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Abstract

In this study, we used choice experiment data to analyze the accuracy of benefit transfer (BT) between two case study areas in Sweden for attributes relevant to the implementation of the EU Water Framework Directive and special consideration zones in marine areas. The accuracy and reliability of a BT based on a model including only easily available socioeconomic information is similar to the accuracy of a BT based on a model that gives the best statistical fit, but requires time-consuming data collection. Further, the former model has almost as good a fit as the latter. The BT error varies significantly across the attributes, regardless of which model is used. The results are inconclusive as to whether socioeconomic adjustments improve transfer or not.

1. Introduction

The introduction of the European Union's Water Framework Directive (WFD) in 2000 (WFD; European Parliament, 2000) has meant a fundamental shift in the demand for benefit transfer (BT). The reason for this is that the directive requires that European waters should be improved to "good ecological status" by 2015, and that estimates of the economic costs and benefits of improvements in ecological status should be included in catchment management plans. Derogations from the requirement of good ecological status are allowed if the costs are deemed unreasonably high compared to the benefits. Since it is unlikely that management agencies in EU countries will have the time or funds to conduct original non-market valuation studies in every specific case, BT remains the only viable option. This has had the effect of putting the spotlight on the performance of BT in different respects.

Previous research on BT has focused mainly on methodological advances, often at the expense of policy-relevant empirical estimates (as concluded in the overview by Johnston & Rosenberger, 2010). However, this study focuses on using well-established statistical models for choice experiments (CE) to estimate willingness-to-pay (WTP) values and to test value transfer for the attributes *improved water quality* and *less noise and littering*. The former attribute is of direct policy importance for the implementation of the Water Framework Directive. The latter attribute is of direct policy importance since, in Sweden, special consideration zones (SCZ) in marine areas are being introduced, in which there are several restrictions, e.g. to boat traffic, noise and littering. It should be mentioned that, to the best of our knowledge, no BT has been conducted involving noise and littering in coastal areas.

The study areas are two inlets in Sweden: the Eight Fjords area, around the islands Orust and Tjörn, in the county of Västra Götaland, north of Gothenburg; and Himmerfjärden in the county of Stockholm. Our set-up is similar to that of Yong, Swallow & McGonagle (2005) who apply CE to estimate valuation functions for the protection of coastal sites for public access in the USA. They focus on the evaluation of how different model specifications affect BT success by comparing CE models containing only the resource attributes to models containing socioeconomic characteristics and/or respondents' attitudes. However, the included covariates are not motivated on statistical grounds. Our focus lies in comparing a "specific" model, i.e. a model that gives the best statistical fit but requires the government agency to collect detailed information to calculate the value of the BT function at a potential policy site, with a "general" model, i.e. a model that only requires the government agency to collect readily obtainable demographic data at the policy site. The research question is: how much is the BT improved when the specific, rather than the general model, is used? Or put another way, how much accuracy is lost when moving from the specific to the general model? The results have importance, since the specification of the BT function will determine the type of information that must be collected at the policy site. Our study also highlights the importance of including socioeconomic attributes in BT modeling; an issue which has so far received limited attention in the CE literature, an exception being Johnston & Duke (2010). However, this study differs from Johnston and Duke's approach, not only in the object of valuation, in their case agricultural land preservation, but also in that their focus is on the reliability of BT when socioeconomic adjustments are infeasible.

The increasing research interest in BT, spurred by government needs such as those imposed by the Water Framework Directive, has resulted in a large and increasing literature on BT, with the majority of the research conducted in the last 15 years. A nice attempt to summarize research contributions and identify issues and challenges can be found in Johnston & Rosenberger (2010). A striking feature in Johnston and Rosenberger's review is how little consensus has been reached on different issues that need to be settled before BT can be applied systematically by government agencies. Specifically: what could be a minimum acceptable reliability threshold when comparing benefit estimates transferred to a policy site with corresponding estimates resulting from actually conducting a study at the policy site? This is an issue of direct importance for the tests conducted in this study, but so far little more has been said than that the acceptable level of transfer accuracy is context dependent – i.e. the required accuracy depends on the policy needs (e.g. Kristoferson & Navrud, 2005; Columbo & Hanley, 2008; Stapler & Johnston, 2009). However, one issue on which a reasonable amount of consensus has been reached is the importance of similarity between sites and populations for performing valid and reliable BTs (Johnston & Rosenberger, 2010).

The remainder of the paper is organized as follows. The case study areas, the scenarios, the survey and the CE method are described in the next section. This is followed in section 3 by the empirical results of the survey, focusing on the accuracy of BT based on the specific and on the general models. Finally, section 4 concludes the paper with a discussion of policy implications, comparison with previous research and options for future research.

2. Background and methods

2.1. The study areas

The two study areas are similar to each other in several respects. They are situated close to large Swedish cities: Himmerfjärden, being close to Stockholm on the east coast; and the Eight Fjords area, being close to Gothenburg on the west coast (see Figure 1). Both areas are widely used for recreation, such as fishing, bathing, hiking and boating, and have a mix of visitors – permanent residents, frequent visitors such as summer house owners, and less frequent visitors. See the descriptive statistics for further details.

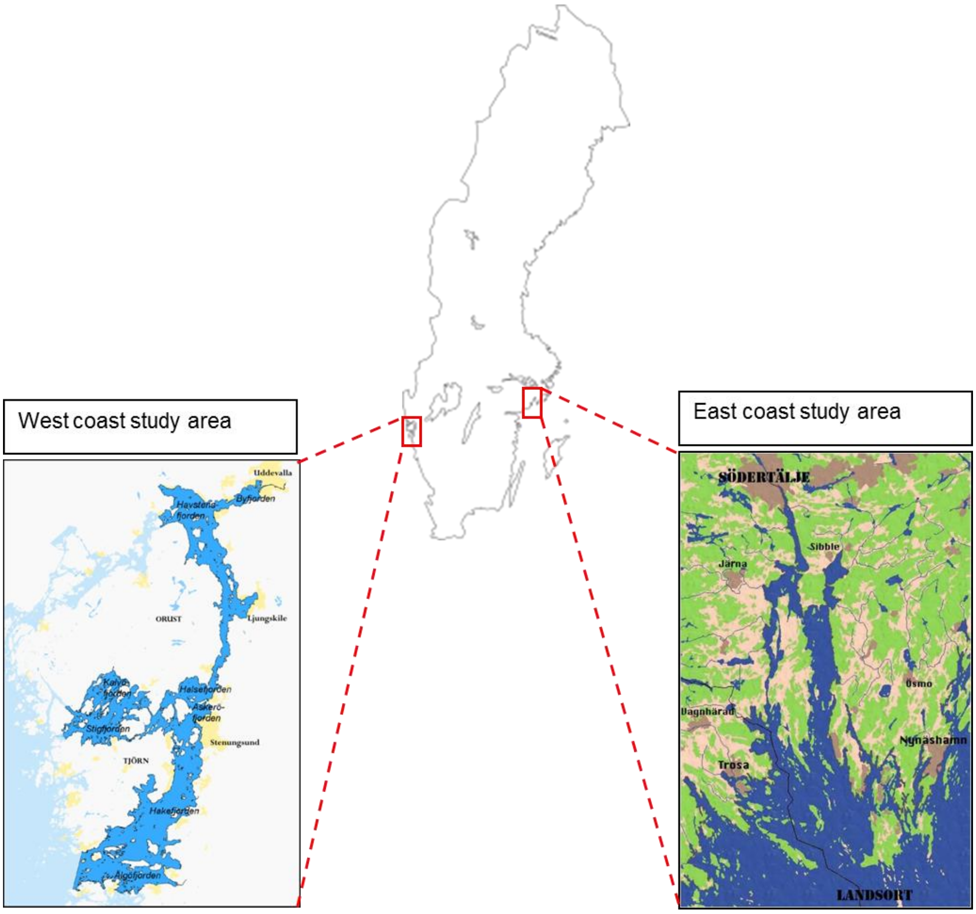

Figure 1. The locations of the study areas.

The areas are also similar in terms of environmental problems and their potential solutions. There are three main kinds of ecological problems in the areas: eutrophication effects, littering and noise from, for example, speeding boats, and decreasing fish populations. Fish populations will, however, not be addressed in this paper. Potential actions for improvement regarding eutrophication and littering and noise are an introduction of SCZs with restrictions to boat traffic, noise and littering, and a reduction of nutrient effluents from, for example, sewage treatment plants in the area. High concentrations of nutrients cause decreased water clarity (measured as Secchi depth), decrease of bladderwrack (*Fucus vesiculosus*) stands, and overgrowth with filamentous macroalgae. These effects disturb recreational activities in the areas. Bladderwrack presence is well correlated with the Secchi depth, since it is dependent on light from the surface. Also, a high nutrient concentration leads to the growth of filamentous macroalgae, which compete with the bladderwrack. The existence of bladderwrack stands is thus an indicator of good water conditions with respect to eutrophication.

Heavy growth of filamentous macroalgae in some eutrophied areas causes algae mats to assemble in shallow bays and on beaches. These algae mats are torn loose during storms and decompose quickly. In some parts of the Eight Fjords area, this is a severe problem (c.f. Harlén & Zackrisson 2001), causing a nuisance for recreationists. In the Himmerfjärden study area, however, the problem with algae mats is less severe. On the other hand, the Himmerfjärden area has problems with cyanobacterial blooms, which are not present in the Eight Fjords area. These blooms are a natural phenomenon in the Baltic Sea, which Himmerfjärden is a part of, but the frequency and extent of occurrence increases with increasing concentrations of nutrients. Cyanobacterial blooms are in some cases toxic and can be harmful, not least to children and animals. This can limit the opportunities for beach recreation in the Himmerfjärden study area.

