5. Guidelines for assessing benefits

In the previous sections various methods for assessing the social and economic benefits that recreational fisheries provide to individuals and societies have been described. In the following we will summarize this content using a complementary approach that brings the economic and the human dimension paradigms together.

At the center of the argument is the first row in Figure10, which is a simplified representation of the various stages of human behaviour through decision making. Behavioural antecedents lead to behavioural intention, which of course is closely related to actual behaviour. There is of course a feedback mechanism from actual behaviour to behavioural antecedents, in the form of perception and other pathways.

The two paradigms, i.e. HD and economic, and the types of data that support exploration in each paradigms largely align with these specific stages. Actual behaviour provides revealed preference information (the proof is in the market) and can be captured by various monitoring or observation techniques, while intended behaviour can only be captured through survey questions. The same is true for the whole suite of behavioural antecedents.

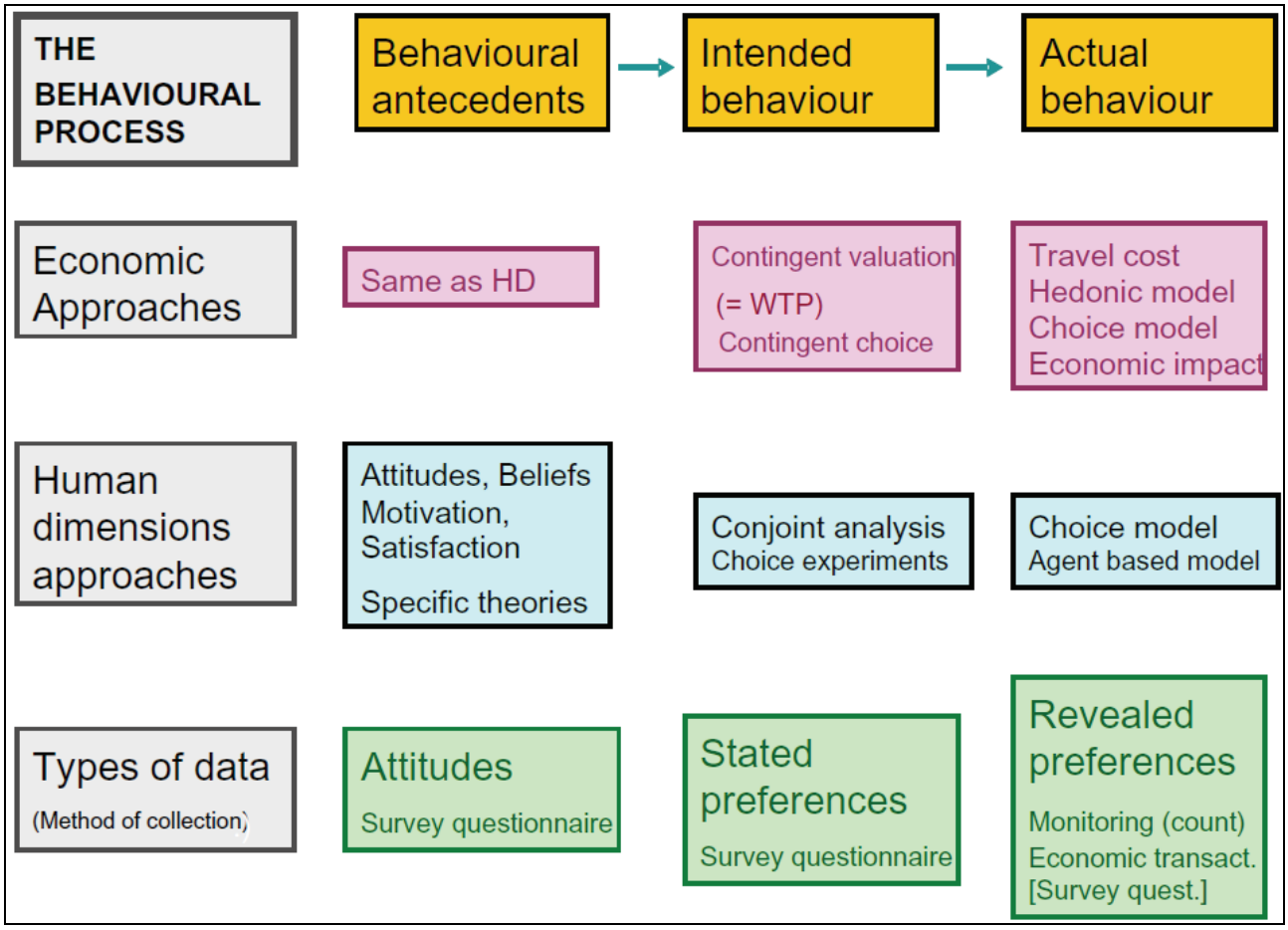

Figure 10. Relationship between economic and human dimension research.

If we look at the focus of the various research paradigms, it becomes obvious that resource and environmental economics is focused on actual or intended behaviour, while the classical focus of human dimensions research has been on behavioural antecedents for the purpose of informing decision makers by looking at the attitudes and other social psychological concepts. Economic approaches may use antecedents to enhance some of their models, but until recently this has not been a major concern of these. The last row of Figure 10 links the behavioural process to both the

types of data and collection methods necessary to address the two paradigms presented in rows two and three.

In addition in this section, the usability, suitability, and accuracy of the various valuation methods discussed in section 3 are compared to provide policy makers with a quick reference guide summarizing extensive detail provided previously. This section presents this comparison in a tabular summary format that allows the user to select the type of analysis suitable for his or her decision setting quickly. This tabular representation is a discrete representation of what in actuality is a continuum of potential decision settings.

Figure 11 is illustrative of a qualitative continuum between accuracy, costs and time for both decision context and choice of valuation approach. Note that there is no direct correspondence between policy analysis type above the main arrow and the valuation methods below it. Fisheries specific decision settings include the following broadly defined categories that utilize both paradigms:

- Advocacy: total economic value of freshwater fishing (national/regional level) and human health benefits. Used for informational purposes and advocating for additional research or funding for particular projects. For example many countries publish periodic statistics about particular industries;
- Scoping/design: development of fisheries surveys and policy formulation, establishment of fisheries management boards/mechanisms;
- Cost- benefit analysis: fisheries projects, wetlands restoration, water quality/pollution measures, EU Water Framework Directive (derogation), industrial development permitting;
- Allocation of resources: allocation between commercial fisheries, recreation fisheries, conservation and other uses;
- Natural resource damage assessment (NRDA) and liability: oil spills, power plant (cooling/hot water, hydropower) to set compensation levels; and
- Pricing: pricing of licences, pricing of access to water bodies, market studies.

In addition to direct observation and questionnaire surveys, section 3.2.3 discusses the use of benefits estimated from other studies as a way to quickly address policy or damage assessment needs. Reliability of the benefit transfers is context dependent. Contextual factors include: level of uncertainty, acceptable level of uncertainty, required confidence of the decision context (comparability in uncertainty in costs and benefits), study site in terms of location, site quality, population characteristics, and the policy change/environmental change. Quality is highly dependent on how much uncertainty is acceptable.

To a large degree, measuring non-economic or human dimensions benefits and economic impacts follow the same sort of continuum (Figure 11). On the low accuracy/low cost end of the continuum, estimates of expenditures and impacts can come from other studies. Similarly for social, psychological, and physiological benefits, those can come from other studies as well. As with economic value benefit transfers, these transfers from other studies apply to new analysis situations best when the settings and activities are similar. For instance, a policy maker would be ill advised to transfer a trip expenditure estimate from the marine environment for the freshwater environment. For economic impacts, the policy analyst would not want to use multipliers from a study done in a country or region with an industrial structure that was vastly different.

On the high cost/high accuracy side, nothing beats a survey tailored specifically to the analysis task at hand. Fortunately, if the researcher has chosen to design and administer an original survey, it is possible to gather a wide range of data fitting the requirements of both paradigms including economic valuation, expenditure and human dimensions. For instance, asking a contingent

valuation question or conducting a choice experiment takes up very little survey space. It is often possible to also get an expenditure profile from a previous trip and/or gather human dimensions information.

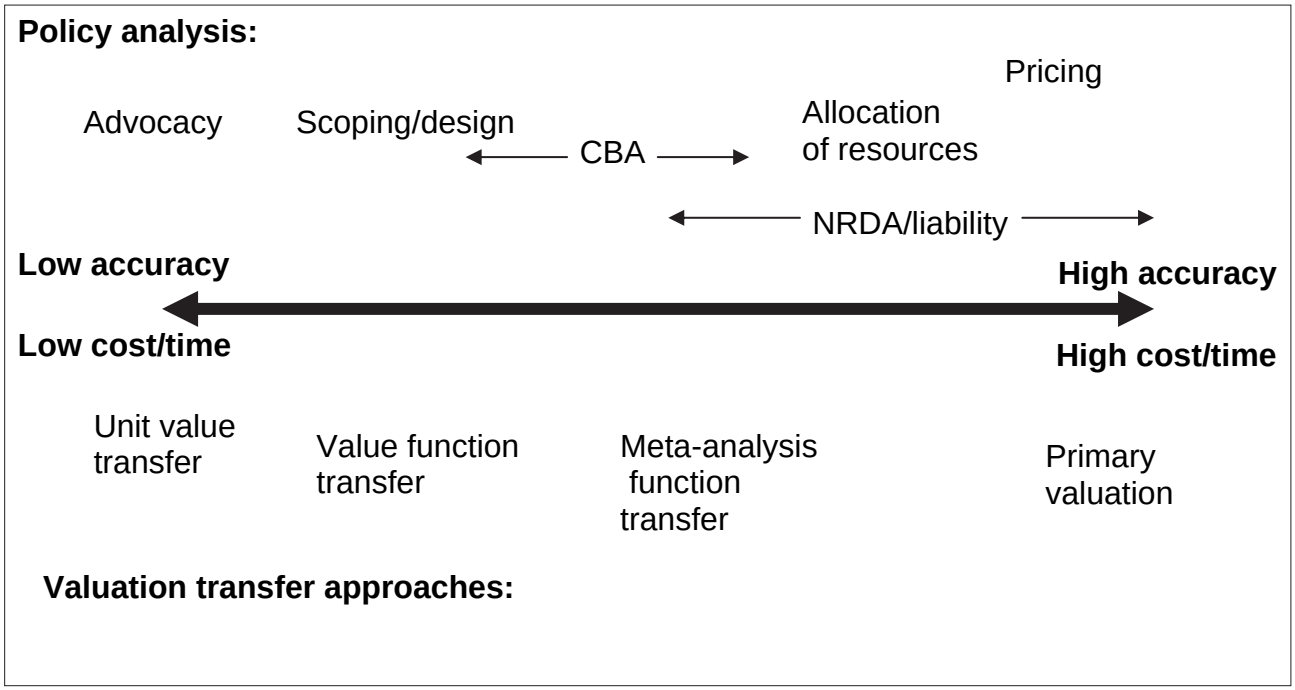

Figure 11. A continuum of decision settings associated to accurary, costs and time (adapted from Brookshire, 1992).

