Using expert elicitation to reduce benefit transfers: An application to the Baltic Sea

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Abstract

This study explores whether expert elicitation may help reducing transfer errors. The protocol developed in this project is planned to be implemented to experts on non-market and benefit transfer. As a first step, it has been tested on college-degree students who have attended a non-market valuation class during the spring semester of 2015. The good under study is the reduction of marine eutrophication in the Baltic Sea. Experts are requested to adjust the WTP of a Finish person to represent the WTP of an identical person who lives in Sweden, Denmark, Germany or Poland. We compare transferred values reported by experts against *true* WTP values –which are obtained from a contingent valuation simultaneously conducted on nationally representative samples of the inhabitants of the nine Baltic Sea countries. We find encouraging preliminary results: experts transfer WTP i) to Poland with accuracy (4% transfer error); ii) to Sweden and Germany, within the average transfer errors reported in previous studies (31%); and iii) to Denmark still with large inaccuracy (148%). The approach in this paper can be seen as an attempt to rigorously incorporate decisions taken by experts in their role as researchers.

Keywords: Benefit-transfer, Expert Elicitation, Contingent Valuation, Baltic Sea

JEL classifications: Q51

1. Introduction

Benefit transfer takes pre-existing values from a study case to provide a customized benefit estimate for a new policy case (Kaul et al., 2013). The United States and the European Union mandate the assessment of both benefit and costs when designing specific environmental policies and regulations (Boyle et al., 2010; Johnston and Rosenberger, 2010). This requirement must usually be met in a limited amount of time which makes benefit transfer a particularly useful tool for public policies.

Benefit transfer has slowly evolved from a relatively ad-hoc approach to a more rigorous set of procedures and protocols.[3] However, many challenges remain (Johnston and Rosenberger, 2010). This paper focuses on, arguably, the most pressing of the challenges faced by benefit transfer: large absolute transfer errors. Evidence suggests that, once outliers are excluded, the average and median absolute transfer error are, respectively, 35% (Boyle et al., 2010) and 39% (Kaul et al., 2013). To put these numbers in context, the error in commercial real estate appraisals is around 11% (Boyle et al., 2010) –i.e. the average benefit transfer errors are more than three times larger than property appraisal errors.

This paper reports preliminary evidence on whether transfer errors can be reduced through the use of expert elicitation. Expert elicitation encompasses a number of strategies to systematically gather, process and summarize quantitative information provided by a relatively small group of experts (see Morgan, 2014; Evrard et al., 2013; Cooke and Goossens, 2000). Exploring the potential synergies between expert elicitation and benefit transfer seems a promising research area because expert elicitation has been developed to gather reliable information in contexts where empirical data is expensive, limited or unreliable (James et al., 2010).

Actually, two previous studies have already explored the complementarities between expert elicitation and benefit transfer. Leon et al. (2003) train students on non-market valuation and ask them to estimate the WTP to preserve two National Parks in Spain. Their results indicate that experts are unable to estimate the values of the sites under analysis. Strand et al. (2015) conducts an expert elicitation on more than 200 non-market valuation experts from 36 countries. These experts were asked to predict the outcome of a survey that would elicit WTP for the Amazon forest preservation among their own countries' populations.

The expert elicitation protocol developed in this project is planned to be implemented to experts on non-market valuation and benefit transfer. As a first step, this protocol has been tested on seven college-degree students enrolled in a non-market valuation course during

[3] A turning point towards this formalization occurred in 1992, when the Association of Environmental and Resource Economics and the US EPA jointly sponsored a workshop and associated special issue of *Water Resources Research*. See the papers in this special issue for further details on initial critiques to benefit transfer. For recent descriptions of the state-of-the-art, see Kaul et al. (2013), Boyle et al. (2010), and Johnston and Rosenberger (2010).

the Spring semester in the University of Helsinki. The good under valuation is the reduction of marine eutrophication in the Baltic Sea.

The expert elicitation question has been phrased as a benefit transfer exercise. We provide the expert with the WTP of a hypothetical Finish person –described in terms of age, monthly net income, education, and distance to the coast. This is a *true* WTP calculated from a contingent valuation exercise simultaneously carried out in the nine coastal countries of the Baltic Sea.[4] Then the experts are asked to transfer the WTP to person identical in terms of age, income, education and distance to the coast but living in a different country –Sweden, Denmark, Germany, and Poland. In addition, experts are asked to identify the factors driving the differences in WTP across countries. We explore with a clustered OLS specification whether these factors systematically modify the transferred WTP reported by experts. When experts consider that there is trust in government, they increase the WTP by 12 euros in average. Average transferred WTP values are compared against true values –which are also calculated from the contingent valuation study carried out in the coastal countries of the Baltic Sea.

Preliminary results are encouraging. Experts transfer with accuracy WTP from Finland to Poland –with absolute transfer errors of 4%. For the cases of Sweden and Germany, absolute transfer errors are around 31% –just below the average 35% reported by Boyle et al. (2010) and the median 39% reported by Kaul et al. (2013).

Given these promising preliminary results, we will be implementing this expert elicitation protocol on experts in non-market valuation, benefit transfer and the Baltic Sea policy. Ultimately, we aim to carry out transfer from and to the nine coastal countries. While we have been able to perform preliminary analysis with a total of 28 answers, an increase in efficiency is expected when we are able to gather benefit transfers for all nine countries and more respondents.