The EU's WFD requires coastal and inland water areas to be classified according to a five-level scale describing the ecological status – water quality – of the area. Further, "good ecological status" has to be achieved by 2015 (European Parliament 2000). The formal requirements for good status are specified so as to allow *"only a slight departure from the biological community which would be expected in conditions of minimal anthropogenic impact"* (EC 2010). This means that the requirements for each status level vary both between countries and within countries. In Sweden, the Environmental Protection Agency (Swedish EPA 2007) has developed norms for status classification based on different representative geographical areas, and we have used water clarity, presence of bladderwrack and amount of overgrowth with filamentous algae in the description of the water quality scale provided to the survey respondents. We also used photos representative of each water quality class (see Appendix I). Cyanobacterial blooms are not included in this status classification; general eutrophication effects related to the water quality classification, such as those described above, do not always co-vary with cyanobacterial blooms. This is because different nutrients can be involved in the growth of cyanobacterial blooms than those that affect the other aspects of water quality described above (Elmgren & Larsson 2001).

Regarding noise and littering, county administrative boards in Sweden have responded by introducing SCZs, in which there are (not legally binding) restrictions regarding, e.g., littering, boat traffic and other sources of noise. In principle, the same types of restrictions apply in all SCZs, making this policy a "standard" one.

2.2. Scenarios

The status quo for *water quality* differs between *very low*, *low*, and *moderate* in different parts of the study areas, as described in Appendix I for the east coast study area[1]. *Algae blooms* is a separate attribute since it is not included in the WFD status classification and since different types of action may be needed regarding these two issues. Also, during the early phases of the study, it was tested whether the general public sees *water quality* and *algae blooms* as separate, and a conclusion from this was that it is possible to separate them as two different attributes, given that information of the causes of the respective eutrophication effects were provided in the questionnaire. Status quo for *algae blooms* was defined as *high risk for one large scale bloom in the study area every year*. Regarding noise and littering, status quo was defined as *no specific policy action is taken against the problems.*

For the eutrophication-targeting policy action, the scenario was defined as improved technology in municipal sewage treatment plants. For noise and littering, the scenario was defined as an introduction of SCZs in certain parts of the study areas, as described in Appendix I for the east coast study area. Three SCZs would be introduced in each study area.

An implementation of these policy actions should lead to changes in the attributes. For *water quality* and *algae blooms*, two potential levels of improvement were presented, and for *noise and littering*, there was only one potential level of improvement. The *water quality* scenarios were an improvement by one level (e.g. from *very low* to *low*) or by two levels (e.g. from *very low* to *moderate*), in each part of the study areas. For *algae blooms* (Himmerfjärden only), the scenarios were a high risk of one large-scale bloom in the study area every third, or every tenth year. For *noise and littering*, the scenario was less noise and littering as a result of the restrictions implied by the introduction of the SCZs. The scenarios are summarized in Table 1, below.

[1] We used "very low", "low", "moderate", "good", and "very good" as descriptors of the water quality levels to the respondents. This corresponds to "bad", "poor", "moderate", "good", and "high", as used in WFD policy documents.

Table 1. The valuation scenarios

	Water quality	*Algae blooms* (Himmerfjärden only)	*Noise and littering*
Status quo	Very low, low or moderate	High risk of one large-scale bloom every year	No specific actions are taken
When policy actions are taken	Improvement by one level or Improvement by two levels	High risk of one large-scale bloom every third year or High risk of one large-scale bloom every tenth year	Less noise and littering as a result of SCZ restrictions

The financing of the proposed improvement projects was described as a monthly fee to be collected from the citizens of the surrounding municipalities between the years 2010 to 2029. The fee would support a government fund for implementation of the proposed plan of action. The proposed actions would be pursued if the benefits to the public exceeded the costs.

2.3. Survey

A web-based panel survey was conducted during fall 2009 in both study areas. The questionnaire was extensively pre-tested, through focus groups and a pilot study, and then minor adjustments were made. The panels, supplied by the survey company Norstat, consisted of randomly selected adults (18 years or older). Such panelists agree to participate in the panel and regularly receive requests to participate in surveys on different topics. The panelists are compensated for their efforts.

In this paper, we present data from four sampling groups[2], two in the Himmerfjärden (henceforth, the east coast) area and two in the Eight Fjords (henceforth, the west coast) area. The *east non-locals* are panelists who live in the southern parts of Stockholm County, but not close to the east coast study area. The *east locals* are panelists who live close to the east coast study area. The *west non-locals* are panelists who live in the western parts of Västra Götaland County, but not close to the west coast study area, and the *west locals* live close to the west coast study area.

[2] In total, five samples were collected. The data from the fifth sample, targeted at people with a non-Swedish background, will be presented elsewhere.

The questionnaires (full versions available in Östberg et al. 2010) consisted of five parts. The first part concerned familiarity with and usage of the areas. The second part described the present status of the coastal environment and contained questions about the respondents' attitudes towards and familiarity with environmental problems in the coastal environment. In the third part we presented the scenarios (see section 3). This was followed by the CE questions. The respondents were here asked to choose between different alternatives that were combinations of different attribute levels, one of them being cost, with the amounts 0, 20, 100, 500, and 1000 SEK per month per household. The respondents on the east coast were faced with six choice sets while the respondents on the west coast were faced with seven. Each choice set consisted of three alternatives, where the first alternative was always the status quo, offering no environmental improvements and no cost to the respondent. See Figure 2 for an example of a choice set. The survey concluded with socioeconomic questions.

	Option A	*Option B*	*Option C*
Water quality	As today	As today	One class improvement
Algae blooms	As today	Every 10th summer	As today
Noise and littering	As today	As today	Less noise and littering
Cost to your household	0 SEK/month	20 SEK/month	100 SEK/month

☐ I would choose Option A

☐ I would choose Option B

☐ I would choose Option C

Figure 2. Example of a choice set.

2.4. Method

In this study, we use the CE method to estimate respondents' WTP for different hypothetical changes in water quality, algae bloom-risks, and noise and littering in coastal environments. The respondents' choices are modeled using a standard random utility framework in which utility is divided into observable and unobservable components (Hanemann, 1984). Individual *i'*s utility from the environmental improvement policy program (henceforth "policy program") *p* is defined as:

$$U_{ip}\ (X_p, D_i, Y_i - Cost_{ip}) = v_{ip}\ (X_p, D_i, Y_i - Cost_{ip}) + \varepsilon_{ip},$$

where X_p is a vector of attributes that characterize policy program *p*, D_i is a vector of socioeconomic variables that characterize individual *i*, Y is income and $Cost_{ip}$ is the cost to individual *i* of the policy program *p*. v_{ip} is the part of the utility function that is observable to the analyst while ε_{ip} is the unobservable part, which is modeled as a random term. An individual faces three different policy programs, *p* = A, B, C, and either chooses one of the policy programs B or C, or neither of these, which results in the status quo, option A. The model assumes that an individual compares the different alternatives and chooses the one that offers the greatest utility. Individual *i* will choose policy program B if

$$U_{iB}\ (X_B, D_i, Y_i - Cost_{iB}) \geq U_{iz}\ (X_z, D_i, Y_i - Cost_{iz}), \quad \text{for z = A, C},$$

which is the same as:

$$v_{iB}\ (X_B, D_i, Y_i - Cost_{iB}) + \varepsilon_{iB} \geq v_{iz}\ (X_z, D_i, Y_i - Cost_{iz}) + \varepsilon_{iz}.$$

If the ε_{ip} are assumed to be independently and identically drawn from an extreme value type 1 distribution, then the model can be estimated as a multinomial logit (MNL) (Hensher, Rose, & Greene, 2005). Based on the above notation, a BT would use an estimated utility function from site *j = n* to approximate a welfare measure at site *m*. This welfare measure could then be compared to an original site-specific value obtained for site *m* to conduct a convergent validity test of BT accuracy (Rosenberger & Stanley, 2006).

Regarding the design of the choice sets, we used a D-optimal procedure (OPTEX) in SAS to generate an orthogonal main effects design and a cyclical fold over; see Kuhfeld (2005). This allowed us to estimate the different attributes independently of one another, and at the same time, to limit the number of choice sets presented to each respondent to lessen the task complexity. Two blocks, each consisting of six choice sets, were required for the east coast survey, while no blocking was necessary for the west coast survey, which consisted of seven choice sets. A standard cheap talk-script (see Appendix II) was used, highlighting, e.g., the importance of evaluating each choice set independent of the others, and asking the respondents to give their true preferences, despite the hypothetical situation (cf. Carlsson et al., 2005; Cummings & Taylor, 1999).

