribute-levels among which trade-offs exist. By choosing their preferred alternative, respondents are assumed to maximize their utility while indirectly expressing their willingness-to-pay (McFadden, 1974).

Across research fields that apply CEs, such as health care, marketing, transportation and environmental economics, the attribute generation process

consists of two initial steps: 1) identify attributes and 2) assign attribute-levels. Attributes influence an individual's decision, thus ignoring relevant attributes in a CE biases findings (Lancsar and Louviere, 2006, Coast *et al.*, 2012). Moreover, as a mission-oriented discipline, stated preference approaches should be user-useful, which requires that practitioners respond to stakeholder needs from the start and collaborate to achieve the protection of ES and guarantee the flow of these ES to beneficiaries (Cowling *et al.*, 2008). A sound attribute selection process, that entails both detailed reporting and rigorous performing of qualitative methods, can reduce the complexity of choice tasks and therefore the cognitive burden associated with CEs (Rolfe *et al.*, 2004). The latter issues may arise when respondents are asked to trade between multifaceted and unfamiliar goods and services such as those generally involved in environmental valuation (Hoyos, 2010). The initial stage of any stated preference valuation study has to be grounded on some kind of social elicitation process in order to inform environmental or other public policy decision-making (Brouwer *et al.*, 1999). This stage is essential if the problem of stakeholder unfamiliarity that might occur when using stated preference valuation methods is to be surmounted (Hein *et al.*, 2006, Barkmann *et al.*, 2008, Cowling *et al.*, 2008). Brouwer et al. (1999) demonstrated that CE respondents favoured participatory approaches, here a combination of personal interviews and group discussions, to inform environmental decision-making process. Hence, obtaining attributes to build a CE requires a rigorous selection process.

Attribute identification and assigning attribute levels should be performed using qualitative approaches, due to their suitability to identify attributes for CEs (Bateman, 2002, Coast *et al.*, 2012, Kløjgaard *et al.*, 2012). Qualitative research methods include literature reviews, visits to the study area, exploratory surveys, expert opinions, key informants, existing conceptual and policy relevant outcome measures, focus groups and interviews (Bateman, 2002, Blamey *et al.*, 2002, Coast *et al.*, 2012, Abiiro *et al.*, 2014). Recent papers in health economics call for detailed reporting on the processes of attribute generation for CEs and argue that qualitative studies are best suited to derive attributes, since they reflect the perspective and experiences of the potential beneficiaries (Coast and Horrocks, 2007, Ryan *et al.*, 2009, Coast *et al.*, 2012, Kløjgaard *et al.*, 2012, Hiligsmann *et al.*, 2013, Abiiro *et al.*, 2014, Michaels-Igbokwe *et al.*, 2014). They agree that a list of possible attributes can be generated a priori from the literature, and that this list must be upgraded through participative processes, such as focus groups, expert consultations and pilot testing.

In the environmental economics domain, we are only aware of Armatas et al. (2014) who documented a detailed attribute selection process. They applied the Q-methodology, a non-monetary preference elicitation technique that can highlight ES that are suitable for valuation and salient to a wide range

of stakeholders. Additionally, it allows a statistical analysis of the data (Armatas *et al.*, 2014). Environmental CE studies that have applied qualitative methods to select attributes generally combine them with other methods, such as previous research, expert consultation, discussions, consultations, focus groups, and interviews. However, where qualitative methods are applied for attribute generation, very often little or no description is provided, thus leaving room for doubt regarding whether these are meticulously performed (Coast *et al.*, 2012, Abiiro *et al.*, 2014, Armatas *et al.*, 2014). Environmental CE studies which do not perform qualitative work assume that selecting attributes based on previous work, literature review or "discussions" suffices (Li *et al.*, 2004, Rajmis *et al.*, 2009, Liu and Wirtz, 2010). We observed that information such as the time and the type of stakeholders required to perform the qualitative work are also frequently lacking.

This paper responds to and builds on the afore mentioned health and ecological economics studies. We contribute to the need for more accurately defined procedures for qualitative research prior to CE design by documenting a study carried out in a national park in Belgium. We propose a user-friendly process for selecting attributes from the most frequently used, but poorly described and most likely poorly performed qualitative techniques, i.e. focus groups (FGs) and individual interviews (INTs). This study provides a meticulous approach to qualitative research to support the selection of attributes for environmental CEs.

The remainder of this paper is organized as follows. In Section 2, we first describe our case study, outline the rationale for the research methods chosen, and propose a framework for the identification and selection of CE attributes. Then, we thoroughly outline our approach in six successive stages, including the results. In Section 3, we discuss the results, while Section 4 holds the conclusion and provides general recommendations.

2 Attribute selection process

Study setting

The study was focused on the National Park Hoge Kempen (NPHK), located in the Province of Limburg in the East of Belgium (Fig. 1). This young national park (inaugurated in 2006) is surrounded by six municipalities with a total of about 163,500 inhabitants, equivalent to a population density of 450/km^2 (average density in Flanders 539/km^2). The first and only Belgian national park covers an area of approximately 6000 ha with a rich variety of habitats, including heathlands. This cultural North-European landscape, rich in biodiversity, has experienced a drastic surface reduction in the past decades due to urbanisation and tree planting for the coal mining industry.