Differences between this study and previous applications, arguably, represent a step further to consolidate the use of expert elicitation in benefit transfer contexts. For instance, experts in Leon et al. (2003) are individuals with no field experience that received theoretical

[4] See Ahtiainen et al. (2015) for details on the estimation of WTP, and Ahtiainen et al. (2012, 2014) for details on the contingent valuation survey.

training on WTP estimation with the ultimate goal of using their answers to obtain a priori distributions of WTP. In contrast, this project consults students only during the testing stage, and the students have spent a semester being trained in non-market valuation. While Strand et al. (2015) consults proven experts on non-market valuation, they leave space for ambiguity in the elicitation questions –i.e. it is not clear whether the expert is requested to report the population's WTP or his/her opinion on how much the population under study should pay. In contrast, this paper tailors the elicit question and tests it to eliminate sources of ambiguity.

2. Benefit transfer literature

Benefit transfer entails transferring an existing value estimate from the study site to an unstudied policy site (Brouwer 2000). There are two main approaches to benefit transfer: unit value transfer and function transfer (Johnston et al. 2015). Unit values can be transferred either as simple unadjusted values, or as values that are adjusted, for example, for differences in the population or the environmental good. In function transfer, a WTP function estimated for the study site is used to predict values at the policy site. This approach makes it possible to use more information about the study and the policy site and population, and correct for differences therein. Large amount of research has been carried out to reach consensus on an essential feature: study cases and policy cases should be as similar as possible and departures from such similarity may be better handled through function transfers (see Kaul et al., 2013; Bateman et al., 2011; Boyle et al., 2010; Johnston and Rosenberger, 2010).

Generally, as the study and policy sites tend to always differ, some adjustments in benefit transfer are necessary. The need for adjustments is particularly high in international benefit transfers, where values are transferred across countries (Ready & Navrud, 2006, Lindhjem & Navrud 2008). International transfers require correcting for differences in currencies and income levels (Navrud, 2004; Navrud & Ready, 2007; Ready et al., 2004). Also adjustments for cultural differences have been considered, but according to Hynes et al. 2013, their effect on transfer errors may be small.

Despite the use of different benefit transfer approaches and adjustments, transfer errors observed in international studies have been relatively high, ranging from 20% to 400% (Ready et al., 2004; Barton & Mourato, 2003; Kosenius & Ollikainen, 2015). Some level of transfer error is expected and may also be tolerable from a policy-point of view (Kristofersson & Navrud, 2005). However, there is still a need to find approaches that would reduce transfer errors and improve the accuracy of benefit transfers.

3. Expert elicitation strategy and data

The expert elicitation protocol includes four sections: 1) background questions; 2) presentation of the study and environmental change; 3) scenario and WTP questions; and 4) benefit transfer exercise through the expert elicitation question. Sections 2 and 3 used information from the contingent valuation survey described in Ahtiainen et al. (2012, 2014) –in particular, the depiction of the area under study, the change in the environmental good and the valuation scenario. To ensure comparability, the protocol depicted the same scenario and change in marine eutrophication as the original survey. The protocol is included in Appendix 1.

The protocol was developed in the autumn 2015. Before the testing stage, the protocol was piloting on three experts –two Finish experts on non-market valuation and Baltic Sea policy, and one German expert on non-market valuation. This piloting stage lead to changes in wording and to adding de-briefing questions. Piloting experts reported comfortability with transferring WTP values through the expert elicitation question.

3.1 Elicitation question

The expert is asked to carry out a benefit transfer. A Finish person is described in term of age, income, level of education, and distance to the coast. The expert is asked to assume an identical individual who lives in a different country, and provide his/her assessment of how much this individual would pay. Each expert carries out four benefit transfers –with respect to Sweden, Denmark, Germany and Poland.

To avoid ambiguity, the expert was informed about what we are asking him to do –paying particular attention to explicitly stating that they needed to report estimates of maximum willingness to pay of a hypothetical person. The following lines were meant to do so:

> *Next we would like you to make a benefit transfer exercise. This means that we would like you to estimate the maximum willingness to pay of a person in a given country based on the willingness to pay of a similar person in Finland.*

The protocol also explicitly states that the individuals are identical with the difference that they live in different countries, and the implications difference in location may have. The following lines were meant to do so:

> *The individuals are identical in terms of their age, income, education and distance to the coast, but live in different countries. You may take into account any additional factors that you think will affect willingness to pay, for example differences in cultural issues, trust in government, environmental attitudes, availability of substitutes and use of the Baltic Sea. Please present the willingness to pay estimates in euros.*

For the testing version of the protocol, we describe the hypothetical person as follows:

> *Assume a Finnish individual who is 51 year old, lives at a 60 kilometers distance from the coast, has 19 000€ annual net income and has a university level education. This individual's annual willingness to pay is 58€.*

An example of the expert elicitation question looks as follows:

Based on this information, what is the annual maximum willingness to pay (€) you would assign for an individual with identical age, distance, income and education in Sweden?

Once the expert has carried out the benefit transfers to a given country, he/she is asked to choose the factors that may be driving the differences in WTP. He/she can choose to explain it in written way and/or pick from the options listed in the protocol. These options include different levels of trust in government, different level of use of Baltic Sea, different levels of cultural identity attached to the Baltic Sea, environmental attitudes, and number of available substitutes.

Experts also report their level of certainty in making the benefit transfer exercises. This certainty is expressed probability terms. They express their certainty for each of the four benefit transfers.