3. Results

3.1 Descriptive statistics

On the east coast, 297 *locals* and 506 *non-locals* responded to the questionnaire. The number of respondents on the west coast was 251 *locals* and 251 *non-locals.* Summary statistics are given in Table 2 for general characteristics, such as age, sex, education level, income, whether or not there are children (0-12 years old) or youths (13-17 years old) in the household, whether the respondent was born in Sweden, whether his/her parents were born in Sweden, and whether the respondent lives in an urban area or in the countryside. Summary statistics for more specific characteristics are also given in Table 2. *Frequent visitor* is the share of respondents who visit the areas more than 50 times per year. *Visited young* is the share that has spent time in the area while growing up. *Visited SCZ* is the share that has visited any of the proposed special consideration zones. The respondents' perception of the importance of the Swedish coastal environment, compared to other social issues, such as healthcare, childcare, education and the labor market, is captured by the variable *Attitude - important*. This is the share of respondents that responded 1, 2 or 3 on a scale from 1 to 5, where 1 is 'much more important' and 5 is 'much less important'. We also present the shares of respondents who have experienced noise and littering, turbid water, and algae blooms, respectively. *EO* is the share of respondents that are members of an environmental organization. Finally, we present the share of respondents who have visited an area with very low, or low water quality. See Table 4 for a summary of variable names.

Table 2. Summary statistics for the different groups.

	east locals	east non-locals	west locals	west non-locals
General characteristics				
Age	48.06 (12.50)	41.15 (12.50)	43.48 (11.11)	40.81 (11.30)
Sex (female=1)	0.57 (0.50)	0.67 (0.47)	0.62 (0.49)	0.61 (0.49)
University degree (yes/no)	0.40 (0.49)	0.53 (0.50)	0.45 (0.50)	0.60 (0.49)
Income (>30000 SEK)	0.32 (0.47)	0.37 (0.48)	0.36 (0.48)	0.37 (0.48)
Children in household (yes/no)	0.24 (0.43)	0.28 (0.45)	0.25 (0.44)	0.26 (0.44)
Youths in household (yes/no)	0.24 (0.43)	0.20 (0.40)	0.27 (0.57)	0.17 (0.44)
Born in Sweden (yes/no)	0.95 (0.23)	0.91 (0.29)	0.96 (0.19)	0.98 (0.14)
Parents born in Sweden (yes/no)	0.85 (0.36)	0.74 (0.44)	0.86 (0.35)	0.88 (0.33)
Countryside (yes/no)	0.66 (0.47)	0.07 (0.26)	0.47 (0.50)	0.12 (0.33)
Specific characteristics				
Frequent visitor (yes/no)	0.36 (0.48)	0.05 (0.22)	0.38 (0.48)	0.11 (0.32)
Visited young (yes/no)	0.48 (0.50)	0.34 (0.45)	0.62 (0.49)	0.44 (0.50)

Visited SCZ (yes/no)	0.52 (0.50)	0.12 (0.32)	0.24 (0.43)	0.12 (0.33)
Attitude - important (yes/no)	0.89 (0.32)	0.83 (0.38)	0.90 (0.31)	0.86 (0.35)
Experienced noise and litter (yes/no)	0.72 (0.45)	0.80 (0.40)	0.84 (0.37)	0.84 (0.37)
Experienced turbid water (yes/no)	0.87 (0.33)	0.77 (0.42)	0.79 (0.42)	0.84(0.37)
Experienced algae blooms (yes/no)	0.89 (0.33)	0.77 (0.42)		
EO (yes/no)	0.13 (0.34)	0.13 (0.34)	0.07 (0.26)	0.10 (0.30)
Visited very low (yes/no)	0.62 (0.49)	0.22 (0.42)	0.41 (0.49)	0.19 (0.39)
Visited low (yes/no)	0.33 (0.47)	0.10 (0.31)	0.32 (0.47)	0.16 (0.36)

Standard deviations are given in parentheses.

Considering the general statistics for the different groups, Table 2 shows that, independent of region, the average age is higher for *locals* than for *non-locals*, and the overall average age is just over 40 years. Also, independent of region, about 60 percent of the respondents are women. Further, depending on region, between 40 and 45 percent of the respondents have a university education. Moreover, the share of respondents in the different groups with a household income over 30 000 Swedish Kronor per month varies between 32 and 37 percent.

When it comes to household composition, independent of group and region, about 5 percent of the respondents were not born in Sweden, while about 15 percent of the respondents have one or two parents who were not born in Sweden. The share of respondents with children (0-12 years old) in their household is about 25 percent for all four groups, while the share of respondents with youths (13-17 years old) in their household is slightly lower.

Finally, the big difference in the share of respondents living in the countryside (less than 10 000 inhabitants) between the *non-locals* and the *locals* is due to the fact that the *locals* represent rural municipalities while the *non-locals* represent urban areas. Apart from this difference, it can be concluded that the demographic composition of the four groups is similar. Regarding representativeness, our samples correspond well with the panel structure in the areas; see Östberg et al. (2010) for details.

Let us turn to the more specific characteristics presented in Table 2. Independent of region, a larger share of *locals*, compared to *non-locals*, visited the area when they were young. Also, not unexpectedly, *locals* visit the area more frequently than *non-locals*. So it is not surprising that *locals* are more likely to have visited an area with low or very low water quality, or one of the proposed SCZs. Table 2 also shows that the statistics of the specific characteristics for *east non-locals* are very close to those of the corresponding group on the west coast. However, a comparison of the two *locals* groups shows that a much larger share of the *east locals*, compared to the *west locals*, have visited any of the planned SCZs (0.52 vs. 0.24) and that *east locals* are more likely to have visited an area with very low water quality (0.62 vs. 0.42). The *west locals* visited the area when they were young more frequently than did the *east locals* (0.62 vs. 0.48). A large share in all four groups has experienced noise and littering (0.72-0.84) and turbid water (0.77-0.87), though not necessarily in the study area. About 80 percent of the respondents on the east coast have experienced algae blooms. Also, a large proportion of all four groups (0.83-0.90) thinks that, compared to other issues, issues related to water quality improvement are important. Finally, about 10 percent of the respondents in the different groups are members of an EO.

Summary statistics for the activities undertaken by the respondents in the study areas and the nature of their accommodation are given in Table 3. It is notable how similar many of the results are for the two regions and the different groups. However, in a few cases the results are noticeably different between the groups. First, *west non-locals* go sailing much more frequently, and fishing much less frequently than the other groups. Second, *east locals* drive a boat with more than 10 hp, and go ice-skating and skiing more frequently[3] than the other groups. Third, on the west coast, diving and visiting relatives are more popular than on the east coast. The reverse holds for bird watching.

When it comes to differences between *locals* and *non-locals*, as expected there is a much larger share of *local* respondents who live in the area than do *non-locals*, while the reverse holds for the share of respondents owning a summer house in the area, or who visit relatives when making a trip to the area. In general, the most popular activities by far when visiting the area are swimming, sunbathing and walking (which includes hiking and jogging). Still, these activities are more popular for *locals* than for *non-locals,* as are fishing and barbequing.

[3] It is not surprising that people go ice-skating or skiing more frequently on the east coast than on the west coast, as it is rare to have a winter with a lot of snow and ice on the west coast.

Table 3. Summary statistics for activities and lodging when visiting the study areas

	east locals	east non-locals	west locals	west non-locals
Activity				
Sailing	0.14 (0.35)	0.15 (0.36)	0.13 (0.342)	0.31 (0.46)
Boating, <10 hp	0.15 (0.36)	0.13 (0.33)	0.16 (0.366)	0.11 (0.31)
Boating, >10 hp	0.35 (0.48)	0.18 (0.39)	0.16 (0.37)	0.15 (0.36)
Water scooting	0.01 (0.06)	0.02 (0.12)	0.00 (0.00)	0.01 (0.10)
Water skiing	0.03 (0.16)	0.02 (0.14)	0.02 (0.14)	0.03 (0.16)
Kayaking or rowing	0.18 (0.39)	0.14 (0.35)	0.13 (0.33)	0.07 (0.26)
Surfing	0.01 (0.11)	0.02 (0.12)	0.01 (0.12)	0.01 (0.10)
Swimming	0.83 (0.38)	0.69 (0.46)	0.85 (0.36)	0.67 (0.47)
Sunbathing	0.70 (0.46)	0.59 (0.49)	0.76 (0.43)	0.56 (0.50)
Walking	0.69 (0.46)	0.54 (0.50)	0.60 (0.49)	0.48 (0.50)
Bird watching	0.11 (0.32)	0.08 (0.26)	0.03 (0.17)	0.01 (0.10)
Diving	0.03 (0.32)	0.04 (0.20)	0.11 (0.32)	0.12 (0.32)
Barbequing	0.38 (0.49)	0.28 (0.45)	0.31 (0.46)	0.24 (0.43)
Ice skating or skiing	0.18 (0.38)	0.05 (0.22)	0.04 (0.20)	0.01 (0.10)
Fishing	0.36 (0.48)	0.27 (0.45)	0.32 (0.47)	0.14 (0.35)
Work	0.08 (0.27)	0.04 (0.18)	0.14 (0.35)	0.02 (0.13)
Visit relatives	0.14 (0.35)	0.27 (0.45)	0.29 (0.456)	0.53 (0.50)
Other	0.14 (0.35)	0.09 (0.29)	0.08 (0.27)	0.05 (0.23)
Lodging				
Camping	0.07 (0.26)	0.09 (0.29)	0.04 (0.193)	0.08 (0.27)
Rented cabin	0.01 (0.09)	0.05 (0.23)	0.01 (0.07)	0.11 (0.31)
Summer house	0.02 (0.15)	0.11 (0.31)	0.04 (0.193)	0.12 (0.32)
Residence	0.40 (0.49)	0.04 (0.18)	0.30 (0.459)	0.00 (0.00)
Visitors as a share of total number of respondents (Number of visitors)	0.88 (260)	0.40 (200)	0.83 (208)	0.44 (111)

Standard deviations are given in parentheses.