Like the majority of protected areas worldwide, the NPHK relies largely on domestic governmental budget for ES and biodiversity conservation, habitat restoration and visitor management. In the European Union, financing the costs to achieve these objectives is a highly debated political issue (Hoyos *et al.*, 2012). Further empirical data are necessary to demonstrate public preferences for different management options of protected areas. Showing the benefits of protecting and conserving the NPHK could raise awareness and influence local stakeholders' attitudes toward supporting protected areas. A stated preference economic valuation captures these preferences and can elicit the socio-economic benefits - or Total Economic Value (TEV) - of the park, and hence the potential development of conservation payment mechanisms. The economic valuation - the choice experiment (CE) – implies that stakeholders need to be consulted to express their preferences for the park's characteristics that may be included in the CE. Stakeholder participation for assessing the needs of the local community has been frequently recommended and named a success factor of natural resource management and protected area tourism (Millennium Ecosystem Assessment, 2005, Dudley, 2008, Liu *et al.*, 2010, Maynard *et al.*, 2014). Combining the stakeholders' wide-ranging objectives and their variable level of awareness and knowledge about ES and biodiversity is a key milestone in successful park management (Dudley, 2008). Consequently, the diversity of stakeholder perceptions, knowledge, and preferences for management options (*e.g* increase vs maintenance of current visitor facilities, conservation interventions, accessibility) needs to be reflected in qualitative work.

The lack of empirical evidence on a specified demand for biodiversity conservation, ES and protected area management in Belgium is the gap in literature. Moreover a CE can be valuable for park managers that aim to design alternative financing mechanisms, such as Payments for Ecosystem Services (PES), which reflect the preferences of the park stakeholders and the public's willingness-to-pay for park conservation.

For this study, we conducted focus group discussions (FGs) and semi-structured interviews (INTs) with various stakeholders of the NPHK. Stakeholders' perceptions were investigated for different categories of park characteristics: ES (cultural, provisioning, regulating and habitat), park and tourism infrastructure, land use and management interventions. Characteristics were not restricted to ES *per se* in order to avoid miscomprehension of the respondents given that a majority is unfamiliar with the ES concept (Barkmann *et al.*, 2008, Armatas *et al.*, 2014). First, we present a framework for attribute selection. Second, we propose a user-friendly attribute selection protocol consisting of 6 stages: 1) stakeholder sampling and identification of park characteristics, 2) creation of a card set and a discussion guide, 3) data collection through FGs and INTs, 4) qualitative data analysis, 5) results, and 6) selection of potential CE attributes.

Framework for the identification of CE attributes

There is no 'gold standard' for the generation and definition of attributes (Louviere *et al.*, 2000). However, attributes for a CE should be chosen in such a way that they reflect the perspectives of both the public (demand-relevant) and the decision makers/resource managers (policy-relevant), have a sound scientific basis (measurable), and conform to Lancaster's theory of value (Lancaster, 1966, Blamey *et al.*, 2002, Ryan *et al.*, 2009, Abiiro *et al.*, 2014). Researchers should clearly consider two phases of attribute development: 1) initial attribute development and 2) the generation of meaningful wording (Coast *et al.*, 2012). Phase one, the identification of initial attributes, should be informed by a thorough literature review on the study topic to obtain attributes which can potentially be included in a CE. Identifying attributes exclusively on the basis of a literature review may lead to the omission of attributes considered important to the study population (Coast *et al.*, 2012). Consequently, in phase two, a rigorous qualitative study identifies initial attributes important to stakeholders and contributes to reduce misspecification of attributes and invalid CE estimates (Coast *et al.*, 2012, Abiiro *et al.*, 2014).

Several studies in health economics (Coast and Horrocks, 2007, Coast *et al.*, 2012, Kløjgaard *et al.*, 2012, Abiiro *et al.*, 2014, Michaels-Igbokwe *et al.*, 2014) and one in ecological economics (Armatas *et al.*, 2014) highlight the need for rigorous and thorough reporting of respondent preferences to be accounted for in stated preference surveys and the lack thereof. They stated that the most frequently used qualitative methods, such as FGs and INTs, are poorly described due to the lack of methodological standards. FGs are carefully planned discussions designed to explore subjects' perceptions on a specific topic in a neutral setting. Comprising up to 12 participants, FGs are conducted by a trained moderator who follows a discussion guide (Kaplowitz, 2001). The group is 'focused' in that it entails some sort of collective activity, here a ranking exercise. This group interaction is used to generate data (Barbour and Kitzinger, 1999). Our attribute selection process is a response to the call expressed in these studies.

The methodological framework is operationalized in our case study in 6 stages.

Stage 1: Park characteristic and stakeholder identification

A preliminary list of park characteristics was developed using official ES classifications (MEA, CICES and (de Groot *et al.*, 2002). From the grey literature, books and reports on the study area were examined. Including every single park characteristic is unrealistic. Therefore, the selection process necessitates rigour and extended expert consultation to ensure that the card set includes the most relevant and representative characteristics of the park. Three

pilot focus groups with lay people (environmental economics research team, relatives, potential park visitors) and respectively three and four expert meetings with park managers, and university researchers (ecologists, biologists and economists) were held to improve definitions of park characteristics and to identify additional ones that were not encountered during the literature review. We identified a final list of 52 characteristics: 18 cultural services, 5 regulating services, 3 provisioning services, 2 habitat/supporting services, 5 land use types, 9 infrastructure- and 9 management-related characteristics (Tab. 1). According to the Research Institute for Nature and Forests (INBO), who tested with 38 cards, participants would start showing signs of fatigue and boredom with a too large number of cards. Knowing that, we decided to limit the card set to 52 items.