3.2 Selection of experts and implementation

The expert protocol was implemented in November 2015 to seven participants of a non-market valuation course at the University of Helsinki. The elicitation was implemented in the latter part of the course. That is, the students had gone through substantial amount of material, articles and exercises related to environmental valuation methods, including benefit transfer. The implementation included a half-an-hour introduction to the task and its goal, after which the students proceeded to filling in the survey. All seven participants provided answers to the benefit transfer questions, which resulted in a total of 28 responses.

4. Results

Table 1 report the average WTP reported by the experts. They were estimated through OLS. Column 1 reports clustered estimates. Clusters are carried at the respondent level. The second column reports clustered weighted estimates. Each answer is weighted by the self-reported probability measuring certainty of the experts. The third column reports averages conditional on the reasons stated as reasons of differences in WTP across countries. Because only one reason is significant, the fourth column reports estimates conditioning only on trust in government.

For all countries, average WTP does not substantially differ across specifications. We focus our attention on the fourth set of estimates. Accordingly, a Swedish person has a WTP of 65.8 euros. She/he is followed by a person in Denmark (63.7 euros), Germany (43.5 euros), and Poland (19.9 euros). In terms of factors determining the WTP estimated by the expert, trust in government increases WTP by 9.4 euros. That is, if the expert believes that the government is trusted by their citizens then he/she thinks that the citizens are more willing to pay.

Table 2 compares the transferred WTP and the true WTP. True WTP are calculated based on the models reported by Ahtiainen et al. (2015). When using t-tests, only for the case of Poland, we cannot reject the null hypothesis that transferred and true WTP are identical. In the other three cases, transferred and true WTP differs at 5% level or more.

In terms of absolute transfer errors (last column of table 2), Poland's is 4%. The case of Denmark is less encouraging, with 148%. Sweden's and Germany's are around 31% --which fall close below average and medians reported in previous studies. In comparison to the transfer errors reported by Ahtiainen et al. (2015), the transfer errors reveal more accurate transfers. Depending on the methodology used, average transfer errors in Ahtiainen et al. (2015) range from 71% to 164%. With the exception of Poland, the transfer errors from the expert elicitation are below 31%. These results, as whole, seem promising.

5. Conclusion and discussion

When implementing a benefit transfer through an expert elicitation protocol. Measuring the accuracy in terms of absolute transfer errors, the method proposed in this paper yields promising results. These results are preliminary because they are obtained in the testing stage. We believe that gathering of a larger amount of data, as we plan to do in the final implementation stage, will increase efficiency in the estimates.

Our approach can be seen as an attempt to rigorously put in practice earlier proposals in the benefit transfer literature pointing out the need of bringing to the front the expert decisions taken by researchers (see McConnell, 1992).

As it is the case with other statistical methods, there are warnings against the miss-use, over-use, and/or abuse of expert elicitation.[5] Morgan (2014) discusses the conditions under which an expert elicitation makes sense, and concludes that "expert elicitation should build on and use the best available research and analysis and be undertaken only when the state of the knowledge will remain insufficient to support timely informed assessment and decision making" (p. 7176). In our opinion, this statement describes every context in which benefit transfer undergoes the task of providing timely public policy recommendations. Therefore, our call for further research exploring strategies to combine benefit transfer and expert elicitation.

[5] e.g. abuse of meta-analysis in Environmental and Natural Resource Economics (Nelson and Kennedy, 2009).

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Tables

Table 1. Average transferred WTP, estimated through OLS

	OLS **(I)**	**OLS (self-reported certainty as weight) (II)**	**OLS (self-reported certainty as weight) (III)**	**OLS (self-reported certainty as weight) (IV)**
	WTP (std errors)	**WTP (std errors)**	**WTP (std errors)**	**WTP (std errors)**
Countries				
Sweden	68.9***	68.5***	64.7***	65.8***
	(3.63)	(4.19)	(7.78)	(4.29)
Denmark	63.1***	66.4***	62.5***	63.7***
	(7.14)	(7.45)	(6.74)	(6.53)
Germany	45.7***	46.5***	46.3***	43.5***
	(3.55)	(3.15)	(6.86)	(2.59)
Poland	27.4***	28.0***	23.8***	19.9***
	(4.62)	(4.58)	(8.40)	(5.19)
Reasons behind differences in WTP				
Trust in government	---	---	12.2***	9.39***
			(2.79)	(2.98)
Use of Baltic Sea	---	---	-9.62	---
			(5.55)	
Cultural identity	---	---	-4.93	---
			(6.32)	
Environmental attitudes	---	---	10.8	---
			(7.60)	
Substitutes	---	---	3.13	---
			(4.94)	
R-squared	0.96	0.96	0.97	0.97
N	28	28	28	28
Number of respondents	7	7	7	7

Standard errors are clustered by respondent

*** p<0.001

Table 2. Comparisons of transferred WTP and true WTP

	True WTP (based on Ahtiainen et al., 2015)	**t-test True WTP versus WTP from (IV)**	**Absolute Transfer errors (%)**
Sweden	99.72	4.50	31.31
Denmark	26.74	-5.31	148.32
Germany	31.83	-2.11	31.55
Poland	29.14	0.64	4.07

APPENDIX 1

Expert Elicitation Protocol for Benefit Transfer of the Benefits of Reduced Eutrophication in the Baltic Sea

Introduction

Dear participant, thank you for taking part in this expert elicitation.

We aim to use your opinion to calibrate the transfer errors of a benefit transfer focused on coastal countries of the Baltic Sea.

The value to be transferred corresponds to the willingness to pay for reduction of eutrophication in the Baltic Sea.