Overall, the summary statistics for the specific characteristics (Table 2) and the summary statistics for the activities undertaken and type of lodging (Table 3) show that there are many similarities, as opposed to differences, between the different groups and regions.

3.2. Modeling results

The choice data were analyzed using NLOGIT 3.0 statistical software. Definitions of the variables used in the models are given in Table 4. The variable ASC is the alternative-specific constant, specified as one for the status quo option and zero otherwise. The ASC captures variations in preferences that are not explained by the other variables in the model. To account for heterogeneity in the samples, socio-demographic variables were interacted with the alternative-specific constant. In this way we can uncover the effects these variables might have on respondents' choice of a policy option instead of the status quo. To identify the different characteristics that affect the probability of a given response in each of the four samples, we used purposeful selection of variables, following the steps proposed in Hosmer and Lemeshow (2000), to arrive at a final, statistically driven model. The results from these models are presented in Table 5.

Table 4. Definition of model variables

Variable	**Definition**
Attributes	
Quality 1	One level of improvement in the water quality
Quality 2	Two levels of improvement in the water quality
Algae 3	Risk of a large-scale algae bloom every third summer
Algae 10	Risk of a large-scale algae bloom every tenth summer
Noise & litter	Less noise and littering
Cost	The cost of an alternative
Characteristics	
Attitude	The respondent's attitude towards the Swedish coastal environment compared to other social issues such as healthcare, childcare, education and labor market on a scale from 1 to 5 where 1 is 'much more important' and 5 is 'much less important'
Byear	The year the respondent was born
Children	Number of children, 0-12 years old, in the respondent's household
Countryside	Dummy indicating if the respondent lives in a rural area or in a community with no more than 10 000 inhabitants
Degree	Dummy indicating if the respondent has a university degree
EO	Dummy indicating if the respondent is a member of an environmental organization
Experienced algae blooms	Dummy indicating if the respondent has experienced algae blooms in the coastal environment
Experienced noise & litter	Dummy indicating if the respondent has experienced noise and litter in the coastal environment
Experienced turbid water	Dummy indicating if the respondent has experienced turbid water in the coastal environment
Female	Dummy indicating if the respondent is female
Income	Respondent's household income
Swedish parents	Dummy indicating if both the respondent's parents were born in Sweden
Swedish	Dummy indicating if the respondent was born in Sweden
Visited low	Dummy indicating if the respondent has visited an area with low water quality
Visited SCZ	Dummy variable showing if the respondent has visited any of the proposed SCZs
Visited very low	Dummy indicating if the respondent has visited an area with very low water quality
Visited young	Dummy variable indicating if the respondent spent time in the area when he/she was growing up
Youths	Number of adolescents, 13-17 years old, in the respondent's household
Activities	
Barbeque	Barbequing
Boat	Go motor boating with a motor less than 10 hp
Dive	Diving
Fish	Fishing
Row	Rowing or paddling
Sail	Sailing
Swim	Swimming/bathing
Walk	Walking, hiking or jogging

Table 5. Estimated results from statistically driven models

Variable	west locals	west non-locals	east locals	east non-locals
Quality 1	0.928586*** (0.132566)	1.11048*** (0.138867)	1.16085*** (0.104621)	0.877575*** (0.0768902)
Quality 2	1.50135*** (0.143768)	1.78822*** (0.151403)	1.4545*** (0.101454)	1.22353*** (0.074568)
Algae 3			0.92814*** (0.100819)	0.802763*** (0.0746215)
Algae 10			0.936909*** (0.0999452)	0.716116*** (0.0734405)
Noise and litter	0.237606*** (0.0826609)	0.246757*** (0.0840031)	0.108982 (0.0681596)	0.104384** (0.0511738)
Cost	-0.00348629*** (0.000186146)	-0.00368056*** (0.000194757)	-0.00297356*** (0.000144637)	-0.00277645*** (0.000104459)
ASC	1.63623*** (0.471689)	46.6297*** (12.6377)	1.80485*** (0.436168)	-1.27079*** (0.442681)
Frequent visitor	0.45691*** (0.162755)		0.297313** (0.139616)	-0.557293** (0.234754)
Visited young		-0.397141*** (0.148473)	-0.732203*** (0.141304)	0.395748*** (0.112892)
Visited SCZ	-0.733849*** (0.158356)			
Attitude	-0.39841*** (0.109737)	-0.397835*** (0.118615)	-0.621147*** (0.11455)	-0.224357*** (0.0723585)
Experienced noise & litter	1.14748*** (0.169705)	0.501102*** (0.183296)	0.555131*** (0.147254)	0.392387*** (0.119327)
Experienced turbid water		0.564952*** (0.163096)		0.219851** (0.106276)
Experienced algae blooms			0.458703** (0.199817)	0.378724*** (0.114395)
Income	0.0969451** (0.0436044)	0.0448531 (0.0404708)	0.0355915 (0.0355069)	0.00566491 (0.0263768)
Sex	0.349482** (0.146233)	0.477899*** (0.142666)		0.403741*** (0.101776)
Swedish parents	0.392636** (0.199319)		0.619381*** (0.000481709)	0.477168*** (0.123948)
Swedish				0.869779*** (0.207274)
Countryside	-1.00168*** (0.15271)			
Byear		-0.0230119*** (0.00638911)		0.013892*** (0.00406363)
Children		0.341018** (0.148764)	0.33447** (0.149094)	
Youths	-0.433787*** (0.165139)			0.372948*** (0.134144)
EO		0.754172** (0.307513)	0.487464** (0.217754)	
Degree			-0.67896*** (0.139685)	
Very low		-0.783575*** (0.204834)	-0.377405** (0.149247)	
Low			0.361987** (0.146625)	
Swim		0.502886**		

Variable	west locals	west non-locals	east locals	east non-locals
		(0.208308)		
Barbeque		0.682697** (0.290122)		
Row			0.429846** (0.200594)	0.752735*** (0.267547)
Boat				-0.64614*** (0.242193)
Walk				-0.381541*** (0.132479)
Fish				0.377893** (0.189768)
Dive	-0.68458*** (0.254698)			
Sail	0.937901*** (0.271697)		-0.430371** (0.191749)	
Log-likelihood	-1294.106	-1246.459	-1357.006	-2445.763
Pseudo-R^2	0.31832	0.32686	0.28081	0.24291
Number of observations	1757 (21 skipped)	1757 (63 skipped)	1782 (54 skipped)	3036 (84 skipped)

Note: ***significant at 1%, **significant at 5%, * significant at 10%. Standard errors are given in parentheses.

In the models, the coefficients for the attributes are all significant, except for *noise and littering* in the east coast model for the *locals*, and they all have the expected signs. Positive signs indicate that the respondents have positive preferences for these attributes. The highly significant cost coefficients have negative signs in all groups, showing that the higher the cost associated with an environment-improving alternative, the less likely it is that a respondent will choose that option. Overall, the models are highly significant and show a good fit[4]. All the ASCs are significant at the 1% level, showing that there are systematic reasons besides the attributes included in the models that reflect why respondents choose the status quo. Even though the summary statistics are similar for the four groups, different socioeconomic variables are of importance in the four models. It is noticeable that the signs for some variables also differ between the models. For example, respondents from the *east locals* who visit the areas of concern more than 50 times per year are more likely to be in favor of the proposed policy programs while respondents from the *east non-locals* are less in favor. Respondents from *east non-locals* who spent time in the area when they were growing up are more likely to choose an improvement program, while those from *west non-locals* and *east locals* prefer the status quo situation. The statistically best-fitting models include different socioeconomic variables that describe the respondents from each sample and that are significant when we want to improve the models' statistical fit to the survey data. *West locals* respondents who visited any of the

[4] According to Domencich and McFadden (1975), values of pseudo-R^2 between 0.2 and 0.4 are comparable to R^2 values of between 0.6 and 0.8 for the linear regression model.

proposed SCZs and who live in a rural area are more likely to choose the status quo option. The coefficients for *attitude* and *experienced noise & litter* are highly significant in all models, indicating that respondents who show a greater concern for the Swedish coastal environment in comparison with other social issues and respondents who have experienced noise and litter in the coastal environment are more likely to support the proposed policy programs. *West non-locals* respondents who have experienced turbid water are more likely to choose an improvement program while the opposite holds for *east non-locals* respondents. Algae blooms are only a problem on the east coast and both *east locals* and *east non-locals* respondents who have experienced algae blooms are more likely to support an improvement of present conditions. The coefficient for income is positive in all models, but only significant in the *west locals* model. Females in all samples except *east locals* are more likely to choose an improvement plan over the current situation. Respondents from all groups, except *west non-locals*, whose parents were both born in Sweden, are more likely to choose an improvement program. The variable indicating whether an individual was born in Sweden or not, only enters the *east non-locals* model, with a positive coefficient. Age **(**as *–Byear***)** is included in both the *non-locals* models and shows that older people are more likely to choose an improvement program on the west coast, while on the east coast they are more in favor of the status quo. The number of children in the respondent's household has a positive effect on choosing an improvement program in the *west non-locals* and *east locals* models, while the number of adolescents has the opposite effect in the *west locals* and *east non-locals* models. Membership in an environmental organization increases the probability of choosing an improvement program in the *west non-locals* and *east locals* models. Respondents with a university education are less likely to support an improvement program in the *east locals* model. Surprisingly, respondents in the *west non-locals* and *east locals* models who have visited an area with very low water quality are less likely to choose an improvement program. A more intuitive result in the *east locals* model is that a respondent who has visited an area with low water quality is more likely to choose an improvement program. Regarding the activities undertaken by respondents in the two areas, it can be noted that they have various effects in the models.

