THE RECREATIONAL VALUE OF SMALL NATURAL AREAS IN DENMARK

What can we expect from previous studies?

Abstract

This paper is inspired by the choice experiment from Jensen (2015) about the creation of small forests, wetlands and energy willows in agricultural land in Denmark. We review existing literature to investigate how and in which context other studies have analyzed public preferences for access to natural areas. By critically examining similarities and dissimilarities between these studies and Jensen's questionnaire, we can derive expectations about how the respondents of her choice experiment value public access to small natural areas in Denmark. Furthermore, the findings of the literature review allow us to identify shortcomings of Jensen's questionnaire.

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0. Introduction

Denmark can be placed among the world's most intensive agricultural producers. It dedicates more than half of its land to agricultural purposes. Intensive agricultural production is accompanied by the use of fertilizer which has led to an excess of nitrogen in the ground and surface waters.
Possible ways to mitigate this nitrogen excess includes the replacement of small pieces of agricultural land with patches of wetlands, forests and energy willows. Next to the task of nitrogen retention, they can have additional values for society such as recreational opportunities.

Jensen (2015) has integrated the three types of mitigation areas in a choice experiment in Denmark to elicit the recreational value of these sites. Our paper is inspired by this choice experiment. It should be read as a preparation for modeling the experiment. The aim is to hypothesize what would be the findings of this modeling regarding public access to these sites.
To that end, we review existing literature to investigate how and in which context other studies have analyzed public preferences for access to natural areas. By critically examining similarities and dissimilarities between these studies and Jensen's questionnaire, we can derive expectations about how the respondents of her choice experiment value public access to small natural areas in Denmark. Furthermore, the findings of the literature review allow us to identify shortcomings of Jensen's questionnaire.

This paper is divided into five sections. The first section describes the current situation of nitrogen levels in Denmark and the benefits of each land conversion method in terms of nitrogen mitigation. The second section briefly elaborates on Ecosystem Services theory and Economic Valuation Techniques. The third section is a literature review of previous studies that look at natural sites and public preferences regarding public access and recreational purposes. The fourth section introduces the specific choice experiment carried out by Jensen (2015) and relates it with previous literature. In the fifth and last section we sum up our findings.

1. Background

Denmark is one of the most intensive agricultural producers in the world dedicating about a 60% of its land to agricultural purposes (between crop production and livestock). The agricultural sector contributes significantly to Danish exports as more than two thirds of the production are exported (Dalgaard, et al. 2014).
The use of fertilizers has improved the efficiency of crop production in the agricultural sector. However, this has also led to an excess of nutrients like nitrogen (N) in underground and surface waters (Adetunji, 1994).
A study from Dalgaard et al. (2014) analyzes policies carried out in Denmark to mitigate the N levels since the mid-1980s. The study looks into data about N levels from the Green

Revolution to 2010 to examine the effects of mitigation policies adopted to reduce the N-input. The Green Revolution was the largest boom in the Danish agricultural sector that took place after World War II. This boom was characterized by a high level of fertilizer input on the fields. The increase of nitrogen went from 15 kg N in 1945 to 143 kg N (Dalgaard et al. 2014 after Dalgaard & Kyllingsbæk, 2003 and Dalgaard et al. 2009), to 74 kg N nowadays (Dalgaard, et al. 2014 after Statistiks Denmark, 2012).
The policies carried out to mitigate the N levels were different in nature. Dalgaard et al (2014) classify them into three different groups: (1) Command and Control (C&C), (2) Market-based regulation and governmental expenditure (MBR), and (3) Information and voluntary action (IVA). The first group refers to the policies that use the law to, for example, ban certain practices. The second group refers to the policies affecting the markets by, for example, introducing quotas or taxes to disincentive certain activities. Finally, the third type includes "*knowledge production and communication of information about more sustainable N-management practices and technologies via research and extension services"* (Dalgaard et al. 2014, p.4). These results show that all the policies implemented had a clear impact on the reduction in N-input the agricultural sector. Specifically, from 1990 to 2010 the N-input was reduced by a 34%.

While urban and agricultural systems are recognized as sources of nitrogen pollution (Weitzman & Kaye, 2016 after Carpenter et al. 1998 and Driscoll et al. 2003), forests can function as a nitrogen sink, retaining a high percentage, from 30 to 80%, of added nitrogen (Weitzman & Kaye, 2016 after Nadelhoffer et al. 1999 and Perakis & Hedin 2001). Due to their high denitrification rate, wetlands work as an effective nitrogen sink as well. The denitrification process in wetlands is quantitatively the most important process regarding water quality improvement. Various studies have found different values for nitrogen retention in wetlands, ranging from 7,1% (Alström et al. 2000), 19% (Jansson et al. 1998), 50% (Alström et al. 2000) up to 100% (Jansson et al. 1998) of the nitrogen loading (Hofmeister, 2006). Constructed wetlands reach their maximum retention rate after five to ten years (Feibicke, 2006).
Furthermore, planting willows for nitrogen management in strategic locations on farms can represent an opportunity for land conversion (Franklin, McEntree, & Bloomberg, 2016). Willows are recognized for their high biomass production, which can enable nitrogen extraction (Franklin, McEntree, & Bloomberg, 2016 after Rockwood et al. 2004). Since willows have deep roots, they are able to capture nitrogen draining through deeper soils that are not reachable for common agricultural plants (Franklin, McEntree, & Bloomberg, 2016 after Licht & Schnoor, 1993; Pilipovic, Orlovic, Nikolic, & Galic, 2006).