We ask your opinion about what ranges of values can be considered reasonable when transferring the WTP from a given Baltic country to another Baltic country.

We use this survey to gather and summarize the opinion of experts in topics that cover non-market valuation, benefit transfer, and the Baltic Sea.

The strategy followed in this protocol is similar to appraising a property. In a typical appraisal exercise, an appraiser uses sale price of nearby and similar properties to develop a calibrated appraisal value. This similarity has recently been highlighted by Boyle et al. (2010).

With this survey, we explore how useful this appraisal-benefit transfer comparison can be in reducing transfer errors in benefit transfer exercises.

I1. What is your opinion on considering benefit transfer similar to a property appraisal exercise?

- ○ I agree with this characterization
- ○ I am not convinced this is an appropriate characterization
- ○ I disagree with this characterization
- ○ I don't know

This protocol has been developed closely following guidelines in the longstanding expert elicitation literature –which is also known as Delphi method, structured expert judgement, and quantitative decision making. Useful references to this method, including a critical review highlighting the danger of overusing it, include Cooke and Goosens (2000), Rowe and Wright (2011), and Morgan (2014).[6]

[6] References:

Boyle, Kevin J., et al. "The benefit-transfer challenges." *Annu. Rev. Resour. Econ.* 2.1 (2010): 161-182.

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SECTION 1. BACKGROUND QUESTIONS

1. When did you first start working with environmental/non-market valuation? Please provide the year when you first started studying or applying valuation methods.

in the year _____

2. Is environmental/non-market valuation your main research field?

○ Yes

○ No

3. Which of the following methods and topics have you applied or studied in your own research? Select the methods and topics you have addressed or used in your own research, and report the number of applications you have carried out on the corresponding method or topic. Please remember that one study may belong to several categories. You may choose several items.

Topic/Methodology	I have applied or studied	Number of studies (published or unpublished)
Contingent valuation	○	
Choice experiment/choice modelling	○	
Travel cost method	○	
Hedonic pricing	○	
Benefit transfer	○	
Meta-analysis	○	
Meta-analysis for benefit transfer	○	
Expert elicitation	○	
Bayesian analysis	○	
Eutrophication in the Baltic Sea	○	
Public policy in the Baltic Sea	○	

4. In terms of non-market valuation, of which three countries do you consider you have the most experience? Please write the names of the countries below, starting with the country you have the most experience of.

country I have the most experience _____

country I have the second most experience _____

country I have the third most experience _____

5. What is, in your opinion, the preferred option for benefit transfer when the study site and the policy site are different?

- ○ Simple mean value transfer
- ○ Adjusted mean value transfer
- ○ Value function transfer
- ○ It depends. Please provide a short explanation:

_____

6. Have you participated in an expert elicitation before as an expert? Keep in mind that alternative denominations of expert elicitation include the Delphi method, structured expert judgment, and quantitative decision making, among others.

- ○ Yes, with an aim of environmental valuation
- ○ Yes, with some other aim than environmental valuation
- ○ No

7. What is your opinion on using expert elicitation to calibrate benefit transfers? Please choose one option that best represents your view.

- ○ I am for the approach
- ○ I am against the approach
- ○ I do not have enough knowledge on expert elicitation to offer an opinion
- ○ I do not think that calibration of benefit transfers is needed

8. Why are you of this opinion?

9. Are you familiar with the BalticSUN contingent valuation survey on reduced eutrophication conducted in all Baltic Sea coastal countries in 2011?

○ Yes, I have read papers/reports on it.

○ Yes, I have heard about it somewhere.

○ No, I am not familiar with it at all. **=> skip question 10 and move to Section 2**

10. Are you familiar with the willingness to pay results obtained with the BalticSUN valuation survey? Please choose the response option that best represents your knowledge level.

○ Yes, I know the mean willingness to pay in some of the Baltic Sea countries.

○ Yes, I know the mean willingness to pay in my own country.

○ Yes, I have some idea of the mean willingness to pay in some of the Baltic Sea countries.

○ Yes, I have some idea of the mean willingness to pay in my own country.

○ No, I do not know the mean willingness to pay in my own country or any other country.