In order to be able to transfer estimates of WTP from a study site to another site where knowledge of the population is limited, a set of general models were estimated for each group, which only incorporated the attributes along with the socioeconomic variables sex, income, age, university education and whether an individual was born in Sweden or not. These variables were chosen because they can be easily accessed through public registers. The results from these general models are presented in Table 6.

Table 6. Estimated results from the general models

Variable	west locals	west non-locals	east locals	east non-locals
Quality 1	0.97722*** (0.130578)	1.13648*** (0.137881)	1.11371*** (0.102442)	0.854581*** (0.0760924)
Quality 2	1.51278*** (0.142121)	1.79188*** (0.150523)	1.40343*** (0.0991954)	1.19662*** (0.0737588)
Algae 3			0.906923*** (0.0989634)	0.792959*** (0.0738724)
Algae 10			0.906282*** (0.0978087)	0.694317*** (0.0727301)
Noise and litter	0.265706*** (0.0812871)	0.263279*** (0.0832546)	0.123436* (0.0673604)	0.108449** (0.050889)
Cost	-0.00332505*** (0.000174265)	-0.00358331*** (0.000187676)	-0.00287085*** (0.000139463)	-0.00273277*** (0.000102674)
ASC	20.6891* (12.0503)	41.0639*** (12.3357)	7.98836 (10.0647)	27.7193*** (7.56815)
Sex	0.310581** (0.139059)	0.481835*** (0.136828)	0.07776 (0.132086)	0.441592*** (0.0983628)
Income	0.0205046 (0.0410426)	0.0969717** (0.0383349)	0.036833 (0.0350148)	0.031778 (0.0254831)
Byear	-0.010626* (0.00612392)	-0.0209066*** (0.00624079)	-0.00364173 (0.00514009)	-0.0143664*** (0.00383766)
Swedish	0.3436 (0.382381)	-0.291734 (0.454216)	-0.778964*** (0.243936)	0.433621** (0.178013)
Degree	0.145678 (0.138701)	0.0106872 (0.138262)	-0.38275*** (0.128264)	-0.21783** (0.0957269)
Log-likelihood	-1377.787	-1287.171	-1420.858	-2506.732
Pseudo-R^2	0.27550	0.30632	0.25155	0.22706
Number of observations	1757 (21 skipped)	1757 (63 skipped)	1782 (48 skipped)	3036 (78 skipped)

Note: ***significant at 1%, **significant at 5%, * significant at 10%. Standard errors are given in parentheses.

All the attribute coefficients are significant and have the expected signs. The included socioeconomic variables interact with the ASCs and most of these are significant in the models. Females and older people are more likely to choose a policy program over the current situation, although these variables are not significant for *east locals*. Income is only significant for *west non-locals,* which indicates that a higher household income increases the probability of choosing an improvement program. Respondents from *west locals* and *east non-locals* that were born in Sweden are more in favor of improving the present conditions while the opposite holds for *west non-locals* and *east locals*. The coefficient for this variable is, however, not significant for the west coast groups. The variable for university education is significant and negative on the east coast, indicating that respondents with a university degree are less likely to choose an improvement program.

The statistical fit of the individual best-fitting model for each sample is superior to that of the corresponding general model, however the difference is relatively small and the general models still fit the data well. Since information regarding the variables that are included in the general models can be easily attained for a desired population at a low cost, if the aim is to do a BT, these models would be easier to adapt to another population than a model including more respondent-specific variables.

3.2 Benefit Transfer tests

The validity of BT can be evaluated by performing statistical hypothesis tests of the equality of benefit estimates between the study and policy sites. Since in the experimental design the number of attributes and the choice sets differ between the two study areas we cannot simply pool these datasets to test for equal model parameters. But even though the differences limit statistical analysis they also present a more realistic situation for the evaluation of BT. To test the validity of BT we test the equality of mean WTP estimates. Besides testing whether a value transfer is valid, one should also evaluate its reliability. While the validity test requires that the WTP estimates be statistically identical between sites, reliability requires that the difference between the transferred value and an original value estimated at the policy site be small (Navrud & Ready, 2007).

Marginal WTP estimates provide information about respondents' preferences for a unit change in a specific attribute such as an improvement in water quality by one level. The negative of the ratio between an attribute's coefficient, $\beta_{attribute}$, and the coefficient of the cost attribute, β_{cost}, gives the marginal WTP for that attribute:

$$\text{marginal WTP} = -\beta_{attribute} / \beta_{cost}$$

These estimates can be useful for decision-makers when evaluating benefits relative to the costs of marginal changes in single aspects of environmental quality. Since the scale parameter cancels out when calculating WTP, the estimates are directly comparable across the coasts. The mean marginal WTP estimates from the best-fitting models for each group are shown in Table 7, along with their 95% confidence intervals, obtained using the Krinsky & Robb procedure with 1000 replications (Krinsky & Robb, 1986).

Table 7. WTP estimates from the statistically driven models

	west locals	west non-locals	east locals	east non-locals
Quality 1	265.94 (188.32; 350.58)	300.64 (223.43; 380.67)	391.44 (325.96; 453.56)	317.05 (263.89; 368.36)
Quality 2	431.72 (344.70; 526.30)	487.92 (402.73; 585.09)	490.23 (426.42; 560.23)	440.82 (390.55; 491.21)
Algae 3			313.90 (244.47; 382.77)	288.46 (237.23; 346.37)
Algae 10			316.60 (252.49; 376.71)	258.65 (208.14; 307.03)
Noise and litter	68.27 (20.11; 114.54)	66.00 (22.23; 113.13)	37.85 (-5.03; 80.98)	37.56 (1.14; 75.19)

SEK (Swedish Kroner), 95% confidence intervals are given in parentheses

The results in Table 7 show that there are differences in estimated WTP both within and across the two coasts. For *improved water quality*, WTP seems to be increasing at a decreasing rate when we look at the estimated values for one and two levels of improvement. It is interesting to note that *west locals* express lower WTP than *west non-locals*. In contrast, we find the opposite result on the east coast, namely that *locals* express higher WTP than *non-locals*. The attribute for reducing the risk of a large-scale algae bloom was only included in the east coast survey and it seems that the respondents are somewhat indifferent between the levels of this attribute. It is also surprising to note that *east non-locals* have a lower WTP for reducing the risk of a large-scale algae bloom to every tenth summer than they have for reducing it to every third summer, although the difference is not significant.

Comparing the mean estimates for *less noise and littering*, it is clear that the respondents on the west coast have higher WTP than respondents on the east coast. In fact, the confidence interval shows that there may even be negative WTP for *east locals*. One explanation for this might be that some respondents feel that they have something to lose if an SCZ were to be introduced. For example, although the respondents may in general be in favor of less noise, they may dislike speed restrictions for their own motor boats.

It is not evident from the descriptive statistics (Table 2 and 3) why the WTP estimates vary between the different groups.

Based on these estimates, it is possible to calculate the transfer errors for mean marginal WTP between the *locals* and *non-locals* groups. The transfer error is the error that occurs when benefit estimates from one study site are transferred to another policy site and it is calculated as the absolute value difference in the following way:

$$\text{transfer error} = \frac{|WTPs - WTPp|}{WTPp}$$

where WTP_s denotes the estimated willingness-to-pay from the study site and WTP_p is the value from the policy site. Since the errors are calculated relative to WTP_p, they depend on the direction of transfer. A wide range of transfer errors, and guidelines as to what is acceptable, can be found in the BT literature. Colombo et al. (2007) consider a value transfer error of up to 30-80% acceptable for a cost-benefit analysis, especially when the benefits outweigh the costs. Generally, transfer validity studies show that the average transfer error tends to be in the range of 25-40% although individual transfer errors may be as high as 100-200% (Navrud, 2007).

Even though the confidence intervals for the estimated WTP values overlap to some extent, it is of interest to formally test the hypothesis of equal mean estimates of WTP between the groups. A two sample *t*-test rejects the null hypothesis of equality in means for every attribute. These results suggest that there are significant differences in mean WTP estimates between the groups. However, Kristofersson and Navrud (2005) illustrated that the above test, assuming the classical null hypothesis of equality, may lead to a Type II error (that is, failing to reject the null hypothesis when it is false). They argue that a more suitable null hypothesis for a BT test would be that environmental values differ and thus they suggest using equivalence tests instead. In equivalence testing, the null hypothesis is that the mean values are different and if the null hypothesis can be rejected one can conclude that the values are equivalent within a predetermined significance level. The test calls for a definition of an interval, or tolerance level, between -Δ and Δ, within which values are regarded as equivalent. Following Kristofersson and Navrud (2005), we set up the null and alternative hypotheses:

$H_0 = D \leq -\Delta \text{ or } D \geq \Delta$,

$H_A = -\Delta < D < \Delta$,

where D is the difference between two WTP estimates that we want to investigate. If we can reject the null hypothesis then we can conclude that the two estimates are equivalent. The acceptable tolerance level or transfer error should be based on the costs of making an erroneous decision if the decision is based on the BT estimates. To test for equivalence we perform a two one-sided test (TOST) at the 5% significance level and an acceptable transfer error (Δ) of 20%, 40%, or 60% was used to allow for a sensitivity analysis. Results from the equivalence testing are presented in Table 8, along with the associated transfer errors. The mean WTP estimates for *improved water quality* by two levels are all equivalent within the 20% tolerance level for all groups. The mean values for *improved water quality* by one level are equivalent within a 20% error margin for the *non-locals* groups while the estimated values for the *locals* groups are equivalent within the 40 and 60% tolerance levels depending on the direction of the transfer. The transfer errors regarding water quality are fairly low when the transfer is performed across the *non-locals* groups and increases when transferring between the *locals* groups. The estimated mean WTP estimates for implementing SCZs differ a lot between the two coasts and this is reflected in the large transfer errors. The transferred values from the west coast to the east coast are equivalent within a 60% tolerance level but the opposite transfer does not generate equivalent values within any of the tested levels.

