"Capacity building on the assessment of environmental and resource costs as support to the implementation of the European Union Water Framework Directive in the Baltic Member States"

Project number PPA04/MC/6/5

Case study report

Applying contingent valuation to the restoration of salmon migration along the Valgejõgi River

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1. Introduction

The EU Water Framework Directive (WFD) has been fully transposed into national legislation in Estonia. The first steps of the Directive's implementation process have already been carried out, in particular the preparation of a typology of water bodies, the characterisation of river basin districts including the economic analysis of water use and the development of a new monitoring programme for complying with the requirements of the WFD.

The economic assessment prepared for the characterisation of river basin districts did not deal with the question of environmental and resource costs that are relevant in particular to water pricing and cost-recovery assessments. Indeed, there is today very little knowledge on this topic in Estonia and there is no study developed yet that has estimated such costs. To respond to the limited expertise and knowledge in Estonia but also in Latvia and Lithuania, and to build capacity in these countries on the assessment of environmental and resource costs, the Encobalt project was proposed and accepted for financing by SENTER international (The Netherlands). More specifically, the project proposed to build capacity based on a "learning by doing" principle by testing specific valuation methods and techniques in pilot river basins in close collaboration with experts from institutions dealing with the implementation of the WFD in Baltic Member States. In addition, the project aimed at raising awareness among policy and decision makers and stakeholders involved in integrated river basin management planning in the Baltic Member States.

During the inception period of the Encobalt project, discussions took place between project partners and relevant institutions in the different countries for defining (i) the valuation methods to be tested and (ii) the environmental issue to be investigated.

- It was decided to test the contingent valuation method in each case study/country.
- The issue of river continuity and salmon migration was chosen as the focus for the Estonian case study.
- The Valgejõgi River in the Harju sub-river basin was selected as the case study area.

This report presents the results of applying the contingent valuation method for valuing environmental costs & benefits in the Valgejõgi River, Estonia. It first presents the case study area. It then summarises the steps taken for setting up the contingent valuation survey, before presenting the main results obtained when analysing the survey data. It concludes with elements on the relevance of the results to the WFD implementation in Estonia and on possible follow-up activities.

2. Description of the case study area

2.1 Main characteristics of the case study area [1]

2.1.1 General description of the case study area

Estonia is divided into 3 river basins and 8 sub-river basins (see figure 1):

- The West-Estonian river basin including the Läänesaarte, Harju, Matsalu and Pärnu sub-river basins;
- The East-Estonian river basin including the Peipsi, Viru and Võrtsjärve sub-river basins;
- The Koiva river basin forming an international river basin with Latvia.

A specific groundwater sub-river basin was also proposed, i.e. the Pandivere groundwater sub-river basin belonging to both the West-Estonian and East-Estonian river basins.

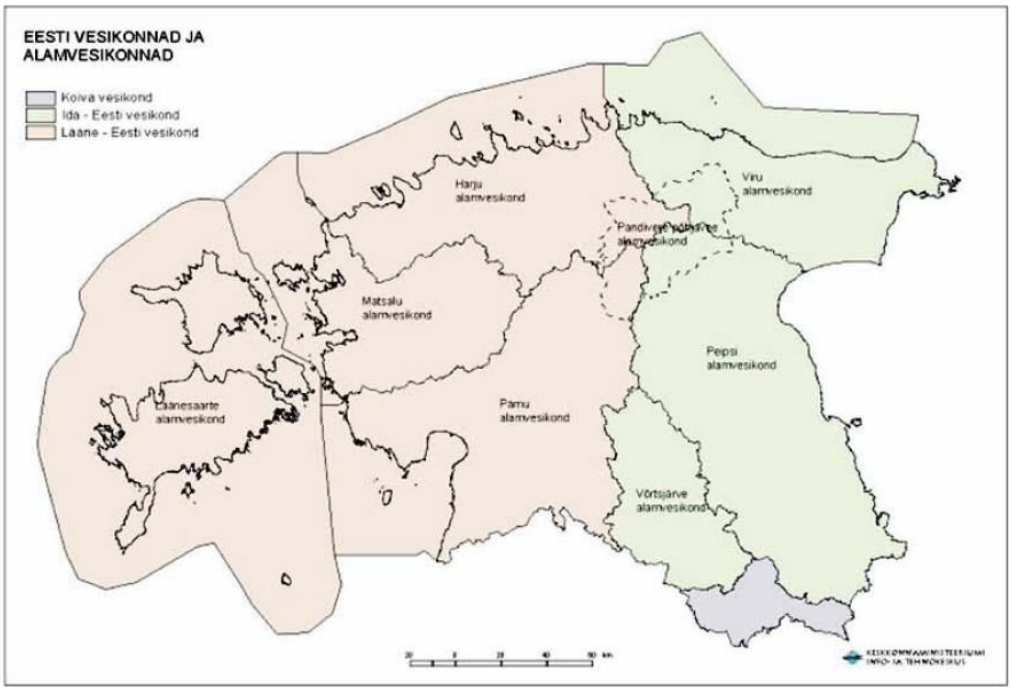

Figure 1. The different river basins and sub-basins in Estonia
(source: Estonian Ministry of Environment)

The case study area, the River Valgejõgi sub-region, belongs to the Harju sub-river basin and is its easternmost region as presented in Figure 2 below.

[1] Information prepared based on the "Harju sub-River Basin District Water Management Plan", March 2006 and "Surface Water - Technical background document", February 2006 under the project – Technical assistance for the the Pilot Harju sub-River Basin District Water Management Plan

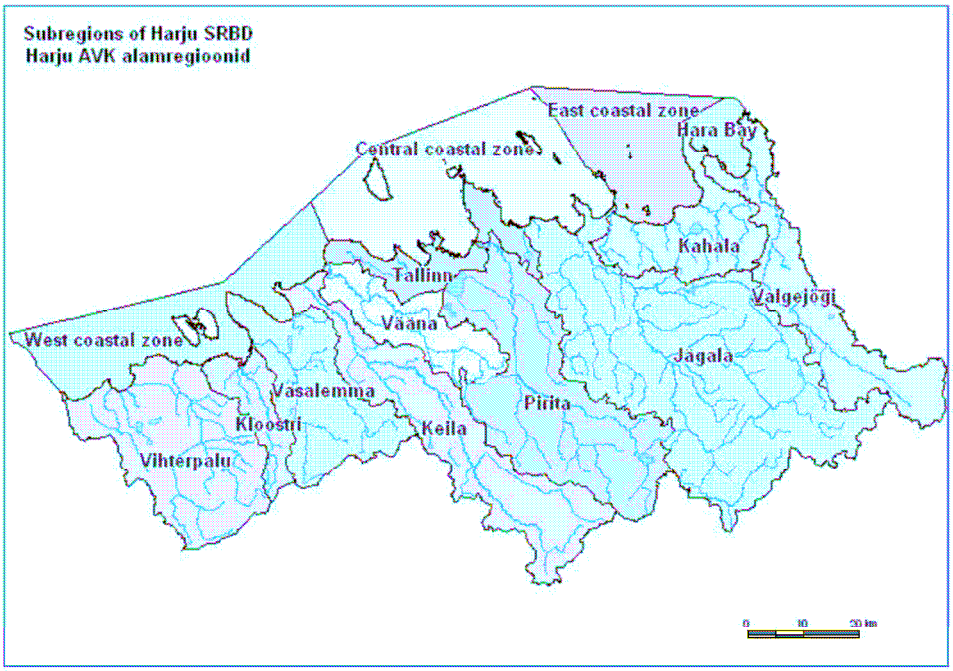

Figure 2. The different sub-regions of the Harju river sub-basin of Estonia

(source: Harju sub-River Basin District Water Management Plan)

There are 10 water bodies identified within the river Valgejõgi sub-region:

- Lohja
- Lohja lake
- Ohepalu Suurjärv (lake)
- Pala
- Pikkoja
- Rauakõrve
- Tõõrakõrve
- Valgejõgi 1
- Valgejõgi 2
- Valgejõgi 3

These water bodies are all sections of the main Valgejõgi River that provides the name to the sub-region. The Valgejõgi River is one of the longest rivers in the Harju sub-river basin with its 85 km length. The sub-region extends as a narrow strip from the sea to Pandivere highland. Similar to the Jägala sub-region, the southern part of the Valgejõgi catchmen overlaps with the Pandivere groundwater basin. Natural conditions vary quite remarkably with the catchment area. In the south, the area is predominantly agricultural with influences from the Tapa town and its surroundings. Land use in the middle section of the Valgejõgi River is dominated by forests and wetlands. And the river mouth of the Valgejõgi River is under the influence of the town of Loksa. In general, the status of water bodies in the sub-region is moderate. The most upper stream water body only is at high risk. From an administrative point of view, the sub-region is divided between the municipalities of (from South to North) Väike-Maarja, Tamsalu, Rakvere, Saksi, Lehtse, Tapa town, Kadrina, Kuusalu and Loksa.

2.1.2 Main land use forms in the case study area

Land use in the Valgejõgi River sub-region (see Table 1) is dominated by forest (63% of the total area), agricultural land (21% of the total area) and wetlands (4% of the total area). Figure 3 presents the spatial distribution of the different land use types in the catchment area.

Table 1. Land use in the river Valgejõgi sub-region
(source: Harju sub-River Basin District Water Management Plan)

Land use	In % of total area
1. Agriculture, arable land	21
2. Agriculture, pasture	6
3. Dumpsites	0
4. Forest	63
5. Industry	1
6. Mining	0
7. Nature	1
8. Peat extracting area	0
9. Urban, roads, marina and airports	3
10. Water	1
11. Wetlands	4
Total area	**100**

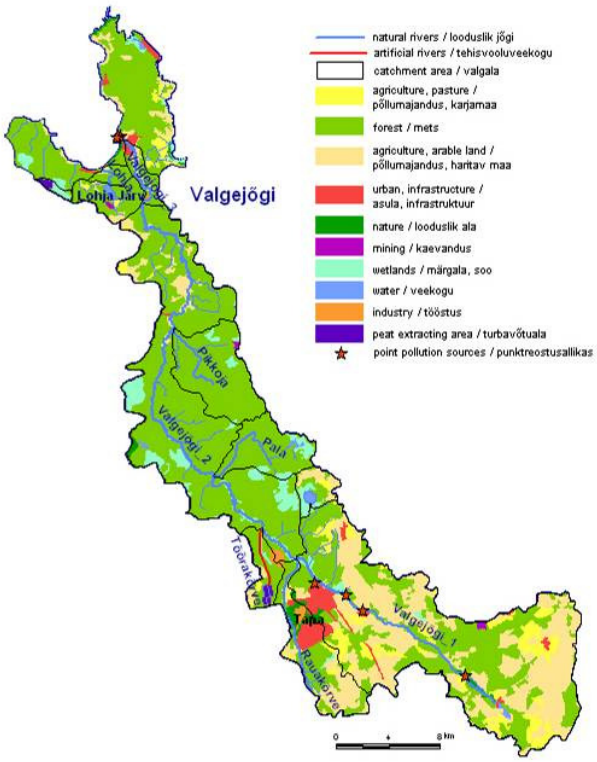

Figure 3. Land use in the river Valgejõgi sub-region
(source: Harju sub-River Basin District Water Management Plan)

2.2 Key water management issues

2.2.1 Main pressures in the case study area[2]

The main load of polluting substances in the sub-region originates from agricultural arable land and forest. As indicated above, more than 60% of the region is covered by forests and 21% is covered by arable land and pastures. Where nitrogen concentration is problematic, it mainly originates from agricultural arable land. In the case of phosphorus, the main sources of pollution is arable land but also point source pollution probably from the town of Tapa in the Valgejõgi 1 water body. The prevailing load of nutrients to the Valgejõgi middle and lower reaches (Valgejõgi 2 and Valgejõgi 3) comes from smaller streams and connected sub-catchments.

2.2.1.1 Physico-chemical pressures

Priority hazardous substances
There are three past pollution sites in the town of Tapa with some national importance: the Tapa airbase, and the fuel and sorting stations of the Tapa locomotive depot. Soils and also groundwater in these areas are polluted with oils. Several old military objects with local importance are located along the coastline. Old closed landfills (Tapa and Loksa landfills) in the sub-region are correctly covered. There is no known hazardous leachate from these landfills.

