



Preferences for Saimaa ringed seal conservation: cultural ecosystem services, recreation benefits and valuation of conservation programs

Our Saimaa Seal-LIFE: Deliverable in D4 Recreation benefits, 2023

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Summary

Seal region on Lake Saimaa creates certain ecosystem services with benefits perceived by local people and tourists. Part of the benefits come from provisioning services such as fish catch. Some benefits are cultural services, such as recreation and tourism but also existence values obtained from increased number of Saimaa ringed seals have high importance. These ecosystem services have different levels depending on the state of ecosystems expressed as seal population. The value of benefits needs to be estimated to be comparable with the costs of conservation. For the socioeconomic assessment, we identify four groups of beneficiaries and people bearing the costs of conservation: 1) general Finnish population that perceive the existence values of seal population, 2) local people and summer cottage owners who perceive the change in the recreation benefits and existence values depending on the seal population but can perceive disutility from conservation measures in the area, 3) recreational fishermen who face the cost of hindrances in fishing but may perceive the increased recreation benefits or existence values, and 4) tourists visiting area.

1. Introduction

In assessing the benefits of Saimaa ringed seal conservation, the focus is on ecosystem services associated with magnitude of seal population. For example, recreation and tourism benefits from Lake Saimaa can be associated with the frequency of observed Saimaa ringed seals in the lake landscape. Saimaa ringed seal, like other endangered species, do not create only direct use value via recreation or tourism, such as revenues or value-added goods or services but, in addition, people may place a high value on the conservation of seal, or on preventing the population to decrease (i.e. conservation measures can increase individuals' perceived utility) even though they would never visit the area or see the seals. This value is called a non-use or existence value. Also symbolic, artistic and other cultural values can be attached to Saimaa ringed seal, they as well as recreational values, are included in so-called cultural ecosystem services.

Measuring these values means application survey-based valuation methods. First, we study how important Finns perceive different cultural ecosystem services related to Saimaa ringed seal. Second, we apply travel cost - contingent behavior method to discover how people's future recreational and touristic use of Lake Saimaa would change due to conservation actions and growth in the seal population. Models of the travel cost - contingent behavior method reveal the monetary value of recreation benefits and their changes. Third, we apply choice experiment that can be used to take into account the existence values people perceive. With CE we define people's willingness to pay for alternative conservation scenarios of seal population.

The data of 1487 respondents were collected with Internet survey from respondent panel representing Finnish citizens supplemented with visitors of Linnansaari National Park by the Lake Saimaa. The survey data reveals the diverse benefits of Saimaa seal conservation (Lankia et al. 2022).

The results presented in this deliverable facilitate the cost-benefit analysis that compares the costs and benefits of conservation with different conservation actions that can help to increase the Saimaa ringed seal population. The value of benefits needs to be estimated in monetary terms to be comparable with the costs of conservation. In this deliverable, we show the variety of benefits from conservation and define the key conservation benefits in monetary terms.

In the following we first describe the data collection and statistical analyses used. We present the results of Saimaa ringed seal related ecosystem services, recreation values and monetary values of various conservation programs.

2. Data and methods

2.1. Survey data collection

The study is based on a survey data collected in spring 2022. The survey was addressed to four groups of Finnish population that were identified as beneficiaries of Saimaa ringed seal conservation and people bearing the costs of conservation: 1) Finnish people that perceive the existence values of seal population, 2) local people and summer cottage owners who perceive the change in the recreation benefits and existence values depending on the seal population, 3) recreational fishermen who face the cost of hindrances in fishing but may perceive the increased recreation benefits or existence values. We are also interested of the effects of seal population on 4) tourists visiting the area. All these groups were taken into account in the survey design.

The survey was designed in 2021-2022 by experts of environmental valuation in collaboration with natural scientists specialized in Saimaa ringed seal research. Before testing the survey using a pilot study, several experts working on Saimaa ringed seal conservation in academics, nature conservation organizations, and state-owned organizations gave feedback on the survey. A pilot survey was conducted in March 2022 (N=210). Pre-testing evaluated the entire survey instrument, with focus on the descriptions of the current state of Saimaa ringed seal population and the conservation measures as well as the valuation scenarios. After the pilot survey, the survey was shortened, and the final design for the valuation questions was made.

The final survey was implemented in April - May 2022. The survey was collected from three separate samples. The first sample consisted of over 18-year-old Finnish citizens. Stratified random sampling was used, stratifying e.g. on age, gender, and location, with the aim of obtaining a representative sample of the general population. The second sample consisted of residents of the municipalities located around the Lake Saimaa. The third sample consisted of visitors of Linnansaari National Park. The survey was conducted by a private survey company IROResearch. For Samples 1 and 2, the data was collected using an internet panel by IROResearch. For sample 3, the contact details of the sample were received from Linnansaari National Park visitor survey.

Altogether 1487 respondents answered the survey, and the response rate was 10.3%. The number of observations in each sample are given in Table 1. The average response time was around 15 minutes.

Table 1. Number of respondents in each sample

Sample	Number of observations
Finland	913
Lake Saimaa region	522
Linnansaari National Park visitors	52
Total N	1487

2.2. Survey content

The survey included altogether 44 questions (some of which were not posed to all respondents). The questions were grouped into 7 sections:

- 1) Introduction to the survey
- 2) Respondent's connection and visits to Saimaa region as well as experiences related to Saimaa ringed seal
- 3) Most recent recreational visit to Lake Saimaa
- 4) Recreational fishing on the Lake Saimaa (asked only if the respondent goes fishing on the Lake Saimaa)
- 5) Preferences for conservation measures
- 6) Recreational visits to Lake Saimaa in the future
- 7) Background questions.

The descriptive statistics from the survey are reported in the deliverable of Our Saimaa seal-project Lankia et al. 2022.

To assess the benefits of Saimaa ringed Seal conservation, the survey included detailed questions on the importance of different cultural ecosystem services related to Saimaa ringed Seal, questions on the recreational visitation and recreational value of the Lake Saimaa, and on the preferences for Saimaa ringed seal conservation activities. Methods used in the assessments are presented in the following section.

2.3. Methods

Importance of cultural ecosystem services

To define the importance of cultural ecosystem services related to seal, a set of questions based on ecosystem service classification (CICES) modified to seal case were posed to respondents. They evaluated the importance of cultural ecosystem services for them with a five-point scale from not at all important (1) to extremely important (5). The services related to either active use of the area either directly or indirectly or to pure existence of the seal population. The ecosystem services presented to the respondents were:

- recreation and traveling on the seal area
- opportunity to observe a seal in nature
- artistic inspiration from the seal
- studying and learning of Saimaa seal
- seal as a symbol of lake Saimaa
- seal as a symbol of nature conservation
- existence of Saimaa seal as such
- existence of seal population in future
- discussions and arguments concerning the seal
- following live stream of Saimaa seal
- seal as a pull factor for nature tourism
- opportunity for voluntary work for Saimaa seal

Impacts of Saimaa ringed seal conservation on the recreational value of the Lake Saimaa

To discover how people's future recreational and touristic use of the Lake Saimaa would change if seal population changed due to conservation activities, we applied combined travel cost - contingent behavior method (TC-CB). TC-CB is a commonly used method (e.g. Lankia et al. 2019, Bertram et al. 2019, Egan et al. 2022) in the evaluation of expected changes in recreational benefits due to hypothetical future changes in environmental quality or recreational facilities of a specified area. The TC-CB method is based on travel cost method that is supplemented with contingent behavior data. The travel cost method (e.g. Zhang et al. 2015, Hanauer et al. 2017., Czajkowski et al. 2019) is a revealed preferences method for estimation of recreational value of a specified area in monetary terms. In the method, data on the number of recreational visits people have made in a certain time period to a specified recreational destination and the associated travel costs are used to reveal the demand and monetary value of the visits. In this study TC-model reveals the recreation benefits of visiting Lake Saimaa in its current state.