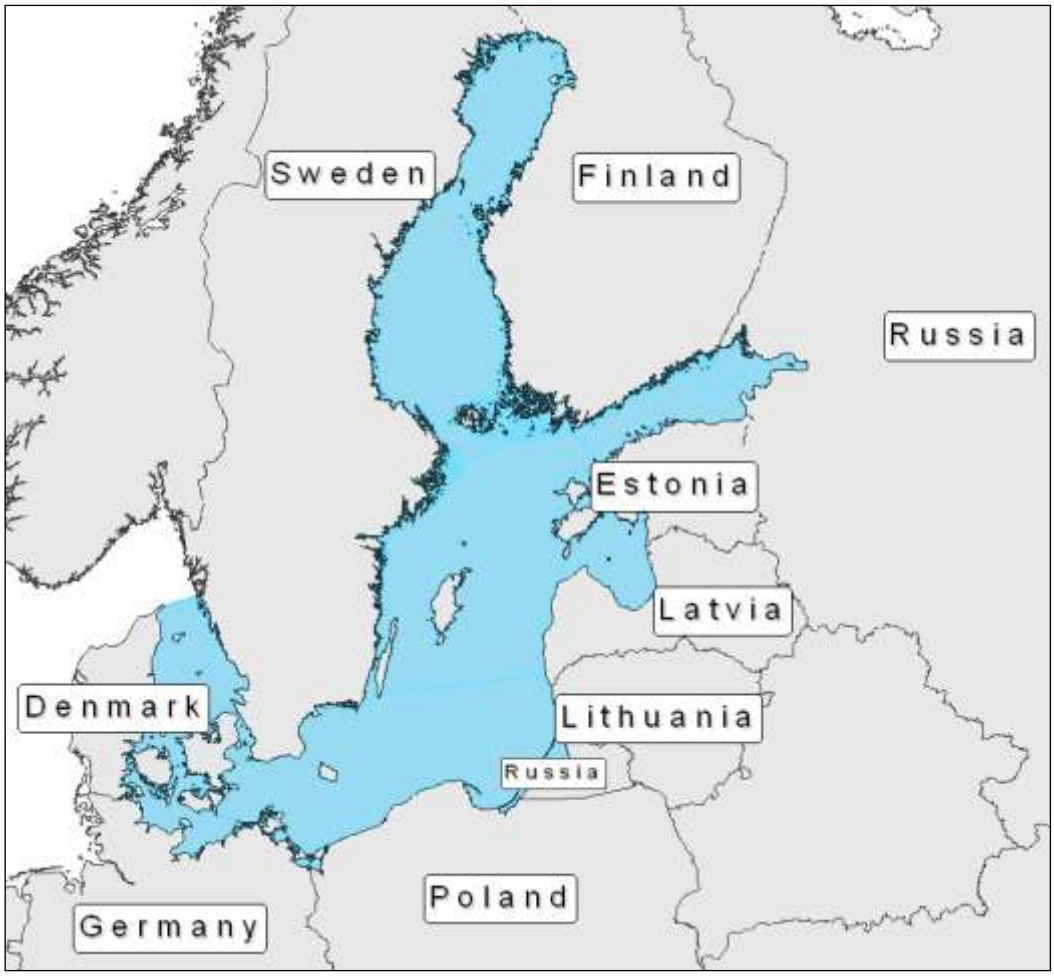
SECTION 2. PRESENTATION OF THE STUDY AND THE ENVIRONMENTAL CHANGE TO BE VALUED

This section describes the contingent valuation study that was implemented on nationally representative samples of inhabitants of the nine coastal countries of the Baltic Sea – Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

WTP estimates from this contingent valuation have already been used to carry out benefit transfers (see Ahtiainen et al. 2015).[7] The transfer errors are relatively large, with the preferred method yielding transfer errors between 1% and 460%. We aim to use your expert opinion to calibrate these benefit transfer errors.

The rest of the section describes the environmental good to be valued. The survey valued reductions in eutrophication in the entire Baltic Sea. The contingent valuation survey explained that the Baltic Sea is the whole sea from the Bothnian Bay in north to the Gulf of Finland in east and Kattegat in west. The Baltic Sea is depicted with light blue colour in the map below.

[7] Ahtiainen, H., Artell, J., Czajkowski, M., & Meyerhoff, J. (2015). ”Performance of different approaches in international benefit transfer: Insights from a nine country experiment”. University of Warsaw, Faculty of Economic Sciences, working paper No. 28/2015, available at http://www.wne.uw.edu.pl/files/3114/3759/9623/WNE_WP176.pdf.


Sweden
Finland
Russia
Estonia
Latvia
Denmark
Lithuania
Russia
Poland
Germany

Respondents of the contingent valuation protocol were presented an eutrophication reduction scenario. Changes in eutrophication were shown on a colour scale prepared by marine scientists. This water quality scale is illustrated in the table below.

Description of the effects of eutrophication						
Water quality	***Water clarity***	***Blue-green algal blooms***	***Underwater meadows***	***Fish species***	***Deep sea bottoms***	**Water quality**
Best possible water quality	**Clear**	**Seldom**	**Excellent condition** **Good for fish spawning and feeding**	**Cod, herring and perch common**	**No oxygen deficiency** **Bottom animals common**	Best possible water quality
	Mainly clear	**Sometimes**	**Patchy vegetation** **Good for fish spawning and feeding**	**Cod, herring and perch common**	**Oxygen deficiency in large areas** **Bottom animals common**	
	Slightly turbid	**In most summers**	**Cover a small area** **Less good for fish spawning**	**Fewer cod, but herring and perch common** **More roach, carp and bream**	**Oxygen shortages often in large areas** **Some bottom animals rare**	
	Turbid	**Every summer**	**Cover a small area** **Bad for fish spawning**	**Fewer cod, herring and perch** **More roach, carp and bream**	**Oxygen shortages often in large areas** **Some bottom animal groups have disappeared**	
Worst possible water quality	**Very turbid**	**On large areas every summer**	**Almost gone** **Not suitable for fish spawning**	**Almost no cod, fewer herring and perch** **Lots of roach, carp and bream**	**Oxygen shortages always in large areas** **No bottom animals in many areas**	Worst possible water quality

Valuation scenario

Respondents were presented the level of eutrophication on maps. The maps were prepared by marine scientists and were based on the best available knowledge on the development of eutrophication in the Baltic Sea. The colours on the map correspond to the water quality scale (blue = best level, red = worst level).

Eutrophication was said to be reduced in the entire Baltic Sea area. This meant that eutrophication was presented as an average for large areas, and local conditions could be slightly better or worse from the regional averages shown in the maps.

The contingent valuation survey described a program that would reduce the nutrient loads to the Baltic Sea by, for example, reducing the use of fertilizers, changing to phosphate-free detergents and increasing the efficiency of wastewater treatment. Measures that reduce nutrient emissions the most efficiently would be taken. All Baltic Sea countries would agree upon implementing these measures and the chosen program would be internationally binding.