Nutrients
The pressure of point pollution sources is remarkable only in the Valgejõgi 1 water body. The share of phosphorous load from point sources is 40% in this water body. The main source at the origin of this load is the discharge from the wastewater treatment systems of the town of Tapa (7 000 inhabitants). In addition, there are important historical pollution sites, those named above and also the railway station itself, the timber industry and a military polygon in the town. There is also pollution coming from the Moe settlement with Moe distillery (Moe Piiritusetehas). And there are large cattle and pig farms in the upstream section of the river in the smaller Porkuni settlement.

The town of Loksa with around 3 850 habitants located in the Valgejõgi river mouth influences the Valgejõgi 3 water body.

In general, the main load of nitrogen and phosphorous in the region comes from diffuse sources (see Table 2 & Table 3 below). In the southern part of the region, namely water bodies Valgejõgi 1, Rauakõrve and Ohepalu Suurjärv, arable land and agriculture is the main source of pollution. It is important to note that the area is defined as a nitrate sensitive region.

The northern part of the region belongs to the Lahemaa National Park. This nature protection zone imposes strict regulation and agriculture is not very important in this area. The main load of phosphorous and nitrogen comes from forests and nature. For example, in the Pikkoja water body, 90% of the nitrogen load and 86% of the phosphorous load comes from forests and nature.

[2] Information prepared based on the "Surface Water - Technical background document", February 2006 under the project – Technical assistance for the the Pilot Harju sub-River Basin District Water Management Plan

Wetlands are located around the middle course of the river Valgejõgi. Their pressure is remarkable in the Pala water body only.

Sand and gravel mining was important in the past. However, all sandpits have been closed because of nature protection regulations

The network of roads is poorly developed in the area, apart for the Tallinn-Narva main road in the Northern part of the area.

There is one port in the seacoast next to the Valgejõgi river mouth: Loksa harbour. The harbour is 2.3 to 5.8 meter deep and it serves mainly for industrial activities concentrated in the complex of Loksa Ship-yard (transit, shipbuilding and ship repair). There is also an old military port located in Hara bay (Hara port). But it has no known influence on rivers or lakes.

Along the coastline, a bathing place is located. Also the river is used for bathing. But there is no large official bathing place along the river. Although the Lahemaa National Park is rather popular in terms of recreation, the estimated pressure from tourism is considered low today.

Table 2. Nitrogen load in the Valgejõgi River sub-region
(source: Surface Water - Technical background document)

Nitrogen load in Valgejõgi sub region

Water body	Calc. conc	Needed reduction	Urban, infrastructure	Mining	Forest, natural areas	Wetlands	Agriculture, arable land	Agriculture, pasture	Industry	Peat extracting	Deposition	Animals	Point	Total	Inflow from upstream
Lohja Järv	1,055	15%	-	7	4	0	43	35	0	-	12	-	-	100	(0)
Lohja	1,127	0%	1	-	40	-	20	-	-	-	-	-	-	62	38
Rauakõrve	2,525	0%	12	-	17	1	56	7	3	-	-	5	-	100	0
Ohepalu Suurjärv	1,234	27%	-	-	1	16	63	12	-	-	9	-	-	100	(0)
Valgejõgi_1	3,458	13%	3	0	9	0	51	14	0	-	0	18	4	99	1
Tõõrakõrve	1,777	0%	-	-	31	4	23	17	7	18	-	-	-	100	0
Pala	0,766	0%	-	-	75	19	0	-	-	-	5	-	-	100	0
Pikkoja	0,887	0%	-	2	90	7	1	-	-	-	-	-	-	100	(0)
Valgejõgi_2	2,198	0%	0	-	10	2	4	0	0	0	0	-	-	17	83
Valgejõgi_3	2,200	0%	0	-	0	-	1	-	0	-	-	-	-	1	99

Table 3. Phosphorus load in the Valgejõgi River sub-region
(source: Surface Water - Technical background document)

Phosphorus load in Valgejõgi sub region

Water body	Max conc	Needed reduction	Urban, infrastructure	Mining	Forest, natural areas	Wetlands	Agriculture, arable land	Agriculture, pasture	Industry	Peat extracting	Dumpsites	Deposition	Animals	Point	Total	Inflow from upstream	Total with upstream
Lohja Järv	0,030	0%	-	22	3	0	40	33	1	-	-	0	-	-	100	0	100
Lohja	0,050	0%	5	-	37	-	20	-	-	-	-	-	-	-	61	39	100
Rauakõrve	0,092	13%	30	-	11	1	40	5	8	-	-	-	6	-	100	0	100
Ohepalu Suurjärv	0,030	0%	-	-	1	16	69	13	-	-	-	0	-	-	100	(0)	100
Valgejõgi_1	0,271	71%	5	0	4	0	26	7	0	-	-	0	17	40	100	0	100
Tõõrakõrve	0,052	0%	-	-	26	4	20	15	21	15	-	-	-	-	100	0	100
Pala	0,050	0%	-	-	79	20	1	-	-	-	-	0	-	-	100	0	100
Pikkoja	0,050	0%	-	6	86	7	1	-	-	-	-	-	-	-	100	(0)	100
Valgejõgi_2	0,147	45%	0	-	6	1	2	0	0	0	-	0	-	-	10	90	100
Valgejõgi_3	0,145	45%	0	-	0	-	0	-	0	-	-	-	-	-	1	99	100

2.2.1.2 Pressure on hydro morphology

The different water bodies in this sub-region are mainly natural. The only artificial water body in the region is Tõõrakõrve ditch. The upper section of the Valgejõgi River has been dredged and modified in the past.

However there are several dams located along the river and several smaller artificial lakes and ponds (not defined as water bodies). These impose barriers on fish migration, the main barriers in the Valgejõgi river being listed below:

- Kotka dam with trout breeding pond Nõmmeveski dam (fall of 1.5 meter; water body Valgejõgi 3)
- Nõmmeveski dam (fall of 1.5 meter; water body Valgejõgi 2)
- Pikakose hydropower plant (fall of 1.3 meter; water body Valgejõgi 2)
- Vanaküla hydropower plant (fall of 1.6 meter; water body Valgejõgi 2)
- Vahakulmu artificial lake of a watermill (fall of 2 meters; water body Valgejõgi 1)

In addition, smaller natural fall structures are present in the lower part of the river. Furthermore, there are several beaver dams in the area. This is a problem especially in the river reach belonging to the Lahemaa National Park. Regulations of nature protection area make it more complicated to clean the river from the trees cut down by beavers. For that reason, the river is full of trees leading to slow water flow and higher water temperature.

2.2.1.3 Accidental pollution

The most significant risks in the region are related to transit. Fuel and oils are often transported by train and the Tapa railway station is an important railway junction. The Tallinn-Narva road connects the capital of Estonia with Russia and thereby the cargo transit is very active.

2.2.2 Dams on river Valgejõgi and their impacts[3]

A very important issue for the Valgejõgi River is improving its ecological quality and achieving "good" water status according to the criteria set in the WFD. One of the most important indicators of the ecological quality of the river is the status of fish species. "Good" status" for fish means that the diversity and composition of fish species are close to natural conditions and that there are no significant deviation from the age structure of natural fish communities. The important precondition of achieving the "good" status for fish communities and other biological elements is the good hydro-morphological quality of the river. The good hydro-morphological quality of a river implies the existence and good condition of natural rapids, fast-flowing gravel-bottomed river parts, alluvial meadows and old rivers. A very important criterion especially for fish is river continuity and the absence of blockage along the river to ensure a close-to-natural hydrological regime of the river.

According to existing data, more than 22 fish species live in the Valgejõgi River: river and brook lamprey, salmon, sea and brown trout, grayling, pike, eel, roach, dace, ide, chub, minnow, tench, riffle minnow, vimba bream, crucian and gibel carp, stone loach, spined loach, burbot, three-spined stickleback, nine-spined stickleback, perch and bullhead.

[3] Information prepared based on "Jõgede hüdrobioloogiline kompleksseire, 2003. aasta aruanne", Tartu, 2004

The water quality of the river is currently not a problem for fish habitat and it does not limit the distribution of fish types. Based on the principles of the WFD, the status of the river from the fish point of view has been evaluated as following: the state of the fish population may be evaluated as *moderate* or even *bad* from Porkuni Lake to Moe dam (due to unstable hydrological regime), as *moderate* from Moe dam to Kotka dam and from Kotka dam to river mouth as *moderate* or even *good* (see Figure 4 below). This is further described and analysed below.

Kotka dam
7 km from the river mouth

Nõmmeveski dam
18.5 km from the river mouth

Moe dam
ca 75 km from the river mouth

Figure 4. Main dams and hydromorphological pressures along the Valgejõgi River
(source: "Lõhe Eesti jõgedes", Estonian Green Movement, 2006)

- **Reach I: from the river mouth to Kotka dam – status "good to moderate" -** This part of the river is open to salmon but isolated from the rest of the river because of the Kokta dam. Based on the current diversity of fish species and their number, it can be assumed that there are extensive violations of the hydrological regime at the Kotka dam from time to time resulting in water shortage in the lower river reach. The violations of the natural hydrological regime and isolation of the rest of the river are, besides illegal fishing, the main reasons explaining the low population of several fish species (salmon, river and sea trout, etc).
- **Reach II: from Kotka dam to Moe dam – Status "moderate" -** Fish like salmon and sea trout are missing in this section. The number of most fish species typical for the river is significantly lower compared to the "non-disturbed status" of the respective river type. The main problems for fish are the dams along the river (Kotka, Tapa, Moe, Vahakulmu). Obstacles for migration are also natural terraces and an old dam at Nõmmeveski. This means that the river is composed of isolated 5-6 sections with

separate fish habitat. The migration and fish movement between these sections is impossible.

- **Reach III: above Moe dam – Status "moderate to poor" -** This part of the river (ca 8 km) is isolated from the rest of the river due to the Moe and Vahakulmu dams. Because of that, fish are very easily damageable both by negative human impacts (for example violations of the hydrological regime on dams) and unfavourable nature conditions (i.e. drought). As this section of the river is isolated from the rest of the river, recovering fish habitat in this upstream reach is considered as nearly impossible.

In the case study two ways for improving the water quality of river Valgejõgi are proposed. In order to achieve the goals set by the Water Framework Directive.

2.3 Use and non-use values relevant to the case study

The Valgejõgi River can be evaluated as being at risk of failing "good" water status according to the WFD mainly because of problems of river continuity and limited/absence of fish migration. Table 4 summarises the main problems with goods and services provided by the aquatic ecosystem today – and expected impacts on use and non-use values.

Table 4. Expected implications from failing "good water status" in Valgejõgi River

Environmental goods and services provided by the aquatic ecosystems	Damage to the goods and services caused by existence of dams	Benefits from improving water quality (reintroducing salmon) in the river
Non-use values		
General healthy functioning of the river ecosystem, preserving biodiversity (for own benefit)	Reduced biodiversity (e.g. concerning salmon and other fish community, other species and plants). Changed river characteristics (i.e. loss of rapids)	Presence of salmon and other protected fish who need similar living/breeding conditions, more diverse biota, ensured healthy functioning of the river ecosystem (today and in the future)
Use values		
Commercial salmon fishing	Currently commercial salmon fishing is prohibited in river Valgejõgi as it has been set as being a naturally suitable river for salmon by law and is under protection. Also illegal fishing is problem especially in the river mouth	It might be possible in future to have commercial fishing in case the salmon population will be sustainable and that could help to solve the problem of illegal fishing.
Recreational Angling	Recreational angling of salmon is allowed (based on fishing permits)	Improved possibilities for catching salmon and other protected fish
Recreation (e.g. boating, swimming, sightseeing etc.)	Existence of dams allows better swimming possibilities (dam-lakes) but boating and canoeing is interrupted because of dams	No benefits for swimming Improved landscape and visually natural state of river

Hydro-energy	Existence of dams allows production of hydro-energy and Kotka dam was used for hydropower generation some time ago. Additionally the possibility of building a hydropower plant at Nõmmeveski dam is under discussion	Building fish-passes: Better possibilities for salmon to migrate and possibility for generating hydro-power remains Partial removal of dams: No benefits for hydro-power production but fish would have very good possibilities for migration along the river

3. Setting up the survey

3.1 General aspects

The aim of the survey was to determine how inhabitants value the restoration of the population of salmon and of other fish species in the Valgejõgi River. Although the survey concentrated on the area surrounding the Valgejõgi River, the problems related to the loss of salmon population are similar in most of the Estonian salmon rivers. Therefore the results of this study are also considered as relevant to other rivers and to discussions on measures for re-introducing salmon in these rivers.