The contingent behavior method is a stated preferences method that asks people how their behavior, e.g. visit frequency to a specified recreational site, would change if a specified change in the site quality occurred. Combining data on both actual recreational behavior in the past (travel cost method) and expected future behavior under different future scenarios (contingent behavior method) allows the estimation of changes in the recreational value while grounding the results on real past behavior. Here, TC-CB method is used to evaluate how increase in the Saimaa ringed seal population or changes in the length of the net fishing ban would affect the volume and economic value of the recreational visits to Lake Saimaa.

In order to assess the current extent of recreational use of Saimaa, the survey elicited total number of annual recreational visits to Saimaa from the respondents who had visited the area for recreation in the last 12 months. The respondents were first asked how often they visited Saimaa or its shoreline in their leisure time during the last 12 months by providing them the response options daily, weekly, monthly, and more rarely. After this, the number of visits during the indicated period was asked in more detail. For example, the respondents who stated that they visited Saimaa weekly were asked how many times a week. The total number of visits by a visitor was then calculated by multiplying the weekly frequency by 52, the number of weeks in a year.

After eliciting the current volume of the recreational visits to Lake Saimaa, respondents were asked how the following future scenarios would affect the number of future visits.

1. The population of the Saimaa ringed seal would increase by 2.5-fold: "The current size of the Saimaa ringed seal population is around 430 individuals. How often would you visit Saimaa in the next 12 months if the population increased 2.5-fold?"
2. The ban for net fishing would be extended to the end of July: "Net fishing is currently prohibited in Saimaa from 15 April to 30 June. How often would you visit Saimaa in the next 12 months if the ban was extended until the end of July?"
3. The ban for net fishing would be extended to last around the year: "Net fishing is currently prohibited in Saimaa from 15 April to 30 June. How often would you visit Saimaa in the next 12 months if the ban was extended to year-round?"

To reduce response burden, half of the sample was presented with the net fishing ban July -scenario and the other half the net fishing ban around the year -scenario. The increased Saimaa ringed seal population scenario was presented to all the respondents.

Preferences for Saimaa ringed seal conservation scenarios

We applied choice experiment to define the non-use values associated with Saimaa ringed seal. The preferences of citizens for different conservation scenarios for Saimaa ringed Seal can be derived using choice experiment (CE) method. CE belongs to stated preference methods, and it uses a survey to ask respondents to choose their preferred alternative between two or more discrete alternatives that are described with attributes. By varying attribute levels and including a price variable as one of the attributes, respondents' perceived benefits in monetary terms i.e. willingness to pay (WTP) for a different scenarios or attribute levels is indirectly revealed based on the choices they make (e.g., Hanley, Mourato and White, 2001). Each respondent answers several choice tasks. The number of choice tasks typically ranges between 4 and 8 in environmental studies.

Alternative conservation scenarios were presented to the respondents. The scenarios contained the varying levels of Saimaa ringed seal population and the conservation measures aimed at increasing the seal population, i.e. restrictions for fishing, snowmobiles and shoreline construction. Table 2 presents the attributes and their levels in more detail. An example of the choice task is presented in Figure 1.

Table 2. Attributes in the choice experiment.

Attribute	Description	Current state	Levels
Size of the Saimaa ringed seal population	The Saimaa ringed seal is a highly endangered subspecies of the seal that lives only in Finland, in the waters of Saimaa. At its lowest point, the population was less than 200 individuals in the 1980s.	Currently the population is around 430 individuals.	<ul style="list-style-type: none"> • The population will stay at 430 • The population will increase to 600 • The population will increase to 800 • The population will increase to 1000
Duration of the net fishing ban	By banning net fishing in the most important habitats for Saimaa ringed seal cubs, the number of deaths due to fishing nets will be reduced.	Currently, net fishing is prohibited in nesting areas from 15 April to 30 June. As for vendace nets, the fishing ban ends on June 20. In addition, during open water season, the nets must be anchored and it is forbidden to lower the nets to the vertical wires. The use of gears dangerous for Saimaa Ringed Seal is prohibited all year round. The scope and duration of the net fishing ban can be changed by regulation.	<ul style="list-style-type: none"> • Stays as it is (15.4-30.6) • Extends until the end of July • Extends until the end of October • Lasts all year round
Motor vehicle ban on ice	Saimaa ringed seals are particularly sensitive to disturbances during the reproduction and fledging phase, especially motor vehicles are harmful to nesting.	Currently, motorized vehicles on ice are restricted in Saimaa national parks, in Lietvesi near Puumala and in Jänisselkä near Rääkkylä. The ban can also be extended elsewhere.	<ul style="list-style-type: none"> • Stays as it is (100 km²) • Area doubles to 200 km² • Area quadruples to 400 km²
Building sites available for construction along the shoreline	The construction of the shores of Lake Saimaa causes disturbances for the Saimaa ringed seal, and the constructed shores are not suitable for nesting areas. So far, approx. 30% of the seal's potential nesting area has been lost as a result of shoreline construction.	The construction along the shoreline can be restricted on zoned construction sites if they are located in nesting areas. Nowadays, construction is restricted if the seal nests closer than 800 meters from the construction site. It is possible to expand the construction restriction, which would reduce the number of beach construction sites available in Saimaa. Landowners will be compensated for the resulting losses.	<ul style="list-style-type: none"> • Stays as it is (7200) • Decreases by a quarter from the current (5600) • Decreases to half of the current (3600)
Cost, €	Additional conservation measures incur costs.		<ul style="list-style-type: none"> • 0 (current) • 10 • 20 • 50 • 100 • 200 • 500






		Nykytila	Skenaario A	Skenaario B
Norppakanta, yksilöä		Nykyisin n. 430	Tavoite: kanta 2-kertaistuu	Tavoite: kanta 2,5-kertaistuu
Verkkokalastuskiellon kesto		15.4.–30.6.	Pitenee heinäkuun loppuun	Pysyy nykyisellään
Moottoriliikennekielto jäällä, km ²		100 km ²	Pysyy nykyisellään	4-kertaistuu
Rantarakennuspaikkoja käytettävissä		7200	Vähenee puolella nykyisestä	Vähenee neljänneksellä nykyisestä
Lisäkustannus sinulle verona vuosittain 10 vuoden ajan		0 €	100 €	10 €

Figure 1. Example of the choice task.

2.4. Statistical methods

Importance of cultural ecosystem services

In the analysis of the measures of seal related cultural ecosystem services, first, the descriptive information of the importance of various ecosystem services is presented. Second, the measures were grouped with factor analysis (Principal component method). The objective of factor analysis is to reduce the collection of variables into a smaller set of variables. These factors describe relationships and patterns among the original variables. Factors are formed by regrouping the original variables based on shared variance (Yong and Pearce 2013) to identify groups of variables that are associated with each other. The number of factors was determined based on their eigenvalues, with an eigenvalue higher than one as the limit. To ease the interpretation of the factors, they are rotated in factor analysis. Here, we used varimax rotation, which assumes that the factors are uncorrelated. The final importance values in the ecosystem service groups were obtained by calculating the factor scores in SPSS with the correlation method. To avoid a large number of missing values in factor scores, in the factor analysis, missing values in the importance ratings were replaced with mean values. The analysis produced two factors.