5.1. Suitability of different methods

Figure 12 contains some general recommendations for the use of different stated and revealed preference techniques for measuring economic value at a glance. These recommendations are provided based on their various capabilities and data requirements, which have been explained in more detailed in section 3. Figure 12 contains two broad types of analysis needs; policy development and analysis and damage assessment. Policy development and analysis is further broken down into the following decision settings; policy advocacy, resource allocation, fishing regulations, licence or access pricing, ecosystem service valuation and compensatory or punitive damages. All of these decision contexts could be framed in terms of classic benefit/cost analysis or other analysis techniques that utilize value estimates. This section is aimed primarily at the types of survey needed for economic valuation, except for the choice experiment technique which is shared across the two paradigms. Again it is important to point out that if an original data collection is planned to assess economic value it is important to also take time to gather human dimensions data.

5.1.1 Revealed preference vs. stated preference suitability

Reveal preference (RP) techniques: RP techniques utilize the observation of actual angler choices when selecting recreational opportunities. As such, estimating economic values or behaviour using actual behaviour is superior to using hypothetical techniques. However, all RP techniques require data on actual angler choices and, in some cases, data on historical choices and historical angling quality. In many cases this data is not available, obviating timely policy analysis. Also, when evaluating policies with this technique, there has to be variation in the policy variables in the observed data. For instance if one is trying to measure the value of changing a minimum size limit but the current minimum size limit is the same over the available data, it will be impossible to tease out the value of the change in the size limit.

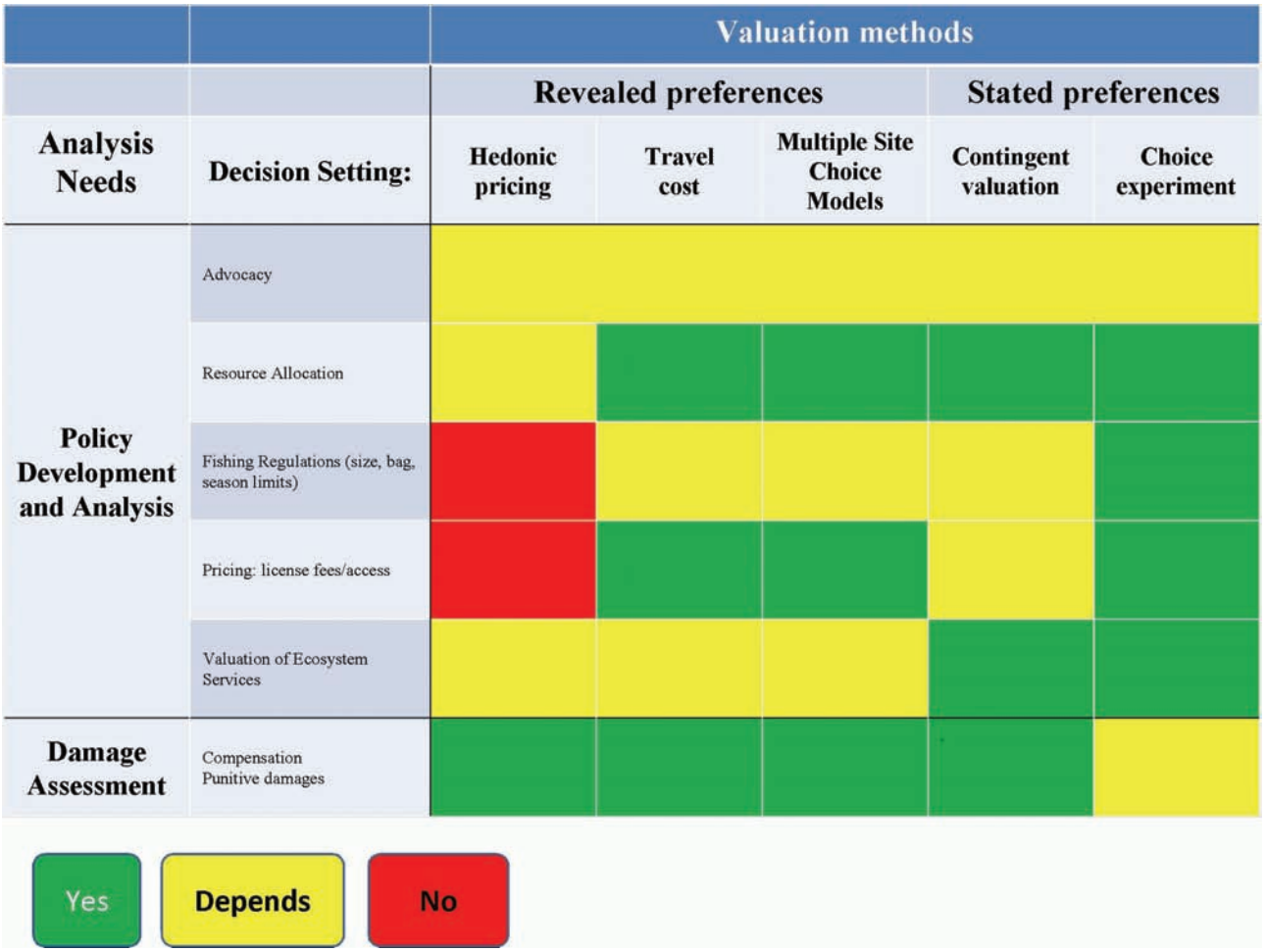

Figure 12. Suitability of different non-market valuation methods, both SP and RP, for various policy and management needs.

Stated preference (SP) techniques: SP methods are necessary when the needed information on angler choices does not exist. Usually, as stated above, data regarding historic angling quality or data that includes variation in policy variables is missing. Additionally, choice experiments are a technique that brings economic and human dimension analysis together. Typically, SP methods are required when non-use values are associated with policy change or in context that benefits are not yet implemented. Typically, if the number of substitutes is low for the good being valued, the non-use values can be significant, further recommending this technique for very unique resources. Another advantage of SP methods is that value estimates can be used to rank hypothetical but realistic management scenarios, with the base condition being status quo or opt-out (continuing the current policy in future) option. The possibility to describe new goods, limit the choice sets and posit a hypothetical market offers more alternatives for valuation than RP methods. Particularly, choice experiments are suitable when willingness to pay for individual attributes or multi-dimensional valuation is required, while contingent valuation is optimal for valuation of a single scenario situation, i.e. when the WTP for the environmental good or service in total is needed (e.g. Bateman et al., 2002). Further, SP techniques are advantageous, since the questionnaires and focus groups are major parts of the methods, and thus they have more potential to involve public in a participatory mode than RP techniques.

5.1.2 Decision settings

In the following, a set of common decisions settings is described and related to the information in Figure 12. The list presented here is by no means exhaustive but represents a set of general groupings to allow the user to quickly decide where to focus analysis funds and time. All decisions

settings presented under policy development and analysis generally conform to the concept of benefit/cost analysis introduced in Section 2. There are other guides to help policy makers design, use and interpret social science information in a policy context. The US National Oceanic and Atmospheric Association has designed a very basic visual tool they call the human dimensions wheel that contains a portion of the information presented here.[10]

In order to gain wider acceptance for the use of economic valuation and human dimensions methods in various decision-making processes it is imperative that managers and administrators have an understanding of the concepts underlying their use in various decision settings. Those have been provided in section 2. While this section appears to focus on economic valuation, it is imperative to examine other human dimensions when assessing policies. Fortunately, when original data collections are necessary, both types of data can and should be collected. This section relates the concepts presented in section 2 to their execution presented in section 3. It is imperative that managers communicate the types of analysis they need to the staff and associated researchers that administer data collection programs so that an adequate policy analysis infrastructure is created and maintained.

Fisheries regulation: This encompasses a large number of policy assessment types including; size limits, bag limits, instream flow, seasonal closures and access restrictions to name a few. Most of these issues are framed in terms of cost-benefit analysis. Broadly speaking the SP methods are more flexible regarding the policy context and so more applicable. Often, however, cost-benefit analyses require very tight analysis schedules, obviating the use of survey based methods and underscoring the need for regular data collections aimed at recreational anglers. As internet use continues to increase, it is now becoming possible to generate and complete surveys online very rapidly. Additionally, choice experiments are excellent candidates for online administration as attribute levels can be tailored on the fly to the individual respondent, improving model fit and therefore better valuation estimates.

For fishing practice regulations, choice experiments excel. RP methods require variation in the policy attributes across either time or space to estimate the impact of changing a regulation. For example, both the travel cost method and the multiple site choice method require variation in the policy attributes within the data collected from site visitors. For instance, if the resource manager wants to evaluate a change in the size limit, the manager must collect data across similar sites with variation, either spatial or temporal, in the minimum size limit for the species of interest. Often, this is very difficult. Temporal variation requires that data be collected from the same sites across a change in minimum size limits. The limitations of that technique are obvious as these types of surveys are rarely conducted with any regularity. Spatial variation in policies requires that different sites have different minimum size limits for the same species. This can be the case; however it is more likely that an entire region or state has the same minimum size limit for a particular species. On the other hand, for choice experiments the researcher designs an experimental design containing the necessary variation in policy variables. In addition, if the researcher has adequate foresight, enough variation can be built into the experimental design such that the data collected can be used for multiple changes in policies.

Choice experiments have enjoyed wide usage in the human dimensions field as well. By allowing the researcher to include multiple attributes of the hypothetical fishing trip including regulations, preferences and other behavioural antecedents, this technique links human dimensions and economic valuation that allows forecasting angler behaviour.