In the frame of the survey, 501 randomly selected persons who live near the Valgejõgi River were interviewed. The interviews were carried out between mid-February and the beginning of April 2007.

3.2 Building the questionnaire

Two different types of questionnaire were used in the survey. The first questionnaire concentrated solely on salmon, while the second questionnaire made reference to salmon and other protected fish species instead of salmon only. The main purpose of applying two different questionnaires to two sub-samples was to estimate the relative importance of salmon in respondents' values and whether different values would be given for salmon and for salmon and other protected fish species.

The questionnaire was composed of 43 open-ended and close-ended questions (see Annex I). As the survey was carried out by face-to-face interviews, the number of questions and the specifics of the information given had to be well considered. The average length of the interviews was 15-25 minutes.

The questionnaire consisted of 6 sections.

- The first section provided a short introduction to the survey, the questionnaire and the organisation of the interview.
- The second section focused on people's general opinion about the area and environmental issues. It included general questions about the Valgejõgi River and fish. People were asked to rank the importance of different issues for the area (i.e. education, water quality, health service etc.), to specify how they define good quality for surface water in general and to identify impacts dams might have. Questions dealt with people's connection to the Valgejõgi River in terms of frequency and reasons of visits. People were also asked to give their opinion about current river water quality. Questions about fishing and fish eating habits were also included in this section.
- The third section described the current water status situation of the Valgejõgi River (do you find the described situation realistic?), with two proposed scenarios and questions about people willingness to pay for each scenario.
- The fourth section of the questionnaire dealt with the respondent's socio-economic characteristics (gender, age, working sector, education, income, etc).
- The fifth section gave the possibility for respondents to evaluate the difficulty in filling the questionnaire and responding to specific questions.
- The sixth section was for the interviewer to put specific comments on the interview.

3.3 Defining scenarios for valuing water quality improvements

The Valgejõgi River is one of the naturally suitable rivers for salmon in Estonia. It has been designated by authorities as a salmon river for its whole length (85 km).

The characteristic of salmon is that salmons are born in rivers, they migrate to the sea and, as adults, they return to the same river where they were born to reproduce. Water quality in Valgejõgi River is not problematic but the Kotka and Nõmmeveski dams interrupt the migration and reproduction of salmons. As a result, most of the Valgejõgi River (including 90% of spawning grounds) cannot be reached by salmon today. Today there are no fish passes built on these dams.

In recent years, the Kotka dam was used for hydropower generation. Today, its future and the possibility to build a hydropower plant at Nõmmeveski dam are under discussion. This would however impact on river flow regimes and might not be suitable for salmon migration. Also, small fish going from the river to the sea can get killed in working turbines – thus limiting the re-establishment of salmon in the river Valgejõgi.

Two different scenarios of improvement in water status along the Valgejõgi River were proposed to respondents: implementing the first scenario would allow reaching "good" water status from point of view of salmon habitat and migration, while implementing the second scenario would allow reaching "high" water status. Both scenarios are further described below.

Scenario 1

Achieving **"good" status** for the Valgejõgi River from a salmon point of view requires several measures:

- Building fish passes both on Kotka dam and Nõmmeveski dam
- Cleaning of some natural spawning grounds to facilitate salmon reproduction
- Setting specific requirements (stopping turbines when needed etc) to hydropower companies for the management of their hydropower plants in line with the requirements of salmon rivers and habitats.

Such actions would ensure that salmon has the possibility to migrate and reproduce as long as 75 km from the river mouth (till the Moe dam). However, some of the threats imposed by dams and hydroelectricity generation remain (small fish dying while swimming through working turbines, possible flooding of spawning grounds because of dam operation, etc).

Scenario 2

Achieving **"high" status** from a salmon point of view is expected to be more costly and complex, requiring for example the partial or complete removal of the Kotka and Nõmmeveski dam. Additional cleaning of natural spawning grounds would also be required.

Applying such measures would definitely ensure free migration along the river for salmon (till Moe dam). It would make it possible to start partial restoring of the areas that were under dam-lakes and which are essential for salmon both as hatcheries and living places. These actions would also remove threats caused by the current dam operation.

Table 5 summarises predicted changes in different environmental goods and services for both scenarios. This table was also included in the questionnaires and presented to respondents.

Table 5. Possible changes in environmental goods and services in implementing proposed scenarios.

Environmental goods and services	Current situation – "moderate" quality	Benefits from improving water quality to "good" quality	Benefits from improving water quality to "high" quality
Presence of salmon in the river	Salmon can reach only the first 7 km of the river due to the Kotka dam	Salmon can reach 75 km of the river and be present there	Salmon can reach 75 km of the river and be present there
Access to spawning grounds	Salmon can reach around 10% of spawning grounds along the river	Salmon can reach around 90% of spawning grounds along the river	Salmon can reach around 90% of spawning grounds along the river
State of feeding grounds for salmon	Inadequate river flow in the first 7 km limit the capacity of feeding grounds	Inadequate river flows in the 75 km limit the capacity of feeding grounds	Feeding grounds are in natural state in the 75 km of the river
Quantity of spawn salmon	No spawn salmon	50% of natural spawn salmon population potentially restored But 30-40% of new salmon is lost on its way back to the sea (not taking into account illegal fishing)	100% of natural population potentially restored No loss of new salmon on its way back to the sea (not taking into account illegal fishing)
Overall sustainability of salmon population in the river Valgejõgi	There is no sustainable salmon population	A sustainable salmon population is partially restored	A sustainable salmon population is fully restored
Possibilities of swimming in dam lakes	Possible	Possible	Not possible as dams are removed
Possibility of hydropower production	Possible	Possible	Not possible as dams are removed

3.4 Elicitation format

The willingness to pay (WTP) question was elicited using a payment card (PC) complemented by an open-ended question. The payment card displayed a series of values that were shown to the respondent to facilitate respondents' thinking in specifying their maximum WTP. The payment card used contained 24 cells including "I do not know" and two open-ended options:

- Open-ended possibility for specifying WTP values higher than the different values displayed on the payment card;
- Open-ended possibility for specifying WTP values in the range of those indicated in the payment card (e.g. 25 EEK).

Proposed values ranged from zero and 300 EEK. The example of the payment card used is presented in Table 6.

Table 6. Example of the payment card used for the contingent valuation survey in the Valgejõgi River case study

1. What is the <u>maximum</u> amount you would be willing to pay as a special separate tax <u>per month</u> for the <u>next 10 years</u> on behalf of your <u>entire household</u> in order to see this scenario implemented? • **Remember this payment will be <u>over and above the households costs</u> you already pay today** • **Remember that this special separate tax money will only be used to implement the measures to improve the situation for salmon**				
0 EEK ☐	15 EEK ☐	35 EEK ☐	100 EEK ☐	More than 300 EEK ☐ Please specify _____ EEK
5 EEK ☐	17 EEK ☐	40 EEK ☐	120 EEK ☐	Other amount ☐ Please specify _____ EEK
7 EEK ☐	20 EEK ☐	50 EEK ☐	140 EEK ☐	I do not know ☐
10 EEK ☐	25 EEK ☐	60 EEK ☐	170 EEK ☐	
12 EEK ☐	30 EEK ☐	80 EEK ☐	250 EEK ☐	

As the case study consisted of two scenarios, respondents willing to pay in principle for implementing both scenarios had to state two maximum WTP values. This gives the opportunity to test if respondents value differently "good" status and "high" status. In addition, as the sample was split into two parts depending on whether only salmon or salmon and other protected fish species were considered, it was possible to test if respondents value specifically salmon or just fish in general.

3.5 Payment vehicle

In Estonia the environmental and financial damages to the river caused by the existence of dams are the responsibility of the owner («polluter-pays-principle»). In case the dam is privately owned, related costs should be paid by the private owner. There is the possibility for cooperation with the state or local government bodies, which via taxpayers' money can support the dam owner as it is the responsibility of the state to comply with the requirements of the WFD.

In the questionnaire it was clarified that the involvement of inhabitants would be via a separate monthly tax which would be used only for implementing the proposed measures in order to achieve either "good" or "high" water quality of the Valgejõgi River. It was also pointed out that this separate tax would be additional to the current household costs and the duration of payment would be 10 years.

3.6 Pre-testing

In the frame of the project, pre-testing in two rounds was carried out to test the questionnaire. Another aim of pre-testing was to train interviewers and ensure they were acquainted with the topic and the set up of the questionnaire (which questions to miss, presenting the cards etc.).

The first training of the interviewers took place at the beginning of February 2007. Its goal was to introduce the project and case study to the participants and to give instructions for working with the questionnaire. While going through the questionnaire, suggestions were made by interviewers in terms of wording of some questions and the usefulness of adding a separate card for income classes. Based on these suggestions, corrections were made in the

questionnaire and the improved questionnaire and cards were used for the first round of pre-testing.

During the first pre-testing round which was carried out in the area (in Kuusalu) a couple of days after the training the questionnaire, 25 questionnaires were completed. No people refused being interviewed. The average length of the interviews was 35-40 minutes so suggestion was made to reduce the number of questions to avoid respondents' fatigue. The general feedback on the usefulness of the cards and scenarios was positive – the comparative table was said to be very good and understandable for explaining issues in the Valgejõgi River. One comment was made that two people being interviewed were sure that there already were fish passes on the dams, although this is not the reality.

During the feedback meeting, all questions were discussed one-by-one and comments made by interviewers were taken into account for developing the next version of the questionnaire for the second pre-testing round. The open-ended questions that had been left in the questionnaire were transformed into close-ended questions for the second round of pre-testing. The following WTP values were obtained during this first pre-testing:

- First scenario – Out of 25 persons, 17 were willing to pay and 8 persons were not willing to pay. The proposed sums varied between 5 and 250 eek. The average WTP was 56.76 eek per household per month (equivalent to 3.6 Euro per household per month).
- Second scenario – Out of 25 persons, 12 were willing to pay and 13 were not willing to pay. The proposed sums varied between 5 and 100 eek. The average WTP was 47.5 eek per household per month (equivalent to 3.04 Euro per household per month).

The second pre-testing round was carried out two days later also in the case study area (in Kolga). Overall, 24 questionnaires were completed (12 about salmon and 12 about salmon and other fish species). Two persons refused to being interviewed because of limited time availability. After the interviews, a meeting with interviewers was held to collect their comments and opinions. Again suggestions were taken into account in developing the final version of the questionnaire. The following WTP values were obtained during this second pre-testing:

- Questionnaire focusing on salmon only
    - First scenario – Out of 12 persons, 10 were willing to pay and 2 persons not willing to pay. The proposed sums varied between 25 and 125 eek. The average WTP was 64 eek per household per month (4.09 Euro per household per month)
    - Second scenario - Out of 12 persons, 7 were willing to pay and 5 persons not willing to pay. The proposed sums varied between 25 and 125 eek. The average WTP was 62.86 eek per household per month (4.02 Euro per household per month).
- Questionnaire focusing on salmon and other fish species
    - First scenario – Out of 12 persons, 5 were willing to pay and 7 were not willing to pay. The proposed sums varied from 10 to 50 eek. The average WTP was 26 eek per household per month (1.66 Euro per household per month).
    - Second scenario – Out of 12 persons, 2 were willing to pay and 10 persons not willing to pay. The proposed sums varied from 10 to 15 eek. The average WTP was 12.50 eek per household per month (0.80 Euro per household per month).