Table 1. List of 52 park characteristics

Characteristic category	***From literature review on ES, expert meetings with park managers and researchers (biologists, economists)***
	Park characteristics
Cultural services	
Recreation	Biking, Hunting, Fishing, Wildlife spotting, Mountain biking, Walking, Jogging, Dog walking, Horseback riding
Scenery	Landscape variety, Panoramic view
Heritage	UNESCO, Cultural heritage
Research & Education	Research opportunities, Education, Youth activities
Spiritual	Peace and quiet, Conservation of plants and animals, Social interactions
Regulating services	Groundwater storage, Carbon storage, Pollination, Water purification, Air purification
Provisioning services	Wood, Sand, Drinking water
Habitat services	Biodiversity refuge, Soil fertility
Land-use types	Heathlands, Natural forests, Wetlands, Pine forests, Agricultural land
Management interventions	Restoration of disturbed habitats, Ecological defragmentation, Hunting, Grazing horses, Control of invasive species, Presence of wild boar
Infrastructure	
Tourism	B&Bs, Hotels, Camping & Holiday park, Local products, Gateway attractions, Art
Park	Connectivity between areas, Accessibility public transport, Signposting

This list was not restricted to ES *per se* in order to avoid miscomprehension of the respondents given that a majority is unfamiliar with the ES concept (Barkmann *et al.*, 2008, Armatas *et al.*, 2014). Though, all 52 characteristics can be directly or indirectly associated to an ES category. The CE is then the way to estimate the value of the attributes behind an ecosystem service (e.g. a CE accounts for the importance of landscape variety, cultural heritage, or recreational activities) (García-Llorente *et al.*, 2012). For the FGs and INTs, stakeholder participants were selected by maximum variation sampling: internet-based research of the study area, meetings with park managers and snowball sampling during the actual data collection. Like Armatas et al. (2014), we aimed at a diversity rather than a quantity of opinions, namely surveying between 40 and 60 participants. Through this purposive sampling saturation was reached.

Stage 2: Creation of a card set and a discussion guide

We presented the characteristics in a way that is easily understood by respondents unfamiliar with ES and biodiversity features. We built on the approaches of Armatas et al. (2014) and the Belgian Institute for Nature and Forest (INBO, 2014). Similarly, we created a visual card set to obtain preferences of the park stakeholders for the 52 characteristics. People seem to grasp the concepts faster and more clearly when visual examples are given, being on screen, on pictures or on maps (Petheram and Campbell, 2010). It also reduces confusion and the cognitive demand on respondents (Cerda *et al.*, 2013). The cards presented real photographs from the NPHK and were numbered 1 to 52. The card set was the support material for a rank ordering exercise to be completed during the FGs and INTs (Stage 3). A 12-page discussion guide was then designed to include the instructions of the exercise, the definitions of the cards and possible associated questions, and the description of the overall study. This guide ensured that moderators acquire background information on the research topic and become familiar with the card set. The moderator is then able to comment in perspective and provide clarification to the participants. This step is particularly important if the moderation is the task of someone other than the researcher and guarantees uniformity across all FGs and INTs (Krueger and Casey, 2000).

Stage 3: Data collection - focus groups and interviews

Between October 2014 and January 2015, 4 FGs and 14 INTs were conducted. The qualitative process was comprised of two parts: 1) a ranking exercise and 2) an interactive discussion. The first part aimed at ranking the 52 characteristics on a scale from ‘most important’ (score 1) to ‘not important at all’ (score 5), and hence, obtain a list of preferred characteristics. For FGs,

the moderator was assisted by a note taker and a computer manager. A slide show consisted of three introductory slides and the card set was projected. The displayed cards were linked to the polling software TurningPoint. Each participant held a voting remote to assign an importance score to each card. This exercise resulted in a ranking of the characteristics projected, based on the mean scores of the group. TurningPoint is a powerful way to collect data quickly from large groups of participants. It does not only keep participants awake, but also keeps them engaged and interested in presentation material. Participants could interact with each other and TurningPoint allowed them to make changes to their original vote as a consequence of group discussion.

In the second section, participants had to discuss the outcomes of the voting and were given the opportunity to make changes and to identify potentially missing important characteristics. This interactive discussion further informed us about the respondents' rationale for categorisation of the park characteristics and about their level of understanding. At the end of the discussion, they had to reach consensus upon the most important park characteristics. Among these top characteristics, they specified those that require intervention by responding '*Yes*' or '*No*' to the question '*Should there be more in terms of quality or quantity?*'. Stakeholders can find a characteristic important and be satisfied with its current state. If they express to willingness for change, a characteristic cannot be included in a CE as one can only value changes. '*Not applicable*' was a possible answer when the situation of the characteristic was unknown or not quantifiable, such as 'UNESCO designation'. Hereafter, these characteristics are defined as demand-relevant.

INTs were conducted in a similar manner using the same cards with a 10x8cm format and assembled into a card deck. FGs and INTs took about 1h30 (30 minutes polling, 1 hour discussion) and 45 minutes respectively. To conclude, each participant filled out a consent form that included background socio-demographic questions (age, occupation, residence, work place, visit frequency to the park, residence duration if residing in one of the six municipalities surrounding the park). All FGs and INTs were tape-recorded, transcribed and translated into English for analysis.