[10] Human dimensions wheel available here: http://www.csc.noaa.gov/surveydesign/hdwheel.html. Last accessed October 17, 2009.

For site accessibility evaluations the choice experiment method is the most applicable because it can account for multiple site characteristics. However, choice experiments require special purpose surveys that need extensive development and implementation time. Multiple site choice models are also excellent at assessing accessibility concerns and increments and decrements to other quality attributes, however they require extensive data on historic quality and angler use.

While requiring similar types and amounts of data, multiple site choice models are superior to travel cost models. While multiple site choice models may be the most acceptable from a legal standpoint because they involve revealed preferences, they have their limitations. Several of those have been mentioned above. To be able to assess a policy, data must contain variation in that policy variable. They require extensive data on site characteristics, including access characteristics and catch rates. As is often the case in Europe, catch information is not periodically collected. As a result, data on historical catch rates is not available and cannot be obtained. Finally, multiple site choice models require individual specific data on site visitation, necessitating a specialized survey. Because a specialized survey must be conducted for these types of models, the researcher is advised to collect SP data at the same time. Combining stated and revealed data in the same analysis strengthens both. That is, combining the non-hypothetical nature of multiple site choice models with the flexibility of choice experiments increases credibility and the ability to analyze complex policy scenarios that neither method could do alone.

Overall, the hedonic pricing method seems to be the least applicable, largely because of the data requirements regarding property characteristics near the fishing site in question. However, there has been a recent resurgence in the use of hedonic modelling in the economics valuation literature. Recently, Carter, Agar and Waters (2008) used a hedonic model of charter boat fees to develop per pound willingness to pay estimates for grouper species in Florida for use in a fishery allocation study.

Finally, cost benefit analysis requires the market analysis of industries such as commercial fishermen, processors and distributors, resource owners that provide access and businesses that provide for-hire recreational services. Generally, these types of estimates can be generated by analyzing cost and return data from individual businesses. Sometimes, this type of information is already collected by government agencies. If that data does not exist, specialized surveys need to be conducted. Market analysis techniques are not included in Figure 13 because the type of data collection required is uniform across valuation techniques. To reiterate, if original industry data collection is necessary, human dimensions data should also be collected.

Policy advocacy: Given that the need for accuracy is low and the need for rapid assessments high, benefit transfer of existing contingent valuation or choice experiment results may be sufficient to demonstrate the total economic values of recreational fishing at aggregate levels. However, until now the number of original valuation studies in Europe has been low and a need exists for more rigorously conducted studies. Unless the policy being advocated involves only one recreational site, site specific RP techniques, such as single site travel cost models are not recommended. Multiple site choice models, another RP technique, can be appropriate but have their limitations when the policy maker is seeking the total value of all sites included in the model. Multiple site choice models are limited in this regard because they value single sites or groups of sites by examining the opportunity cost of travelling to other, more distant sites. If you are trying to value access to all sites, there are no substitutes left in the model to estimate the total value of access. Regarding human dimensions analysis, it is appropriate to use studies of benefits conducted elsewhere while more studies are conducted in Europe.

Resource allocation: Because changing resource allocations may have negative impacts on existing user groups, it is important to use the most rigorous data and analysis. Additionally, because of the gravity of this type of analysis, it is important to capture impacts beyond economic

valuation. Economics can be used to explore efficiency (value) and distributional effects (economic impacts, but falls short in addressing equity and fairness. As a result, it is imperative to examine the social impacts in addition to the economic metrics. Also, due to the rigor required, benefit transfer is not an acceptable technique. For commercial valuation estimates, detailed data on cost and returns is required. For the consumers of recreational fishing, many techniques are suitable. Hedonic analysis has been used to value recreational resource values using both charter or guide fees and home price data for homes located near the resource. However, it is more typical to use revealed preference techniques as hypothetical techniques may be subject to criticism. Because allocation is often a hotly contested issue, commercial businesses are reluctant to accept valuation estimates that come from SP methods. Unfortunately, a limitation of both travel cost and multiple site choice models includes the inability to construct the entire willingness to pay schedule across all possible allocations. On the other hand, only choice experiments will allow the researcher to construct the entire recreational willingness to pay schedule across all potential allocation scenarios.

Pricing (licence fees/access fees): Most methods are applicable, except hedonic pricing because its data is retrieved from a different type of market to that for fishing visits. Again, revealed preference models are often preferred by constituents particularly when the information will be used to raise licence and access fees. As a result, multiple site choice models, travel cost and choice experiment methods are the most amenable to evaluating marginal costs of site access. The choice experiments have the added advantage that other hypothetical attributes of the visit can be evaluated.

Valuation of ecosystem services: Recreational use data can often be used to measure the use value of ecosystem services. Values for instream flow, erosion control and water quality commonly use recreational angler value as a component of the total value of those environmental amenities. The most flexible and least expensive technique utilizes choice experiment data. While it is possible to estimate values of water quality from multiple site choice models, these models require spatially explicit data on water quality that can be tied to the site chosen. This can be possible in regions with extensive periodic water quality monitoring; however the monitoring program must match up with the spatial scale used to define the recreational sites in the site choice model. For instance, suppose the researcher is interested in the value of water quality at a particular lake. If the lake has multiple access points but only one water quality monitoring point, there is no variation in water quality that can be used to estimate value. Additionally, if the lake did monitor quality at multiple locations, the researcher must also collect on-water location choice from boaters, to determine what water quality monitoring zone the angler fished, similarly for hydro-morphological issues and policies.

Compensation/punitive damages: Economic valuation techniques are extensively used in the USA in legal damage assessment and are expected to be forthcoming within the European Union (Pearce & Özdemiroglu, 2002). All non-market valuation methods can be used for calculating compensation claims. In most cases, RP techniques, such as hedonic, travel cost and multiple site choice models, are preferred by the courts in the USA over SP techniques. Early in the development of natural resource damage assessment techniques, much controversy arose over the use of hypothetical choices or SP techniques. However, because of the lack of RP data for all cases and, for some cases, the impossibility of collecting RP data for non-use values, SP techniques must be used in practice. In 1993, the National Oceanic and Atmospheric Administration (NOAA), within the US Department of Commerce, convened a panel of experts to review the use of contingent valuation in the wake of the Exxon Valdez disaster; one of the largest natural resource damage cases to that point in history. That panel produced a report summarizing the expert panel's findings on the use of contingent valuation for natural resource damage assessment (Arrow et al., 1993).[11] The report of the expert panel included a list of guidelines that are still used to define the most accurate way to conduct contingent valuation surveys. The choice experiment method has potential, but is relatively new and untried in this legal setting, whereas contingent valuation has been widely

[11] Report available at http://www.darrp.noaa.gov/library/pdf/cvblue.pdf . Last accessed October 17, 2009.

used in damage assessment cases in USA courts. That is changing however, and one example of the use of a choice experiment used for natural resource damage assessment is a case study taken from polychlorinated biphenyl pollution in the Green Bay of Lake Michigan (USA) (Bishop et al., 2000). For more information on the suitability of each valuation method, the NOAA Damage Assessment, Remediation, and Restoration Program web site contains a library of US case law on damage assessment including many case studies.[12]

5.2 Discussion

For policy analysis scenarios with both costs and benefits, it is important that costs and benefits are measured with comparable metrics. Hence, if a formal cost benefit analysis is the final aim, funding should be provided so that both costs and benefits would be studied at the same time in collabouration.

While benefit transfer methods have their own problems, this valuation technique allows quick assessments in situations where funding or time may not exist for a more formal analysis. All techniques discussed here, with the possible exception of hedonic and market based approaches, require a specialized survey of at least resource users and possibly non-users. That said, both hedonic and market analysis may require surveys if the data needed for their execution is not periodically collected through other means.

As pointed out above, it is important to be efficient when conducting surveys. Surveys are costly and time consuming. Fortunately if a survey is designed well, it will be possible to gather revealed preference data, stated preference data, expenditure data, and human dimensions data in the same instrument thereby extending scarce management agency resources. In addition to extending budgets, collecting all four categories of data strengthens the entire policy analysis process.

Finally, designing and funding survey programs that periodically collect this information should be a priority. Multiple site choice models depend on regularly collected data, and this type of model is often the superior model when adequate data exists. Also, periodic data collection allows policy analysis to proceed more quickly. Finally having data on hand will encourage policy makers to utilize economic and human dimensions advice more often. Many times economics and human dimensions information is not included in policy formation simply because the data is not readily available.

It is clear that the economic and non-economic HD approaches to benefits have their own sets of strengths and weaknesses, and both are able to make contributions to assess the multidimensional and highly complex concept of benefits associated with recreational fishing. The major advantage of the economic approach is its comprehensive framework to fisheries benefits and its ability to assess benefits in one common currency – money. Both a positive and a negative quality of economic benefit measurement is that it produces a single value measure that encompasses many attributes of value, including many of the attributes singled out in the HD section above. Because it is neater, more compact, and denominated in a common currency, economics is more readily assimilated into the policy process. Economic value, in contrast to HD measures, is strictly an efficiency measure, and, as such, it does not incorporate all aspects of social impacts, equity or fairness. Irrespective, there is great potential to include cognitive and emotional variables measured with traditional psychometric HD approaches into revealed and stated preference methods from economics (Gentner & Sutton, 2007). This incorporation allows the elegant combination of social-psychological HD research and quantitative economics. However, only few applications combine these approaches in a recreational fishing context to date (e.g., Oh & Ditton, 2008; 2006; Dorow et al., 2010).

[12] http://www.darrp.noaa.gov

In the box below, the decision support tool developed by Dorow et al. (2010) is presented as a good example of combining both paradigms into an easy to use management tool.

Box 14. Decision support tool for eel management (Dorow et al., 2010).

The results of a choice experiment can be used to create a decision support tool (DST) which can be used to predict the market share or policy support for scenarios composed of the study's variables. Figure 5.1 shows the interface of the DST for the eel study (Dorow et al. 2010). The tool is laid out to compare the current eel management, an alternative eel management scenario and the 'stop fishing for eel' base alternative. The cells in the top portion of the sheet act as input buttons, in which any level of the respective variables can be chosen. The three rows below contain the market shares (percent of policy support) for the respective alternatives, which in this example have been segmented by angler specialization. The block at the bottom displays the consumer surplus that the respective alternatives would fetch compared to the current alternative.