Third, to examine whether there are groups among the respondents whose opinions differ regarding the importance of ecosystem services, the values of the importance factors were analyzed with k-means cluster analysis. This analysis classifies respondents iteratively into multiple (k) clusters based on given measures, here the importance factors, such that respondents within the same cluster are as similar as possible, whereas respondents from different clusters are as dissimilar as possible. In k-means clustering, each cluster is represented by its center, which corresponds to the mean of the measures assigned to the cluster (e.g., Hair et al. 1998). The clusters were compared using the means of their importance factor scores. We continued the analysis by examining the socio-demographics of respondent clusters with logistic regression models.

Impacts of Saimaa ringed seal conservation on the recreational value of the Lake Saimaa

To assess the recreational value of Lake Saimaa and how Saimaa ringed seal conservation measures affect the value, a TC-CB model was estimated. Recreational visit frequency data has special features that need to be taken into account in the statistical estimation of the TC-CB model. First, the dependent variable, the number of visits, can have only integer values equal to or greater than zero, and second each individual in the data has multiple observations for the dependent variable due to the hypothetical future scenarios. To take these features into account, random effects Poisson regression model was applied as it allows only non-negative integer values and accounts for the possible correlation between the multiple observations of an individual. The random effects Poisson regression model allows also overdispersion, a feature commonly observed in recreational demand data (Whitehead et al. 2013). Estimating the model provides a demand function of recreation visits as an exponential function of explanatory variables.

$$y_i = e^{(\beta_0 + \beta_{TC}TC + \beta_1x_1 + \dots + \beta_nx_n + \beta_{Seal}Seal + \beta_JNFB_{July} + \beta_{yr}NFB_{Year})}$$

, where TC is the travel cost variable, x_1-x_n are other explanatory variables included in the model, and Seal, NFB_{July} and NFB_{Year} represent the hypothetical scenarios of the increase in the Saimaa ringed seal population, and extension of the net fishing ban until end of July (NFB_{July}) or year around (NFB_{Year}). Based on the estimated demand function the economic value of a recreation visit can be calculated with the formula $-1/\beta_{TC}$ (Haab and McConnell 2002). The economic value of a recreational visit represents the amount individuals are at maximum willing to pay for the visit.

The explanatory variables in the models included travel costs, age, gender, residency in the Saimaa region, having access to a leisure home in the Saimaa region, and an interaction variable between the travel costs and residency in the Saimaa region. The descriptive statistics of these variables are presented in Table 3.

Table 3 Explanatory variables in the travel cost – contingent behavior model (n=557)..

Variable	Definition of the variable	Mean (Std. Dev)
TC, EUR/person	Round trip travel costs to Lake Saimaa, EUR/person	27.59 (53.88)
TC_local	Round trip travel costs to Lake Saimaa, EUR/person, for locals	7.48 (17.70)
Age	Age in years	58.01 (14.48)
Gender (1=female)	1 = female, 0 = male	0.59 (0.49)
Local	1 = Lives in the Saimaa region, 0 = Lives in other parts of the country	0.76 (0.43)
Has a leisure home in the Saimaa region	1 = Has access to a leisure home in the Saimaa region, 0 = Does not have access to a leisure home in the Saimaa region	0.39 (0.49)

The travel cost variable is defined as follows. For those who typically travel to lake Saimaa with a private car or a private boat travel costs are defined as round trip distance from a respondent's home to their most typical recreational recreation by the Lake Saimaa multiplied with a respective kilometer allowance (EUR 0.46/km for private cars, EUR 0.80/km for a motorboat (Veronmaksajat 2022)). For

those who typically walk or cycle to Saimaa, the travel costs were set to zero. To obtain travel costs per person, travel costs were divided by the travelling party size. Finally, to account for the fact that the visits might have had also other purposes than recreation by the lake Lake Saimaa (e.g. visiting friends or relatives), the travel cost variable was weighted with responses to a survey question “How important part recreation by lake Saimaa was to your visit?” with weights ranging from 0.1 (only a small part of the purpose of the visit) to 1 (the only purpose of the visit). To study, whether the impact of travel costs on the number of visits and consequently the economic value of a visit differs between those who live in the Saimaa region and those who live in the other parts of the country, also an interaction variable (TC_local) between TC and being a local was added in the model.

Preferences for Saimaa ringed seal conservation scenarios

To examine respondents’ preferences for Saimaa ringed seal population size and different conservation measures, a mixed logit (MXL) model was used. MXL takes respondent heterogeneity into consideration by allowing coefficients to differ across the respondents according to a pre-specified distribution. MXL can be used to estimate any discrete choice model and it relaxes the assumption of the independence of irrelevant alternatives (IIA) related to multinomial and conditional logit models (Train 2003). In MXL model, the probability of choosing alternative i is the expected value of the logit probability integrated over all different values of β , weighted by the mixing distribution $f(\beta)$ (Hensher, Rose & Greene 2005):

$$P_{ni} = \int \left(\frac{e^{\beta'x_{ni}}}{\sum_{j=1}^J e^{\beta'x_{nj}}} \right) f(\beta) d\beta$$

Typically, $f(\beta)$ is specified as continuous, and it can follow any distribution, for example normal, log-normal or uniform distribution.

3. Results

3.1. Importance of cultural ecosystem services

Respondents evaluated how important seal associated ecosystem services were for them (Figure 2). Existence values and symbolic meaning of seal were emphasized in the responses. Although recreation, tourism and services related to observing seals were less important, their rates were above the midpoint of the scale.