3.7 Sampling procedure

The sample area included 17 municipalities surrounding the Valgejõgi River but not the whole sub-river basin. This sample area was chosen as the Valgejõgi River is the easternmost sub-

region of the Harju sub-river basin. If random sampling in the whole sub-basin would have been chosen, a large number of interviews would have been conducted in Tallinn (capital of Estonia) which was considered as problematic. Thus, it was decided to concentrate on the area closest to the river – and respondents were selected randomly in the 17 municipalities.

3.8 Practical organisation of the survey

Face-to-face interviews were carried out during three weekends from February 17 to April 4 2007. Five hundred and one people were interviewed in 17 municipalities surrounding the Valgejõgi River or 26 towns/settlements, namely Kiiu, Valkla, Kolga, Kuusalu, Loksa, Alavere, Lehtmetsa, Kehra, Aegviidu, Lehtse, Tapa, Albu, Aravete, Järva-Jaani, Roosna-Alliku, Tamsalu, Vajangu, Väike-Maarja, Vao, Hulja, Kadrina, Võsu, Aaspere, Haljala, Lepna and Rakvere. The duration of each interview carried out was on 17 minutes on average.

The interviews were carried out by 8 interviewers from whom 7 were women and 1 was a man. During the 2 rounds of pre-testing, interviewers were trained and made familiar with the questionnaire and cards that were shown to the respondents.

Response rate is 69 percent. The main reasons explaining why the remaining 31% of people approached were not willing to be interviewed were that their limited time availability, their lack of interest or their limited knowledge and understanding about the survey issues.

4. Results of the survey

The following section presents the main statistics and results of the survey dataset. As the sample included respondents between 15 and 74 year old, the questionnaires of people younger than 18 years old were removed (as they do not have their own income and they do not have the right to make decisions over the family budget). Hence, the total number of available observations is 491.

4.1 General characteristics of the respondents and representativeness of the sample

In order to be able to test the representativeness of the sample, the sample characteristics were compared with the characteristics of the entire population from which the sample was drawn. The characteristics of the population and of the sample are presented in Table 7, Table 8, Table 9 and Table 10 below.

Table 7. Sex structure of the sample compared to the total population (age 15-74)

Total population *	No of population	Share in %
1. Sample area	*54369*	*100*
Woman	*28272*	*52.0*
Man	*26097*	*48.0*
Our sample	**No of respondents**	**Share in %**
Woman	*322*	*65.6*
Man	*169*	*34.4*

* Source: Estonian Statistical Database
Note: the sample was drawn from people between 15 and 74. Since the sample was drawn at the beginning of February and the statistical office has updated the data recently, numbers above differ slightly from the ones used in the sample for the survey.

Table 8. Age structure of the sample compared to the total population (age 15-74)

Total population *	No of population	Share in %
1. Sample area:	*54369*	*100*
15-20	*7434*	*14.0*
21-30	*9350*	*17.0*
31-40	*8948*	*16.0*
41-50	*10331*	*19.0*
51-60	*8626*	*16.0*
61-70	*7196*	*13.0*
71-74	*2484*	*5.0*
Our sample	**No of respondents**	**Share in %**
15-20	*31*	*6.2*
21-30	*92*	*18.4*
31-40	*97*	*19.4*
41-50	*115*	*23.0*
51-60	*90*	*18.0*
61-70	*50*	*10.0*
71-74	*26*	*5.2*

* Source: Estonian Statistical Database

Table 9. Average household size of sample compared to the total population

Population	Average size of household	1 person households (% of total)	multiple person households (% of total)
Sampling area*	***2,37***	***35***	***65***
Our sample	*2.76*	*19,2*	*80,8*

* Source: Estonian Statistical Database

Table 10. Professional and social groups of the sample compared to the total population

Total population	No of population	Share in %
1. Sample area:		
Industry	*No data available***	
Agriculture, hunting, forestry, fishing	*No data available***	
Administration and public sector	*No data available***	
Reaching and research	*No data available***	
Services sector	*No data available***	
Tourism	*No data available***	
Constructing	*No data available***	
Health and social care	*No data available***	
Student	*4715*	*6.5% of the total population of the sample area*
House-person	*3144*	*4.4% of the total population of the sample area*
Unemployed	*4092*	*5.6% of the total population of the sample area*
Retired	*15463*	*21.4% of the total population of the sample area*
Our sample	**No of respondents**	**Share in %**
Industry	*97*	*19.4*
Agriculture, hunting, forestry, fishing	*32*	*6.4*
Administration and public sector	*44*	*8.8*
Reaching and research	*30*	*6.0*
Services sector	*96*	*19.2*
Tourism	*5*	*1.0*
Constructing	*39*	*7.8*
Health and social care	*8*	*1.6*
Student	*24*	*4.8*
Unemployed	*7*	*1.4*
Retired	*88*	*17.6*
House-person	*31*	*6.2*

* Source: Population Census 2000
** Data about socio economic characteristics such as profession and income is not available in Estonian statistics Database for municipalities but only for counties

More than two thirds of the 491 people are women (65.5 %). 23.4 percent of all respondents were in the age between 41 and 50 (19.8% between 31 and 40 and 18.3% between 21 and 30). Twenty-three percent was in the age below 31 and 15.5 percent above 60.

Overall, 18.3 percent of respondents worked in the service sector, 17.9 percent in the industry sector and the same percentage were retired. Less people were engaged in agriculture, forestry and fishing (6.5%), public sector and administration (9%), teaching and research (6.1%), construction (7.9 %), house-person (6%), student (2.9%) and even less in tourism, health sector, enterprise, transport and logistics. Only 1.3% of respondents stated that they are unemployed.

More than 50 % of respondents have either secondary or secondary-special education, 17.5% basic education and 15.5 % higher education with 13 respondents having primary education only. More specific information is given in Figure 7.

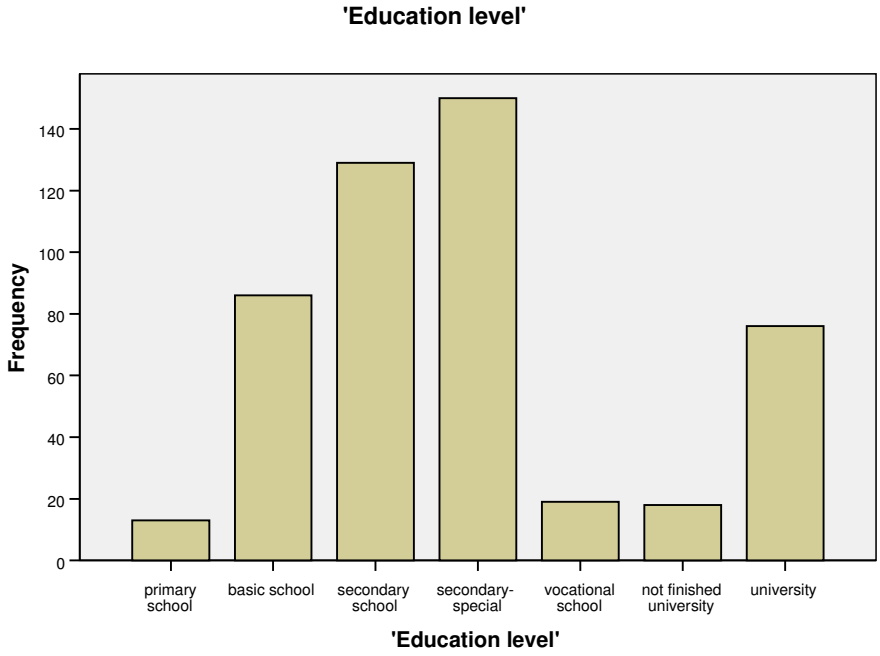

Figure 7. Educational level of respondents

For fifty-three percent of the respondents, two persons have a regular income in their household, 36.7 percent having one person per household with regular income, 8.4 percent having three persons per household with regular income and two percent only having either 4 or 5 persons bringing regular income in the household.

Figure 8 presents the distribution of respondents between income classes. In total, 22 respondents out of 491 refused to state their income (4.5%). Most of the respondents fall under the income classes 2 500 EEK to 20 000 EEK. Only 3.7 percent of the respondents have a monthly income of less than 2 500 EEK and 9.5 percent have a monthly income of more than 20 000 EEK.

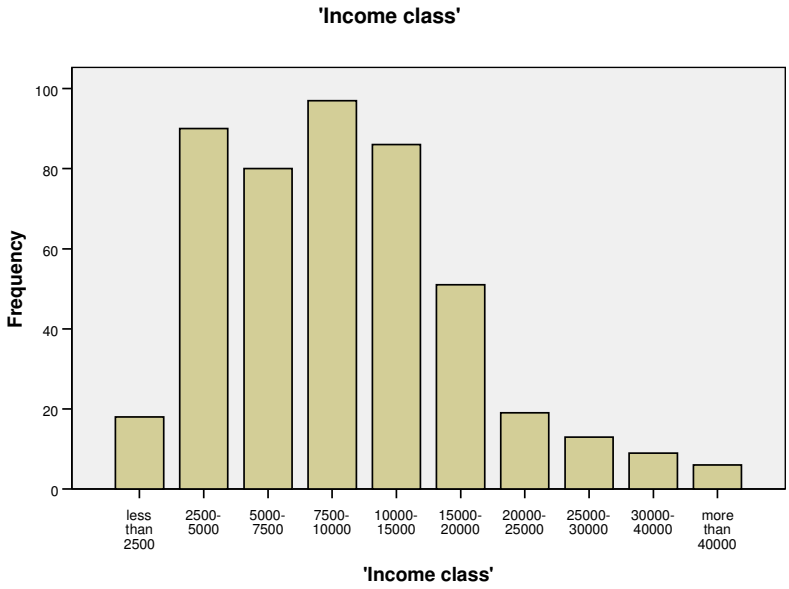

Figure 8. Distribution of the respondents' households' monthly income classes (in EEK)

Overall, 86.4 percent of the respondents stated that they are not active in the environmental field. Several respondents participated in specific environmental actions (8.8%), were members of environmental non-governmental organizations or supported such organisations financially (2.4%).

On average, the sample represents rather well the different age groups of the area. It has however, an average household size slightly larger than the average for the total area. Also, there is over-representation of women in the sample, and an under-representation of retired and unemployed persons. This could lead to a higher average income for the sample as compared to the total population of the area considered.

4.2 How important is the Valgejõgi River for respondents?

Overall, 25.3 % of these respondents live up to 5 km from the river, 6.7 % live in the distance between 6 to 10 km, 53.6 % between 11 and 20 km and 14.5 % between 21 and 30 km (see Figure 5).

Figure 5. Distance of respondents' living place from the river

Overall, 197 respondents visit the Valgejõgi River once a year or more often (40.1%) with 294 respondents stating that they visit the river less than once a year (59.9%). The main reasons explaining rare visits to the river (less than once a year) were as follows: no reason or time to go (67.6%), the river is too far (9.8%), I do not go fishing/angling there (8.2%). Some respondents also did not know where the Valgejõgi River is (see Figure 6)

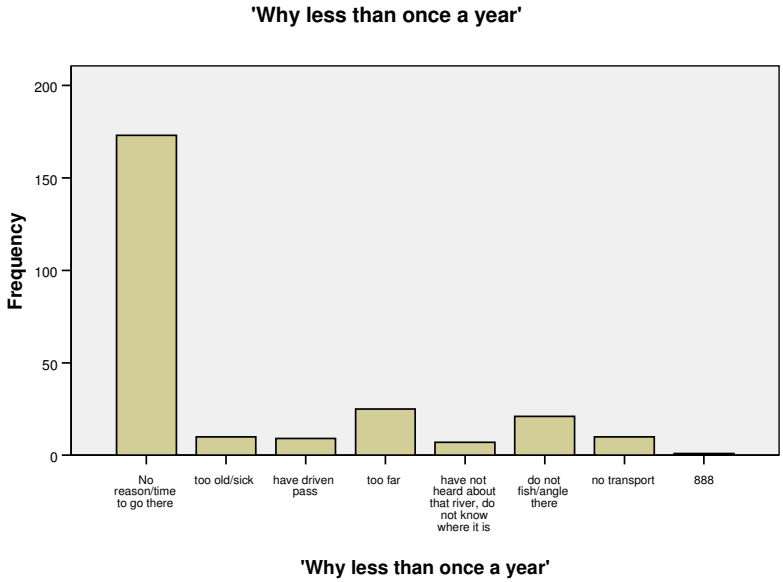

Figure 6. Reasons explaining why people visit the Valgejõgi River less than once a year. (888 = 'I do not know where the river is')

As the Northern part of Estonia has many rivers that are close by with similar conditions, respondents were asked if they are visiting other rivers besides the Valgejõgi River. Overall, 226 people said that they are visiting other similar rivers (46 %) including 7 other rivers also designated as salmon rivers. For 123 people interviewed, the Valgejõgi River is the closest river (25.1%) but for the remaining 368 respondents, there are other rivers closer to their living place than the Valgejõgi River (74.9%).