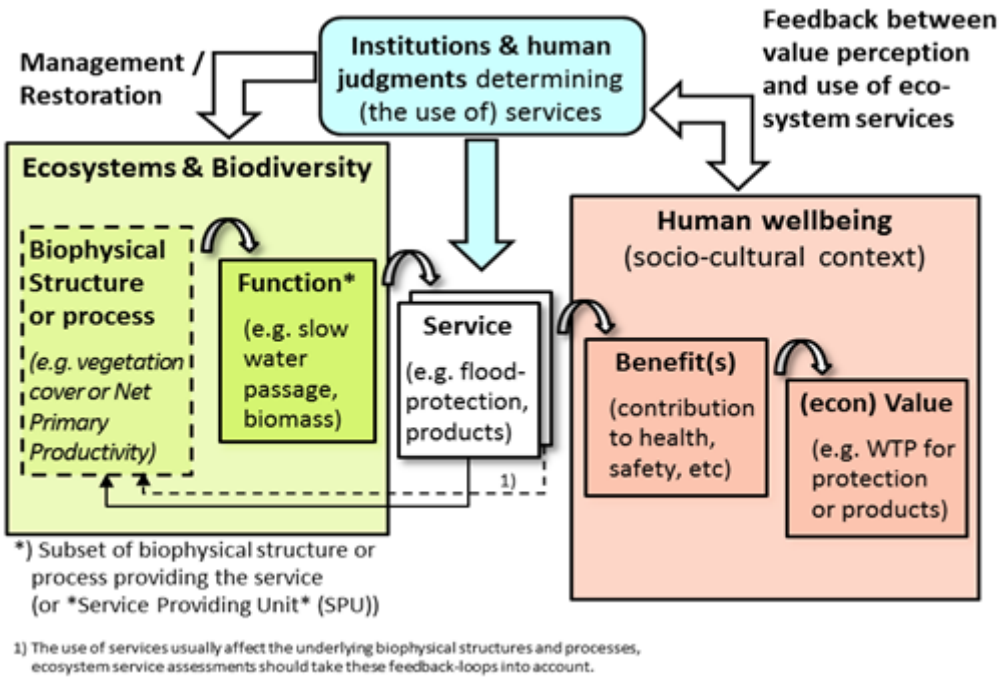
2. Ecosystem Services and Economic Valuation

An ecosystem can be seen as a "multi-product" that generates a multitude of ecological-economic services (Pearce, 2006). The quantitative and qualitative valuation of these ecosystem services and their incorporation into policy and decision-making have been

discussed since the concept emerged in the early 1990s (Pandeyaa, et al. 2016 after Daily, 1997; de Groot et al. 2002; Brauman et al. 2007; Daily et al. 2009, de Groot et al. 2010 and Guerry et al. 2015). The ecosystem services have been defined in many ways, but the most popularly used definition refers to it as the direct and indirect contributions of ecosystems to human well-being (Braat & de Grood, 2014 after TEEB Foundations, 2010).

In figure 1, Braat & de Groot (2014) show the flow of the ecosystem services. They distinguish between Ecosystem & Biodiversity and Human Wellbeing. The former involves the functions that the ecosystems provide and the latter reflects how people value these services. Therefore, the role of natural science is placed in the first section of the figure while the role of the economic valuation is in the second section. Both are connected through the Institutions and Human Judgement that influence how the ecosystems are managed.
The primary function of small forests, wetlands and energy willows in the choice experiment of Jensen (2015) is N mitigation. The services vary from the higher water quality to potential recreational values. The benefits that people would extract from these ecosystems also vary widely from an increase in health (due to better water quality) to an increase in recreational options. Economic valuation attaches a monetary value to these benefits. The information generated from the economic valuation process is later used to determine the optimal level of exploitation of the ecosystem. At the same time, it allows the policy makers to come up with better ecosystem management initiatives.

Figure 1: The Economics of Ecosystems and Biodiversity (TEEB) overview diagram.



Source: Braat & de Grood (2014)

Natural science relies on data- and simulation-based approaches to understand and quantify environmental assets and ecosystem services, their generation, functioning and trends of production. For instance, collecting data for livestock and agricultural production can deliver

indications on production trends of essential ecosystem service benefits (Pandeyaa, et al. 2016).
As mentioned before, when connecting ecosystem services with human well-being, monetary valuation of ecosystem services plays an important role in policy and decision-making (Pandeyaa, et al. 2016 after Gomez-Baggethun et al. 2010).
Economic valuation assigns monetary values to non-market goods and services measuring the change in human wellbeing that arises from the provision of those goods and services. Economic valuation refers to welfare economic theory which states that a higher level of utility or wellbeing corresponds to a higher level of welfare. The human wellbeing is reflected by individual preferences. Whenever individual preferences are comprehensive (meaning that the individual is able to compare preferences), stable (meaning that the individuals' preferences are consistent over time and identical regardless of the elicitation method) and coherent (meaning that the individual's preferences are consistent), the concepts of cost, benefit, willingness to pay (WTP), willingness to accept (WTA) and economic efficiency can be applied. (Bateman, et al. 2002).
In welfare economic theory it is assumed that in a perfectly competitive economy, each individual secures economic efficiency by acting in accordance with his own preferences in order to maximize the benefits to himself. An individual obtains a benefit whenever he is willing to give up something that he attaches a value to in order to receive that benefit. An individual obtains a cost whenever he gives up something that he attaches value to, being willing to do so only by receiving a compensation. The welfare measures are either the willingness to pay (WTP) to secure a benefit or avoid the cost, or the willingness to accept (WTA) to forgo a benefit or suffer a cost. (Bateman, et al. 2002).