Table 8. Results of the Two One-sided Test (TOST) for the statistically driven models

	Quality 1		Quality 2		Noise and litter	
Direction of transfer	Error[a]	TOST[b]	Error	TOST	Error	TOST
From *west locals* to *east locals*	-32%	60%	-12%	20%	80%	60%
From *east locals* to *west locals*	47%	40%	14%	20%	-45%	Not eq.
From *west non-locals* to *east non-locals*	-5%	20%	11%	20%	76%	60%
From *east non-locals* to *west non-locals*	5%	20%	-10%	20%	-43%	Not eq.

[a]Transfer error associated with the BT. [b]The lowest level of significant equivalence at the 5% level. The levels that are tested are 20%, 40% and 60% of the original study site estimate of mean marginal WTP.

Turning now to the general models, the estimated mean marginal WTP values can be seen in Table 9 along with their corresponding confidence levels.

Table 9. WTP estimates from the general models

	west-locals	west-non-locals	east-locals	east-non-locals
Quality 1	293.82 (214.99; 376.28)	318.43 (236.81; 402.40)	389.27 (318.51; 461.16)	313.27 (260.27; 367.14)
Quality 2	453.40 (365.43; 550.00)	501.04 (412.10; 600.85)	489.14 (416.12; 564.38)	438.87 (385.92; 489.87)
Algae 3			315.69 (244.77; 389.37)	289.96 (236.59; 345.14)
Algae 10			317.01 (256.21; 378.68)	254.01 (200.03; 308.45)
Noise and litter	80.34 (30.71; 127.38)	72.91 (27.10; 116.36)	42.82 (-5.51; 87.43)	40.13 (4.20; 74.30)

SEK (Swedish Kroner). Note: Confidence intervals are given in parentheses at 95% level, obtained by Krinsky & Robb simulations with 1000 replications.

A two sample *t*-test for the equality of means rejects the null hypothesis in every case, indicating that there are differences in mean marginal WTP values between the groups. The equivalence tests for the general models along with transfer errors are presented in Table 10. The results show that the mean WTP estimates for *improved water quality* by two levels are equivalent within the 20% tolerance level for all groups. The mean values for *improved water quality* by one level are equivalent within the 20% margin for the *non-locals* groups and within 40% for the *locals* groups. Regarding the introduction of SCZs, the mean WTP estimates are equivalent within a 60% acceptable transfer error if the west coast is used as study site and the estimates are transferred to the east coast. If the transfer is reversed and we use the east coast as study site, the values are not equivalent within any of the specified and tested levels of transfer error.

Table 10. Results from Two One-Sided Tests (TOST) for general models

	Quality 1		Quality 2		Noise and litter	
Direction of transfer	Error[a]	TOST[b]	Error	TOST	Error	TOST
From *west locals* to *east locals*	-25%	40%	-7%	20%	88%	60%
From *east locals* to *west locals*	32%	40%	8%	20%	-47%	Not eq.
From *west non-locals* to ***east*** *non-locals*	2%	20%	14%	20%	82%	60%
From *east non-locals* to *west non-locals*	-2%	20%	-12%	20%	-45%	Not eq.

[a]Transfer error associated with the BT. [b]The lowest level of significant equivalence at the 5% level. The levels that are tested are 20%, 40% and 60% of the original study site estimate of mean marginal WTP.

If we look at the equivalence tests for the best-fitting models in comparison to those for the general models, the results are almost the same. This means that we can use the general models for BT between the coasts without any major errors compared to using the best-fitting models. The transfer errors are similar and, for *improved water quality* in the *locals* groups, they are lower when using the general models. The transfer errors for *less noise and littering* are slightly higher for the general models compared to the best fitting models for all groups. The estimated WTP values for *improved water quality* are transferable across the two coasts if we accept a transfer error of 20 to 40 percent depending on the magnitude of improvement. When it comes to the transfer of an estimated WTP value for *less noise and littering*, the results of the equivalence tests are not symmetric. If the transfer is from the east coast to the west coast the non-equivalence is not rejected at any of the tested levels. If the transfer is performed in the opposite direction though, the estimates are equivalent within a 60% tolerance level. This means that WTP values from the west coast could potentially be used as a transferred benefit estimate for the east coast depending on the level of transfer error one is willing to accept.

4. Discussion and conclusions

In this study, we have presented an analysis of the accuracy of BT for attributes relevant to the implementation of the EU Water Framework Directive and the establishment of Special Consideration Zones in two case study marine areas in Sweden. The analysis revealed that when comparing the best-fitting, or "specific", BT models with more general models that require only limited, publicly available information to be collected at the policy site, the general models perform quite well. Although the specific models naturally perform better than the general models from a statistical point of view, the difference in fit is relatively small. Considering locals and non-locals separately, the accuracy of BT from one study area to another was estimated through equivalence tests (cf. Kristoferson & Navrud, 2005). When comparing the equivalence tests for the specific models to those for the general models, the results are almost the same, suggesting that the general models are acceptable for BT. Often a BT function includes explanatory variables that require the government agency to collect detailed information in order to estimate the benefit at a new policy site. For example, the percentage of frequent visitors, the percentage of visitors or residents who are members of an environmental organization, and the percentage of visitors who engage in certain activities, such as fishing or swimming. This is costly, and our results for the attributes *improved water quality* and *less noise and littering* show that using a more general BT function, containing only explanatory variables for which the mean value at a given policy site can be obtained from public databases (e.g., income, age, sex), does not lead to a significant reduction in accuracy or reliability.

However, the BT error for *less noise and littering* is larger than for *improved water quality*, regardless of whether a specific or a general model is used. This implies that if precise estimates of the benefits of less noise and littering are required at the policy site then perhaps a new original valuation study, rather than a BT, should be conducted at the policy site.

More generally our results have bearing on the question of whether socioeconomic attributes improve transfer accuracy in CE BT (cf. Johnston & Duke, 2010). It has been argued that socioeconomic adjustments may fail to increase, or perhaps even diminish, transfer accuracy. Although the socioeconomic attributes in our case are more often significant than not, BT accuracy varies, as mentioned above. Since our results are mixed, and given the very limited number of studies on noise and littering in marine environments, future research is needed on the effect of including socioeconomic attributes in general, and for noise and littering in particular. What measure should be used to define BT accuracy? Johnston & Duke (2010) have chosen to use the transfer error, whereas we have chosen to use the equivalence test suggested by Kristoferson & Navrud (2005). In this test, WTP estimates are assumed different unless the hypothesis test demonstrates, with a chosen probability level, that the difference is smaller than a specified tolerance limit, where we used a 20, 40 or 60% tolerance level. The advantage of the equivalence test is that the assumption of difference unless proven otherwise reverses the burden of proof. In general, however, we can merely note that the lack of a universally accepted test of BT accuracy limits the possibilities for comparisons across studies.

The novelty of the reduced noise and littering attribute makes for an interesting analysis of marginal WTP. As the results showed, there might even be a negative WTP for reducing noise and littering among some of the locals on the east coast, which might be explained by the fact that many locals own boats and might feel inconvenienced by speed restrictions intended to reduce noise. Analogous results have been observed for the snowmobile conflict in the Yellowstone National Park (e.g., Mansfield *et al*., 2008), where snowmobile riders experience a welfare loss from restrictions on use, while non-riders experience a welfare gain.

As mentioned earlier, the *algae blooms* attribute was only used in the east coast (Himmerfjärden) case study area, which somewhat limits comparability and opportunities for BT tests. To not use this attribute was not an option however, since these blooms are an increasingly common phenomenon in the Baltic Sea, which Himmerfjärden is a part of, and are in some cases toxic and can be harmful, not least to children and animals. This effect of eutrophication is well-known by the public and much discussed in the Swedish media. On the other hand, including this attribute in the west coast study would be pointless, since the phenomenon rarely occurs on the west coast of Sweden. Although a perfect match of the attributes in both CEs would provide an ideal situation for BT, the actual design of the surveys is more realistic since alternatives were formed to match the most relevant policy actions in each study area. This is likely to be the case in many real applications of BT for use in policy evaluations.

In order to reach broader consensus about the issue of model specifications, more cases have to be studied to test specific vs. general models as a basis for BT. These studies should be made for different environmental topics. A desired outcome from future research would either show that a general conclusion for all areas can be drawn, or, as is the case for many other BT issues, that different topics require particular guidelines.

Regarding policy programs related to noise and littering, there is general lack of knowledge of people's monetary preferences for such programs. Hence there is a need for more valuation studies on this topic.

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Appendix I.

[This Appendix gives a brief overview of the scenarios in the questionnaire.]

Scenario 1: Improved water quality.