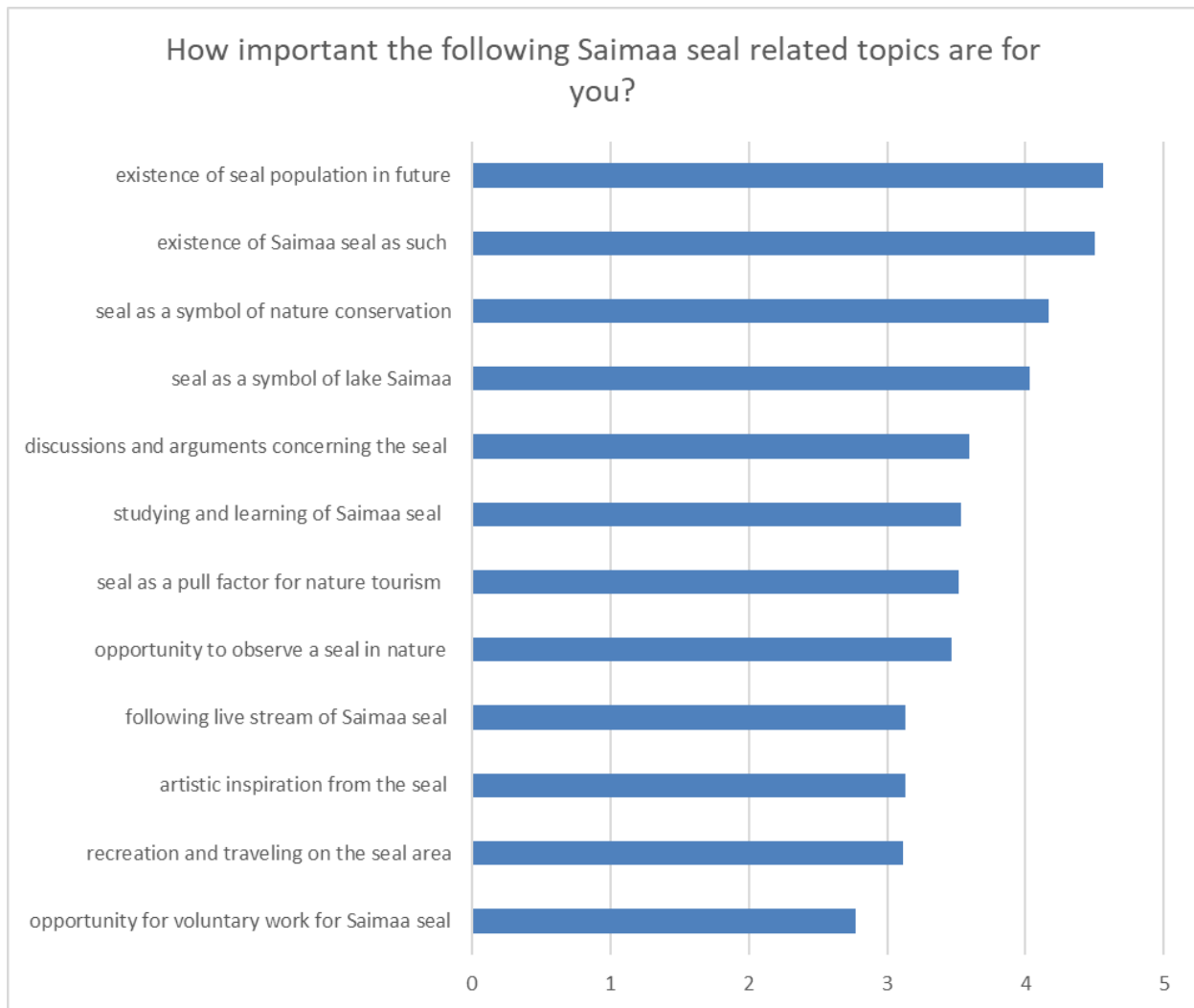


Figure 2. Importance of various cultural ecosystem services related to Saimaa seal.

Table 4. Factors of perceived cultural ecosystem services.

Cultural ecosystem services	Component 1: use	Component 2: non-use
recreation and traveling on the seal area	0.770	0.114
opportunity to observe a seal in nature	0.722	0.281
artistic inspiration from the seal	0.710	0.328
studying and learning of Saimaa seal	0.652	0.497
seal as a symbol of lake Saimaa	0.421	0.716
seal as a symbol of nature conservation	0.362	0.804
existence of Saimaa seal as such	0.208	0.898
existence of seal population in future	0.196	0.898
discussions and arguments concerning the seal	0.532	0.542
following live stream of Saimaa seal	0.687	0.321
seal as a pull factor for nature tourism	0.627	0.270
opportunity for voluntary work for Saimaa seal	0.769	0.210

The factor analysis (Table 4) revealed two separate factors of the seal related cultural services i.e. it shows how ecosystem services group together. The first factor was composed of activities related to

seal such as recreation, observing, artistic inspiration, voluntary work. The second factor is related to existence values and symbolic meaning. The factor scores were used to classify respondents. The solution of three clusters clearly described the differences between clusters (Table 5). Half of the respondents, the first cluster, stressed use values but also non-use values was represented as the mean factor score was above zero. The second cluster, over a third of the respondents, emphasized non-use values. For 14% of respondents, neither non-use nor use values were as important as to others. Table 5 also presents the means of the importance of cultural services showing highest importance for all the services in Cluster 1. Cluster 2 emphasizes the importance of Seal as a symbol and the existence of seal and the population in future. In Cluster 3 importance is under the midpoint (3) of the range in almost all the cultural services.

Table 5. K-means clustering results.

	Cluster 1	Cluster 2	Cluster 3
Use related services (mean factor score)	0.750	-0.864	-0.370
Non-use related services (mean factor score)	0.180	0.506	-1.920
Cluster size, number of respondents	731	544	212
Cluster size, %	49	37	14
Importance of various cultural ecosystem services related to Saimaa seal in Clusters	Mean	Mean	Mean
recreation and traveling on the seal area	3.8	2.5	2.5
opportunity to observe a seal in nature	4.1	3.0	2.6
artistic inspiration from the seal	3.7	2.7	2.2
studying and learning of Saimaa seal	4.1	3.2	2.4
seal as a symbol of lake Saimaa	4.6	4.0	2.6
seal as a symbol of nature conservation	4.6	4.3	2.6
existence of Saimaa seal as such	4.8	4.7	3.0
existence of seal population in future	4.8	4.8	3.1
discussions and arguments concerning the seal	4.1	3.4	2.4
following live stream of Saimaa seal	3.8	2.6	2.1
seal as a pull factor for nature tourism	4.1	3.1	2.7
opportunity for voluntary work for Saimaa seal	3.5	2.1	2.0

Logistic regression was used to model the membership in the clusters obtained by the k-means clustering. The respondents in Cluster 1, who expressed both use and non-use services to have high importance, were more often female respondents (Table 6). Higher age and lower income associated positively with the cluster membership. These respondents typically had spent their childhood in an urban area and were more often the voters of green or left-wing parties. In this group, people living by Lake Saimaa as well as visitors of Lake Saimaa were overrepresented. Respondents having seal observations were more typical in this cluster than in the other two clusters. In Cluster 2 perceiving only non-use benefits younger respondents with higher education were over-represented. Typically, they did not have Saimaa visits or experiences of seeing the seal. Respondents in Cluster 3 who did not perceive seal related ecosystem services as important as others, were more often lower educated and male respondents. Landowners by Saimaa were over-represented in this group.

Table 6. Logistic regression for modelling the membership in the clusters.

	Cluster 1: Use and non-use values	Cluster 2: Only non-use values	Cluster 3: Less importance
	Coef. (p-value)	Coef. (-p-value)	Coef. (-p-value)
Female gender	0.451 (0.000)	0.036 (0.755)	-0.963 (0.000)
Age	0.013 (0.001)	-0.010 (0.012)	-0.006 (0.286)
High education	-0.188 (0.117)	0.360 (0.003)	-0.332 (0.052)
Income, personal monthly net 1000 €	-0.064 (0.091)	0.077 (0.039)	-0.022 (0.673)
Childhood living env. rural	-0.237 (0.037)	-0.071 (0.534)	0.575 (0.000)
Political party green and left	0.336 (0.008)	0.070 (0.584)	-1.048 (0.000)
Conservation organization member	0.590 (0.000)	-0.177 (0.242)	-1.461 (0.000)
Home by Saimaa	0.369 (0.012)	-0.179 (0.239)	-0.429 (0.049)
Land owned by Saimaa	-0.415 (0.038)	0.013 (0.955)	0.755 (0.007)
Saimaa visitor	0.651 (0.000)	-0.610 (0.000)	-0.180 (0.418)
Seal observations	0.531 (0.000)	-0.581 (0.000)	-0.018 (0.930)
Constant	-1.332 (0.000)	0.036 (0.886)	-0.655 (0.057)
Chi-square	187.5	110.8	149.1
Sig.	<0.000	>0.000	0.000
N	1487	1487	1487
Pseudo R2	0.158	0.098	0.171
Predicted correct (Cut value 0.5)	65.4	65.3	85.7

3.2. Recreational benefits of the Saimaa ringed seal conservation

Table 7 shows the share of the respondents who had visited the Lake Saimaa for recreation in the past 12 months, over 12 months ago but under 5 years ago, and over five years ago. As expected, the share of the visitors is high among those living or having access to a leisure home in the Saimaa region and lower among those who do not have such attachment to the area. The subsequent results on the volume of the recreational visits are based on the respondents who had visited the Lake Saimaa in the past 12 months.