It is important to elicit and include individuals' preferences in a project or policy appraisal (Bateman, et al. 2002). Including those that are most affected, participation may lead to a better policy or project design (Pandeyaa, et al. 2016 after Davis and Whittington, 1997).
Choice modelling is one economic valuation method that we deal with in this paper. It can be used to estimate both use- and non-use values. Its application can be used to draw the following conclusions in a policy context: the relevance of the attributes for people's valuation of non-market attributes; the ranking of the attributes; the value of changing more than one attribute at a time; and the total economic value of a resource or good (Bateman et al. 2002).
Choice experiments is one choice modelling approach that is the focus in this paper. In choice experiments, the respondent faces a range of alternatives and is asked to choose the one that he prefers the most. A status quo alternative is included as one option to deliver welfare-consistent estimates. Furthermore, the respondent has to trade off changes in attribute levels against costs. Choice experiments are supported by basic theory. First of all, it is based on Lancaster's theory that *"any good can be described as a bundle of characteristics, and the levels that they take''* (Bateman et al. 2002, p. 278 after Lancaster, 1966). Furthermore, it is linked to random utility theory derived from Luce (1959) and McFadden (1973). The idea is that the respondent compares the utility that he or she can get from each alternative and finally chooses the one that gives the highest utility (Bateman et al. 2002).

3. Literature review

This part of the paper reviews four articles that analyze natural sites' attributes for recreational purposes and the public preferences for accessing these sites. The first three articles use choice experiments in order to find welfare measures for different attributes. Another approach is used in the last article of this literature review where the authors aim to find preferences for different attributes of forests in Denmark combining data from actual forest visits and Geographic Information Systems (GIS).

So far, there does not seem to be any study conducted with subject to public preferences regarding access to energy willows. Therefore, this review only deals with literature regarding forests and wetlands. Table 1 summarizes the main information of each article analyzed in this literature review.

Table 1: Main information of the articles reviewed

Author	Country	Natural Area	Methodology	MWTP for access in DKK
Bauer et al. (2003)	USA (Rhode Island)	Wetland	Choice Experiment	Boardwalk: 335 Viewing tower: 268
Westerberg et al. (2010)	France (Provence)	Wetland	Choice Experiment	Passive recreation: 223.5 Active recreation: 618.4
Elsasser et al. (2010)	Germany (North East)	Forest	Choice Experiment	145.5 - 149
Agimass et al. (2017)	Denmark	Forest	GIS	No welfare measures

Source: Personal collection

3.1. Public Preferences for Compensatory Mitigation of a Salt Marsh in the USA

Background

The background of the study from Bauer et al. (2004) is not related to land conversion from agriculture to a natural site to mitigate the excess of N. In this case, the research objective is to solve the degradation of certain existing wetlands. This study is important to consider since the authors support the hypothesis that the opportunity of having access to the wetland (salt

marsh) can make people attach a higher value to a certain mitigation project. Therefore, they introduce the aspect of access to their analysis

In order to mitigate the degradation of natural sites like wetlands, the public authorities need to put mitigation projects into action. The financing of these projects usually comes from society through income taxes. Therefore, it is needed to know the value that people attaches to these sites (Bauer et al. 2004). In this context, Bauer et al. (2004) analyze public preferences for mitigation projects to stop the degradation of wetlands in Rhode Island, USA. Their research question was: How much is the public willing to pay for wetland mitigation, and what mitigation attributes are important to gain public support?

Methodology

Bauer et al. (2004) use a choice experiment questionnaire to ask people about their preferences. There were three mitigation options: creation of new wetlands, restoration of degraded wetlands and preservation of existing wetlands. The attributes that are changing in each option refer to the size of the mitigation area, the costs of the project, the presence of endangered species and the possibility of having access through a walking path, having the possibility of getting a view of the area from a viewing tower or not having access at all.
The questionnaires were carried out in person in Rhode Island Division at the Motor Vehicles registry of South Kingstown. This location is 10 miles away from a big restoration project. Therefore, the respondents were considered to have a high knowledge about the salt marsh mitigation.

The authors used the results from the questionnaire to estimate first, a multinomial logit model and second, a nested logit model. A t-test and a likelihood-ratio test showed that the nested model fitted the data better. A nested model is characterized by the estimation of probabilities following a tree structure (Forinash & Koppelman, 1993). In this case, Bauer et al. (2004) used one branch when people decided not to take any action (status quo) and another branch when taking action was chosen (preservation or restoration). The advantage of the nested logit model over the multinomial logit model is that the nested logit model does not assume all the choice options to be independent from each other (Hoffman & Duncan, 1988). The authors estimated the nested logit model by maximum-likelihood using all the attributes and also some interactions between the action/no-action attributes with geographic attributes from the respondents. Those were “female”, “high income” and “graduate”.