Stage 4: Qualitative data analysis

The ranking lists of all focus groups and interviews were obtained by simple arithmetic mean (Kaplowitz and Hoehn, 2001). The final ranking is based on the aggregated mean scores. The 'very important' park characteristics (scored mostly '1') were retained, as well as the ones obtaining a ' *Yes*' to the question '*Should there be more?*'. These selection criteria reveal stakeholder-relevant characteristics and reduce them to a number clearly more manageable for CE attribute selection.

FGs and INTs were analysed using tape-based and note-based analysis, wherein we created an abridged transcript of the relevant and useful portions of the discussion. We opted for an abridged transcript due to the researchers' thorough understanding of the purpose of the study (Krueger and Casey, 2000). An abridged transcript is much shorter (it focuses exclusively on important portions) than a full transcript in a transcript-based analysis (entire discussion). Our transcript required 2 to 4 hours given that most information was revealed during the interactive discussion. The content of the transcripts is exclusively used to support the wording and definitions of attributes to be used in the CE.

Stage 5: results

Analysis of the ranking exercise

In total, 46 stakeholders participated in the FGs and INTs (Tab. 2). These included: 26 males (54%) and 21 women (46%); 64% aged 46 and above; 57% lives in one of municipalities surrounding the park (park residents) and 43% in the rest of the province of Limburg. The majority of residents (79%) have resided in the park's vicinity for over 20 years. Stakeholders were grouped into 9 different organisations.

Perceptions regarding the importance of park characteristics were evaluated considering one factor: stakeholder organisation. Differences among organisations were tested with a non-parametric Kruskal-Wallis test using IBM SPSS Statistics 22.

Table 2. Profile of the participating stakeholders

Stakeholder organisation	**N**	**Gender**	**N**	**Age**	**N**	**Residence**	**N**
Park office managers	6	Males	25	18-45	15	Six municipalities around the NPHK	26
Tourism enterprises	8	Females	21	46-55	20	Since 0-10 years	2
Local government	10			56-65	4	Since 10-20 years	6
Regional government agency	1			65+	7	Over 20 years or always	18
University	2					Other municipalities	20
Private land owner	1						
Industry	3						
Nature organisation	13						
Residents	2						
Total	**46**						

Stakeholders' perceptions regarding the importance of the NPHK's characteristics are shown in Table 3. Considering the mean score of all stakeholders for the 52 characteristics, 7 achieved a score of 'very important' (mean score 1-1.5), 25 of 'important' (1.51-2.5), 17 of 'neutral' (2.51-3.5) and 3 were 'less important' (3.51-4.5). For the 'very important' characteristics, differences among stakeholder organisations are found for 'biodiversity refuge' (Kruskal-Wallis test, $P < 0.013$) and 'heathlands' ($P < 0.015$). The industry and the residents were the groups that assigned the lowest scores overall.

Table 3. Stakeholders' perceptions regarding the importance of the NPHK's characteristics (here top-15). Values are the mean of all stakeholders + standard deviation (SD). A Kruskal-Wallis test was used to calculate the differences among stakeholder groups.

Characteristic	**Mean**		**Kruskal-Wallis test**		**H_0=distribution is same across groups**
	Score (1-5)	SD	χ^2 (df=8)	P-value	
Nature conservation	1.17	0.437	14.936	.06	Yes
Natural forests	1.17	0.437	15.028	.059	Yes
Biodiversity refuge	1.2	0.401	19.314	.013	No[a]
Wetlands	1.37	0.572	13.328	.101	Yes
Landscape variety	1.43	0.688	14.053	.08	Yes
Heathlands	1.46	0.959	18.992	.015	No[b]
Air purification	1.5	0.624	10.846	.211	Yes
Education	1.52	0.809	8.052	.428	Yes
Walking	1.54	0.836	13.334	.101	Yes
Peace and quiet	1.59	0.858	11.57	.171	Yes
Water purification	1.72	0.861	11.574	.171	Yes
Defragmentation	1.74	0.976	11.692	.165	Yes
Connectivity	1.76	0.822	2.393	.967	Yes
Restoration of disturbed habitats	1.76	0.993	8.293	.405	Yes
Groundwater storage	1.8	0.885	13.126	.108	Yes

PAM = park office managers, UNI = scientists, PRI = private land owners, REG = Regional government agency, MUNI = local government (municipalities), TOUR = tourism businesses, VOL = volunteering nature organisations, RES = residents/sportspersons, IND = industries.

[a] PAM (1.0) = UNI (1.0) = PRI (1.0) = REG (1.0) ≥ MUNI (1.1) ≥ TOUR (1.13) ≥ VOL (1.21) > RES (2.0) > IND (2.0)

[b] PAM (1.0) = UNI (1.0) = PRI (1.0) = REG (1.0) = TOUR (1.0) ≥ MUNI (1.2) > VOL (1.93) > RES (2.0) > IND (3)

Outcome of the interactive discussion

The majority of respondents answered in favour of more actions regarding biodiversity refuge (74.5%), plant and animal conservation (72%), peace and quiet (68%), natural forests (66%), air purification (64%), ecological defragmentation (57%) and education (53%). All categories of ES are represented as well as 'ecological defragmentation' from the management category. The current amount of heathlands and wetlands as well as the level of landscape variety were satisfactory (Tab. 4).