Table 7. Recreational visitation by the Lake Saimaa

	All	Residents of the Saimaa region	Leisure home in the Saimaa region	No connection to the Saimaa region
	%	%	%	%
Have you visited the Lake Saimaa for recreational purposes?				
Yes, in the past 12 months	41.02	76.59	84.27	12.44
Yes, over 12 months ago but under 5 years ago	12.78	11.87	9.79	13.65
Yes, over 5 years ago	19.37	6.34	3.5	29.59
No	26.83	5.2	2.45	44.32
N	1487	615	286	828

Table 8 shows frequency of recreational visits to Lake Saimaa for those respondents who had visited Lake Saimaa for recreational purposes in the past 12 months. To provide insights on the visitation by different visitor groups, the visit frequency is presented separately for all visitors, those who live in the Saimaa region, those who have a leisure home in the region and for those who have no connection to the Saimaa region (i.e. do not live in the region nor have a leisure home there). Among all visitors, 14% reported they visit the Lake Saimaa and its shoreline daily on their free time (Table 5). Those who live in the region were the most active visitors as expected.

Table 8. Frequency of recreational visits to the Lake Saimaa

	All (n=610)	Lives in the Saimaa region (n=471)	Has a leisure home in the Saimaa region (n=241)	No connection to the Saimaa region* (n=103)
Daily	14%	18%	15%	1%
Weekly	31%	39%	40%	0%
Monthly	24%	26%	29%	9%
More rarely	31%	17%	16%	90%

*Does not live in the Saimaa region, nor has a leisure home in the region

Table 9 presents the mean and median number of visits by the same groups as above¹. Among all Saimaa recreational visitors, the average number of recreational visits in the past 12 months was 120 per person that is 2.3 visits a week. The average ranges from four visits per person by those who live outside the Saimaa region and do not have a leisure home in the region to 151 visits by visitors living in the area. While the average values are rather high, the median values are smaller indicating that a small proportion of very high visitation frequency have large impact on the average value.

¹ In order to remove erroneous and outlier observations, the visit frequency data was limited to observations with values smaller than or equal to 1825, i.e. to observations with at maximum four visits per day (15 observations were removed). In addition, the observations of the residents of the Saimaa region were limited to observations for which the distance from home to respondents' typical recreational site is at maximum 234 km, which is the distance between Joensuu and Lappeenranta, the northernmost and the southernmost towns by the Saimaa (7 observations was removed). In addition, 31 observations with infeasible combinations of visit frequency and distance (such as 365 visits a year and distance over 200 km) to recreational site to lake Saimaa were removed from the data.

Table 9. Number of visits to the Lake Saimaa in the past 12 months

Sample	All (n=579)	Lives in the Saimaa region (n=444)	Has a leisure home in the Saimaa region (n=221)	No connectio n to the Saimaa region* (n=102)
Mean (<i>S.d.</i>)	120 (221)	151 (238)	138 (239)	4 (8)
Median	36	52	52	2

*Does not live in the Saimaa region, nor has a leisure home in the region

**One outlier observation (number of visits 1095) was removed from the data. If that was included, the average would be 15 and the standard deviation 108. Removing the observation does not impact the median

Due to the approach the visit frequency questions were set, the reported number of visits by those owning a leisure home in the region, might be an overestimate of the actual number of visits, if, for example, someone who visits their leisure home weekly in the summer season, but never in wintertime reported that they visited Saimaa every week. Unfortunately, the data does not allow the investigation of seasonal visitation and the possible overestimation.

Tables 10-12 show the distribution of the answers to the questions on how the hypothetical future scenarios would impact visitors' visit frequency in the future. Most of the visitors (83%) reported that they would visit the Saimaa and its shoreline as often as currently if the Saimaa ringed seal population increased 2.5-fold, 14% stated that they would visit the lake more often than currently, and 2% less often than currently. Those living outside the Saimaa region were most positively responsive to the increase in the population: 22% reported that they would visit the Saimaa more often than now if the seal population increased.

Extending the ban on net fishing until the end of July or year around had a smaller impact on the expected number of visits in the future. Over 90% of the visitors reported that they would visit the lake during their free time as often as now if the ban was to be extended until the end of July (Table 10), 5% reported they would visit the lake less often than now. Respondents who have a leisure home in the region reported slightly more often than others that they would visit the lake less frequently if the ban was extended. The distribution of the answers to the question on the impact of extending the ban to be year-round was similar.

Table 10. Impacts of the hypothetical future scenarios on the visit frequency. Scenario: Saimaa ringed seal population increases 2.5 fold

Sample	All	Lives in the Saimaa region	Has a leisure home in the Saimaa region	No connection to the Saimaa region
As often as now	83%	84%	86%	76%
More often	14%	13%	11%	22%
Less often	2%	3%	3%	2%
N	610	471	241	103

Table 11. Impacts of the hypothetical future scenarios on the visit frequency. Scenario: Extending the ban on net fishing until the end of July

Sample	All	Lives in the Saimaa region	Has a leisure home in the Saimaa region	No connection to the Saimaa region
As often as now	92%	91%	91%	94%
More often	3%	3%	1%	4%
Less often	5%	6%	9%	2%
N	295	228	110	49

Table 12. Impacts of the hypothetical future scenarios on the visit frequency. Scenario: Extending the ban on net fishing year-round

	All	Lives in the Saimaa region	Has a leisure home in the Saimaa region	No connection to the Saimaa region
As often as now	90%	89%	89%	94%
More often	5%	6%	3%	4%
Less often	4%	5%	8%	2%
N	315	243	131	54

Tables 13-15 present the mean and median number of the expected trips within 12 months under the hypothetical future scenarios². For all the groups except for the respondents having a leisure home in the region, the mean number of visits would increase by a few visits if the seal population increased 2.5-fold. Those having a leisure home in the area would make on average as many visits as earlier. The median number of visits would stay at its current level for all except the respondents living in the area whose median number of visits would increase.

When looking at the entire dataset, extending the net fishing ban would reduce the mean number of visits by five visits a year regardless of the length of the extension, but the median number would stay at the current level. Also, for respondents living in the region, the mean number of visits would decrease by a few visits under both scenarios. For respondents having a leisure home in the region, the mean number of visits would even increase if the net fishing ban was extended until the end of July while it would decrease if the ban was extended to year around. However, the median would decrease in the net fishing ban July scenario indicating that few observations with high number of visits probably increase the mean. For respondents who do not have a connection to the region, the net fishing ban scenarios would change the mean number of visits by one or two visits to one direction or another, while the median would stay at its current level.