Respondents were also asked to specify why they are visiting the Valgejõgi River site or other similar rivers. The main results are presented in Table 11 below.

Table 11. Reasons for visiting the Valgejõgi River and other similar rivers

Activity	River Valgejõgi	Other rivers
Fishing/angling	24	41
Boating/canoeing	14	24
Swimming	19	40
Walking/jogging/other sports	101	69
Sightseeing/relaxing	113	143
Visiting relatives	7	4
Driving pass	6	3
Due to work	5	7
For an event/party	6	2
Living there/summerhouse	2	9

Overall, 178 respondents stressed that somebody in their family has fishing as activity. People who are fishing themselves or with family members involved in fishging account to 37.1% of total respondents. People are mainly fishing as a hobby (167 responses) but also because they eat fish or because they are selling it. In the sample, 94.7 percent of respondents are eating fish and 208 people mentioned they were eating salmon specifically.

4.3 Respondents' opinion about water status

Respondents were asked to rate current water quality of the Valgejõgi River. Twelve percent of respondents considered the river quality to be either good or very good and 28.1 percent thought that the water quality in river Valgejõgi is moderate or below that. 292 respondents chose the option „I do not know". More specific distribution between different quality classes is shown in Figure 9.

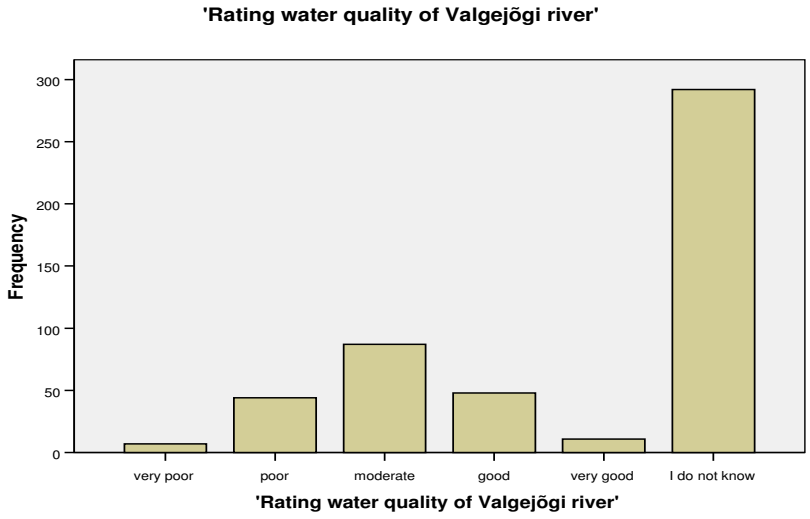

Figure 9. Respondents' ratings of water quality of the Valgejõgi River

Additionally people were asked how they define good quality of surface water. They were given possibility to choose two options from given statements that most correspond to their views. The results are as follows.

Surface water of good quality…

- *…allows the development of animal and plant species of clean waters* - 258 responses
- *…allows the safe practice of activities like swimming from a health point of view* - 250 responses
- *…is water at its natural state that does not suffer from negative human influence* - 147 responses
- *… allows the practice of activities like canoeing and fishing* - 139 responses
- *…can be used as drinking water for human consumption without additional treatment* – 122 responses
- *… allows to use water for garden watering* – 52 responses

Overall, 85.7 % of respondents found the current situation described in the questionnaire realistic. The main reasons for people who did not agree with the description provided to them were that (i) respondents do not know the situation so they can not evaluate the accuracy of the given description (43 responses) and (ii) some respondents mentioned the existence of fish passes that already made migration possible (8 responses). A few respondents also stressed that the description of the current situation was too positive as (from their point of view) river quality is in reality worse than described in relevant sections of the questionnaire.

In general 94.9 percent of respondents found it important to reintroduce salmon (or protected fish) to the Valgejõgi River. The main reasons why salmon/protected fish should be reintroduced are presented in Table 12.

Table 12. Why should salmon/protected fish be reintroduced in the Valgejõgi River?

YES	NO
Non-use values	
Former status and the variety of species should be restored – 194 responses	Existance of salmon in the river is not important – 6 responses
Valuable fish species should be protected/preserved – 55 responses	Fish will die in the river anyway – 4 responses
Fish have to be in river as it shows the cleanliness of the water – 58 responses	
Salmon should not dissapear totally – 13 responses	
Use values	
More fish can be angeled/eaten – 142 responses	Do not eat fish or go fishing – 5 responses
Hydroenergy is not that important – 3 responses	Hydroenery is more important – 3 responses

Almost sixty percent of respondents justified the need to re-introduce fish/salmon in the river based on non-use values only. Twenty-five percent mentioned use values only and eight percent mentioned both use and non-use values. Forty respondents did not explain their choice.

4.4 Respondents' willingness to pay

Out of 491 respondents, 253 (or 51 %) are willing to pay for the first scenario aimed at improving water status up to good status. This number is reduced to 188 (or 38%) when respondents are asked whether they are willing to pay for the second scenario aimed at improving water status up to high/very good status.

On average, WTP values for respondents who provided answers were in average 52 eek per household per month. Unexpectedly, the average values are similar for the first scenario and for the second scenario. A wide range of values were mentioned for both scenarios among respondents, the standard deviation being close to 65 eek per household per month for both scenarios. The wide range of values is illustrated in Figure 10 and Figure 11 below.

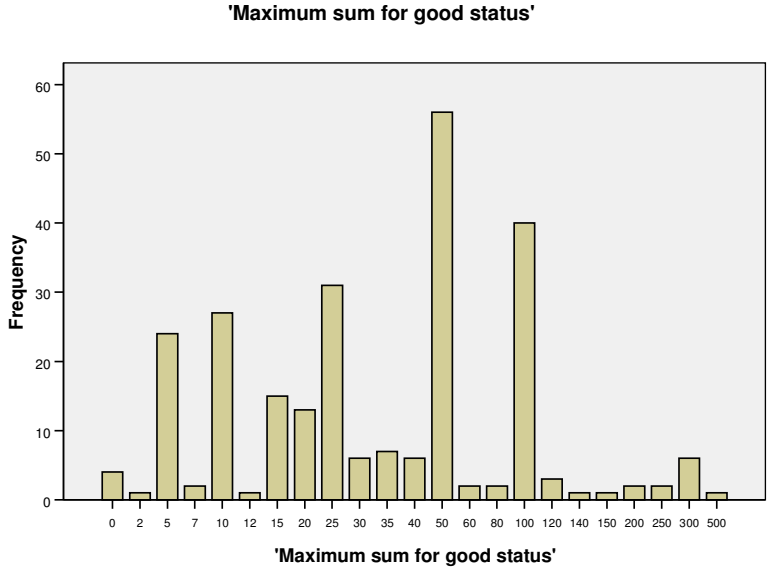

Figure 10. Frequency distribution of WTP values for achieving "good" status for the Valgejõgi River

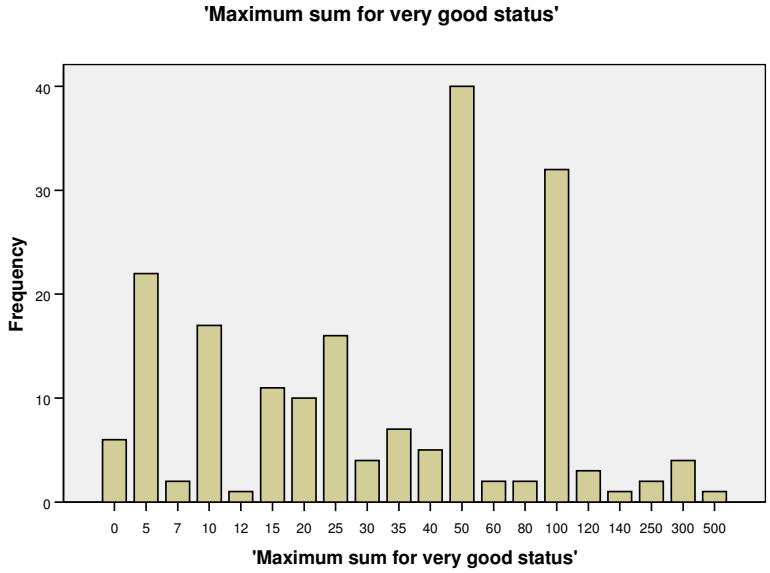

Figure 11. Frequency distribution of WTP values for achieving "Very good" (high) status for the Valgejõgi River

It is important to stress that respondents who agreed to pay for both scenarios gave very similar WTP values to both scenarios. This is illustrated in Figure 12 below.

Figure 11. Linking respondent's willingness to pay for Scenario 1 (good water status) and Scenario 2 (high water status). N = 188

4.5 Why do respondents protest?

Respondents were asked to explain their unwillingness to pay for each of the two scenarios of water status improvement in the Valgejõgi River.

Scenario 1: achieving "good" status - Ninety percent of respondents thought that achieving "good" status based on described measures would be possible. People who did not find it possible stressed that: the proposed measures cannot be carried out; joint agreement between stakeholders will not be reached; the status of the river is so bad that these measures would not help reintroducing salmon; it would be too costly; hydro-energy and fish cannot co-exist. Around 52 percent of respondents are in principle willing to pay to implement measures for reaching "good" status. The reasons why some respondents are not willing to pay are presented in Table 13 that attempts to separate zero and protest bidders. Zero bidders were added later during the analysis of the results to the WTP amount as 0 EEK.

Table 13. Protest answers and zero bidders for Scenario 1

Protest bidders	Zero bidders
Government/state should finance these measures – 18 responses	My income is too low – 103 responses
I do not agree with the monthly payment, one-time payment would be better – 6 responses	I find other things I can spend my money more important – 66 responses
Hydro-energy producer should finance these measures – 4 responses	I do not eat fish or go fishing – 17 responses
Funds will not be used to implement proposed measures – 1 response	The river/area is too far – 17 responses
	This is not the best solution and it will not bring expected results – 12 responses
	This topic does not interest me – 5 responses
	There is already enough salmon/protected fish – 1 response
Overall: **13.2%** (of respondents not WTP)	Overall: **86.8%** (of respondents not WTP)

Scenario 2: achieving "high" water status - 53.6 percent of respondents thought that achieving "high" status based on described measures would be possible. People who did not find it possible gave the following reasons: hydro-energy is important (73 responses), dams should not be removed (54 responses), it would be too costly (12 responses), it is not the best solution (38 responses), local people will be against it (14 responses) and it would not be possible to swim (20 responses). 37.7 percent of respondents would be in principle willing to pay in order to implement measures for achieving "high" status. Respondents who stated that they are not willing to pay were asked to give a reason in order to separate zero and protest bidders (see Table 14). Zero bidders were added later during the analysis of the results to the WTP amount as 0 EEK.