	EEL ALT.	EEL CURR.	
Expected Catch	1 eel	1 eel	STOP FISHING FOR EEL
Expected Length	50 cm	50 cm	
Minimum Size Limit	60 cm	50 cm	
Daily Bag Limit	1 eel	3 eels	
Temporal Closure	14 days	0 days	
Maximum Number of Rods	1 Rod	3 Rods	
Price Increase Per Day	€ 0.00	€ 0.00	

Advanced	1.3%	97.5%	1.1%
Intermediate	4.4%	85.6%	10.1%
Casual	12.2%	62.2%	25.5%

Consumer Surplus* (compared to current)

Advanced	-€ 27.09	€ 0.00	-€ 27.95
Intermediate	-€ 13.98	€ 0.00	-€ 10.05
Casual	-€ 6.90	€ 0.00	-€ 3.78

* Per day of eel fishing

Figure 5.1. Example of a decision support tool.

Method
Stated preference choice experiment.

Management question
The question at hand was how would eel fishing change if expected catch, expected length, minimum size limit, daily bag limit, seasonal closure, gear amount and cost change. These trip attributes were selected because either management action or environmental/stock conditions could impact these attributes. The model allows the user to change any of the attributes and the decision support tool supplies the predicted change in policy support (often interpreted as the potential change in effort) and the change in consumer surplus across three types of user groups; advanced, intermediate and casual (defined in the paper). The screen shot above indicates no change in expected length, catch or trip cost, a reduction in the bag limit from three to one eel, a 14 day closure and a reduction in the number of allowed rods from three to one.

Results
Based on the policy scenario described above, advance anglers lose € 27.09, intermediate anglers lose € 13.98 and casual anglers lose € 6.90 in consumer surplus (economic value) per angling day.

Discussion

This decision support tool presents the marriage of economic and human dimension paradigms in a format that allows rapid assessment of a wide range of potential recreational eel angling regulation changes. An extension, not presented here, allows the calculation of the total change in eel fishing effort. If trip expenditure profiles were collected in the survey, predicted changes in effort can be applied to the expenditure profile and economic impact multipliers applied to the change in expenditure (a loss in this example) to calculate the economic impacts stemming from this potential regulatory change.

6. Recommendations

Social and economic studies including benefit valuation of non-market goods and services tied to recreational fisheries support a range of management decisions. These studies cannot stand alone but can qualify political and management decisions to ensure more efficient allocation of both natural and financial resources.

Research takes time, and for a study of good quality, at least one year is needed if starting from scratch. Researchers are professionals, and there are usually many ways to acquire the data needed. Samples for studies should be chosen with care and they should be large enough to sufficiently represent the population studied. According to Pearce & Özdemiroglu, 2002, many studies can be criticised precisely because inadequate effort is spent on designing and testing the questionnaire employed.

Too often, however, fisheries research is conducted by biologists, who most likely lack the expertise and knowledge to confront the challenge of developing thorough social science surveys and questionnaires (Ditton 2004). In such situations, expert social science survey researchers should be included to avoid low quality surveys and to improve the theoretical groundings of the concepts to be measured in terms of HD benefits fisheries provide to society.

1. To serve the needs for decision support in Europe, there is need for original valuation studies of recreational fisheries. These studies should be designed and reported in a way that makes future benefit transfer and cost-benefit analyses possible. Present benefit studies often represent points in time and in specific location, not holistic and dynamic views. Therefore, continuous surveys and development of existing surveys are important because there is little knowledge on how values change over time.

2. In EIFAC member countries, where appropriate, a national level stated preference survey, i.e. applying contingent valuation or choice experiment, should be developed to conduct to estimate total economic value of recreational fisheries for advocacy purposes. It should be sufficiently representative to also be used for benefits transfer and to identify priorities for fisheries management purposes.

3. EIFAC members should compile national databases (frameworks) of non-market value studies (published and grey literature) for facilitating the conduct of benefit transfer and meta –analysis. EIFAC should establish a repository for this material.

4. National databases on inland recreational fishing sites and their characteristics should be enhanced to support social, economic, and other human dimensions analysis.

   Specifically, there is a need to:

.

   - amend existing, recurring surveys and databases related to recreational fisheries so that they provide information for valuation studies;
   - conduct regular valuation surveys with a maximum 5 year span to map how preferences change in time;

- make studies not only on “interesting trouble-hot-spots” but also on general recreation areas, if benefit transfer should be used;
- have policy makers and fisheries managers be involved in scenario building for the models and surveys, to maximize the benefits attained from the study results.

5. Special emphasis should be given to generating the necessary data for recreation fisheries management and research as part of the public fisheries statistics: An international protocol on classification and data are a tall order but a public accessible database on catch, participation and national classification codes (gear, water, species, geography) in the recreational fishery is the first step to include recreational fishery in the public fisheries statistics.

6. A clear policy for vision and mission should be developed through using a “white paper for recreational fishery”. The policy objectives and management plans may be supported by clear recommendations on public data acquisition and point out the scientific knowledge gaps. It can also serve the purpose of revisiting the administrative support for compliance and control measures.

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List of abbreviations:

BT	=	benefit transfer
CBA	=	cost-benefit analysis
CE	=	choice experiment method
CIOE	=	classic open ended and interval
CM	=	choice modelling
CS	=	consumer surplus
CV	=	compensating variation
CVM	=	contingent valuation method
DC	=	dichotomous choice format
HD	=	human dimensions
HP	=	hedonic pricing method
I-O model	=	input-output model
MB	=	multiple bounded
OE	=	open ended
PC	=	payment card
PS	=	producer surplus
RP	=	revealed preference method
SP	=	stated preference method
TEI	=	total economic impact
TEV	=	total economic value
TC	=	travel cost method
WTA	=	willingness to accept
WTP	=	willingness to pay

Glossary (modified from Bateman et al. 2002):

Altruistic value: Altruism is the desire to secure enhancement of the wellbeing of others. Altruistic economic value is the willingness to pay on the part of individual A to ensure that individual B secures some gain in wellbeing. Altruistic value is an example of non-use value.

Benefit (or bid) function: A regression equation that describes the relationship between WTP and relevant factors such as characteristics of the population, the change in the non-market good or service and so on.

Benefit transfer: An approach which makes use of previous valuations of similar goods at a study site and, with any necessary adjustments, applies them to produce estimates for the same or similar good in a different context, known as the policy site. What is transferred may be a mean WTP, with or without some adjustment for changed conditions (for example, different income levels), or a benefit function (or bid function).

Bequest value: Bequest values measure people's WTP to ensure their heirs and future generations will be able to use the resource in the future. Bequest values are an example of non-use values.

Choice experiment: A form of choice modelling in which respondents are presented with a series of alternatives and asked to choose their most preferred.

Choice modelling (CM): This encompasses a range of SP and RP techniques, including choice experiments, contingent ranking, contingent rating and paired comparisons. CM approaches describe an asset in terms of its attributes, or characteristics, and the levels that these take, and may be used to determine which attributes are significant determinants of value; their implied ranking; the value of changing them; and the total economic value of a resource or good.

Choice set: A set of alternatives presented to respondents, usually in a choice experiment context, where they are asked to choose their most preferred.

Compensating variation: The compensating variation (CV) of a price fall (rise) is the sum of money that, when taken away from (given to) the consumer, leaves him/her just as well off with the price change as if it had not occurred. Thus, utility is held constant.

Construct validity: This examines whether the relationships between measures produced by a CV study and other measures are in accordance with expectations. Examples include predictors from economic theory, and empirical regulations in the form of associations with other variables which seem intuitively correct and which hold across a large number of studies.

Consumer surplus: The difference (or net gain) between the price actually paid when purchasing a good or service and the maximum price the consumer would have been willing to pay for the same good or service. This measure approximates, and is bounded by, the more technically precise measures of economic benefit, compensating variation (CV) and equivalent variation (EV).

Content validity: This assesses whether the SP study asked the right questions in a clear, understandable, sensible and appropriate manner with which to obtain a valid estimate of the construct (say maximum WTP for a specific good) under investigation.

Cost-benefit analysis: A procedure for valuing gains (benefits) and losses (costs) in monetary terms, based on individuals' willingness to pay to secure the benefit or avoid the cost and the resource costs involved.

Direct use value: Where individuals make actual use of a resource for either commercial purposes or recreation.

Economic impact: Economic impact analysis traces the flow of economic transactions through the economy and answers the research question what specific economic sectors win or lose as the result of a policy change. Economic impacts can be expressed in terms of employment, value added (also called the contribution to gross domestic product), total economic output (also called total sales), or income. These effects can be direct, indirect and induced.

Economic rent: Payment made to a factor that is in excess of what is required to elicit the supply of that factor. Economic rent (or resource rent) exists when payments to owners of the resources used in production exceed opportunity costs of maintaining these resources.

Economic value: The monetary measure of the wellbeing associated with the change in the provision of some good. It is not to be confused with monetary value unless the later is explicitly designed to measure the change in wellbeing, nor with financial value which may reflect market value or an accounting convention. The terms economic value and welfare change can be used interchangeably.

Equivalent variation: The equivalent variation of a price fall (rise) is the sum of money that, when given to (taken from) the consumer leaves him/her just as well off without the price change as if it had occurred. Thus, it preserves the post-change utility level.

Existence value: The value that people put on the existence of a resource, even when they have no intention of ever using the resource. Existence values are part of non-use values.

Indirect use value: This arises where individuals benefit from ecosystem functions supported by a resource rather than actually using it (for example, watershed protection or carbon sequestration by forests).

Meta-analysis: A statistical procedure whereby a number of different studies are treated as inputs to a wider study that seeks to explain the variability of outcomes in the individual studies. Meta-studies involve not just outcomes of the original studies (for example, mean WTP) but also the sample size, date and location of the study, the author and so on.

Non-use value: The value placed on a resource by people who are not current users of that resource and who do not intend to use the resource themselves. It is also referred to as passive use value.

Opportunity cost: The value of a resource in its next best alternative use; the net benefit forgone because the resources providing a service can no longer be used in their next most beneficial use.