The survey stated that additional measures to reduce eutrophication cost money, and some of the costs accrue every year. More funds are needed to be able to implement a program. The chosen program was said to be financed by collecting a special Baltic Sea tax from each individual and firm in all Baltic Sea countries. The payments would be mandatory for all individuals and firms, and they would only be used for reducing eutrophication in the Baltic Sea.

When asking for the willingness to pay of the respondents, we asked them to keep in mind that

- Individuals would have to pay the special Baltic Sea tax every year for the rest of their lifetime that would leave them with less money to spend on other things.
- Reducing eutrophication would not improve other environmental problems in the Baltic Sea, such as toxic environmental pollutants, litter, overfishing and the risk of oil spills.
- Respondents had the possibility to use other water bodies, such as lakes, rivers and other sea areas for recreation.

Before presenting specific details about the scenario presented to the respondents, we would like to gather your opinion on the following issues.

11. In your opinion, do people in Country care about reducing eutrophication in the Baltic Sea?

○ Yes, a large majority cares

○ Yes, some people care

○ Yes, a small minority cares

○ No, no-one cares

12. In Country, what percentage of the nationally representative sample of respondents would state they are willing to pay to reduce eutrophication in the Baltic Sea? You may give your answer as an exact percentage or as a range.

_____ %

13. In Country, what percentage of protest zero responses would you expect? This means people who state they are not willing to pay anything even though they value reduced eutrophication In the Baltic Sea. You may give your answer as an exact percentage or as a range.

_____ %

14. In Country, which of the following would be the most important reasons for protest responses? You may pick one or more reasons.

○ Distrust in the success of the program

○ Distrust in the government

○ Negative attitude towards extra taxes

○ Not believing the money will be used for the purpose

○ Opinion that other countries are responsible for dealing with the issue

○ Other, what

_____

15. What is your preferred strategy when dealing with protest answers?

○ Exclude them from the sample before the analysis

○ Consider them as a regular zero responses

○ Other, please specify

_____

SECTION 3. SCENARIO AND WILLINGNESS TO PAY QUESTIONS

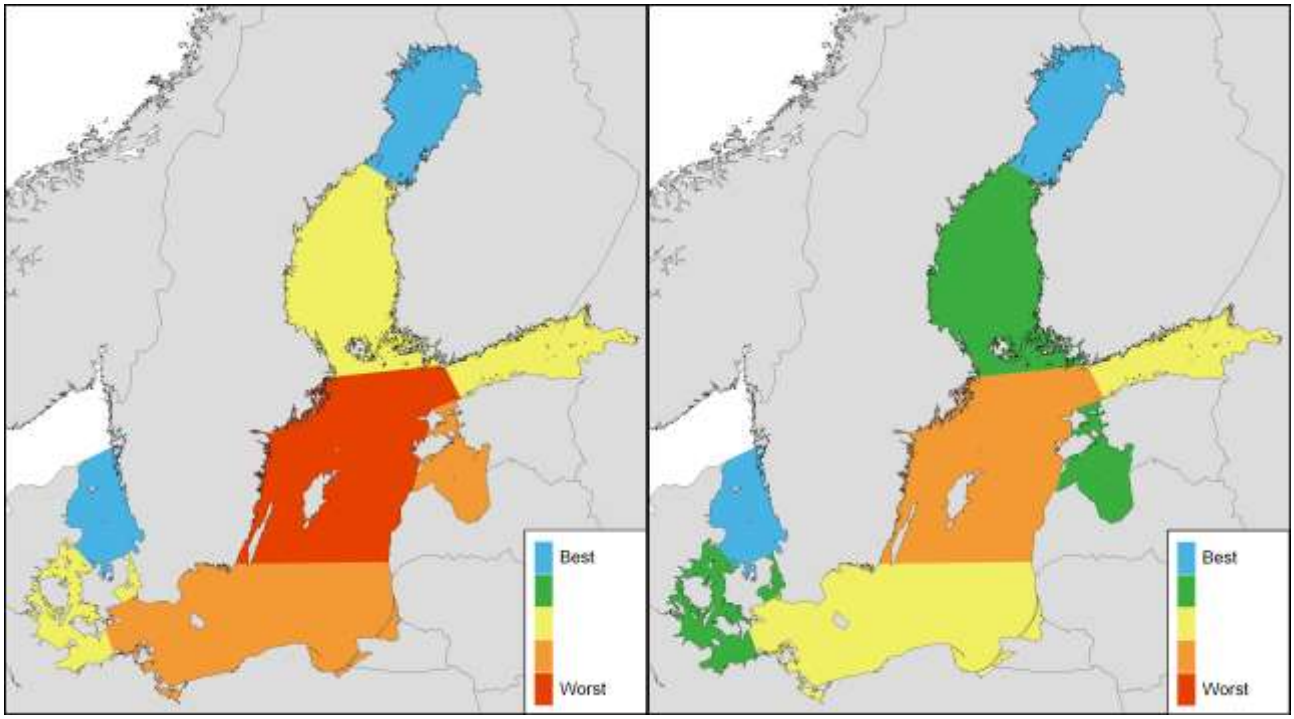
Next we describe the program presented to the respondents and ask some questions on willingness to pay.

Program

The figure below presents two maps. The map on the left illustrates the level of eutrophication in the Baltic Sea in 2050 without a program to reduce eutrophication. The map on the right illustrates the level of eutrophication in 2050 with the program to reduce eutrophication.