Table 14. Protest answers and zero bidders for Scenario 2

Protest bidders	Zero bidders
Government/state should finance these measures – 19 responses	My income is too low – 112 responses
I do not agree with the monthly payment, one-time payment would be better – 1 responses	I find other things I can spend my money more important – 61 responses
Hydro-energy producer should finance these measures – 4 responses	I do not eat fish or go fishing – 14 responses
Funds will not be used to implement proposed measures – 3 response	The river/area is too far – 13 responses
	This is not the best solution and it will not bring expected results – 28 responses
	This topic does not interest me – 6 responses
	I think there is already enough salmon/protected fish – 2 response
	Hydro-energy is important – 34 responses
	The first scenario is better – 18 responses
Overall: **9.6%** (of respondents not WTP)	Overall: **90.4%** (of respondents not WTP)

Both Table 13 & Table 14 stress the low share of protest bidders. It is important to stress, however, that the distinction between zero bidders and protest bidders remains a complex and sometimes subjective decision. Further work would be required on this aspect.

Accounting for the zero bidders identified in the tables above, average WTP values were estimated for both scenarios. Because of the significant difference in percentage of respondents being willing to pay for scenario 1 and for scenario 2, average values accounting for zero bidders are very different among scenarios, i.e. 30.4 eek per household per month and 21.8 eek per household per month for scenario 1 and for scenario 2, respectively.

4.6 Which factors explain respondents' willingness to pay?

4.6.1 Which reasons brought forward by respondents explain their willingness to pay?

People willing to pay for either scenarios or for both scenarios were asked to give reasons why they are willing to pay. The results are shown in Figure 10.

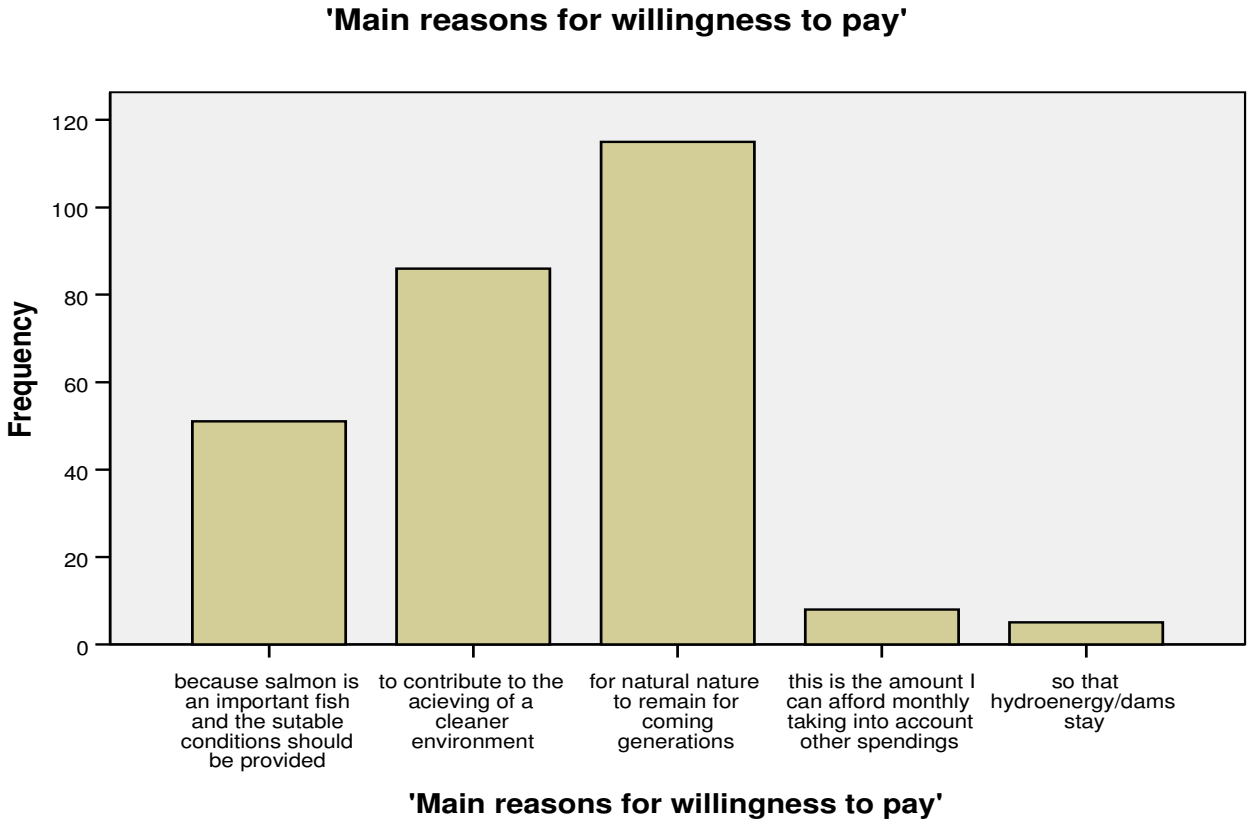

Figure 10. Respondents' main reasons for willingness to pay for achieving either "good" status, "high" status or both for the Valgejõgi River

4.6.2 Looking at individual factors explaining WTP values

Comparisons between sub-sample WTP value means were made for respondents who provided positive values to the WTP question. The outcome of ANOVA for selected variables are summarised below (taking into account tests for equality in variance).

- There is no difference between WTP values provided in both scenarios, as already indicated above. This would imply that the good/expected magnitude of improvement plays a role in people's WTP Yes/No response, but not on the value they then give that might be influenced by budgetary/financial/income issues.

- There is no statistical difference between the average WTP values provided for both scenarios between the two questionnaires applied (reminder: the first questionnaire focused on salmon only, while the second questionnaire focused on salmon and other protected fish species that would benefit from improvement in water quality). This could indicate the importance of salmon as emblematic species in people's responses. At the same time, as indicated in Figure 11, many respondents to the "salmon only" questionnaire stressed that they were accounted for other fish in proposing the WTP value – their value being on average significantly and statistically higher than for those that only accounted for salmon.

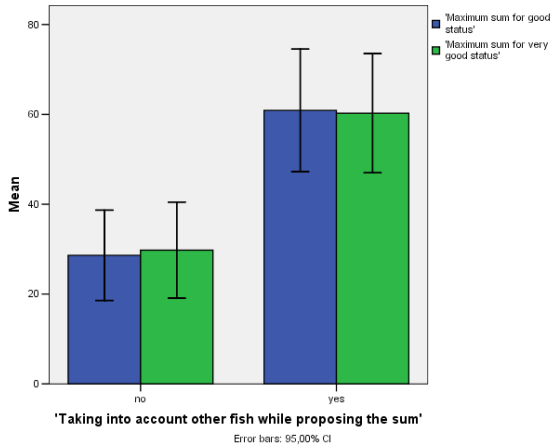

Figure 11. Comparing WTP values for respondents' for the "Salmon only" questionnaire

- Respondents visiting other rivers have a higher value (i.e. 59 eek per household per month) then respondents who do not visit other rivers (i.e. 45 eek per household per month), although the difference is not statistically significant. It is interesting to note also that the highest WTP values are given for both scenarios by respondents who rarely visit the Valgejõgi River – this being rather counterintuitive. Similarly, respondents who say they are active in the field of environment propose higher WTP values, but for the high status scenario only, that respondents who are not active.

- To be fishermen or to have household members involved in fishing activities has a signficant impact on WTP values, 64 eek per household per month versus 43 eek per household per month for households involved in fishing activities and those not, respectively.

- There is much attention given to the influence of the distance to an environmental good and the value people attach to this good. In the Estonian survey, there was no (expected) negative relationship between WTP values and distance from the Valgejõgi River, as indicated in Figure 12. This might be explained by the focus on salmon and fish migration (emblematic species), by the small distances between the Valgejõgi River and other similar salmon rivers and by the fact that being a fishermen or having household members active in fishing activities being a predominant factor.

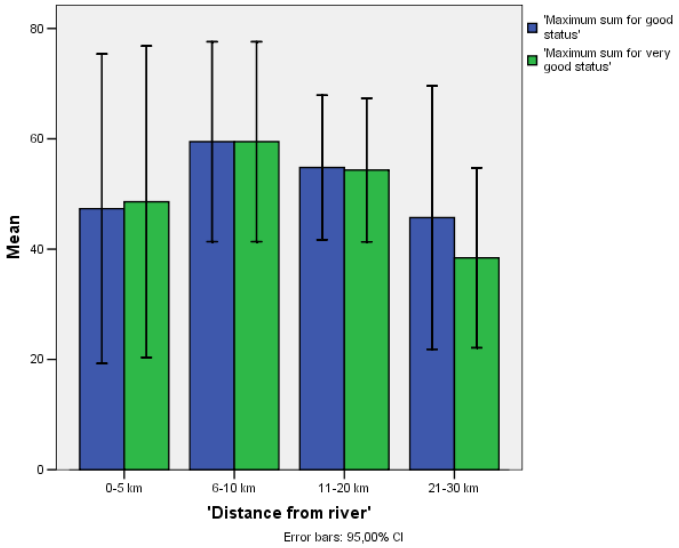

Figure 12. WTP values and distance from the Valgejõgi River

- Male in the sample give higher WTP values than women, and this difference is statistically significant. On average, male are ready to pay 67 eek per household per month while women are ready to pay around 45 eek per household per month. The number of children in the household, however, does not seem to influence WTP values provided by respondents.

- Income has a significant role in explaining differences in values. The WTP values increase with income levels up to the income class of 20 000 to 25 000 eek. For income higher than this threshold, there is less clear trend as indicated in Figure 13 & Figure 14. However, it should be stressed that the number of respondents with income levels falling under these higher income categories is low (10 only).

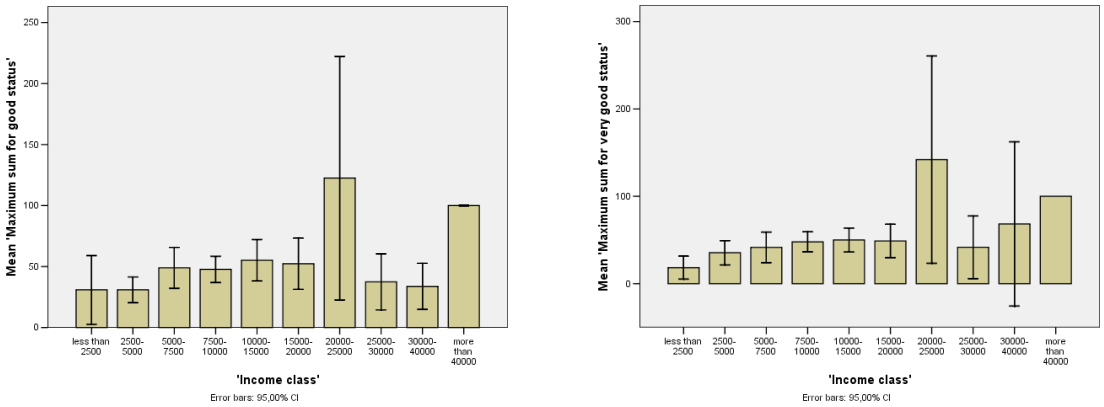

Figure 13 & Figure 14. WTP values for different income classes for Scenario 1 (good status) and Scenario 2 (high status) for the Valgejõgi River

- Calculating the relative WTP values as compared to income gives the opposite results. Indeed, the share of WTP values as compared to income decreases as income increase. Thus, comparatively and as presented in Figure 15, respondents with low income levels are ready to give a larger share of their income to improving water status in the Valgejõgi River as compared to respondents with high income levels. On average, the WTP value per household per month represents around 0.36% of the total income per household per month reported by respondents – ranging from 1.3% for households in the lowest income group to less than 0.1% for households with average income per month of 27 500 eek and 35 000 eek.

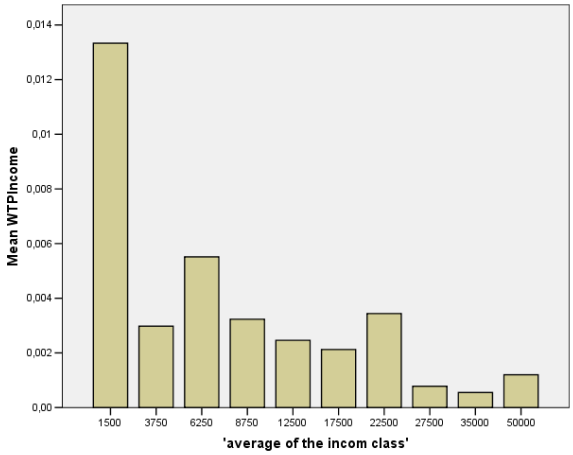

Figure 15. Relative share of WTP values for scenario 1 in total household income for the Valgejõgi River

- There is no statistical difference between WTP values for both scenarios based on the way people assess today's river water quality or whether they find the situation described realistic or not. Figure 16, however, stresses that people that rate water quality as good have the highest WTP values on average.