Option value: The value that people place on having the option to use a resource in the future even if they are not current users.

Payment card: An elicitation format which presents respondents with a visual aid containing a large number of monetary amounts to facilitate the valuation task.

Public goods: Are nonrival and nonexcludable, i.e. these goods can be enjoyed by any number of people without affecting other peoples' enjoyment. For example, an aesthetic view is a pure public

good. No matter how many people enjoy the view, others can also enjoy it. Typically **environmental goods** are purely (both nonrival and nonexcludable) or partly public goods.

Sample frame population: A list of the target population from which the sample will ultimately be drawn, for example, all dwelling units in a city, all visitors to a site, all households with a telephone.

Total economic value: The total economic value of an environmental resource is made up of i) use values and ii) non-use values. Use values are composed of a) direct use value, b) indirect use values and c) option values, whilst non-use values are made up of a) altruistic values, b) existence values and c) bequest values.

Use value: The value placed on a resource by users of that resource.

Utility: This is synonymous with wellbeing.

Willingness to accept compensation: WTA is the amount of money that person require as compensation to forgo the improvement.

Willingness to pay: WTP is the amount of money that a person is willing to give up in order to get a particular good or service (obtaining benefits) based on the specific action or task.

Appendix 1: Examples of used methodology associated to fishery and preservation of fish stocks in the Nordic countries and the Central Europe.

Main reference	Year of publication	Associated good(s)	Used method*	Mean of WTP estimate**
Germany				
Arlinghaus & Mehner	2004	Specialized carp angling	CVM (OE)	881 € per year
Arlinghaus	2004a	Recreational fishing in general in Germany	CVM (OE)	Use value 134 € per year, Non-use value 21 € per year
Arlinghaus	2004b	Recreational fishing in Berlin	TC (multiple sites)	22 € per trip
Finland				
Toivonen et al.	2004	Hypothetical good quality stream in various Nordic countries	CVM (MB and OE)	62-375 € per angler per year depending on country and scenario
Parkkila	2005	salmon angling in the low quality salmon river	CVM (PC)	8-10 € per angler per fishing day 48-57 € per angler per fishing season
Parkkila	2009 forthcoming	New management program for Baltic salmon fisheries	CVM (CIOE), CE	28 € per angler per year forthcoming 2009
Sweden				
Appelblad	2001	Current salmon angling in the Byske river Improvement of river to be as good as Norwegian salmon river	CVM	12 € per angler per day 44 € per angler per week 101 € per angler per year 19 € per angler per day 70 € per angler per week 164 € per angler per year
Paulrud	2004	Fishery in the rivers in Bohus area, Sweden and in the lakes in the area	CVM	13-21 € per angler per fishing trip depending on scenario 6-8 € per angler per fishing trip depending on scenario
Paulrud & Laitila	2004	Local sport-anglers, catching an extra fish in the Kaitum river	CE	2-39 € per angler per fish depending on its size
Håkansson	2007	Salmon angling/ conservation by building, fish ladder, the Vindel river, Sweden	CVM (CIOE)	4-15 € per person as a lump sum depending on scenario and respondent (angler/non-angler)
UK				
Peirson et al.	2001	Re-introduction of salmon in Thames river, current fishing experience in theTeifi river, Current fishing in the Aire river, England	CVM(PC, OE)	4 € per household per year 14 € per angler per fishing trip 3 € per local angler per day

* = Valuation method, CVM= Contingent valuation (payment format: MB, multiple bounded; PC, payment card; CIOE classical open ended and interval; DC, dichotomous choice format), TC = travel cost method and CE = choice experiment

** = Mean of WTP estimates are given as the currencies have been reported (amount of reported WTP estimates) with some exceptions where reported WTP estimate is adjusted to 2007 Euros (Appelblad, 2001; Håkansson, 2007; Parkkila, 2005; Paulrud, 2004; Paulrud & Laitila, 2004; Peirson et al., 2001; Toivonen et al., 2004). It should be noted that several mean WTP estimates are reported in each paper and due to the differences in scenarios, type of WTP questions and used currencies etc. reported WTP estimates are not commensurate.

Appendix 2: Major steps when conducting a contingent valuation (CV) study

These steps follow Champ et al. (2003):

Step 1: Identify the change(s) in quantity/quality to be valued
Conducting a CVM study starts with identifying the change(s) in the quantity or quality of the amenity to be valued, which is motivated based on the current decision problem, i.e. what is the item to be valued. Initially identification of valued change requires a theoretical definition for the measure of the welfare change to be estimated, based on the property rights structure and on the type of the change from the current (status quo) situation. The proposed change can be either a gain or loss, and for them there are different welfare measures: WTP to secure a gain or WTP to avoid a loss, and WTA to tolerate the loss and WTA to forgo a gain. This step is fundamental: it affects the description of the environmental conditions with and without intended policy, frames the statistical analysis and allows clear interpretation of policy context. Also, as the effect of different policy to individual's utility is to be identified. The status quo (leaving things as they are) in resource condition and services it provides to people, and the state after the proposed change, have to be described in detail using physical and biological measures associated to the good. In this way the difference between the baseline utility with current environmental conditions and the utility with the new environmental conditions can be defined. Economists are dependent on available information on physical changes and their impacts in order to identify their effect on an individual's utility. Vague information associated to policy and its effects accomplish vague results, which is a problem particularly with older studies.

Step 2: Identify whose values are to be valued
The second step involves identification of the population of interest, i.e. those who are affected by intended policy and whose values need to be known. There are two criteria to be used for framing the population, namely those people who will benefit from change or, on the other hand, people who will pay for it. For example, the policy question could be whether to allocate more fish stocks to recreational fishing instead of commercial fishing in a certain water area due to the new regulations. In this case, at least the anglers in the water area in question should be included in the sample frame. However, there are potential anglers and public who might be affected by the policy as well. If updated licence data (e.g. register about purchased fishing licences) are available, they can be utilised for framing the sample. In this case, the unit of welfare measurement is defined as individuals (because fishing licence is personal), and study results are represented as mean WTP per individual instead of WTP per household, which is another option. Policy change might also have wider effects on the community (e.g. through the increased activity in the area) or even the national (or international, e.g. internationally recognized recreation site) level, in which case the whole nation is considered as the relevant population.

There are also factors, which can be used to consider whether to determine user and non-user population in the study, from which, the uniqueness of the good (service) in question, scale of the change in question and context in which the results will be used are most important. Once the sample frame is defined, the next phase is to select the particular sample from the frame, typically using probabilistic sampling (see further information Bateman et al., 2002). The selected sample affects aggregation results since the point estimates of value (WTP), which are stated per individual or per household, are lastly expanded to population values. Therefore, the sample should be representative compared to the whole population.

Step 3: Select data collection mode
The CVM method relies on primary data collection with mail surveys (e.g., Arlinghaus & Mehner 2004), telephone or personal interviews, internet-aided surveys or mixed modes. CVM studies

usually employ mail surveys, often due to reasons related to budget and sample representativeness. The cost of sending (including two mailings and a reminder card) a questionnaire to 1 000 people is about 5 000 to 6 000 Euros with mailing (3-4 Euros per person depending on if they answer in the first stage or not) and printing costs currently in Finland. Another method is a telephone survey, which is relatively affordable when compared to the costs associated to interviews. Personal interviews are recommended by many authors, and they provide different opportunities related to chosen valuation techniques. Use of CAPI-surveys (computer assisted personal interviewing) in face-to-face interviews is currently increasing, and is replacing pen and paper methods. In addition, combined mail-telephone or mail-internet surveys have been popular. Internet and web-based surveys are becoming more common in the future. Expected survey response rate affects the mode selection. In general, response rates tend to increase along with the costs. Higher response rates can be expected also among specific user groups such as recreational anglers than in general population surveys.

Step 4: Choose a sample size
Choosing a sample size is related to acceptable level of precision with a given budget. However, CVM studies typically require rather large sample sizes due to the large variance in the WTP responses, and they are rarely smaller than 1 000 individuals. In addition, previous literature may give insight to develop a reasonable estimate of standard deviation for new application with a particular context. On the other hand, sample size is related to methodological issues (e.g. used response format and bid selection) and expected response rate, which is influenced, for instance, by the policy issue under consideration and percentage of invalid mailing addresses. Other considerations include possible use of sub-samples and eligibility of possible respondents in the survey. Therefore, it is difficult to give any accurate recommendation on optimal sample size, but according to Bateman et al. (2002) it is recommended that sample sizes (usable responses) are about 200-500 for open-ended CV surveys and about 500 – 1000 for closed-ended (dichotomous/ referendum) CVM surveys.

Step 5: Design the information component of the survey instrument
The fifth step involves designing the information that is given to the respondent in the questionnaire or an interview concerning the good to be valued, provision of the good and payment method. These issues constitute a significant component in the design of the CVM survey. The main challenge in a CVM study is to design the valuation scenario, including components of the survey instrument and valuation questions, in a way that it is not only understandable for respondents but also scientifically correct.

Firstly, the item to be valued, i.e. the qualitative or quantitative change identified in the first step, is described in written (or verbal) form and with help of illustrative graphs and pictures in order to facilitate the understanding of the respondent. The scenario includes a neutral description of the change to be valued. Information is given in terms of the baseline condition(s) (status quo) and new condition(s) resulting from the policy change, from which one or the other is often missed in older studies, reducing the credibility of value estimates. The standard errors of the welfare estimate decrease when high-powered information is provided to respondents. In a study about brown trout fishing in southern Wisconsin streams, for instance, there was a need to provide information on the affected area with the use of a map, the stocking of the brown trout and composition of catches. In addition, information is needed for substitutes and reminders of budget constraint. If the good is complex and the respondent is unfamiliar with it, more information is needed in order to elicit credible WTP responses.