Eutrophication was said to gradually decrease and water quality to improve until it reaches the state in the map on the right in 2050.

Baltic Sea in 2050 without the program **Baltic Sea in 2050 with the program**

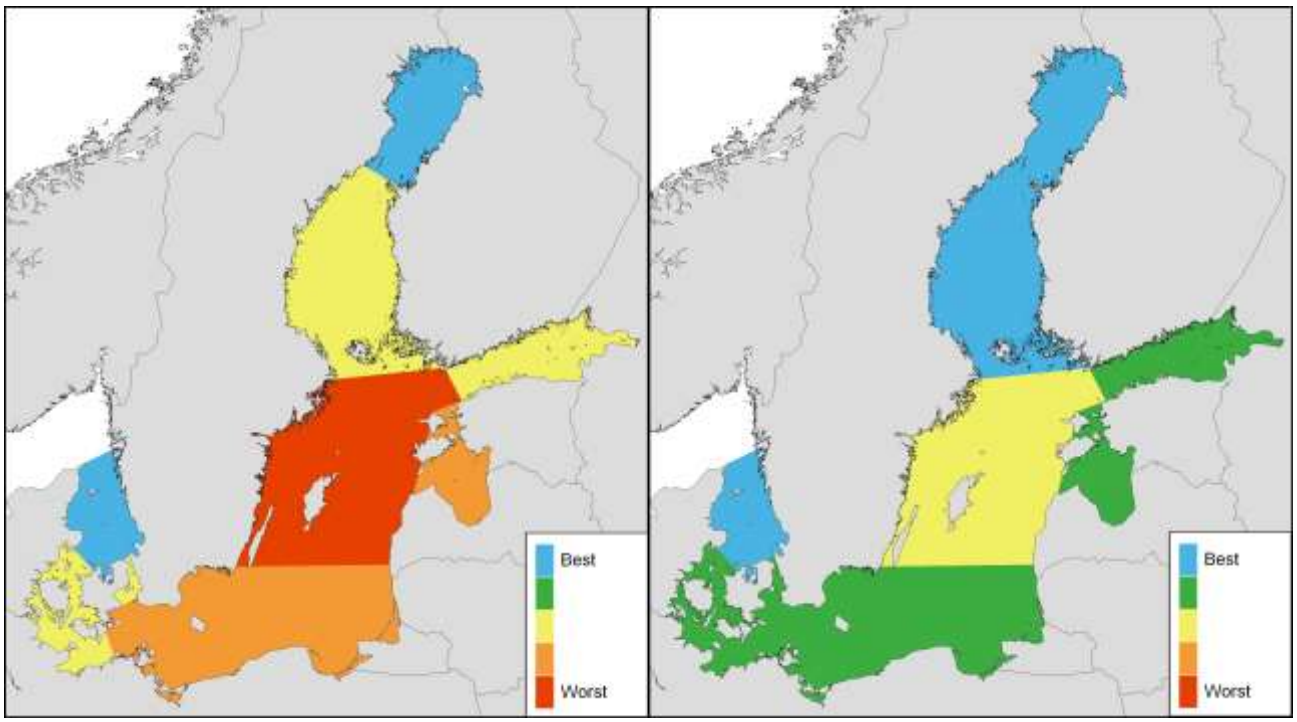


Program

The figure below presents two maps. The map on the left illustrates the level of eutrophication in the Baltic Sea in 2050 without a program to reduce eutrophication. The map on the right illustrates the level of eutrophication in 2050 with the program to reduce eutrophication.

Eutrophication will gradually decrease and water quality will improve until it reaches the state in the map on the right in 2050.

Baltic Sea in 2050 without the program **Baltic Sea in 2050 with the program**



The table below lists the mean willingness to pay (WTP) in Country obtained from a nationally representative sample. WTP is based on the total sample –i.e. including all zero responses, also those that could be identified as protest zeros. Both WTP and income have been corrected using purchasing power parities (which take into account the purchasing power in different countries) and are presented in euros. The associated socio-economic characteristics in the sample are also listed. These are close to the socio-economic statistics in the national population.

Characteristic	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden
Mean annual WTP in PPP corrected 2011 €	47.5	32.6	58.3	31.1	7.0	9.6	16.1	7.7	114.4
Mean annual net income (in PPP corrected 2011 €)	19 900	10 300	19 100	18 700	5800	4100	10 100	8000	17 200
Mean age	50	38	51	42	44	45	39	45	54
Share of people with high (tertiary) level of education, e.g. university and polytechnic	48	55	33	42	25	25	33	45	51
Mean distance to the coast (km)	13	29	60	357	54	186	296	881	39
Maximum distance to the coast (km)	71	146	325	700	200	325	633	9300	257

16. Please offer an estimate of the willingness to pay of an individual in Country assuming that each of the characteristics changes as stated below one at a time. That is, assume that only one characteristic changes, and the rest are fixed at the values listed in the table above.

What, in your expert opinion, would a Countryish individual's willingness to pay in euros be…

a) if the individual's annual net income was 25% percentile €? _____ **euros**

b) if the individual's annual net income was 75% percentile €? _____ **euros**

c) if the individual's distance to the coast was 25% percentile km? _____ **euros**

d) if the individual's distance to the coast was 75% percentile km? _____ **euros**

17. How certain are you of your answers to the previous question on willingness to pay? Please respond by assigning a percentage (%) or percentage range (%-%) which you think represents your certainty level.