Table 13. Number of visits to the Lake Saimaa in a year if the Saimaa ringed seal population increases 2.5 fold

Sample	All	Lives in the Saimaa region	Has a leisure home in the Saimaa region	No connection to the Saimaa region
Mean	123	155	138	5
SD	226	248	239	9
Median	36	60	52	2
N	577	444	221	101

Table 14. Number of visits to the Lake Saimaa in a year if the If the ban on net fishing is extended until the end of July

Sample	All	Lives in the Saimaa region	Has a leisure home in the Saimaa region	No connection to the Saimaa region
Mean	115	143	152	3
SD	221	243	300	4
Median	36	52	48	2
N	276	212	99	47

² In order to remove erroneous and outlier observations, the visit frequency data was limited to observations with values smaller than or equal to 1825, i.e. to observations with at maximum four visits per day (15 observations were removed). In addition, the observations of the residents of the Saimaa region were limited to observations for which the distance from home to respondents' typical recreational site is at maximum 234 km, which is the distance between Joensuu and Lappeenranta, the northernmost and the southernmost towns by the Saimaa (7 observations were removed). In addition, 31 observations with infeasible combinations of visit frequency and distance to one's recreational site at the Lake Saimaa (such as 365 visits a year and distance over 200 km) were removed from the data.

Table 15. Number of visits to the Lake Saimaa in a year if the If the ban on net fishing is extended year round

Sample	All	Lives in the Saimaa region	Has a leisure home in the Saimaa region	No connection to the Saimaa region
Mean	115	147	110	6
SD	209	228	157	10
Median	36	60	52	2
N	300	232	122	53

The effects of Saimaa ringed seal conservation measures on the recreational use of Saimaa can be assessed based on the changes in the number of visits, but if the benefits are to be compared with the monetary costs of the conservation measures, the monetary value of the changes in the recreational use needs also be assessed. Thus, travel cost – contingent behavior model was estimated. Results for the random effects Poisson models are presented in Table 16. The models explain the number of recreational visits respondents take to Saimaa within 12 months with the travel costs of the visits, the socio-demographic explanatory variables and the hypothetical scenarios of an increase in the Saimaa ringed seal population and extension of the net fishing ban until the end of July of year around. The model enables estimating the economic value of the recreational visits separately for respondents living in and outside the region.

Table 16. Random effects Poisson models for the number of recreational visits to the Lake Saimaa

Independent variables	Coefficient
Travel costs (EUR per person)	-0.0044***
Travel costs_lives_in_the_Saimaa_region	-0.0178***
Age (years)	0.0117**
Gender (1 = female)	-0.1951*
Lives in the Saimaa region (1 = yes)	1.7107***
Has a leisure home in the Saimaa region (1 = yes)	0.4047***
Seal 2.5x	0.0271***
NetFishBan_July	-0.0347***
NetFishBan_Year	-0.0250***
Constant	2.6938***
Alpha	1.7114***
Log likelihood	-9939.07
Number of observations	1662
Number of groups	557

***p-value<0.01, **p-value<0.05

As expected, the travel costs affect the number of trips negatively and statistically significantly: the higher the travel costs the fewer visits are taken. As expected, those who live in the Saimaa region and those who have a leisure home in the region made more visits than others. The statistically significant coefficient for the interaction variable TC_lives_in_the_Saimaa_region indicates that the visit frequency is more sensitive to travel costs for respondents living in the Saimaa region than for those living in other parts of the country. In the Saimaa region, the number of visits is probably influenced a lot by whether one lives right by the lake, where it is easy to visit the lake even several times a day, or whether one lives tens of kilometers away, in which case the number of visits may be significantly smaller. Those who visit Saimaa from other parts of the country make perhaps a few visits each year,

for example to a summer cottage, to relatives or to a tourist destinations, in which case the distance to Saimaa might not affect the number of visits so much.

Also, older age and male gender increases the number of visits. The variables Seal 2.5x, NetFishBan_July, NetFishBan_Year present the hypothetical scenarios, and their coefficients indicate that they have statistically significant impact on the number of visits. Increase in the Saimaa ringed seal population increases the number of visits, while extension of the net fishing ban would decrease the number of visits. Based on a wald test (p-value 0,000), the coefficients for NetFishBan_July and NetFishBan_Year do not differ statistically significantly from each other, indicating that the two net fishing ban extension scenarios have similar effects on the visit frequency.

The modelling results can be used to calculate the number of visits for those living in and outside of the Saimaa region under the scenarios. These predictions are presented in Table 17. For both groups, increasing the Saimaa ringed seal population would increase the recreational visits per person on average by 1 to 4 visits and extending the net fishing ban decrease the visits on average by 1-4 visits per person per year.

Table 17. Predicted number of visits in the past 12 months and under the hypothetical future scenarios

Scenario	Lives in the Saimaa region	Lives in other parts of the country*
Past 12 months	131	27
Seal population 2.5x	135	28
Fishing ban July	127	26
Fishing ban year	128	26

*Respondents in this group might have a leisure home in the Saimaa region

The models also enable the estimation of the economic value of a recreational visit. They are presented in Table 18. The economic value presents the maximum amount an individual would be willing to pay for a recreational visit to the lake Saimaa. According to these modelling results it varies from EUR 45 per visits for respondents living in the Saimaa region to EUR 230 for those living in the other parts of the country.

Table 18. Economic value per visit

Group of respondents	Economic value/visit, EUR/person
Respondents who live in the Saimaa region	45
Respondents who live outside the Saimaa region	230

Multiplying the per visit values with the predicted number of visits in each scenario yields an estimate of the annual recreational value of Lake Saimaa per person under the different scenarios (Table 19). For both of the groups, increasing the Saimaa ringed seal population would increase the recreational value of Lake Saimaa, while extending the net fishing band would decrease it. The changes in the annual recreational value of Lake Saimaa due to the scenarios are of similar size for both groups. This can be explained by the high per visit value and low visit frequency for those living outside the Saimaa region and in contrast, the lower per visit value and high visit frequency for the locals.

Table 19. Economic value of recreational visits to Lake Saimaa, €/person/year

	For respondents living in the Saimaa region	For respondents living in other parts of the country
Scenario	€/person/year (change in the value compared to the value in the past 12 months)	€/person/year (change in the value compared to the value in the past 12 months)
Past 12 months	5 940	6 192
Seal population 2.5x	6 103 (+163€ (3%))	6 362 (+170€ (3%))
Net fishing ban July	5 737 (-203 € (-3%))	5 981 (-211€ (-3%))
Net fishing ban year	5 793 (-147€ (-2%))	6 039 (-152€ (-2%))

3.3. Preferences for Saimaa ringed seal conservation scenarios

Table 20 presents the results for MXL model. The cost of conservation program affected respondents' choices as expected. Increasing cost decreased the likelihood of choosing an alternative. The cost interaction variable for those respondents who had been to the Lake Saimaa for recreation in the last 12 months, i.e. recreational users, had a small positive coefficient. This means that the conservation program cost had a slightly smaller negative effect for recreational users' choices of preferred conservation programs, and they were willing to pay more for the conservation programs than the non-users.

All levels of increases for Saimaa ringed seal population were significant and positive, indicating a strong preference for larger seal population. However, the largest population level (1000 seals) had negative interaction for visitors, hence for recreational users, the benefit from the seal population of 1000 seals was actually smaller than from seal population of 800.