Secondly, the method of provision is explained in the scenario. This is the mechanism through which the policy is implemented. For instance, when allocation of fish stock will be changed due to the policy, these policies have to be specified. Then, a payment vehicle is selected and described in the scenario. Income taxes (e.g. species protection), admission fee, donations (when reliable one

exists) and increased user fees (recreation) have been widely used. Choosing the payment vehicle means balancing between realism and rejection of the payment vehicle. Then, a decision rule is selected, which means stating the mechanism by which the respondents are informed of the provision of the valuation item in reality. This can be done using individual or summary (e.g. if majority vote positively) statistics on valuation responses. It is closely linked to payment method but is often neglected. In the case of user valuations, such as recreational fishing, it is not applicable because of individual trip costs. Selecting the time-frame for payment tells the respondent the amount of payments and how frequently the payments are required for the policy. Alternatives can be one-time payment, each time when participating, or annual payment for x year e.g. during the next five years. It should be reliable in the sense that connection between the time frame and benefits of the policy change for the respondents is as evident as possible.

Step 6: Design the contingent valuation question

After all the information is given, the respondent can be asked questions to determine how much they would be willing to pay (WTP) for the good (e.g., Arlinghaus & Mehner 2004). There are three primary response formats, open ended (OE), payment card (PC) and dichotomous choice (DC), and they all have strengths and weaknesses (see Champ et al., 2003). The chosen format affects the welfare estimates. OE format asks directly how much the respondent would be willing to pay at most for the specified change, but this is nowadays rather rarely applied, because potential zero bid problem and theoretically reasons (present example of OE format, see e.g., Håkansson, 2007). Instead, the different DC formats are currently used most commonly, such as single bounded dichotomous choice (SBDC), including one bid offer to the respondent, and double-bounded dichotomous choice (DBDC), with two rounds of the bid offers. In addition, DC can be framed as a referendum format. In DC formats bid (price) varies randomly across the sample, and they are relatively inefficient because less information is available from the respondent. Other problems in DC formats are related to “yea” saying and anchoring. The PC format includes several bids, varying from very low bids (starting from zero) to higher ones. In case that each bid in the card is multiple bounded by “response certainty” (definitely or probably yeas; unsure; definitely or probably no), the format is called polychotomous. All the formats, except the open-ended, requires careful selection of bids (e.g. using pretest and the help of previous studies), the number of which is usually 5 - 8. On the other hand, people should be allowed to state also zero responses, in order to identify people who truly hold zero value for the item being valued and whose utility will not increase according to described change. The questionnaire should also include screening questions considering the zero-value. In addition, the follow-up questions are used to identify respondents with real zero WTP for the policy from those who provide zero answer as a protest, and motives for positive WTP. There are several reasons for the protest answers and the questionnaire is designed to include also questions to reveal those and other misleading responses (e.g. outliers with unrealistic high values).

Step 7: Design the auxiliary questions

The questionnaire should be designed to include auxiliary questions, which are used to collect the data to be used in the analyses. Firstly, the questions associated to the respondent’s income and other variables, which provide covariates for statistical analysis, are needed. Secondly, the questions that can be used for assessing the validity of valuation responses are developed. The respondent’s understanding about the good being valued and change the good is providing needs to be evaluated with thorough questions.

Step 8: Pretesting and implementation of the survey

Before implementing the final survey the questionnaire should be pretested through the one-to-one interviews, focus groups and pilot survey. The purpose of the pre-testing is to ensure that the questionnaire is understandable for the respondents in order to elicit the information that it is designed for. Further pretesting is used to find out whether the chosen statements and wording (particularly terms) will cause any problems. Costs of valuation surveys varies a lot depending on budget, sample size, survey mode (mail, telephone, face-to-face interview etc.) and by whom it is

conducted (professional or student), the complexity of questionnaire design and level of analysis anticipated. Typically, 6 000 Euros can be considered as a minimum budget for implementing a valuation survey, which does not include data entry (see further information e.g., Bateman et al. 2002). In addition, total costs and time frame of a valuation study tend to increase along with the complexity of the proposed change and its impacts. Further, in the case of recreation fishing the data is typically collected during the fishing season or immediately after that, and must be considered when determining time frame of the study.

Steps 9 and 10: Data analysis, statistical analyses and reporting study results

After the data collection, the data analysis procedures are developed and statistical analyses are conducted. The mean WTP measure for the good being valued is estimated by using econometric models, and individual valuations are aggregated (i.e. mean WTP per individual is multiplied by the number of population affected by the change) to the whole population. in question. Presuming that the CVM study is designed carefully and following the guidelines, estimation of the preliminary results (e.g. sample averages) should not take much time. However, it should be noted that several assumptions associated to econometric modelling typically have substantial effect on obtained results. Besides estimation of the WTP estimates (preliminary and final sample averages and aggregation values), their reliability and validity need to be addressed. Finally, the study results, particularly estimated values, average and aggregated values, are reported and produced for the needs of the policy analysis. Also study results can be further used in benefit transfer analyses.

Appendix 3: Major steps when conducting a choice experiment (CE) study

In the following text a brief overview is provided for setting up a CE study (Bateman et al., 2002; Bennet & Blamey, 2001; Champ et al., 2003; Hensher et al., 2005).

Before the steps of conducting an experimental design, i.e. manipulation of the attributes and their levels, the importance of precise characterization of the decision problem is highlighted. The decision problem needs to be identified, especially regarding the geographical and temporal scope of the quality changes (environmental problem), but also the types of the values that are affected by the changes (economic problem). It has to be sorted out whether the policy change impact on single site or multiple sites matter and what is the time frame for the change. For instance, changing the fishery regulation in the lake affects the quantity and quality of fish catch at least locally. Policy change might have larger effects on fishing opportunities or existence of some fish species in the future.

Conduction of a choice experiment is above all about understanding the behavioural aspects and statistical characteristics of design, and balancing between them in order that experiment will be credible for respondent, useful for policy making and reliability of estimated results. In addition, although the experimental design process is presented below in a step by step manner, it is more like a sequence of steps and returns to the previous stages are needed.

Step 1: Identify the alternatives, their attributes and attribute levels
At first the components to be used within the experiment are produced. It starts by defining the alternatives and their number, since in choice experiments individuals make choices among several choice situations (choice sets) which include at least two alternatives. Alternatives with different combinations of attribute levels can be unlabeled or labelled. In the first case alternatives are defined with generic titles (e.g. alternative 1, alternative 2. in a management option study), and in later case titles are labelled with the names, which describe the alternative (e.g. bus, car, train in a travel mode study). No-choice or status quo (or so called opt-out option) alternative is typically one of the alternatives in study. The different alternatives are determined by specified attributes and their levels, and thus, the most relevant attributes associated to environmental quality are selected and described. Alternatives include always a price as one of the attributes, which is used as a payment vehicle. In case of recreational fishing, different fish species, size of expected catch, state of fish species (e.g. described by number of smolts from the river), number of anglers (possible congestion problem) and quality of the fishing site environment could be the factors that are relevant for anglers and represent characteristics of an angling site. On the other hand, regulation measures, such as, bag size limit and fishing control might be selected based on their importance for policy decision making. Previous literature, focus groups with representative people and experts, and other pre-tests are typically used to identify the most relevant attributes. However, ambiguity and inter-attribute (associated to cognitive perceptions) correlations must be also considered, because ambiguous attributes are not able to explain variation.

The attribute levels are preferably described quantitatively (e.g. days needed to catch salmon 7, 4, 1), rather than qualitatively (e.g. many, quite many, only few days). This, however, requires existence of adequate data from current and possible future (forecast) levels of attributes. The correctness of attribute definition is essential in order to attach a single meaning, for instance, to the number of salmons under different conditions of respondents. It might be that an attribute needs to be separated into two distinct attributes, in this case one describing fishing success and another state of the salmon stock. There are two concerns for specifying the attribute levels, a range of each attribute level and number of attribute level. A range of attribute levels should encompass whole range (minimum and maximum value) being part of the respondent's preferences. Then for the needs of model estimation, the extreme values experienced by the respondent are needed, but the range still should be feasible and not unrealistic wide. The number of attribute levels is typically

different for each attribute and is dependent on required information about the utility attached to change in each attribute level, such as, whether the utility is linear (2 levels is appropriate) or non-linear (more than 2 levels is needed). Most of the researcher's time is recommended to spend on above mentioned issues in order to produce reliable results.

Further, by changing the levels for the chosen attributes, different goods can be produced. In the next step, the levels are assigned to the choice sets of alternatives to be presented to the respondent.

Step 2: Develop experimental design considerations
The next step is to make decisions concerning the experimental design to be used, i.e. the specification of attributes and their levels for use in an experiment. There are number of methods available. In full factorial design all possible combinations of attribute levels (choice sets) are used construction of the alternatives. In that case, with several attributes and their levels the number of different combination is however high. Through using the fractional factorial designs the number of choice sets can be decreased, since only a fraction of the full factorial is taken. Instead of making a selection of the choice sets of alternatives randomly, scientific methods are needed to produce a subset of all combinations, e.g. orthogonal designs, optimal choice probability design, efficient design etc. Sometimes so called end-point design with only extremes of the attribute levels can be employed, to reduce the size of the design.

For specifying the design the alternatives need to be selected, whether they are generic or labelled (meaning to respondent), which also affect on the size of design. Sometimes only main effects of each attribute might be of interest, but for certain policy changes also the interaction effects of different attribute levels are expected to be significant for the respondent and should be estimated. The design and modelling requirements are also different for the estimation of the linear and non-linear effects of the attributes, and need to be considered. Assuming the worst case, i.e. very complex non-liner relationship among several attributes and their levels might seem to be the best strategy for the researcher. However, that kind of strategy means very large design and sample size and therefore is very costly and might be unfeasible to conduct. Statistical analysis requires certain degrees of freedom, and determines the minimum number of the different combinations of the attributes and their levels in design.

Finally, the blocking strategy is used to divide the final combinations (choice sets) into different segments (blocks), each of them having certain number of the choice sets (e.g. 4-10 depending on size of design), which are given to a different respondent (sub-samples). A small design with 27 combinations, could be blocked to 9 blocks in which case each respondent receive 3 combinations (choice sets), for instance. Typically allocation of choice sets is done randomly.

The next step is about developing the choice context and scenario descriptions. These are again critical steps, and appropriate framing requires time. Development of experimental design includes construction of alternatives that will be presented tothe respondent in the survey.

Step 3: Generate experimental design
This step includes conduction of an actual experimental design, which is one of the most controversial tasks related to CE process and therefore is only mentioned in this Occasional Paper. The experiments are generated using systematic and planned design process to combine the attribute levels into choice sets, which are going to be represented to the respondent. Different types of designs can be generated depending on, e.g. preferred statistical properties, which are already defined in the previous step. The specialised computer softwares (e.g. Sawtooth software) and statistical packages (e.g. SPSS and SAS), can be used to generate experimental designs.