Results

The variable “access’’ had a statistically significant and positive effect on the probability of choosing to take a mitigation action. People showed a marginal willingness to pay (MWTP) of $54.3 for having a boardwalk and $43.4 for the view tower. Therefore, the respondents were willing to pay $10 more for having actual access to the natural site. Also, the respondents prefer “restoration” with less acres and higher costs but with access, rather than “preservation” without access but with more acres and less costs. These results show that

having access is very important for people since they are willing to give up some extension of the salt marsh and some income in order to get access to the site.
The authors conclude that public access is one of the most important attributes that the wetland mitigation programs should include, if they seek for public support.

3.2. Valuation of social and ecological functions of a wetland in Southern France

Background

Westerberg et al. (2010) conducted a choice experiment to elicit public preferences regarding potential land use and activity alterations of the Marais des Baux wetland.
For centuries the Marais des Baux wetland in southern France has experienced drainage almost leading to its entire disappearance. Increasing awareness of wetland ecosystem services and reconsideration of agricultural practices in the area constituted the context of the emerged desire to determine future land use priorities of the Marais des Baux. Similar to our study's context, the background of this article considered agricultural land to be sacrificed to make space for a natural area. Although in the study of Westerberg et al. (2010) the wetland was already existing and of a much bigger size than the one that we are investigating here, we can still draw conclusions regarding public access to this type of natural site. Since the respondents had to elicit monetary values for access and recreational opportunities in connection with a possible extension of that wetland we can gain insights of these kind of interactions and people's value of it.
The decision process regarding a restoration of the Marais des Baux wetland was accompanied by various obstacles. First, the local community feared the increase of mosquitos and the loss of employment in the agricultural sector resulting from the restoration. Second, there were contradicting opinions about recreational uses, access to the area and lack of knowledge about public preferences of landscape modifications. The authors aimed to overcome these obstacles and guide policy-makers and landowners in this process by quantifying public preferences for different potential land use changes in the area (Westerberg et al. 2010).

Methodology

Through interviews with landowners, planners, experts and other stakeholders, as well as the review of existing literature, the authors identified relevant attributes and levels for the choice experiment that were pre-tested in focus groups. The final data collection took place through personal interviews where the respondents had the possibility to get help from the interviewer when filling in the questionnaires. In addition to the choice sets, questions about the respondent's characteristics and attitudinal questions were included in the questionnaire.
The population from which the sample was drawn was living within a 10 km radius of the Marais des Baux. Convenience sampling was employed to choose the sample. The final sample size consists of 90 respondents. With each respondent evaluating nine choice sets, the

total number of choices observed was 810. The interviews took place in January and February 2008.

The following attributes were included in the questionnaire. The size of the wetland was varied from its original size of 200 ha up to a size of 1200 ha replacing cereal and cropland with ponds, reed beds and marchland. Another attribute captured three different options for tree hedges in the area, the attribute biodiversity represented the existence of common and rare species. Other attributes captured mosquito control and the price of the choice alternative.
Access and recreation were defined in three levels. One possibility was no access and no facilities for recreation meaning that the public only had access to the publicly owned dyke from which it is allowed to hunt. Another possibility was passive recreation meaning that there was access to a surrounding circuit that would be established with recreational and observational facilities. A last possibility was active recreation where walking and biking facilities would allow for a more intense access to the wetland.

The econometric methods were based on the random utility theory which says that an individual's utility from a certain choice alternative is explained by a systematic and observable component and a random component assumed (Westerberg et al. 2010 after Louviere et al. 2000).
The authors estimated a basic conditional logit model, a random parameter logit model to account for unobserved preference heterogeneity across respondents and a random parameter logit model including interactions between respondent-specific characteristics and choice-specific attributes and interactions within choice-specific attributes.

Results

The results of the basic conditional logit model show that next to "hedgerow", "restoration", "mosquito control" and "biodiversity", recreation is a significant factor for the respondents' choice. "Active recreation" was significant at the 1% level and ''passive recreation'' is significant at the 5% level. The sign of both coefficients was positive. They should be viewed as a comparison to the benchmark of having only limited access with no public facilities. The Hausman test indicated that conditional logit model suffers from violation of the independence of irrelevant alternatives (IIA) property. Therefore, the results should be regarded with caution.
In the first random parameter logit model the results showed that "active recreation'' is significant at the 1% level and "passive recreation'' was significant at the 5% level. As in the basic conditional logit model, the sign of both coefficients was positive.
The results of the second random parameter logit model, including inter-attribute interactions and interactions between respondent-specific characteristics and choice-specific attributes, showed that the coefficients were positive and significant as in the previous models. The only difference was, that not only "active recreation'' but also "passive recreation'' is significant at the 1% level now.