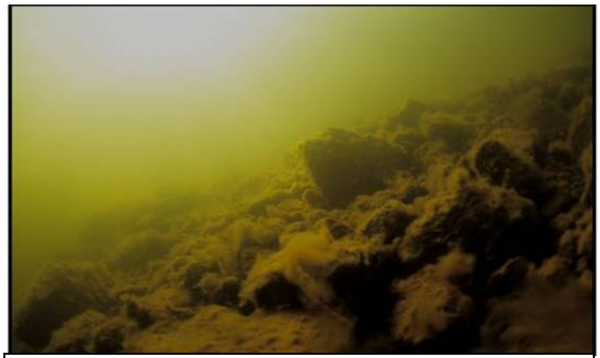
[Information to respondents]

Turbid water implies that the water clarity ("Secchi depth") is low. In turbid water, the living conditions for bladderwrack deteriorate. Large stands of bladderwrack are thus a sign of good water quality. Turbid water is caused by large effluents of the nutrients nitrogen and phosphorus.

FACTS ABOUT SECCHI DEPTH
The Secchi depth is measured during the summer. A white disc is lowered into the water, and the depth at which it is no longer visible is registered. The perceived Secchi depth when bathing etc. can though differ from this result.

The water quality can be divided into five levels, depending on, among other things, the Secchi depth and the amount of bladderwrack.

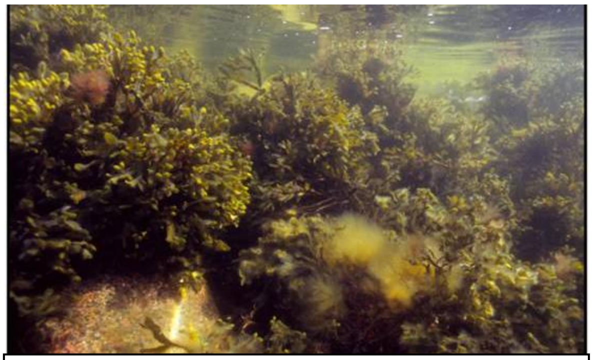
Below, you see examples of what the water looks like at different quality levels. In the boxes below each picture, the levels are described more thoroughly. You will need this info later on in order to proceed with the survey. The water quality levels are called *very low*, *low*, *moderate*, *good*, and *very good* [in Swedish - *mycket låg*, *låg*, *måttlig*, *god*, and *mycket god*].



<u>1.VERY LOW</u>
Sight depth maximum 2,5 meters. Bladder wrack does not exist at all, or to a very limited extent. The environment is very poor in species. Drifting algae mats are common.
Photo: Jerker Lokrantz

<u>2.LOW</u>
Sight depth 2,5 – 3,5 meters. Bladder wrack might exist on very shallow water, very sparsely, or not at all. Drifting algae mats can be common.
Photo: Anders Wallin

<u>3.MODERATE</u>
Sight depth 3,5-5 meters. Sparse bladder wrack stands from a depth of 0,5 to 2-3 meters. Different fine-threaded algae grow on the bladder wrack. Drifting algae mats are common.
Photo: Robert Kautsky

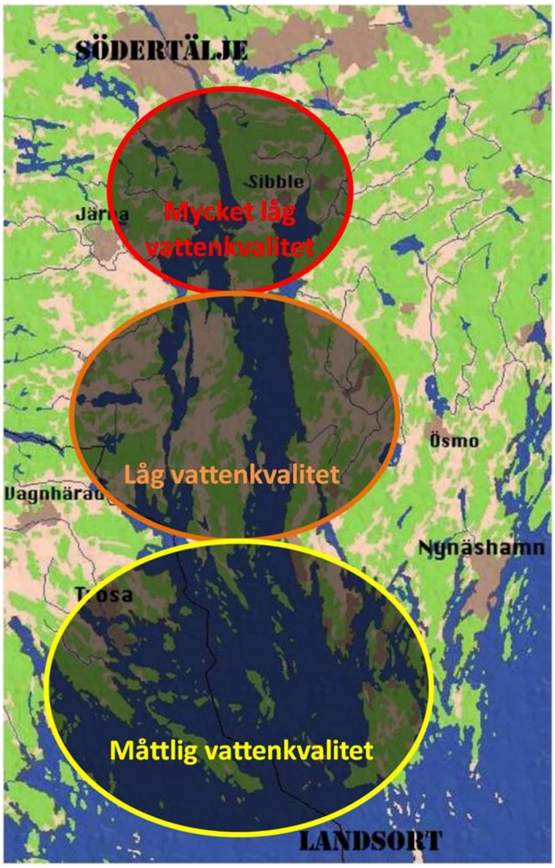


<u>4.GOOD</u>
Sight depth 5-6,5 meters. Bladder wrack forms dense populations. Some brown algae might grow on the bladder wrack. There are no algae mats.
Photo: Jerker Lokrantz

<u>5.VERY GOOD</u>
Sight depth more than 6,5 meters. Bladder wrack forms dense populations. No growth of fine-threaded algae on the bladder wrack. There are no drifting algae mats.
Photo: Forststyrelsen, 2005

The present water quality between Södertälje and Landsort (east coast study area):

On the map, the present water quality is shown in different parts of the area. “Mycket låg vattenkvalitet” = “very low water quality” (red), “Låg vattenkvalitet” = “low water quality” (orange) and “Måttlig vattenkvalitet” = “moderate water quality” (yellow).

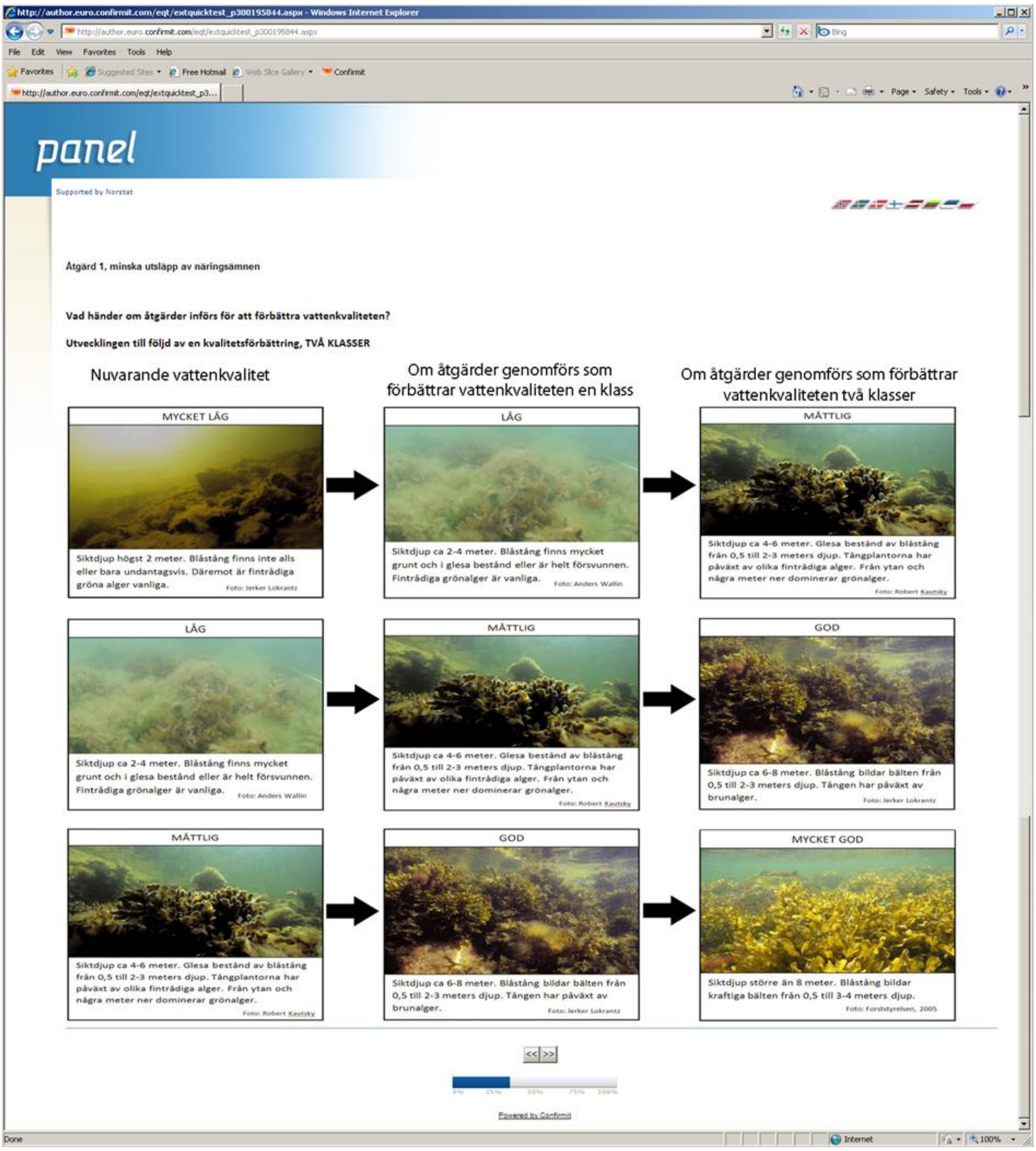


The problems with low water clarity can decrease if emissions of nutrients decrease. The waters between Södertälje and Landsort are affected by emissions from, for example, the sewage treatment plant in Himmerfjärden, a big sewage treatment plant that takes care of sewage from approximately 250 000 people.