Step 4: Generate the choice sets and questionnaire

The questionnaires including the choice sets that are going to be used in survey are finally constructed. In order to avoid biases related to the order of choice sets, their order for each respondent is recommended randomly, so that each respondent views the choice situations in different orders. In addition, the order of the alternatives of choice sets can be randomized. These modifications are more feasible to realise when using electric form of the questionnaire (e.g. in case of internet-aided survey) instead ordinary paper questionnaire, because of very high number of questionnaire versions. In this step the survey instrument, i.e. questionnaire should be finalised in its entirety and data collection is administered.

Step 5: Estimate model and interpret the results for policy analysis and decision support

For the analysis of choice data, which is based on the respondent's choices among alternatives that yield their highest utility, probabilistic models are used. Various statistical softwares (e.g. Nlogit/Limdep) can be used for the welfare estimation. Through the econometric models (e.g. Multinominal logit, Nested logit, and Mixed logit models) the parameters in the utility function are estimated and different values are produced e.g., part-worth utilities (value) for each of the attribute levels and marginal values for different scenarios. Finally, study results can be interpreted and may be used in policy analysis and to support the decision making process.

Appendix 4: Major steps when conducting a travel cost (TC) study

A hand-book example of the steps in conducting a travel cost study is given in Champ et al. (2003), from which a brief overview with comments is given below.

Step 1: Definition of the study area
The first step in any TC study is to define the study site. The study site or sites should be defined as strictly as possible, for example, a particular river or a small group of lakes. The required scale of the study helps to define the size of sites to be analysed. In some cases a regional scale is enough to aggregate recreation benefits, but if the value-effect from change in an environmental attribute is studied, the size of study sites should be kept small enough so that enough variation in the sample is maintained for estimation purposes. If the site is loosely defined, it will cause benefit estimates to be unclear, especially in cases where the evaluated sites are neighbouring each other. For multiple site studies, the general study area should be decided before identifying the sites. For example, it may be decided that sites within a hundred kilometres or two hours from the study population's residences are viable substitutes for each other. The limitation is important, since otherwise the researcher may find himself in a situation where an individual has hundreds of substitute sites, for which the researcher needs to find information.

Step 2: Definition of recreational activities to study
The second step is to define the recreational activities of interest, and the time-scale of the study. When benefits from a recreational activity, like fishing, motivates the study instead of site-specific value, the second step will be the first to take, after which the study area will be defined along with recreation sites inside that area. For these types of studies, a multiple-site approach is better than a single-site study. Clear definition of the recreational activity and season may sound trivial, but in fact it may affect results drastically. For example, in countries with ice cover on inland lakes during winter, the population of ice anglers exhibit different behaviour than summer-anglers. If this is not taken into account, it may severely bias the study results. By clear definition it is not only meant that different fishing methods should be distinguished, but more importantly it should be recognized that people may participate in other types of recreational activities at the same time. If a person primarily fishes but also swims at the site, allocating all the benefits from the visit to fishing would give too high of an estimate of fishing benefits. This is a larger problem with longer trips. If people stay at a site for long stretches of time, it is likely that they will participate in other recreation activities, thus making it problematic to estimate accurate benefits for one specific activity without extensive data. Many studies limit their scope to one-day visits to overcome these problems. Surveys may also be designed to elicit information about other activities during the visit, enabling better estimations through statistical methods.

Step 3: Formation of sampling strategy
The sampling strategy, as the third step, is an important decision affecting the results which can be obtained from the study. There are two options for sampling in general: on-site and off-site sampling. On-site sampling means that the researcher intercepts people at the site of interest and interviews them either orally or using a written survey. The advantages of this approach are that people that actually have visited the site will be caught in the sample and that people may be instructed to fill out the survey correctly. For small, single-site studies this approach may be the best since it could be cheaper than mass mailing of questionnaires. On-site sampling is, however, costly for larger surveys, especially with multiple sites, and requires the site to be such that visitors are easily reached. In practice this means that the study site requires clear points of entry. On-site surveys also tend to obtain information from people who visit the site more often because these people are more likely to be present at the time of interview. This caveat inflates the benefit estimates if not corrected at the model estimation stage. Another important caveat of on-site sampling is that it ignores reasons for non-participation. Off-site sampling with large scale surveys gathering information from both visitors and non-visitors gives light to the reasons why some

people do not visit the site. The important aspect of non-visitors is the group of potential visitors who opt not to visit because of, for instance, too high costs or lacking site quality. Understanding these underlying reasons gives greater comprehension of attainable benefits with changing environmental quality or travel costs. Off-site sampling tends to be costly because it needs a large sample of people. A mail survey with a return envelope has been quoted to cost over 4 Euros per questionnaire in Finland, while the response rate to mailed questionnaires ranges between 40 % and 70 %. On the other hand, a survey of similar size conducted with face-to-face interviews is likely to be much more expensive. In the case that a government agency holds a list of recreational visitors to a site, like purchasers of fishing permits, it is possible to conduct a targeted off-site survey. It is thus important to be aware of existing lists of recreationists and also prior surveys which may give additional insight to the study.

Step 4: Survey design and implementation

After a sampling strategy has been decided it is time to design and conduct a survey. At this time it should be known if also alternative, already existing, databases could be used to supplement the survey. For example, fishing permit holder data may exist, or there may have been useful prior surveys conducted in the area. It must be also noted that substantial survey cost savings can be accrued by combining a TC survey with other surveys to be conducted in the area of interest. Careful survey design is very important; once the data has been collected it is very hard to improve. Survey design benefits from pilot testing of the survey. Depending on the complexity of the study, designing a good survey with a pilot study may take two to four months, and the final survey along with coding the responses to a usable form may take up to half a year. In a TC study the most important questions asked are about the frequency of trips to the site of interest, and possibly to substitute sites, with information on the travel costs. To evaluate fishing benefits, it is imperative that the fish catch and quality per visit are also reported in the survey. Champ et al. (2003) note that it is prudent to ask specific questions only from the last visit to the site, since it is hard for people to remember small details of possibly many fishing trips. Due to the same reason, it is also recommended to conduct surveys just after the season so that the visits are still fresh in the minds of respondents. With continuously collected panel data these problems will not exist as such, but such extensive data collection is rare. Respondent information should include basic socio-economic data, like income, employment, location of residence, family composition, and personal attributes. With a small inclusion to the survey it is also possible to attempt to value changes in site characteristics, like better catch. In this case the respondent will be asked to project the number of future visits to the site, given the current quality and with a better quality. An article by Whitehead et al. (2000) has studied this type of addition.

Step 5: Estimation

After the data collection, demand for fishing will be estimated using econometric methods. With careful preparation in the earlier stages of the study, it is possible to reduce the time spent in the actual estimation. First estimates can be acquired fast thanks to computers, but the validation of the models and deeper insights from the data require time. The first estimates may be far off from the final, publishable, results.

Appendix 5: Table of total economic value (TEV) of recreational fishing in the Nordic countries

In the study, contingent valuation method (CVM) was used to estimate the two TEVs, which measures only net social benefit, consumer surplus, and excludes actual expenditure. In the table below, the figures of columns 3 and 4 are relatively close to one another. The use value of anglers (column 1) added with the non-use value of the non-anglers (column 2) is relatively close to the whole population's WTP for the current state of fish stocks and quality of recreational fishing. This again, column 4, compared to actual expenditure of anglers in each country is in Denmark 415 %, Finland 79 %, Iceland 100 %, Norway 95 % and in Sweden 92 %. These percentages reflect the participation percentages in the respective countries.

			Use value 1	Non-use value 2	TEV 3=1+2	TEV 4
			Fisher's extra WTP for their fishing experience	Non-angler's WTP for current state of fish stocks and current quality of recreational fishing		Fisher's and non-angler's WTP for current state of fish stocks and current quality of recreational fishing
	1999	million				
	Denmark	DKK	248	1650	1898	2150
	Finland	FIM	501	493	994	967
	Iceland	ISK	591	1190	1781	1950
	Norway	NOK	1020	761	1781	1750
	Sweden	SEK	1030	1400	2430	2500
exchange rate September 2008						
	1999	million				
7,46	Denmark	euro	33,3	221,2	254,5	288,3
5,95	Finland	euro	84,3	82,9	167,2	162,6
131,33	Iceland	euro	4,5	9,1	13,6	14,8
8,16	Norway	euro	125,1	93,3	218,4	214,6
9,56	Sweden	euro	107,7	146,4	254,1	261,4
			354,8	552,9	907,7	941,7
consumer price index September 2008 / December 1999 (Finland) =125,9/105,5						
1,19	2008	million				
	Denmark	euro	39,7	264,0	303,7	344,0
	Finland	euro	100,6	98,9	199,5	194,1
	Iceland	euro	5,4	10,8	16,2	17,7
	Norway	euro	149,2	111,3	260,6	256,0
	Sweden	euro	128,5	174,7	303,2	312,0
			423,4	659,8	1 083,2	1 123,8

Appendix 6: The Questionnaire used in the study "Economic value of recreational fishery in the Nordic countries"

Nordiska Ministerrådet
Pohjoismaiden ministerineuvosto
Norræna ráðherranefndin

Questionnaire

"Economic value of recreational fishery in the Nordic countries"

NATURE AND ENVIRONMENT

1. What is your personal relationship to nature and any kind of outdoor recreation? Tick your choice.

		Fully agree	Somewhat agree	Somewhat disagree	Fully disagree	Don't know
1.1.	I like outdoor recreation	☐	☐	☐	☐	☐
1.2.	Nature and environment are important issues to me	☐	☐	☐	☐	☐
1.3.	I prefer to do things other than outdoor recreation during my free time	☐	☐	☐	☐	☐
1.4.	Man can be well off without ever going out to nature	☐	☐	☐	☐	☐

ARE YOU A RECREATIONAL FISHERMAN ?