Since the second random parameter logit model including interactions was found to be superior to the first random parameter logit model by conducting a chi-square test, the results of the second random parameter logit model will be used for the later discussion.
Furthermore, the authors estimated the marginal willingness to pay (MWTP) for each attribute and interaction. The MWTP for "active recreation'' was found to be 19.4 euros. The individual values range between 4 and 36 euros. The MWTP for "passive recreation'' was estimated to be 20.0. The values range between -3 and 44 euros.
On top of that, the authors constructed four different wetland management scenarios to calculate the consumer surplus as a welfare measure. Regarding recreation and access, one of the scenarios indicated that the recreational value of the area can be enhanced even without the restoration of the wetland. This means that although keeping the original size of the wetland, the general public preferred recreational access to the area.

3.3. Landscape benefits of a forest conversion program in North East Germany

Background

We found the following article to be relevant for this literature review since the recreational attribute of the choice experiment was defined in the simple and straightforward way that we want to look at it in in this paper: the presented landscape is either accessible for the public or not accessible. Furthermore. the object of the choice experiment was a forest, one of the types of natural areas that we investigate here.
The study carried out by Elsasser, Englert and Hamilton (2010) used a choice experiment to value the landscape benefits of different types of forests in North East Germany. The results of this article were part of an interdisciplinary research project ('Newal-Net') funded by the Federal Ministry of Education and Research. Among others, the project looked at the conversion of conifer area into 'climate adaptive deciduous woodland'. From an economic perspective, it was asked whether to expect substantial changes in the public's valuation of services provided by the forest such as landscape and recreational value, timber production and carbon sequestration.
For this paper it is particularly relevant whether the authors find if recreational access has a significant impact on the respondents' choice for a landscape alternative and if so, which other interactions with recreational access are important to consider. The context is particularly interesting since the respondents imagine to have the landscape near their home so that they can access it at regular journeys or even see it from home.

Methodology

First, a regional survey was conducted dealing with respondents' opinions about landscapes in the area where they live. Next, a choice experiment was carried out as a regional household survey to elicit monetary value of landscape changes and recreational value. The interviews took place from January to April 2008. Sampling took place through random walk in ten counties of the research project's study region.

In the choice experiment each respondent received six different choice cards presenting three alternative residential environments. The attributes that were varied in the alternatives comprise the landscape view (visualized by computer generated images), the possibility to enter the forest and meadow for recreation and the price indicator represented by the extra yearly cost of living there.
The recreation attribute was varied in two different ways: either accessible for recreation or not accessible. The sample was split into two parts: one subsample receiving 'summer aspect' choice cards with images of the landscapes showing deciduous trees and one subsample receiving 'winter aspect' choice cards with images of the landscapes described above showing trees without foliage. Each subsample was split again into two parts: one sub-subsample receiving choice cards where it is suggested that the presented landscapes are directly visible from their house and one sub-subsample receiving choice cards where it is suggested that the presented landscapes are only visible at regular journeys.
The authors estimated a multinomial logit model based on random utility theory which was then adjusted. The attribute of recreation access was coded as a dummy variable.

Results

In the two summer versions of the questionnaire as well as the winter version where the respondents see the forest at journey only, the coefficients for "recreation access'' were all positive and significant at the 1% level. Only in the winter version where respondents can see the forest from their home, the coefficient for ''recreation access'' was not significant.
Furthermore, it seems that "recreation access'' in case where the forest can be seen from the home was valued less than the view from journeys to the forest. The authors could not give a reasonable explanation other than this observation is the result of sampling artefact.
Moreover, the authors estimated MWTP in euros per household per year for the different attributes compared to the status quo. They found that MWTP for the possibility of accessing the landscape for recreational purposes is relatively large. MWTP for "recreation access'' in the summer versions was 82.65 euros per year when the forest can be seen from home and 133.24 euros per year in the case when the forest can be seen at journeys only.
In the winter version MWTP in the case of a forest view at journeys only is 29.49 euros per year. The winter version in the case of a forest view from home indicated an insignificant coefficient for recreation access. The MWTP in this version was estimated to be 16.08 euros per year.
On top of that, the authors balanced the results in accordance to the vegetation periods. By assuming an approximation length of the summer period in relation to the winter period by seven to five, they weigh the mean marginal willingness to pay for ''recreation access''. The mean marginal willingness to pay is 54.91 euros per year if the forest can be seen from home and 90.01 euros per year if the forest can be seen at journeys only.
The results showed that the winter versions make the possibility to access the landscape less attractive. MWTP in both winter versions were lower than in the summer version and in one of the winter versions recreation access was insignificant.

3.4. The choice of forest sites for recreation: a revealed preference analysis using spatial data in Denmark

Background

In the study of Agimass et al. (2017) the authors used a revealed preferences analysis. The background of this paper does not refer to the specific change of land from agriculture to forest. Instead, using spatial data, they investigated the attributes that people valued more when deciding to go to a specific forest for recreational purposes in Denmark. This is the reason for including this paper in the literature review. It helps to know which attributes are important to consider when we want to create natural sites that attract recreational activities. Moreover, the reasoning and results from Agimass et al. (2017) allow us to discuss what needs to be considered and eventually improved in Jensen's questionnaire.

Methodology

Using Geographic Information Systems (GIS) techniques, the authors mapped the last three forests that people visited for recreational purposes. Through an online questionnaire, the respondents were asked to point on a map the departure point and the three last forests visited. In order to identify the different levels of attributes of the forests, data from publicly available GIS was used. The attributes considered were the forest area, the forest area form (shape), stand density, proportion of dominant species type, presence of nearby nature features (e.g. wetlands and lakes), terrain difference (slope of landscape), presence of historical sites, a dummy for state ownership and the distance from the departure point. Moreover, demographic information of the respondents was elicited in order to consider heterogeneity between them.