Table 4. Demand –relevant characteristics (assigned a *'Yes'*)

Characteristic	Category	Proportion of positive respondents
Natural forests	Land use	66%
Air purification	Regulating service	64%
Peace and quiet		68%
Plant and animal conservation	Cultural service	72%
Education		53%
Biodiversity refuge	Habitat/supporting service	74.5%
Ecological defragmentation	Management action	57%

The transcripts revealed the rationale for the respondents' choices. They seized the meaning of the 52 cards and clearly explained their preferences.

Regulating ES appeared more difficult to understand. Respondents often showed a lack of knowledge regarding their role and function in the park.

Some respondents mentioned certain characteristics as being important policy items, such as the creation of more unmanaged broadleaf forests, wildlife disturbance, monitoring of groundwater level, and the control of invasive species. No new characteristics were suggested during the FGs and INTs.

Stage 6: selection of final characteristics as potential CE attributes

This step consists in combining and reducing the top-ranked characteristics to a number of attributes manageable within a CE. Characteristics that are rated positively by all stakeholder organisations can be judged highly relevant for inclusion in a valuation survey and are likely to be well-understood and valued by respondents. For example, 'biodiversity refuge', 'natural forests' and 'education' are among those that were positively rated by most participants. Characteristics that are perceived as rather neutral (scored 2.51-3.5) should not be candidates for inclusion in a CE (Armatas *et al.*, 2014). This was the case for tourism accommodations, art and wood. Characteristics that are rated negatively may also be candidate for a CE, since they may be

perceived as threatening. Fishing, sand (from extraction) and hunting (as a hobby) obtained the most negative scores. The transcripts can also reveal policy-relevant attributes that are not necessarily demand relevant, which is beneficial considering the need to include attributes that are both demand and policy relevant. For instance, 'pine forests' is not demand relevant for most stakeholder organisations, but is of policy and management concern for the NPHK. The reduction process can be guided by the following inclusion-exclusion criteria, whereby attributes for environmental CE should be:

- in accordance with the methodological foundations of CE (Blamey *et al.*, 2002)
- not too close to the latent construct that the CE is investigating (*e.g.* utility) (Coast *et al.*, 2012)
- extrinsic to a person's personality and experimentally manipulable by intervention (Coast *et al.*, 2012)
- not overlapping other attributes (to avoid inter-attribute correlation) / attributes should be independent or nearly independent of one another / mutually exclusive in nature (Coast *et al.*, 2012, Abiiro *et al.*, 2014)
- policy-relevant (Blamey *et al.*, 2002, Ferrini and Scarpa, 2007)
- demand-relevant: important, understandable and meaningful to people and relate to their reasons for having willingness-to-pay to conserve biodiversity and ES (Blamey *et al.*, 2002, Lancsar and Louviere, 2006)
- measurable (Blamey *et al.*, 2002, Zander and Drucker, 2008)
- ecologically and economically relevant (Johnston *et al.*, 2012)
- describable by combining simple explanations and visual instruments such as photographs, charts, and pictures (Cerda and Losada, 2013)
- limited to a number between 4 and 8 because trade-offs become difficult to understand (Abiiro *et al.*, 2014)

There is no standard rule for the combination and reduction of attributes (Louviere *et al.*, 2000). The attribute selection depends on the study topic and the results the researcher aims to obtain from the CE. In our case, we will calculate the willingness-to-pay of the park visitors for ES and biodiversity deriving from the NPHK.

The presence of different categories of characteristics (i.e. land use types, management practices and ES) with varying geographical scales makes the scaling down complicated. We used ES classifications as the baseline to refine the top-ranked characteristics and to best seize the interactions/bundles between them. We used ES as indicators to understand these interactions. For the non-ES characteristics we identified to which important ES they are associated/linked. For example, we identified what are the most important ES provided by the preferred land use types 'natural forests', 'heathlands' and 'wetlands'. As for the management category 'ecological defragmentation' it can be associated to ES such as 'biodiversity refuge' and 'nature

conservation'. **Fig. 1** displays the interactions between the 12 top-ranked characteristics and the ES contained in the card set.

Next, the researcher selects attributes to design choice sets of mutually exclusive hypothetical alternatives. The final selection is obtained after using the opinion of experts (e.g. CE practitioners, economists and ecologists) to evaluate the proposed interactions and potential inconsistencies between attributes. In spite of being context specific, this step can be presented as a framework. An identical qualitative approach is very likely to produce totally different choice sets when applied in another context. In this regard, our approach remains broad and avoids revealing the final attributes and levels.