2. Did you go fishing for recreation at least once during the last 12 months? Tick your choice.

☐ 2.1. Yes. **Continue with question 3.**
☐ 2.2. No, but somebody in our household did. **Please, go to question number 12.**
☐ 2.3. No and nobody in our household fish for recreation. **Please, go to question number 12.**

WHAT KIND OF A FISHERMAN ARE YOU ?

3. How would you describe your hobby? Would you consider yourself to be an / a (only one choice!)

□ 3.1. Sports fisherman (use mainly rod and line)
□ 3.2. Subsistence fisherman (use mainly gill nets or other standing gear)
□ 3.3. Generalist (use all sorts of gear)
□ 3.4. Occasional angler (This not for Sweden!!)

FISHING AREA AND ACTIVITY

4. By a fishing day we mean "a day when you carry out fishing activities, regardless of how many hours per day". Approximately how many fishing days did you have during the last 12 months?

_____ days. How many of these days were you ice-fishing? _____days.

5. How many of these fishing days did you spend in coastal and sea areas, rivers and lakes? Write "0" for the types of fishing you did not perform.

5.1. Coastal and sea area _____ fishing days

5.2. Rivers _____ fishing days

5.3. Lakes _____ fishing days

6. Thinking of the fishing experience you have had in these three areas; how would you rank them (the one you like the most and 3 the one you like the least)?

6.1. Coastal and sea area Rank □
6.2. Rivers Rank □
6.3. Lakes Rank □

FISHING EXPENSES

7. Approximately how much money did you use during the last 12 months on your recreational fishing? Please fill in the form below. If you had no expenese on an item, please write "0" Kr. DO NOT count costs of items that last for many years, e.g. gear (rods, nets), fishing clothes and boats.

7.1. Automobile transportation to fishing site (fuel, rental cars, road tolls) _____ Kr.

7.2. Boating (fuel, other operating expenses, rental costs etc.) _____ Kr.

7.3. Other transportation to fishing site (ferry, air plane, train etc.) _____ Kr.

7.4. Lodging _____ Kr.

7.5. Licences and annual membership fees _____ Kr.

7.6. Fishing journals, books, videos, CD-roms ... _____ Kr.

7.7. Extraordinary food and drink expenses _____ Kr.
(above what you would have spent anyway)

7.8. Other expenses _____ Kr.

please, specify _____

Please add up your fishing expenses the last 12 months, and write the total below:

TOTAL _____ Kr.

THE NEXT QUESTIONS ARE IMPORTANT TO US - PLEASE, THINK CAREFULLY

The next questions may be difficult to answer and they will certainly require careful consideration. We ask them in order to get some insight into the Nordic people's attitudes towards and valuation of recreational fisheries. In giving your reply, please consider the income of your household. Remember that if you use money on this, you will have less money to use for other things.

8. Think about the experience you had during your recreational fishing the last 12 months, and what it is worth to you to have this experience. Do you think your experience is worth more to you than you paid? What is the **most** you would almost certainly pay **in addition to** what you now spend (see question 7) before you would stop going to the fishing sites you now use? By "almost certain" I mean that the amount you are 95 % certain you would pay

_____ Kr / year **in addition to** what I already pay to have the same recreational fishing experience I had the last 12 months.

9. Imagine that there was a **stream** near your home which for many years had been closed for recreational fisheing. It is a clean, scenic and quiet area with a stream with high water quality. The stream has a natural stock of **salmon and sea trout**, which allows for an above average chance of catching these fish species.
Imagine that the stream is opened up for recreational fishing with rod and line. Due to the sensitivity of the area, the number of anglers / sports fishermen will be restricted. To get access you will have to pay a rent which would grant you a 12 month right to fish in this stream. This money is needed to maintain the stream in its current condition.

The rental scheme will be administered through a local fund in your local county council. A board where you are represented by one of the participating anglers/fishermen will take the day to day decisions on the maintenance plan for the stream.

Think of what it is worth to you to be able to fish in this stream. What is the most you would be willing to pay as an annual rent to be granted access to fish in the stream?

The table below lists some amounts. Start at the top of the table by asking yourself: Would I *certainly pay*, *almost certainly pay*, *be unsure*, *almost certainly not pay* or *certainly not pay* 100 Kr., and put a cross in the alternative that best represents your answer. Ask the same question for 300 Kr etc., and continue all the way down the list to the highest amount (20.000 Kr). Only *one* tick for *each* amount is allowed.

	I would certainly pay	I would almost certainly pay	I am unsure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an annual rent before you would decide not to go fishing in this "new" river? _____ Kr./ year

Write "0" Kr. if you are not willing to pay anything. If "0 Kr.", can you explain why?

_____

10. Now, **instead** imagine there was a **lake** near your home which for many years had been closed for recreational fishery. It is a clean, scenic and quiet area with a lake with high water quality. The lake has a natural stock of **pike, perch and pike-perch**, which allows for an above average chance of catching these fish species.
Imagine that the lake is opened up for recreational fishing with rod and line. Due to the sensitivity of the area, the number of anglers / sports fishermen will be restricted. To get access you will have to pay a rent which would grant you a 12 month exclusive right to fish in this lake. This money is needed to maintain the lake in its current condition.

The rental scheme will be administered by a local fund in your local county council. A board where you are represented by one of the participating anglers / fishermen will take the day to day decisions regarding the maintenance plan for the lake.

Think of what it is worth to you to be able to fish in this lake. What is the most you would be willing to pay as an annual rent to be granted access to fish in this lake?

	I would certainly pay	I would almost certainly pay	I am unsure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an annual rent before you would decide not to go fishing in this "new" lake? _____ Kr/ year

Write "0" Kr if you are not willing to pay anything. If "0 Kr" , can you explain why?

_____

11. Now, **instead** imagine there was a **lake** near your home which for many years had been closed for recreational fishery. It is a clean, scenic and quiet area with a lake with high water quality. The lake has a natural stock of **grayling, brown trout and arctic char**, which allows for an above average chance of catching these fish species.
Imagine that the lake is opened up for recreational fishing with rod and line. Due to the sensitivity of the area, the number of anglers / sports fishermen will be restricted. To get access you will have to pay a rent which would grant you a 12 month exclusive right to fish in this lake. This money is needed to maintain the lake in its current condition

The rental scheme will be administered by a local fund in your local county council. A board where you are represented by one of the participating anglers / fishermen will take the day to day decisions regarding the maintenance plan for the lake.

Think of what it is worth to you to be able to fish in this lake. What is the most you would be willing to pay as an annual rent to be granted access to fish in this lake?

Fill in the table below, in the same way you filled in the table in the previous two questions

	I would certainly pay	I would almost certainly pay	I am unsure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an annual rent before you would decide not to go fishing in this "new" lake? _____ Kr. / year

Write "0" Kr. if you are not willing to pay anything. If "0 Kr." , can you explain why?

_____

12. We would like you to answer the next questions **even if you did not fish yourself**. Those that did fish the last 12 months should of course also answer the questions.

Natural fish stocks in the Nordic countries are threathened in several ways. Low water quality, regulation of water level, barriers to fish and other fauna migration (weirs, dams etc.), reduced water flow due to hydro power development, eutrophication due to emissions of nutrients from agriculture, industry and household sewage, acid rain, fish parasites and diseases; all influence the state of fish stocks. If no action is taken, we will loose our natural freshwater fish stocks.

International agreements to reduce transboundary pollution and national programs to combat the threats specific to each country are now designed. This will cost money. Part of the costs will have to be paid by the taxpayers in each country as an additional income tax. Think what it is worth to you to preserve the natural fish stocks we now have.

The costs are uncertain.The table below lists some possible annual costs to you. What is the most you are willing to pay annually as an increase in income taxes to finance the programs that would preserve the current fish stocks and current quality of recreational fishing in the Nordic countries?

The table below lists some amounts. Start at the top of the table by asking yourself: Would I *certainly pay, almost certainly pay, almost certainly not pay or certainly not pay* 100 Kr., and put a cross in the alternative that best represents your answer. Ask the same question for 300 Kr. etc., and continue all the way down the list to the highest amount (20.000 Kr). Only *one* tick for *each* amount is allowed.

	I would certainly pay	I would almost certainly pay	I am unsure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an additional annual income tax to preserve the current natural fish stocks in the Nordic countries? _____kr/ year
Write "0" Kr if you are not willing to pay anything. If "0 Kr" , can you explain why?

_____

BACKGROUND INFORMATION

This background information will only be used for statistical puposes and will be kept strictly confidential. We need this information in order to explain how the Nordic people´s attitude and value of their fish stocks and recreactional fishing vary between and within the countries.

13. Year of birth? 19 □□

14. Gender? 1. □ male 2. □ female

15. How many persons are there in your household including yourself? □ persons

A household is a group of people living in the same address and using the same refrigerator

16. How many of your household members (including yourself) fish for recreation? □ persons

17. What is your residental environment like. Would you discribe it as

1. □ urban 2. □ semi-urban 3. □ rural

18. How many years of education do you have?

1. □ 10 years or less 2. □ 11 - 13 years 3. □ 14 years or more

19. Approximately how much will you and your household earn in gross income (i.e. before income taxes) in 1999. Please state the expected income to the nearest 10 000 Kr.?

In 1999 my household (including myself) will earn about _____ Kr.

My personal income in 1999 will be about _____ Kr.

In case you do not want to state the amount, please tick the proper interval for

Household income	Personal income
□ 0 - 200 000 Kr.	□ 0 - 100 000 Kr.
□ 200 000 - 400 000 Kr.	□ 100 000 - 200 000 Kr.
□ 400 000 - 700 000 Kr.	□ 200 000 - 300 000 Kr.
□ 700 000 - 1 000 000 Kr.	□ 300 000 - 500 000 Kr.
□ 1 000 000 - Kr.	□ 500 000 - Kr.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN THIS SURVEY.

If you have further comments and/or questions, you can use the space below:

The Methodologies for assessing socio-economic benefits of European inland recreational fisheries were prepared in 2009 by the European Inland Fisheries Advisory Commission (EIFAC) Ad Hoc Working Party on Socio-Economic Aspects of Inland Fisheries. EIFAC considered that the implementation of fisheries policy and management would benefit from a more compatible, comparable and scientifically rigorous application of benefit evaluation methods. These Methodologies were officially endorsed by the twenty-sixth session of EIFAC, which was held in Zagreb, Croatia in the period 17-20 May 2010.

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