Due to the high number of forest destinations available, the authors needed to select a number of forests that would set up the total number of forest choices that the respondent had when choosing to go to a forest. First, they decided to consider the forests inside a radius of 30km distance from the location of the respondent and the forest that had a minimum of 10 ha of extension. After that, using the simple random sampling method through a conditional model, they concluded that the number of destination options that gives consistent estimates was 50. Therefore, the choice set of each respondent consisted of 50 forests that had a maximum distance of 30 km and a minimum size of 10 ha. Finally, they use a random parameter logit model in order to allow for heterogeneity between the respondents.

Results

The attribute "area" referred to the extension in hectares of the forest. This appeared to be highly significant and has a positive effect when people choose the destination forest. Another result to remark is the high significance and negative impact of the attribute "distance". This results showed that people have preferences for forests closer to the residential sites. The negative effect of "distance" becomes smaller when people stated that their mean transport mode is by car rather than walking.

The difference of this article from the three reviewed above is, that the authors are not interested in extracting welfare estimates. Instead, they study which attributes are relevant for people visiting specific forests in Denmark.

4. Economic valuation study in Denmark

4.1. Data description

In this section we present the questionnaire that is used for the analysis in the remainder of this paper.
This paper deals with a questionnaire carried out in April and May 2015 by the Department of Food and Resource Economics of the University of Copenhagen and dNmark Research Alliance. The questionnaire is part of a study from Jensen (2015) that aimed at the estimation of side-effects from Nitrogen reduction measures in terms of recreational and aesthetic values in the landscape.
The questionnaire was conducted as an internet survey. Sampling respondents were selected from a pre-recruited web-panel. Selection bias can be one concern when using internet based surveys since there is a certain group of people active in internet panels (Jensen, 2015 after Olsen, 2009). 22% of the invited respondents completed the questionnaire which is equivalent to 4065 completed responses. The sample is representative for the Danish population regarding gender, age, geographic region and educational level.

After briefing the respondents about the questionnaire purpose, they are asked whether they want to participate. The following questions deal with the respondents' socioeconomic background such as gender, age, place of residence, household size and education. Depending on the respondent's assignment to a subsample, it follows a description of the choice context and landscape attributes either via a video or text. We elaborate on the attributes further below.

After an example choice set, 12 different choice sets are presented to the respondents in a random order. Pictures and keywords summarize the attribute levels of three choice alternatives in each choice set. The respondent is asked to choose one alternative for each set. After each choice set it follows a question on how difficult it was for the respondent to make a choice.
Respondents choosing the status quo alternative in every choice set receive an additional question on why they chose the "Present situation" in all choice situations.
Furthermore, one part of the questionnaire contains additional questions related to the landscape types presented in the choice sets. One question contains a scale where respondents can state how important each attribute was in making their choice. The scale ranges from very important to not important. The next question asks whether the respondents can imagine visiting one or more of the small scale nature areas in the future. The last question is about whether the respondent has the landscape types within 5 km of his or her residence.

The part of the questionnaire related to the choice experiment on recreational and aesthetic values in the landscape ends here. The remainder of the questionnaire relates to another choice experiment and is therefore not relevant for the analysis of this paper. However, it is important to mention that there is the risk of fatigue bias since the questionnaire is relatively comprehensive.

Each alternative in the choice set has four attributes that vary. The first one is the type of landscape change that the respondents would see in the agricultural site. This can be not having any change (status quo) or having a forest or a wetland or an energy willow. For the case of a forest this would be 5 ha large and the energy willow and the wetland would be 1 ha large.