Extending the net fishing ban from the end of June until the end of July was preferred by all respondents, but the preferences for longer bans differed between recreational users and non-users. Extending the ban until the end of October had positive effect on the utility for non-users and vice versa a negative effect for users, whereas extending the ban for all year had a negative effect for all respondents, but the disutility was twice as high for users compared to non-users.

Expanding the motor vehicle ban on ice from the current 100 km² to 200 km² did not have an effect but increasing the size to 400 km² had a negative effect on the respondents' choices. The preferences related to the tested motor vehicle ban did not differ between those respondents who had visited Lake Saimaa for recreation during the past year and those who had not. Interaction variable was tested in the model, but it was dropped as it was not significant.

Decreasing the number of available building sites along the shoreline was perceived as positive by all respondents. Decreasing the number of sites by quarter was preferred by non-users over decreasing the number to half. This was reversed for recreational users, who had a stronger preference for decreasing the number of possible building sites by half.

Beyond the effect of the attributes, there was no clear preference for either choosing conservation program or the current state, as shown by non-significant coefficient for alternative specific constant for status quo level (ASC SQ).

Table 20. Mixed logit model with interactions (N=1487)

Attribute	Level	Mean	S.E	Standard deviation	S.E
ASC(SQ)		-0.285	0.176		
Cost, €		-0.012 ***	0.001		
Saimaa ringed seal population	600	0.589 ***	0.176	2.536***	0.196
	800	0.916 ***	0.180	2.645***	0.194
	1000	1.414 ***	0.194	3.025***	0.218
Duration of the net fishing ban	Until end of July	0.633 ***	0.137	2.921***	0.215
	Until end of October	0.322 *	0.143	3.052***	0.240
	All year	-0.657 ***	0.158	3.176***	0.249
Motor vehicle ban on ice	Area doubles to 200 km ²	0.114	0.098	2.637***	0.206
	Area quadruples to 400 km ²	-0.280 **	0.100	2.178***	0.181
Building sites available for construction along the shoreline	Decrease by one quarter (5400)	0.457 ***	0.123	2.829***	0.203
	Decrease to half (3600)	0.398 **	0.123	2.443***	0.189
Interactions for recreational users	Level	Mean	S.E.		
Cost, €		0.002*	0.001		
Saimaa ringed seal population	600	-0.338	0.212		
	800	0.147	0.213		
	1000	-0.593*	0.233		
Duration of the net fishing ban	Until end of July	-0.242	0.195		
	Until end of October	-0.693**	0.215		
	All year	-0.667**	0.221		
Motor vehicle ban on ice	Area doubles to 200 km ²	n.a.			
	Area quadruples to 400 km ²	n.a.			
Building sites available for construction along the shoreline	Decrease by one quarter (5400)	-0.402*	0.183		
	Decrease to half (3600)	-0.146	0.179		

***, ** and * refer to 0.001, 0.01 and 0.05 significance levels, respectively.

Willingness to pay (WTP) estimates were calculated for two different conservation scenarios (Table 21). WTPs were based on the mixed logit model, and they can be calculated as the negative ratio between attribute coefficient and cost coefficient. The first conservation scenario contained the highest levels for all attributes. WTP for non-visitors was EUR 72.91, whereas for visitors it was EUR -38.50 indicating disutility from the scenario. The second scenario was moderate, containing smaller changes in attributes. WTPs for this scenario were EUR 139.91 for non-visitors and EUR 127.70 for visitors.

Table 21. Willingness to pay for different conservation scenarios, EUR.

Scenario	Recreational users	Non-users
High <ul style="list-style-type: none"> - Seal population 1000 seals - Net fishing ban all year - Motor vehicle ban on ice 400km² - Building sites decreased to half 	-38.50	72.91
Moderate <ul style="list-style-type: none"> - Seal population 600 seals - Net fishing ban until end of July - Motor vehicle ban on ice 200km² - Building sites decreased by one quarter 	127.70	139.91

4. Discussion and conclusion

The survey data revealed the importance of Saimaa ringed seal as a source of cultural ecosystem services. The existence and symbolic values were emphasized. The perceived cultural ecosystem services were used to identify different citizen segments. Although the majority emphasized the importance of seals, half due to use and non-use values and over one third because of non-use values, there was a segment of citizens who did not perceive neither non-use nor use values as important others. Saimaa visitors and residents were emphasized among those who perceived wide variety of cultural services while landowners were overrepresented in the last group of lower importance of cultural services. Differing values of landowners are most probably associated with the perceived land use restrictions due to conservation.

The effects of the Saimaa ringed seal conservation measures on the recreational value of the Lake Saimaa were studied based on survey data and statistical modelling to examine, how growth in the Saimaa ringed seal population and the extension of the net fishing ban would affect the number and monetary value of recreational visits to Saimaa. Based on the statistical model, a 2.5-fold increase in the population of the Saimaa ringed seal would increase the number of recreation visits per person on average 1-4 visits a year. Extending the fishing ban would reduce the recreational visits of Saimaa residents by an average of 1-4 visits per person, depending on the length of the extension. In monetary terms, the growth of the Saimaa ringed seal population by 2.5-fold would increase the recreational value of Lake Saimaa on average by EUR 163-170 per person per year. The extension of the net fishing ban until the end of July or year around would decrease the recreational value on average by EUR 147-211 per person per year. Surprisingly, in the statistical model, there was no statistically significant difference in the effect on the recreational value of whether the fishing ban was extended until the end of July or throughout the year. At least partly, this may be explained by the survey design in which each respondent was presented with only one of the scenarios to reduce the response burden. Thus, respondents were not asked to compare the impacts of the two scenarios on their behavior. It is also possible that the differences between the scenarios would be larger if the analysis was focused on respondents who fish at Lake Saimaa.

When interpreting the results, it is good to note that the majority of the respondents stated that the presented scenarios would not affect their number of recreational visits to Saimaa. In the entire dataset, 83% stated that if the population of the Saimaa ringed seal increased by 2.5-fold, they would visit Saimaa as often as they do now, and 90-92% if the net fishing ban was extended. Thus, the studied scenarios would affect the recreational visits of a relatively small number of people. In addition, recreational benefits of the seal population growth might be underestimated because the analysis

concerned only respondents who had made at least one recreational visit to the lake Saimaa in the last 12 months, and thus the results do not tell whether growth in the Saimaa ringed seal population could attract new visitors among people who are not currently visiting the area. The results of the choice experiment reveal also non-visitors' valuations of increased Saimaa ringed seal population, although not specifying whether their values are related to potential future recreational use of Saimaa.

The economic value of a single recreational visit to Lake Saimaa was estimated to range between EUR 45 for people living in the Saimaa region to EUR 230 for people living in other parts of the country. The values are well in line with the range of the results of previous studies that have estimated economic value of recreational visits to nature areas in Finland. Tienhaara et al. (2021) estimated the economic value of a recreational visit to Lake Puruvesi in Saimaa separately for visitors walking or cycling to the area, EUR 0.30/visit/person, and for others, EUR 70/visit/person. Other previous estimates from Finland include for example, economic value of a visit to Baltic Sea EUR 70-90/Visit/person (Czajkowski et al. 2015, Ahtiainen et al. 2022), visit to River Teno EUR 240-340/visit/person (Pokki et al. 2018), visit to Oulanka National Park EUR 320-360/visit/person (Kosenius and Horne 2016), and visit to River Simo around EUR 60/visit/person (Juutinen et al. 2022).