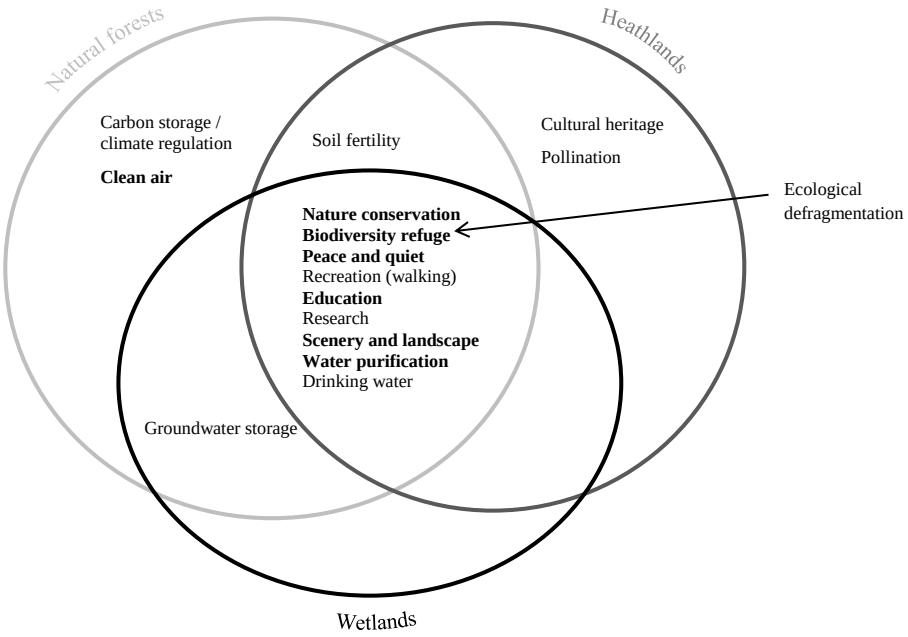

Fig. 1. ES provided by the preferred land use types. In bold, the ES preferred by the park stakeholders.

3 Discussion

This paper contributes to the literature on CE attribute selection. We design a meticulous process for deriving attributes for a CE to elicit preferences for a protected area's goods and services in Belgium. The initial list of 52 characteristics appeared to be understandable and important in the eyes of park stakeholders. The qualitative process provided a ranking of preferences (most to least preferred) for the various characteristics, as well as transcripts that revealed the rationale for the ranking. Stakeholders made bundles of

characteristics. For example, they were unanimous regarding the important role of the NPHK for biodiversity, nature conservation and landscape beauty, whereby these characteristics appeared very frequently together in top of the ranking list. The transcripts also revealed that regulating services were more difficult to comprehend. The majority of respondents ignored the situation of groundwater storage, carbon storage and soil fertility. The intangibility of these ES certainly explains the lower score compared to land-use and biodiversity characteristics for which a direct observation is possible. Abstract or intangible ES prove difficult to practically quantify and measure. Therefore, the inclusion of descriptions and bundles raised by stakeholders makes the incorporation of these types of ES (e.g. scenic enjoyment) more malleable and grounded (de Chazal *et al.*, 2008). The CE will be particularly useful because of its ability to quantify such intangible values, and its ability to estimate these values, simultaneously for a set of different attributes (Bennett and Blamey, 2001, Rogers *et al.*, 2013).

Although final CE attributes require to meet a series of inclusion-exclusion criteria, the researcher has some liberty toward the attribute selection. Also, the question of how much or little qualitative work is needed before designing a CE is largely context-specific (Kløjgaard *et al.*, 2012). In environmental CEs, attributes may represent land use types (Hoyos, 2010, Shoyama *et al.*, 2013), ES (Barkmann *et al.*, 2008), biodiversity features such as plant and animal species (Cerda *et al.*, 2013), tourism facilities and activities (Chaminuka *et al.*, 2012), and geographical attributes such as location and size (Rolfe *et al.*, 2000). The challenge is to construct choice tasks that enhance the CE content validity. A mixture of qualitative methods, literature review and expert appraisal is therefore essential for the selection of stakeholder-, policy-, ecologically and economically relevant attributes. Collaboration with experts (economists and ecologists) is highly recommended to obtain a final combination of attributes, that do not overlap.

Limitations

There were some limitations in conducting this qualitative process to select CE attributes. The respondents did represent a wide range of stakeholders; however, some stakeholder groups consisted of only one participant (e.g. private land owners and regional government agency). Although differences in perceptions within organisations exist, we assume that the opinion of the single stakeholder is representative of the entire category.

A second limitation was the unfamiliarity of participants with certain ES, an issue previously investigated by Barkmann et al. (2011). Clarification was provided for ES such as ‘groundwater storage’ and ‘soil fertility’, that tented to cause confusion. We are aware that the card set photographs and titles may have influenced the participants’ preferences. Although misspecification of

attributes is still possible using qualitative work, the rigorousness of the data collection process reduces that risk (Kløjgaard *et al.*, 2012).

Thirdly, participants had the possibility to assign high scores to all characteristics. Here, 32 characteristics (61%) were scored 'very important' and 'important'. The unrestricted assignment of high scores seems to be problematic when reducing a large number of characteristics to a number of attributes manageable to be inserted in a CE survey (Armatas *et al.*, 2014). The assignment of high scores is certainly due to participants' positive attitude towards ES and biodiversity.

4 Conclusion

This study builds on the identification of park characteristics from literature and expert consultations to design a methodological framework that assists in the meticulous selection of CE attributes using focus groups and interviews. So far, a limited number of scholars published on the lack of rigorous reporting of the attribute selection process.

We demonstrate how six stages, including the use of focus groups and interviews, significantly guided attribute selection. The initial stage was based on a literature review and expert opinions and led to the identification of 52 park characteristics that were perceived to be representative of our case study, the National Park Hoge Kempen in Belgium. The second stage consisted in the design of a discussion guide to support moderators. The third stage included FGs and INTs with various stakeholders who expressed their preferences for park characteristics to be potentially included as attributes in a CE. We found a diversity in the preferences of different groups. For the elicited economic information to be relevant, it is advised that this diversity is investigated in detail. Stage 4 and 5 revealed the rationale for the participants' preferences and the park characteristics that require intervention. In stage 6, we selected the park characteristics as final candidates for CE attributes.