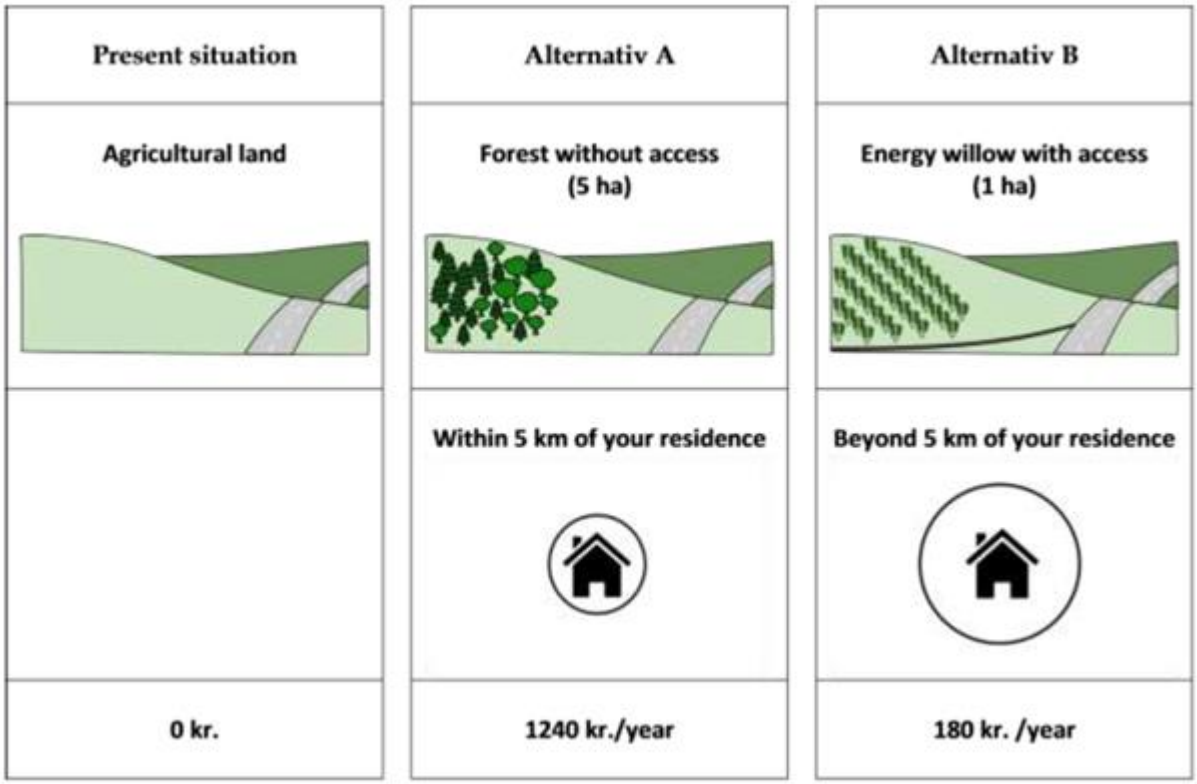
The second attribute is the access and this can vary between two options: either having access to the natural site or not having it.

The third attribute refers to the distance from the respondent's residence to the natural site and this can be within 5 km from the residence or beyond.

The last attribute is the payment that the respondents would do for each alternative. This payment would be collected through a yearly income tax payment and could take the values of 45, 90, 180, 510, 1240, 2100 kr. per year.

An example of choice set is shown in the next figure. The respondents are facing three alternatives in each choice sets, one of them is always the status quo that remains the same. In this specific example the alternative A would be converting 5 ha of the agricultural land to a forest and not having access to this forest which is within 5 km from the respondent residence. The price to pay through an income tax at the end of the year is 1240 kr. For the alternative B the landscape change is converting 1 ha of the agricultural land to energy willow, having access to this site which is more than 5 km away from the respondent's residence and paying 180 kr.

Figure 2: Example of choice set



Source: Jensen (2015)

4.2. Discussion

In this section we discuss the findings of the literature review and relate it to questionnaire presented above.

Access to the natural sites is one of the most valued attribute by the respondents in the reviewed previous literature. In fact, Bauer et al. (2004) concluded that people are willing to give up some acres preserved of wetland in order to have access to it. Similarly, Westerberg et al. (2010) found that in comparison to other attributes, the WTP for public access in their choice experiment is substantial.

Public access is defined in different ways throughout the literature. Bauer et al. (2004) include the attribute of public access through the provision of recreational facilities such as a viewing tower or a boardwalk. Westerberg et al. (2010) distinguish public access with facilities for passive and active recreation. In these two studies the recreational aspect of the nature areas is more straightforward. In the paper of Elsasser et al. (2010) public access is referred to as the simple opportunity of accessing the forest or not. This definition might be more comparable to the one included in the questionnaire of Jensen (2015).

All in all, the results from the literature review show that no matter how public access is defined, the coefficients are all positive and significant. A naive hypothesis would be expecting the same results for Jensen (2015) by simply looking at the estimation results. However, considering the various factors such as the study context and choice of attributes, we have many reasons to believe that several factors will argument against this expectation.

First of all, in Jensen (2015) the size of the natural sites varies from 1 ha for the wetland and energy willow, to 5 ha for the forest. In comparison, in Westerberg et al. (2010) the current wetland size is 200 ha considering an extension up to 1200 ha. In Agimass et al. (2017) the authors agree that the size of the forest has to be at least 10 ha to be considered relevant for recreational purposes. Therefore, we have to be careful when comparing results from these two studies with the ones from Jensen's questionnaire. In accordance with the considerations of Agimass et al. (2017) we would expect that public access would not be significant for the small natural areas in Jensen's choice experiment. Keeping other attributes aside, there might be a preference still for the larger forest than for a smaller wetland or energy willow.

In Jensen (2015) the natural sites proposed refer to hypothetical land conversion projects from agriculture to either, forest, wetland or energy willow. Therefore, the respondents have to imagine the landscape types. The studies from the literature review, however, refer to existing natural areas only. The respondent may have difficulties to choose a landscape alternative that they are not familiar with.
In Bauer et al. (2004) the respondents of the questionnaire were chosen because of their proximity to a big restoration project. Hence, the authors thought that the respondents had a better understanding of the implications of restoring a wetland and could picture easily what the survey was trying to explain.
In the study of Elsasser et al. (2010) the regional survey was conducted in the area where the regional forest development program would actually take place. In Westerberg et al. (2010) the sample was chosen from the population which was determined to live within a 10 km radius of the Marais des Baux.
In Jensen (2015) the proximity of the respondents to the potentially converted land was not considered. However, living close to the affected project site may enhance the respondents' familiarity with the landscape attributes. As a consequence, their choices predict their actual preference more likely. In Jensen's questionnaire the land conversion is hypothetical and respondents have to imagine how the constructed natural areas would look like. Even though the choice experiment refers to a specific existing site in Denmark, respondents living far away from this site, would still be unfamiliar with this type of landscape. By controlling for whether the respondent lives in a rural or urban area we can make assumptions on whether the respondent is more or less familiar with the landscape aspects that the choice experiment is about.
Furthermore, respondents are unfamiliar with the dimensions of the landscape sizes. The only visual information that they have from the landscape changes are the pictures shown in the choice sets. Those pictures do not capture the change in the sites in terms of size. This could lead to, metric bias where the respondent values the natural site on a different metric or scale than the one intended by the researcher (Bateman et al. 2002).