The choice experiment revealed preferences for Saimaa ringed seal conservation scenarios. Finnish citizens had strong preference for increasing the seal population size. For those who had been to the Lake Saimaa for recreation in the last 12 months, i.e. recreational users, there seems to be a turning point for benefits perceived from increased population when the population more than doubles from the current. This might be related to concerns about what effects such a large increase in the population could have for the locals.

While respondents supported extending the net fishing ban by one month until the end of July, longer bans were, understandably, not preferred by recreational users as these bans would likely affect them quite strongly. The net fishing ban for all year did not receive support even from the non-users even though they did not have any personal fishing activities at stake. Based on the results, it seems that moderate extension for the ban is acceptable for both recreational users and non-users.

Interestingly, preferences for a motor vehicle ban on ice did not differ between recreational users and non-users as could have been expected. Doubling the current area of the ban did not affect respondents' utility but making it four times larger than the current one was perceived negatively. This result suggests that adding motor vehicle bans on nesting areas also outside of national parks would be a favored possibility for conservation as long as the total area banned does not grow too large.

The last conservation measure, i.e. limiting the number of available building sites along the shoreline, had contrasting results for recreational users and non-users. Recreational users preferred stronger limitations meaning decreasing the number of sites to half from current, whereas non-users preferred decreasing the number of sites by a quarter. Recreational users' preference for stronger limitations could be due to the fact that many of them are locals and may already have property on the shorelines of Saimaa. Aversion towards more construction may relate to an interest in maintaining the peaceful environment or to keep the property values at a high level. However, all in all, limiting the number of building sites was seen as a positive conservation measure by all respondents.

Comparing the WTP estimates for two different conservation scenarios (moderate and high) it is clear that moderate program is preferred and it produces the highest benefits for Finnish citizens. The difference between the benefits from the two conservation scenarios were especially prominent for the recreational users for whom the program with strongest restrictions produced negative utility. As

the benefits from the moderate conservation program were higher compared to high program also for non-users, the actual shares of recreational users and non-users do not have an effect for the result.

Next in the project, we will analyze in detail the results of the survey data for those respondents who have gone fishing at Lake Saimaa in their free time. The goal is to study current fishing behavior and how expanding net fishing restrictions would affect their fishing choices such as fishing frequency, target species or fishing gear used. The results reported here facilitate the cost-benefit analysis (CBA) of conservation measures for Saimaa ringed seal. The perceived benefits from this study will be compared with the costs of conservation measures including the costs of Saimaa ringed seal conservation faced by fishermen. CBA will reveal how the costs and benefits will be distributed among different groups of people.

References

- Ahtiainen, H., Lankia, T., Lehtonen, J., Bertram, C., Meyerhoff, J., Pakalniete, K., Rehdanz, K., & Pouta, E. 2022. Welfare effect of substitute sites for coastal recreation – evidence from the Baltic Sea. *Journal of Environmental Economics and Policy* 11, 375-395.
- Bertram, C., Ahtiainen, H., Meyerhoff, J., Pakalniete, K., Pouta, E., & Rehdanz, K. 2019. Contingent behavior and asymmetric preferences for Baltic Sea coastal recreation. *Environmental and Resource Economics* 75, 49-78.
- Czajkowski, M., Ahtiainen, H., Artell, J., Budzinski, W., Hasler, B., Hasselström, L., Meyerhoff, J., Nömmann, T., Semenieni, D., Söderqvist, T., Tuhkanen, H., Lankia, T., Vanags, A., Zandersen, M., Zyllicz, T. & Hanley, N. 2015. Valuing the commons: An international study on the recreational benefits of the Baltic Sea. *Journal of Environmental Management* 156, 209–217.
- Czajkowski, M., Giergiczny, Kronenberg, J., & Englin, J. 2019. The individual travel cost method with consumer-specific values of travel time savings. *Environmental and Resource Economics* 74, 961-984.
- Egan, A., Rolfe, J., Cassells, S., & Chilvers, L. 2022. Potential changes in the recreational use value for Coastal Bay of Plenty, New Zealand due to oil spills: A combined approach of travel cost and contingent behaviour methods. *Ocean & Coastal Management* 228, 106306
- Haab, T.C & McConnell, K.E. 2002. *Valuing environmental and natural resources*, Edward Elgar, Cheltenham.
- Hair J.F. Jr., Black, W.C., Babin, B.J., Anderson, R.E. Tatham, R.L. 200. *Multivariate data analysis (sixth ed.)*, Prentice-Hall, Upper Saddle River, NJ USA.
- Hanauer, M. & Reid, J 2017. Valuing urban open space using the travel cost method and the implications of measurement error. *Journal of Environmental Management* 198, 50-65.
- Hanley, N., Mourato, S. & Wright, R. 2001. Choice modelling approaches: a superior alternative for environmental valuation? *Journal of Economic Surveys* 15(3): 435–462.
- Hensher, D., Rose, J. & Greene, W. 2005. *Applied choice analysis: a primer*. Cambridge University Press, Cambridge, UK.
- Juutinen, A., Immerzeel, B., Pouta, E., Lankia, T., Artell, J., Tolvanen, A., Ahtiainen, H., & Vermaat, J. 2022. A comparative analysis of the value of recreation in six contrasting Nordic landscapes using the travel cost method. *Journal of Outdoor Recreation and Tourism* 39, 100528.
- Kosenius, A-K. & Horne, P. 2016. Welfare effects of mining externalities: a combined travel cost and contingent behaviour study. *Journal of Environmental Economics and Policy* 5, 265-282
- Lankia, T., Neuvonen, M., & Pouta, E. 2019. Effects of water quality changes on the recreation benefits of swimming in Finland: Combined travel cost and contingent behavior model. *Water Resources and Economics* 25, 2-12.
- Lankia, T., Tienhaara, A. & Pouta, E. 2022. Survey data of Our Saimaa Seal Life. Deliverable submitted in 2022.

Pokki, H., Artell, J., Mikkola, P., Orell, P. & Ovaskainen, V. 2018. Valuing recreational salmon fishing at a remote site in Finland: a travel cost analysis. *Fisheries Research* 208, 145–156.

Tienhaara, A., Lankia, T., Lehtonen, O. & Pouta, E. 2021. Heterogeneous preferences towards quality changes in water recreation: Latent class model for contingent behavior data. *Journal of Outdoor Recreation and Tourism* 35, 100386.

Train, K. 2003. *Discrete choice methods with simulation*. Cambridge University Press, Cambridge, UK.

Veronmaksajat 2022. Kilometrikorvaukset 2022. <https://www.veronmaksajat.fi/Palkka-ja-elake/Kilometrikorvaukset/kilometrikorvaukset-2022/> Accessed 3.1.2022.

Whitehead, J., Johnson, B., Mason, D. & Walker, G. 2013. Consumption benefits of national hockey league game trips estimated from revealed and stated preference demand data. *Economic Inquiry* 51, 1012-1025.

Yong, A.G & Pearce, S. 2013. A beginner's guide to factor analysis: focusing on explanatory factor analysis. *Tutorials in Quantitative Methods for Psychology* 9, 79-94.

Zhang, F., Wang, X-H., Nunes, P.A.L.D., & Ma, C. 2015. The recreational value of gold coast beaches, Australia: An application of the travel cost method. *Ecosystem Services* 11, 106-114.