Our attribute selection process can reveal ES and other characteristics that are important to a large panel of key stakeholders, being at the national, regional and local level. Additionally, it shows that qualitative methods are an essential tool to identify and select environmental goods and services for inclusion in non-market valuations such as CEs. Our methodological process is particularly useful in natural area management contexts where many stakeholders are involved. Our methodological choices are easily replicable and adaptable, and provide guidance for future environmental CEs. The framing of the FGs and INTs may influence stakeholders' responses, hence the need to design a standardized protocol to ensure both methods produce similar responses. Stakeholders who will affect or will be affected by the future management decisions need to be consulted. Environmental CE researchers need to consider stakeholder engagement as an essential step to

understand their perceptions of the current and potential development scenarios, as well as to gain future support. Attribute selection approaches should be preferably mixed, and meticulously reported to help practitioners and show how the results can be used to guide environmental management and policy decisions.

References

Abiiro, G., G. Leppert, G. Mbera, P. Robyn and M. De Allegri (2014). "Developing attributes and attribute-levels for a discrete choice experiment on micro health insurance in rural Malawi." BMC Health Services Research 14(1): 235.

Armatas, C. A., T. J. Venn and A. E. Watson (2014). "Applying Q-methodology to select and define attributes for non-market valuation: A case study from Northwest Wyoming, United States." Ecological Economics 107(0): 447-456.

Barbour, R. S. and J. Kitzinger (1999). Developing Focus Group Research: Politics, Theory and Practice, SAGE Publications.

Barkmann, J., K. Glenk, A. Keil, C. Leemhuis, N. Dietrich, G. Gerold and R. Marggraf (2008). "Confronting unfamiliarity with ecosystem functions: The case for an ecosystem service approach to environmental valuation with stated preference methods." Ecological Economics 65(1): 48-62.

Bateman, I. J. C., R. T.; Day, B.; Hanemann, M.; Hanley, N.; Hett, T.; Jones-Lee, M.; Loomes, G.; Mourato, S.; Özdemiroğlu, E.; Pearce, D. W.; Sugden, R.; Swanson, J. (2002). Economic valuation with stated preference techniques: a manual.

Bennett, J. and R. Blamey (2001). The Choice Modelling Approach to Environmental Valuation. Cheltenham, Edward Elgar Publishing.

Birol, E. and P. Koundouri (2008). Choice Experiments Informing Environmental Policy: A European Perspective, Edward Elgar Publishing, Incorporated.

Blamey, R. K., J. W. Bennett, J. J. Louviere, M. D. Morrison and J. C. Rolfe (2002). "Attribute Causality in Environmental Choice Modelling." Environmental and Resource Economics 23(2): 167-186.

Brouwer, R., N. Powe, R. K. Turner, I. Bateman and I. H. Langford (1999). "Public attitudes to contigent valuation and public consultation." Environmental Values 8: 325-347.

Cerda, C. and T. Losada (2013). "Assessing the value of species: a case study on the willingness to pay for species protection in Chile." Environ Monit Assess 185(12): 10479-10493.

Cerda, C., A. Ponce and M. Zappi (2013). "Using choice experiments to understand public demand for the conservation of nature: A case study in a protected area of Chile." Journal for Nature Conservation 21(3): 143-153.

Chaminuka, P., R. A. Groeneveld, A. O. Selomane and E. C. van Ierland (2012). "Tourist preferences for ecotourism in rural communities adjacent to Kruger National Park: A choice experiment approach." Tourism Management 33(1): 168-176.

Coast, J., H. Al-Janabi, E. J. Sutton, S. A. Horrocks, A. J. Vosper, D. R. Swancutt and T. N. Flynn (2012). "Using qualitative methods for attribute development for