Furthermore, the choice experiment from Jensen (2015) is about converting existing agricultural land into a natural area. Similarly, Westerberg et al. (2010) replace cereal and cropland with ponds, reed beds and marchland in order to restore the Marais des Baux wetland. This makes results comparable since the respondents' preferences about agricultural land might influence their choice. In contrast, Elsasser et al. (2010) look at the conversion of

an existing forest into a "climate adaptive deciduous woodland''. The paper of Agimass et al. (2017) does not talk about land conversion at all. Here, people have to value public access to an *improved* existing area, rather than the trade-off between farmland and nature. We cannot say whether the trade-off makes respondents value public access more or less. Nevertheless, the respondents' attitudes against or towards agriculture might influence their valuation of public access.
Additionally, Jensen's choice experiment puts the land conversion into a context where the public does not have access to the area. Reminding that the questionnaire was conducted in Denmark, where nature areas are generally accessible to the public, the respondent may think that they have the right to access to the presented nature area anyways. This may lead to a property right bias. It means that the property right perceived for the good in question is misperceived or valued as not intended by the researcher (Bateman et al. 2002). Unless, these responses are not detected as strategic responses, they will generate a lower value for public access than it is actually valued by the public.

It is also relevant to consider the availability of substitute sites. If the respondents have natural sites such as forests, wetlands or energy willows close by their residence, we would expect to find a smaller WTP for having the potential natural sites proposed by the choice experiment in Jensen (2015). This can be tested since the questionnaire includes one question that asks the respondent about the availability of another natural site within 5 km from their home.

Moreover, in Agimass et al. (2017), the variable "distance" is significant and negative meaning that the further away the forest, the smaller the probability of people visiting it for recreational purposes. The interaction of the variables "access" and "distance" in Jensen (2015) could show a higher preference for access when distance is smaller than 5 km. Nevertheless, we do not have information on an upper limit for the distance. Hence we do not know the specific distance where people stop valuing public access.

4.3. Other limitations and recommendations

As we explained above, the sampling in Jensen (2015) was carried out in a random internet survey. This could lead to self-selection bias since a large proportion of those who answer the survey is likely to be respondents who are interested in the topic of the questionnaire We would recommend to instead conduct personal interviews with respondents sampled from a population living close to agricultural areas.
Moreover, we think that the pictures of the natural sites shown in the choice sets can be misleading. It is difficult to imagine the size of the dimension of the change and how the change in landscape will look like. With a changing size of the forest between the choice alternatives, the pictures of the alternative remain the same. We believe that it is important that the respondent gets the impression of the difference in size (from 1 ha to 5 ha) by looking at the pictures.
Furthermore, the period of the year during which the questionnaire is carried out can make a difference in the results. Jensen's questionnaire was conducted between April and May. With

changing Danish seasonal weather, people access natural sites less frequently in winter than in summer. Therefore, we can imagine that people value access less in winter than in summer. Therefore, carrying out the questionnaire in both seasons could give different results.

5. Conclusions

The aim of this paper was to derive expectations on the value of public access to small wetlands, forests and energy willows in a choice experiment from Jensen (2015) comparing the choice experiment questionnaire with existing studies.

The literature review shows that public access to natural sites is always positive and significant. Initially, we expected the same result for Jensen. However, we found many reasons to argument against this expectation.

First of all, we want to point out the uniqueness of the natural areas presented in Jensen (2015) in terms of the size and the synergy between nitrogen mitigation and recreational and aesthetic value.

Related to these special characteristics, the small size of the natural sites, unfamiliarity of respondents with these sites, metric bias and property rights bias could have an influence on the respondents' decisions unlike in the existing studies.

Issues that should be addressed when modelling the data are self-selection bias and the availability of substitutes. Furthermore, we suggest that an upper limit to the distance between the place of residence and the natural site should be taken into account in future studies. This would allow us to know the specific distance where people stop valuing public access.

Generally, there is only limited literature available on the value of public access to natural sites. So far, there has not been any study conducted on the value of public access to energy willows. Considering this type of nature as part of the solution to nitrogen mitigation, there is a further need to investigate the value of this ecosystem. The choice experiment from Jensen's seems to be the first study with the aim of estimating the value of access to energy willow sites.

To sum up, the uniqueness of the natural sites of Jensen's choice experiment make it difficult to use the results from previous studies as a benchmark. It highlights how important Jensen's choice experiment is to fill the literature gap and to be a point of departure for future studies.

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