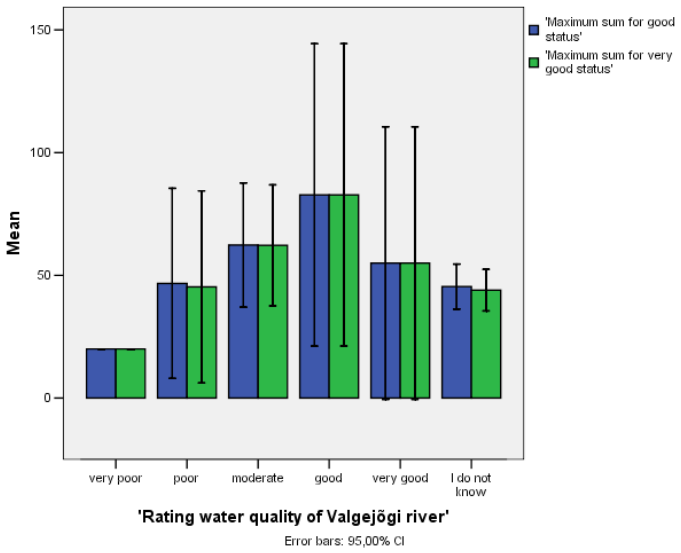

Figure 16. Linking WTP values and people's perceptions of water quality in the Valgejõgi River

- Also, none of the views on what water quality means or implies explain differences in WTP values. But the more certain you are about the value you propose, the highest this value.

4.6.3 Preliminary results of regression analysis

Regression analysis was performed for the identifying the main factors influencing people's Willingness To Pay (yes/no answer, using logistic models) and their WTP values (linear regression, whether on the values themselves or on the lognormal values).

The regression analysis with the logistic model for the first scenario led to the preliminary results presented in Table 15 below.

Table 15. Results of the logistic model for WTP for Scenario 1

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Live in a town (=1) or settlement (=0)	-.369	.193	3.678	1	.055	.691
Fishing activities in the household (Yes = 1, No = 0)	.724	.199	13.255	1	.000	2.062
Knoweldge about river water quality (1 = I don't know, 0 otherwise)	-.302	.197	2.356	1	.125	.739
Mentioned only use values in describing water water quality is (1 = yes, 0 = No)	.388	.205	3.559	1	.059	1.473
Age	-.011	.006	3.135	1	.077	.989
Constant	.581	.352	2.731	1	.098	1.788

These results indicate that fishing activities in the household and the importance given to use values when describing water quality have a positive impact on respondent's willingness to pay for the first scenario. At the contrary, people living in towns, older people and people who had no knoweldge on the quality of the Valgejõgi River have lower probabilities to be willing to pay for the first scenario (although this coefficient is only significant at the 15% level). Surprinsigly, income did not enter as an explanatory variable in the equation – possibly because of correlation betwene income level, living place (town versus settlement and age of the respondent). The overall explanatory power of the model, however, remained low, with a -2 log likehood of 638.7, a Cox & Snell R Square of 0.059 and a Nagelkerke R Square of 0.79. Similar work was done for the second scenario. Nearly the same variables were found significant in explaining the probability for respondents to be willing to pay for the second scenario – apart for the number of children that also explained positively respondent's willingness to pay. As indicated above, this result is not surprising as people's willing to pay for the first scenario are also in the majority willing to pay for the second scenario.

With regards to WTP values, regression analysis was performed with Lognormal values and values themselves (including or not zero bidders) for both scenarios. The results for the second scenario were disappointing. Best results were found for the model with WTP values including zero bidders for the first scenario – with however an very low adjusted R2 (0.07) stressing that much of the variability in WTP values is not explained by the explanatory variables identified. The results are presented in Table 16 below.

Table 16. Results of the linear regression model for WTP values (including zero bidders) for Scenario 1

Variable	Unstandardised coefficients		Standardised coefficients	t	Sig.	95% confidence interval for B	
	B	Std. Error	Beta			Lower bound	Upper bound
Constant	30.7	6.6		4.6	.000	17.75	43.7
Live in a town (=1) or settlement (=0)	-16.3	5.05	-.155	-3.2	.001	-26.2	-6.5
Average income	.001	.000	.124	2.5	.011	.000	.001
Fishing activities in the household (Yes = 1, No = 0)	12.8	5.2	.119	2.5	.014	2.6	23.1
Sex (0 = male, 1 = female	-10.6	5.3	-.096	-2.0	.046	-21.1	-.2

The results stress that the WTP values proposed by respondent to the first scenario are influenced positively by average household income and fishing activities in the household, as already indicated when individual correlations were investigated in the previous section. Thus:

- The higher the income, the higher the WTP values – in line with results obtained in other continvent valuation surveys in Europe and elsewhere.

- Households with members involved in fishing activities have WTP values higher by 12.8 eek per household per month than households with no member involved in fishing activities.

At the opposite, female respondents have WTP values lower by 10.6 eek per household per month as compared to male respondents. And inhabitants living in towns have on average lower WTP values (by 16.3 eek per household per month) than inhabitants living in settlements in rural areas. This variable was also significant in the logistic regression explaining respondents' willingness to pay.

5. Conclusions

5.1 Summary of results

The contingent valuation method applied to value the restoration of fish & salmon migration in the Valgejõgi River showed that 51% of respondents in the area are willing to pay for restoring fish migration and river continuity in the Valgejõgi River up to good water status. Only 38% are willing to pay for restoring the Valgejõgi River up to high water status.

On average, respondents willing to pay propose WTP values of 52 eek per household per month on average – with no significant difference between both water status improvement scenarios or between questionnaires focusing on salmon only or salmon and other protected fish species. This gives an average value of 30.4 eek per household per month and 21.8 eek per household per month on average when zero bidders are considered for scenario 1 and for scenario 2, respectively. Overall, the percentage of protest bidders is very low (around 7% of total respondents).

The main variables that influence respondents' willingness to pay and WTP values include fishing activities in the household (positive), income (positive), age (negative), sex (men have values higher than women), the respondents' knoweldge about current water quality of the river (people who say they do not know it have lower probability of being willing to pay). Unlike expected or foreseen by the theory, the distance to the river was not found influencing significantly willingness to pay and WTP values.

The different tests - the absence of difference between WTP values for both scenarios, the absence of difference between the two questionnaires - would support the assumption that the definition of the good and its magnitude/importance mainly influence respondents' willingness to pay. The WTP values themselves proposed by respondents would be then more influenced by incomes and other financial/budgetary issues.

5.2 Methodological lessons

It might be too early to identify strong methodological lessons from the survey undertaken in Estonia as part of the ENCOBALT project. However, some lessons can already be drawn:

- It is clearly possible to undertake such contingent valuation survey under Estonian conditions. There has been limited protest and negative reactions from inhabitants from the Valgejõgi River area that are rather representative of much of the situation in Estonia (apart for the capital city of Tallin);

- Difficulties were faced in defining the changes in water status and changes in goods and services that would arise if water status is improved up to good status (scenario 1) or very good status (scenario 2). Similar to problems faced in other ENCOBALT case studies, there is limited understanding and expertise in the possible impact of different measures and actions on the ecological status of rivers. And identifying goods and services, use values and non-use values that might be affected, remains a challenge. More efforts would be required to link expertise on ecology and economic expertise;

- Key in undertaking a contingent valuation survey is the pre-testing of the questionnaire. This helps adapting the questionnaire to local conditions, understanding and vocabulary. It is also key in training the interviewers.

- It would have been interesting to interview also inhabitants from Tallinn, to better understand the perceptions and views of respondents on salmon and such emblematic species.

5.3 Follow-up

Additional work is required to proceed with the statistical regression analysis to identify variables and factors explaining respondents' willingness to pay and WTP values. Indeed, a limited number of variables only have been shown to be statistically correlated to willingness to pay and WTP values. Furthermore, the overall explanatory power of the regressions developed remains low.

The values estimated could already be used to illustrate the magnitude of benefits one might attach to improvements in river continuity and fish migration – be it for the Valgejõgi River or for similar salmon rivers that are common in Estonia and that are facing similar morphological and continuity problems.

Additional efforts would however be required to obtain a wider range of values convering different situations and changes in environmental goods and services. Of importance would be to test different methods, so their results can be compared and combined in the most effective way to support the selection of measures for the WFD and share widely with stakeholders and the wider public on the benefits to society the WFD implementation will bring.

*"*Capacity building on the assessment of environmental and resource costs as support to the implementation of the European Union Water Framework Directive in the Baltic Member States*"* (ENCOBALT)

Valgejõgi river Case Study: reintroducing salmon

Final Questionnaire (English version)

Number of the respondent ……..

Interviewer's name …….

Date of the interview ..……

Location of the interview ……

Time of the interview started ……

Time of the interview ended ……

1 INTRODUCTION

I represent the public survey company "Socio Uuringukeskus" and at the moment we are carrying out a survey that focuses on the migration of salmon in the river Valgejõgi in Harju subriver basin in order to collect views and knoweldge of the inhabitants of the area on the protection of salmon and on values they attach to it.

For this survey you have been chosen randomly, it is anonymous and all answers will be used only for the purposes of this study.

Please remember that it is your opinion that matters – so there are no good or bad answers.
We kindly ask you to participate in this survey – it will take around 25 minutes.

If the person does not want to participate, please ask for the reason and record it on a separate page!

2 YOUR GENERAL OPINION ABOUT THE AREA AND ENVIRONMENTAL ISSUES

2. Please rank on the scale of 10 how important in your opinion are for the area: (1 – not important at all, 10- very important) Make a circle		
Education	1 2 3 4 5 6 7 8 9 10	I don`t know
Unemployment	1 2 3 4 5 6 7 8 9 10	I don`t know
Water quality	1 2 3 4 5 6 7 8 9 10	I don`t know
Waste	1 2 3 4 5 6 7 8 9 10	I don`t know
Health service	1 2 3 4 5 6 7 8 9 10	I don`t know
Departure from countryside to towns	1 2 3 4 5 6 7 8 9 10	I don`t know

Please show Map 1 to the respondent!

3. How often do you visit river Valgejõgi during a typical year?	
Every day	☐
At least once a week	☐
At least once a month	☐
At least once a year	☐
Less than once a year	☐
If "Less than once a year", could you explain why? Go to question 4	

4. For what reasons do you visit the river? Several answers are possible	
Fishing, angling	☐
Boating/canoeing	☐
Swimming	☐
Walking/jogging or other sports	☐
Sightseeing/relaxing	☐
Other(s) – Please specify ……..	☐

5. Do you visit often other similar rivers?	
Yes ☐	No ☐ - Go to question 6 or 8

If yes, which rivers?	
Jägala river	☐
Loobu river	☐
Keila river	☐
Kunda river	☐
Pirita river	☐
Other(s) – please specify ……	☐

6. For what reasons do you visit rivers other than Valgejõgi? Several answers are possible	
Fishing, angling	☐
Boating/canoeing	☐
Swimming	☐
Walking/jogging or other sports	☐
Sightseeing/relaxing	☐
Other(s) – Please specify ……..	☐

Remeber that question 6 should be aswered based on questions 3 and 5 – if fishing/angling was chosen – question 6, if not – question 7

7. If you are fishing/angling: Which type of fish are you angling?	
All types	☐
I angle mainly – (please name the types) ……..	☐

8. Are some of your family members fishing/angling?	
Yes ☐	No ☐ - go to question 9

9. For what reasons you or your family members are fishing/angling? Several answers are possible	
For eating	☐
For selling	☐
Just for fun/as a hobby	☐
Other reason(s) – please specify ……..	☐

10. Do you eat fish?	
Yes ☐	No ☐

If Yes, which types of fish are you eating in priority?