[Action scenario]

Assume that in 2010, with the help of, for example, new technology, it will be possible to decrease the emissions of nutrients from the sewage treatment plant in Himmerfjärden as well as from other municipal sewage treatment plants that affect the waters between Södertälje and Landsort.

Below, we present the current water quality in different parts of the area and what will happen if the actions to improve the water quality by one or two levels are undertaken. [The first column shows present water quality in different areas, being very low, low, or moderate. The second and third columns show the water quality in each respective area in a scenario where policy action improves the water quality by one (second column) or two (third column) levels.]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File Edit View Favorites Tools Help
panel
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Åtgärd 1, minska utsläpp av näringsämnen
Vad händer om åtgärder införs för att förbättra vattenkvaliteten?
Utvecklingen till följd av en kvalitetsförbättring, TVÅ KLASSER
Nuvarande vattenkvalitet
Om åtgärder genomförs som förbättrar vattenkvaliteten en klass
Om åtgärder genomförs som förbättrar vattenkvaliteten två klasser
MYCKET LÅG
Siktdjup högst 2 meter. Blåstång finns inte alls eller bara undantagsvis. Däremot är fintrådiga gröna alger vanliga.
Foto: Jerker Lokrantz
LÅG
Siktdjup ca 2-4 meter. Blåstång finns mycket grunt och i glesa bestånd eller är helt försvunnen. Fintrådiga grönalger är vanliga.
Foto: Anders Wallin
MÅTTLIG
Siktdjup ca 4-6 meter. Glesa bestånd av blåstång från 0,5 till 2-3 meters djup. Tångplantorna har påväxt av olika fintrådiga alger. Från ytan och några meter ner dominerar grönalger.
Foto: Robert Kautsky
LÅG
Siktdjup ca 2-4 meter. Blåstång finns mycket grunt och i glesa bestånd eller är helt försvunnen. Fintrådiga grönalger är vanliga.
Foto: Anders Wallin
MÅTTLIG
Siktdjup ca 4-6 meter. Glesa bestånd av blåstång från 0,5 till 2-3 meters djup. Tångplantorna har påväxt av olika fintrådiga alger. Från ytan och några meter ner dominerar grönalger.
Foto: Robert Kautsky
GOD
Siktdjup ca 6-8 meter. Blåstång bildar bälten från 0,5 till 2-3 meters djup. Tången har påväxt av brunalger.
Foto: Jerker Lokrantz
MÅTTLIG
Siktdjup ca 4-6 meter. Glesa bestånd av blåstång från 0,5 till 2-3 meters djup. Tångplantorna har påväxt av olika fintrådiga alger. Från ytan och några meter ner dominerar grönalger.
Foto: Robert Kautsky
GOD
Siktdjup ca 6-8 meter. Blåstång bildar bälten från 0,5 till 2-3 meters djup. Tången har påväxt av brunalger.
Foto: Jerker Lokrantz
MYCKET GOD
Siktdjup större än 8 meter. Blåstång bildar kraftiga bälten från 0,5 till 3-4 meters djup.
Foto: Forststyrelsen, 2005
<< >>
Powered by Confirmit
Done
Internet
100%

Scenario 2. Less noise and littering

[Information to respondents]

Some people experience that, for example, motor boats cause a lot of noise in the coastal environment and that people litter too much in the water and on the beaches.

The present situation between Södertälje and Landsort: The authorities have not taken any specific actions to reduce noise and littering in these water areas.

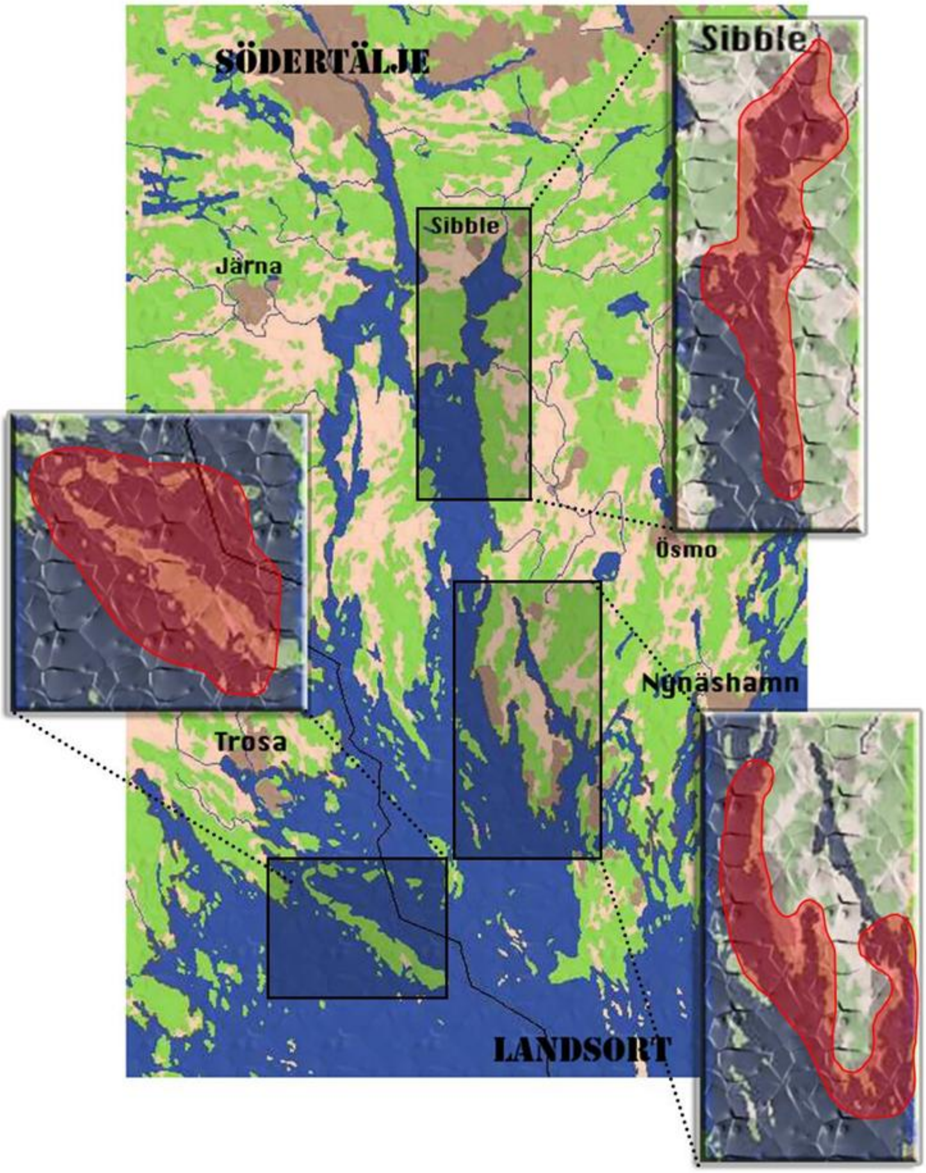
[Action scenario] Introduction of restricted areas

In a restricted area the visitors are encouraged to:

a. Keep to a low speed, maximum 5 knots.
b. Use the engine as little as possible and avoid leaving the engine running.
c. Not drive jolly boats or rubber boats with an outboard engine (if not necessary).
d. Avoid jet-skiing or and other noisy water activities.
e. Not play loud music.
f. Not cause swells for anchored boats or for people that are swimming.
g. Not litter.
h. Not discharge sewage into the water.

In connection with the restricted areas being established, collection points for recycling will be set out. Also, arrangements to take care of sewage will be made.

Assume that in 2010 it is possible to introduce three restricted areas in the waters between Södertälje and Landsort at the locations marked on the map.



Regarding noise and littering one of the following situations can come about:

- Like today: The restricted areas will *not* be introduced and there will therefore *not* be less noise and littering in the area. The situation will basically be the same as today.
- Less noise and littering: The restricted areas will be introduced and hence there will be less noise and littering in the area. The restricted areas will be working according to plan after 1-3 years

Appendix II.

[This Appendix presents the cheap talk script]

How would you choose between different alternatives?
Above we presented how the actions can give different results in the waters between Södertälje and Landsort. On the following six pages you will be asked to choose between three different alternatives (A, B and C). Alternative A is always equal to the current situation, that is, no fee and no actions. Alternative B and C consists of different results of the actions and a fee that your household would have to pay every month between 2010 and 2029.

- You should imagine that you have the possibility to choose between these alternatives. Mark the alternative that you would choose.
- You should make the six choices independently of each other. For example, when you make choice number 2, you should not compare it with choice number 1.
- When you make your choices, assume that nothing else changes, besides the changes that are presented in the alternatives. That is, only consider the changes that are presented to you.
- We have used a special method for varying the size of the fee and the results in the alternatives. Sometimes the size of the fee may vary in a way that you consider to be unrealistic. Even if this is the case, we ask you to choose alternative based on the fees presented in the alternatives. In this manner you help us to understand what you value and what you find important.
- Experience from earlier studies shows that people sometimes tend to answer one thing, but in reality they would act differently. For example, some people might state that they are willing to pay a lower amount than they are actually willing to pay, for example 0 SEK. We believe that one reason for this behavior is that some people might think that they have the right to good water quality. Other people might state that they are willing to pay a higher amount than they are actually willing to pay. We do not want you to think in this manner when you answer our questions. We want you to reveal your true willingness to pay. There are probably other reasons to why some people do not reveal their true willingness to pay. If you have any thoughts regarding this issue, please, write them in the end of the questionnaire.