I am _____ % certain

18. Also other than socio-demographic factors may affect willingness to pay. Assume again that each of the characteristics changes as stated below one at a time, and the socio-demographic characteristics are fixed at the values listed in the table above.

What, in your expert opinion, would a Countryish individual's willingness to pay in euros be…

a) if the individual did not trust the government? **_____ euros**

b) if the individual had a positive environmental attitude? **_____ euros**

c) if the individual used the Baltic Sea for recreation? **_____ euros**

d) if the Baltic Sea is important to the individual's cultural identity **_____ euros**

19. How certain are you of your answers to the previous question on willingness to pay? Please respond by assigning a percentage (%) or percentage range (%-%) which you think represents your certainty level.

I am _____ % certain

SECTION 4. BENEFIT TRANSFER EXCERCISE

Next we would like you to make a benefit transfer exercise. This means that we would like you to estimate the maximum willingness to pay of a person in a given country based on the willingness to pay of a similar person in OwnCountry.

The individuals are identical in terms of their income and distance to the coast, but live in different countries. You may take into account any additional factors that you think will affect willingness to pay, for example differences in cultural issues, trust in government, environmental attitudes and use of the Baltic Sea. Please present the willingness to pay estimates in euros.

Assume a OwnCountryish individual who is X year old, lives at a Y distance from the coast, has Z annual net income and has a university level education. This individual's annual willingness to pay is XX€.

20a. Based on this information, what is the annual maximum willingness to pay (€) you would assign for an individual with identical age, distance, income and education in OtherCountry?

_____ euros

20b. In your opinion, which of the following factors that may cause differences in willingness to pay across countries did you consider in making the benefit transfer? You may choose one or several factors.

○ Use of the Baltic Sea

○ Cultural reasons

○ Environmental attitudes

○ Trust in government

○ Substitutes

○ Other, please
specify_____

20c. How would you rank the importance of the factors you considered in the benefit transfer?
Please mark number 1 next to the most important factor, 2 next to the second most important etc.

_____ Use of the Baltic Sea

_____ Cultural reasons

_____ Environmental attitudes

_____ Trust in government

_____ Substitutes

_____ Other, please
specify_____

20d. How certain are you of your answer to the benefit transfer question? Please respond by assigning a percentage (%) or percentage range (%-%) which you think represents your certainty level.

I am _____ certain

Assume again a OwnCountryish individual who is X year old, lives at a Y distance from the coast, has Z annual net income and has a university level education. This individual's annual willingness to pay is XX€.

21a. Based on this information, what is the annual maximum willingness to pay (€) you would assign for an individual with identical age, distance, income and education in OtherCountry?

_____ euros

21b. In your opinion, which of the following factors that may cause differences in willingness to pay across countries did you consider in making the benefit transfer? You may choose one or several factors.

○ Use of the Baltic Sea

○ Cultural reasons

○ Environmental attitudes

○ Trust in government

○ Substitutes

○ Other, please specify_____

21c. How would you rank the importance of the factors you considered in the benefit transfer? Please mark number 1 next to the most important factor, 2 next to the second most important etc.

_____ Use of the Baltic Sea

_____ Cultural reasons

_____ Environmental attitudes

_____ Trust in government

_____ Substitutes

_____ Other, please specify_____

21d. How certain are you of your answer to the benefit transfer question? Please respond by assigning a percentage (%) or percentage range (%-%) which you think represents your certainty level.

I am _____ certain

Assume again a OwnCountryish individual who is X year old, lives at a Y distance from the coast, has Z annual net income and has a university level education. This individual's annual willingness to pay is XX€.

22a. Based on this information, what is the annual maximum willingness to pay (€) you would assign for an individual with identical age, distance, income and education in OtherCountry?

_____ euros

22b. In your opinion, which of the following factors that may cause differences in willingness to pay across countries did you consider in making the benefit transfer? You may choose one or several factors.

○ Use of the Baltic Sea

○ Cultural reasons

○ Environmental attitudes

○ Trust in government

○ Substitutes

○ Other, please specify_____

22c. How would you rank the importance of the factors you considered in the benefit transfer? Please mark number 1 next to the most important factor, 2 next to the second most important etc.

_____ Use of the Baltic Sea

_____ Cultural reasons

_____ Environmental attitudes

_____ Trust in government

_____ Substitutes

_____ Other, please
specify_____

22d. How certain are you of your answer to the benefit transfer question? Please respond by assigning a percentage (%) or percentage range (%-%) which you think represents your certainty level.

I am _____ certain

Assume again a OwnCountryish individual who is X year old, lives at a Y distance from the coast, has Z annual net income and has a university level education. This individual's annual willingness to pay is XX€.

23a. Based on this information, what is the annual maximum willingness to pay (€) you would assign for an individual with identical age, distance, income and education in OtherCountry?

_____ euros

23b. In your opinion, which of the following factors that may cause differences in willingness to pay across countries did you consider in making the benefit transfer? You may choose one or several factors.

○ Use of the Baltic Sea

○ Cultural reasons

○ Environmental attitudes

○ Trust in government

○ Substitutes

○ Other, please specify_____

23c. How would you rank the importance of the factors you considered in the benefit transfer? Please mark number 1 next to the most important factor, 2 next to the second most important etc.

_____ Use of the Baltic Sea

_____ Cultural reasons

_____ Environmental attitudes

_____ Trust in government

_____ Substitutes

_____ Other, please
specify_____

23d. How certain are you of your answer to the benefit transfer question? Please respond by assigning a percentage (%) or percentage range (%-%) which you think represents your certainty level.

I am _____ certain