11. How would you rate current water quality of river Valgejõgi ?	
Very poor	☐
Poor	☐
Moderate	☐
Good	☐
Very good	☐
I do not know	☐

12. How would you best define good quality for surface water? Among the following proposals, choose the **two** that best corresponds to your opinion. – Surface water of good quality … (*show Card no 1 to the respondent*)	
…allows the development of animal and plant species of clean waters	☐
…allows the (health…) safe practice of activities like swimming	☐
…allows the practice of activities like canoeing, fishing	☐
… allows to use water for garden watering	☐
…can be drunk by humans without treatment	☐
… is water at its natural state that did not suffer from negative human influence	☐
Other(s) – please specify _____	☐

13. There are several dams on river Valgejõgi. Are in your opinion the following statements true or false? Please show Card no 2 to the respondent			
Existance of a dam...	True	False	I don`t know
… allows to produce hydroenergy on suitable conditions	☐	☐	☐
… reduces the river-specific fauna and flora	☐	☐	☐
… helps the free migration of fish along the river	☐	☐	☐
… has negative impact on spawning grounds	☐	☐	☐
… creates better possibilities for swimming (damlake)	☐	☐	☐
… makes it easier to control the water leverl of the river	☐	☐	☐
… reduces the river pollution	☐	☐	☐

3. SCENARIOS

Description of the problem

Please give Card no 3 to the respondent to read or read it yourself if the respiondent asks!

River Valgejõgi is one of the naturally suitable rivers for salmon in Estonia and has been designated by authorities as a salmon river for its whole length (85 km).

The characteristic of salmon is that salmons are born in rivers, they migrate to the sea and, as adults, they return to the same river where they were born to reproduce.

Water quality in Valgejõgi River is not problematic but Kotka and Nõmmeveski dams interrupt the the migration and reproduction of salmon. As a result, most of the Valgejõgi river (including **90%** of spawning grounds) cannot be reached by salmon today.

Currenty there have not been any fish passes built on these dams.

In recent years, the Kotka dam was used for hydropower generation. Today the future of it and the possibility to build an hydropower plant at Nõmmeveski dam are under discussion. This would however impact on river flow regimes and might not be suitable for salmon migration. Also, small fish going from the river to the sea can get killed in working turbines – thus limiting the re-establishment of salmon in the Valgejõgi River.

The environmental and financial damages to the river caused by existance of the dam are the responsibility of the owner («polluter-pays-principle»). In case the dam is in private ownership related costs will be paid by the private owner. There is the possibility for cooperation with state or local government which via taxpayers money can support the dam owner.

Please show Map no 2 and Card no 4!

Your opinion about the problem

14. Do you find the described situation to be realistic?	
No ☐	Yes ☐
If No, please explain what is the difference between your understanding and our description?	

15. Is it in your opinion important to reintroduce salmon to the river Valgejõgi?	
Yes ☐	No ☐
Why ?	

Following we are proposing 2 different scenarios – implementing the first one would allow to achieve "good" status from the salmon point of view and implementing the second one "high" status.

Scenario 1

For achieving **"good" status** for the Valgejõgi river from a salmon point of view, several measures can be proposed -

- ✓ building fish passes both on Kotka dam and Nõmmeveski dam
- ✓ cleaning of some natural spawning grounds to facilitate salmon reproduction
- ✓ setting specific requirements (stopping turbines when needed etc) to hydropower companies for the management of their hydropower plants etc.

- Such actions will ensure that **salmon has the possibility to migrate and reproduce as long as ca 75 km from the river mouth** (til Moe dam).

- However, **treaths imposed by dams and hydroelectricity generation remain** (small fish dying while swimming through working turbines, possible floodings of spawning grounds because of dam operation, etc)

Please show Card No. 4 to the respondent and ask to concentrate on scenario 1!

Your opinion about scenario 1

16. Do you think that achieving good status for salmon in the Valgejõgi river is possible?	
Yes ☐	No ☐
If No, please explain why.	

17. Would you in principle agree to contribute financially to this first scenario and achieve good status for salmon in the Valgejõgi river?	
Yes - go to Question 18	No - go to Question 17
☐	☐

18. If No : What are the main reasons? Several answers are possible Go to Scenario 2	
I don`t eat fish or go fishing	☐
My income is too low	☐
I think there is already enough salmon	☐
I find other things on which I can spend my money more important	☐
Other reason(s) – Please specify: ……..	☐

19. What is the maximum amount you would be willing to pay as a special separate tax per month for the next 10 years on behalf of your entire household in order to see this first scenario implemented?

- **Remember this payment will be over and above the households costs you already pay today**
- **Remember that this special separate tax money will only be used to implement the measures to improve the situation for salmon**

Show the Card no 5 to the respondent!

One response only!

0 EEK ☐	15 EEK ☐	35 EEK ☐	100 EEK ☐	More than 300 EEK ☐ Please specify _____ EEK
5 EEK ☐	17 EEK ☐	40 EEK ☐	120 EEK ☐	Other amount ☐ Please specify _____ EEK
7 EEK ☐	20 EEK ☐	50 EEK ☐	140 EEK ☐	I do not know ☐
10 EEK ☐	25 EEK ☐	60 EEK ☐	170 EEK ☐	
12 EEK ☐	30 EEK ☐	80 EEK ☐	250 EEK ☐	

Scenario 2

In order to achieve **"high" status** from salmon point of view there should be more costly and complicated measures implemented for instance partial or complete removal of the Kotka and Nõmmeveski dam.

- This would definitely ensure **free migration along the river for salmon** (til Moe dam)
- Makes it possible to start **partial restoring of the areas that were under the damlakes** and which are essential for salmon both as hatcheries and livingplaces
- **Loses the threaths caused by the existance and using of the dam** in the part of the river that was under the dam

Please show Card No. 4 to the respondent and ask to concentrate on scenario 2!

Your opinion about scenario 2

20. Do you think that achieving high status for the Valgejõgi river based on scenario 2 would be possible?	
Yes ☐	No ☐
If No, please explain why ?	

21. Would you in principle agree to contribute financially to this second scenario and to achieve high status for salmon in the Valgejõgi river?	
Yes - go to Question 22	No - go to Question 21
☐	☐

22. If No : What are the main reasons? Several answers are possible	
I don`t eat fish or go fishing	☐
My income is too low	☐
I think there is already enough salmon	☐
I find other things on which I can spend my money more important	☐
I find production of hydroenergy important	☐
Other reason(s) – Please specify: ……..	☐

If the respondent has said No for both scenarios then go to Profile of respondent (question 30), if he/she said Yes to scenario 1 then go to question 23

23. What is the maximum amount you would be willing to pay as a special separate tax per month for the next 10 years on behalf of your entire household in order to see this second scenario implemented?

- **Remember this payment will be over and above the households costs you already pay today**
- **Remember that this special separate tax money will only be used to implement the measures to improve the situation for salmon**

Show the Card no 5 to the respondent!

One response only!

0 EEK ☐	15 EEK ☐	35 EEK ☐	100 EEK ☐	More than 300 EEK ☐ Please specify _____ EEK
5 EEK ☐	17 EEK ☐	40 EEK ☐	120 EEK ☐	Other amount ☐ Please specify _____ EEK
7 EEK ☐	20 EEK ☐	50 EEK ☐	140 EEK ☐	I do not know ☐
10 EEK ☐	25 EEK ☐	60 EEK ☐	170 EEK ☐	
12 EEK ☐	30 EEK ☐	80 EEK ☐	250 EEK ☐	

Remember – Questions 23 - 29 need to be answered by respondents who say they would be willing to pay at least for one scenario.

24. What are the main reasons why you are willing to pay the above mentioned amount for scenario 1 or scenario 1 & 2? Only one answer!	
Because salmon is an important fish and the suitable conditions should be provided	☐
To contribute to the achieving of a cleaner environment	☐
For natural nature to remain for coming generations	☐
This is the amount I can afford mothly taking into account other spendings	☐
Other(s) – Please specify……	☐

25. Do you find it important that also other fish species besides salmon would be reintroduced or their multiplicity would be increasing in the Valgejõgi river?	
Yes ☐	No ☐

26. Would you expect that the scenarios presented to you will also have positive impacts on other fish species and fish habitats in the Valgejõgi river?		
Yes ☐	No ☐	I don`t know ☐

27. Did you take into account also the change of conditions for other fish species while proposing the montly sum for reintroducing salmon in Valgejõgi river?	
Yes ☐	No ☐

28. Would you pay this montly sum you proposed irrespective of to which environmental problem solving it will be used?		
Yes ☐	No, this sum was meant only for improving the situation for salmon ☐	I don`t know ☐

29. How certain are you about the amount you are willing to pay for restoring salmon population in the Valgejõgi river?	
Uncertain	☐ - Go to 29
Not uncertain, not certain	☐ - Go to 30
Certain	☐ - Go to 30
I don't know	☐ - Go to 30

30. If you are "uncertain", why are you uncertain?

4 PROFILE OF RESPONDENT

We are now asking you a few questions about yourself. The answers will be treated anonymously and will be strictly confidential. It is essential that you answer all of them for us to be able to treat your questionnaire.

31. Are you a woman or a man?	
Woman ☐	Man ☐

32. What is your age?
……. years

33. How long have you been living in this area?
……. years

34. How many members (including yourself) live in your household?	
….. persons	
How many children up to 17 years old?	
18 - 55 years old	
Older than 55 years old	

35. How many members (including yourself) have regular income in your household?
……. persons

36. In which sector do you work? Only one answer!			
Fishing	☐	Tourism and sports	☐
Agriculture, forestry	☐	Health sector	☐
Industry	☐	A student	☐
Public sector and administration	☐	Unemployed	☐
Teaching and research	☐	Houseperson	☐
Construction	☐	Retired	☐
Services sector	☐	Other (specify)	☐

37. What is the highest education degree you finished?	
Primary school	☐
Basic school	☐
Secondary school	☐
Secondary-special	☐
Vocational school	☐
Not finished university	☐
University	☐
Other (specify) ….	☐

38. Specify in the following income classes the class that corresponds to <u>your household</u>:
Please show Card no 6 to the respondent!

1	Less than 2 500 EEK per month	☐	6	Between 15 000 and 20 000 EEK per month	☐
2	Between 2 500 and 5 000 EEK per month	☐	7	Between 20 000 and 25 000 EEK per month	☐
3	Between 5 000 and 7 500 EEK per month	☐	8	Between 25 000 and 30 000 EEK per month	☐
4	Between 7 500 and 10 000 EEK per month	☐	9	Between 30 000 and 40 000 EEK per month	☐
5	Between 10 000 and 15 000 EEK per month	☐	10	More than 40 000 EEK per month	☐

Tick here if respondant refused to name the income level	☐

39. Are you active in the field of the protection of the environment?	
Not active in the field of the protection of the environment	☐
Member of environmental Non-Government Organisation Which organisation? ……..	☐
Participate in specific activities (cleaning, information campaign, etc)	☐
Supporting financially activities of environmental Non-Government Organisations	☐
Other(s) involvement – Please specify: ……..	☐

40. Do you:	
… belong toa fishing/angling association?	☐
… have a fishing card/fishing permit?	☐

5 RESPONDING TO THIS QUESTIONNAIRE

41. Did you find any difficulties in responding to this questionnaire?	
Yes ☐	No ☐
If yes, on which specific issues and questions? …… ……	

42. How sufficient was the information given to you in the questionnaire in order to build your viewpoint about your financial contribution?	
Sufficient ☐	Not sufficient ☐

43. Would you have any additional remarks and comments?

THANK YOU!

6 SPECIFIC COMMENTS FROM THE INTERVIEWER

This section needs to be filled by the interviewer after the interview when reviewing the entire questionnaire and ensuring that all answers are properly entered.

44. Is there anything that happened during the interview or that you find important that needs to be explained?	
The respondent did not seem to be at ease during the interview	☐
Most responses were given by the respondent and another person – thus they might not reflect entirely the respondent's views	☐
The respondent was not interested at all by the interview	☐
The interview was stopped for some time then started again	☐
Other(s)– please specify	☐