discrete choice experiments: issues and recommendations." Health Economics 21(6): 730-741.
Coast, J. and S. Horrocks (2007). "Developing attributes and levels for discrete choice experiments using qualitative methods." Journal of Health Services Research & Policy 12(1): 25-30.
Cowling, R. M., B. Egoh, A. T. Knight, P. J. O'Farrell, B. Reyers, M. Rouget, D. J. Roux, A. Welz and A. Wilhelm-Rechman (2008). "An operational model for mainstreaming ecosystem services for implementation." Proceedings of the National Academy of Sciences 105(28): 9483-9488.
de Chazal, J., F. Quétier, S. Lavorel and A. Van Doorn (2008). "Including multiple differing stakeholder values into vulnerability assessments of socio-ecological systems." Global Environmental Change 18(3): 508-520.
de Groot, R. S., M. A. Wilson and R. M. J. Boumans (2002). "A typology for the classification, description and valuation of ecosystem functions, goods and services." Ecological Economics 41(3): 393-408.
Dudley, N. E. (2008). Guidelines for Applying Protected Area Management Categories. Gland, World Conservation Union (IUCN).
Ferrini, S. and R. Scarpa (2007). "Designs with a priori information for nonmarket valuation with choice experiments: A Monte Carlo study." Journal of Environmental Economics and Management 53(3): 342-363.
García-Llorente, M., B. Martín-López, I. Iniesta-Arandia, C. A. López-Santiago, P. A. Aguilera and C. Montes (2012). "The role of multi-functionality in social preferences toward semi-arid rural landscapes: An ecosystem service approach." Environmental Science & Policy 19–20(0): 136-146.
Hein, L., K. van Koppen, R. S. de Groot and E. C. van Ierland (2006). "Spatial scales, stakeholders and the valuation of ecosystem services." Ecological Economics 57(2): 209-228.
Hiligsmann, M., C. van Durme, P. Geusens, B. G. C. Dellaert, C. D. Dirksen, T. van der Weijden, J.-Y. Reginster and A. Boonen (2013). "Nominal group technique to select attributes for discrete choice experiments: an example for drug treatment choice in osteoporosis." Patient preference and adherence 7: 133-139.
Hoyos, D. (2010). "The state of the art of environmental valuation with discrete choice experiments." Ecological Economics 69(8): 1595-1603.
Hoyos, D., P. Mariel, U. Pascual and I. Etxano (2012). "Valuing a Natura 2000 network site to inform land use options using a discrete choice experiment: An illustration from the Basque Country." Journal of Forest Economics 18(4): 329-344.
Johnston, R. J., E. T. Schultz, K. Segerson, E. Y. Besedin and M. Ramachandran (2012). "Enhancing the content validity of stated preference valuation : the structure and function of ecological indicators." Land economics : a quarterly journal of planning, housing & public utilities 88(1, (2)): 102-120.
Kaplowitz, M. D. (2001). "Assessing mangrove products and services at the local level: the use of focus groups and individual interviews." Landscape and Urban Planning 56(1–2): 53-60.
Kaplowitz, M. D. and J. P. Hoehn (2001). "Do focus groups and individual interviews reveal the same information for natural resource valuation?" Ecological Economics 36(2): 237-247.

Kløjgaard, M. E., M. Bech and R. Søgaard (2012). "Designing a Stated Choice Experiment: The Value of a Qualitative Process." Journal of Choice Modelling 5(2): 1-18.
Krueger, R. A. and M. A. Casey (2000). Focus Groups. A Practical Guide for Applied Research (3rd Edition), Thousand Oaks, CA: Sage Publications.
Lancaster, K. (1966). "A new approach to consumer theory." Journal of Political Economy 74: 132-157.
Lancsar, E. and J. Louviere (2006). "Deleting 'irrational' responses from discrete choice experiments: a case of investigating or imposing preferences?" Health Economics 15(8): 797-811.
Li, C.-z., J. Kuuluvainen, E. Pouta, M. Rekola and O. Tahvonen (2004). "Using Choice Experiments to Value the Natura 2000 Nature Conservation Programs in Finland." Environmental and Resource Economics 29(3): 361-374.
Liu, S., R. Costanza, S. Farber and A. Troy (2010). Valuing ecosystem services Theory, practice, and the need for a transdisciplinary synthesis. Ecological Economics Reviews. K. Limburg and R. Costanza. 1185: 54-78.
Liu, X. and K. W. Wirtz (2010). "Managing coastal area resources by stated choice experiments." Estuarine Coastal and Shelf Science 86(3): 512-517.
Louviere, J. J., D. A. Hensher and J. D. Swait (2000). Stated Choice Methods: Analysis and Applications. Cambridge University Press.
Maynard, S., D. James and A. Davidson (2014). "Determining the value of multiple ecosystem services in terms of community wellbeing: Who should be the valuing agent?" Ecological Economics(0).
McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. New York, Frontiers in Econometrics Academic Press.
Michaels-Igbokwe, C., M. Lagarde, J. Cairns and F. Terris-Prestholt (2014). "Using decision mapping to inform the development of a stated choice survey to elicit youth preferences for sexual and reproductive health and HIV services in rural Malawi." Social Science & Medicine 105(0): 93-102.
Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-being: Synthesis. Washington, DC.
Petheram, L. and B. M. Campbell (2010). "Listening to locals on payments for environmental services." Journal of Environmental Management 91(5): 1139-1149.
Rajmis, S., J. Barkmann and R. Marggraf (2009). "User community preferences for climate change mitigation and adaptation measures around Hainich National Park, Germany." Climate Research 40: 61-73.
Rogers, A. A., J. A. Cleland and M. P. Burton (2013). "The inclusion of non-market values in systematic conservation planning to enhance policy relevance." Biological Conservation 162: 65-75.
Rolfe, J., -, K. Alam, J. Windle and S. M. Whitten (2004). Designing the Choice Modelling Survey Instrument for establishing riparian buffers in the Fitzroy Basin.
Rolfe, J., J. Bennett and J. Louviere (2000). "Choice modelling and its potential application to tropical rainforest preservation." Ecological Economics 35(2): 289-302.
Rolfe, J. and J. Windle (2015). "Testing attribute selection and variation in a choice

experiment to assess the tradeoffs associated with increased mining development." Land Use Policy 42(0): 673-682.
Ryan, M., V. Watson and V. Entwistle (2009). "Rationalising the 'irrational': a think aloud study of discrete choice experiment responses." Health Economics 18(3): 321-336.
Shoyama, K., S. Managi and Y. Yamagata (2013). "Public preferences for biodiversity conservation and climate-change mitigation: A choice experiment using ecosystem services indicators." Land Use Policy 34: 282-293.
Zander, K. K. and A. G. Drucker (2008). "Conserving what's important: Using choice model scenarios to value local cattle breeds in East Africa." Ecological Economics 68(1-2): 34-45.