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# Abstract

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The restoration of peatlands and small water bodies (streams, ponds, and bird lakes) aims to restore the structure and function of these ecosystems, which have deteriorated primarily due to forestry, drainage, and eutrophication. Although restoration of peatlands and small water bodies is costly, it provides work opportunities, improved biodiversity and increased water quality, and may improve the recreational and tourism value of the area. Assessing the restoration costs in relation to the benefits and people's opinions about restoration helps to evaluate the socio-economic impacts and acceptance of restoration.

We studied the socio-economic impacts of restoration of peatlands and small water bodies through five case studies: 1) by assessing the financial costs and employment effects of restoration, 2) through a public survey focusing on citizens' general awareness, beliefs, and attitudes towards restoration at two time occasions, 3) through a nationwide survey concerning the willingness of people to pay for the restoration of peatlands and small water bodies, 4) through a nationwide survey concerning citizens' preferences and attitudes towards restoration in Finnish national parks, and 5) through a targeted questionnaire to the visitors of Nuuksio National Park in Southern Finland to assess how restoration would influence their visits in the national park.

The studies were carried out as part of the EU funded Hydrology LIFE project (LIFE16 NAT/FI/000583) which focuses on the restoration of peatlands and small water bodies in Finland.

The results show that the employment effects of the restoration can be significant if the restoration is carried out on a large scale, especially in remote areas. The public survey showed that there were no changes in knowledge or opinions towards restoration among citizens during the last five years. The majority of respondents considered that restoration of peatlands and small water bodies have positive effects on the nature and biodiversity and thus improves opportunities for recreational use. Interestingly, the respondents were ready to use more tax money for restoration.

The nationwide survey showed that the potential restoration programs considered in the study provided significant benefits or welfare effects, and the annual WTP values varied from €335 to €427 per household. There was a preference for large restoration programs over small ones, peatland restoration over small water bodies, and state-owned lands over private lands, whereas the proximity of restoration sites to the respondents' homes did not have a significant effect on restoration preferences. The survey on national parks in Finland revealed the restoration of peatlands and streams in national parks was widely accepted and important even though many of respondents were unaware of the previously restored areas or plans to be executed in the future. The respondents considered restoration actions more important than the increase of the number of trails and they would be willing to pay notably more to support conservation rather than park maintenance. The study on Nuuksio National

Park showed that a large proportion of the respondents would visit Nuuksio irrespective whether more peatlands or streams were restored, or whether nearby forests were joined to the national park or not. Therefore, the restoration does not seem to have an impact on nature tourism in the short term.

All in all, people tended to support restoration of peatlands and small water bodies and accepted the use of tax money to meet the restoration goals. Public opinion on restoration has seemed to stay relatively stable over the last years encouraging actions to be implemented all around Finland. Nevertheless, the large heterogeneity in survey responses underlines a need to consider the 'winners' and 'losers' of the restoration programs to increase the acceptance of restoration in society.

**Keywords:** citizen preferences, peatlands, ponds, restoration, small water bodies, streams, willingness to pay

# Contents

# 1. Introduction

The restoration of peatlands and small water bodies (streams, ponds, and bird lakes) aims to restore the structure and function of these ecosystems, which have deteriorated primarily due to forestry, drainage, and eutrophication.

The EU's restoration law may significantly increase the restoration of peatlands and small water bodies compared to current levels. According to the latest estimates (Räsänen et al. 2023), Finland would need to restore 1-3 million hectares of peatlands and 0.4-0.9 million hectares of small water bodies by 2050. The costs for peatland restoration during this period would be between 1.2 and 2.5 billion euros, and for small wate bodies between 1.2 and 1.6 billion euros.

Although restoration of peatlands and small water bodies is costly, it provides work opportunities and immaterial benefits, such as biodiversity and increased water quality, and may improve the recreational and tourism value of the area. Assessing the restoration costs in relation to the benefits helps to evaluate the socio-economic impacts of restoration.

People experience and value the benefits of restoration in different ways depending on their interests and values, and on available information on restoration. People's attitudes towards restoration may also change over time, especially when restoration efforts are increased. Hence evaluation of people's opinions at different time occasions provides information on potential changes in socio-economic impacts of restoration.

In Finland, the restoration of peatlands and small water bodies has been carried out predominantly in protected areas and national parks (Kareksela et al. 2021, Aapala et al. 2013). With the rising number of visitors in national parks, park management must balance biodiversity protection with recreational needs. Information on visitors' attitudes towards restoration assists in evaluating how effectively parks have succeeded managing biodiversity simultaneously with recreation.

We studied the socio-economic impacts of restoration of peatlands and small water bodies through five case studies:

1. by assessing the financial costs and employment effects of restoration
2. through a public survey focusing on citizens' general awareness, beliefs, and attitudes towards restoration at two-time occasions
3. through a nationwide survey concerning the willingness of people to pay for the restoration of peatlands and small water bodies
4. through a nationwide survey concerning citizens' preferences and attitudes towards restoration in Finnish national parks
5. through a targeted questionnaire to the visitors of Nuuksio National Park in Southern Finland to assess how restoration would influence their visits in the national park

The studies were carried out as part of the EU funded Hydrology LIFE project (LIFE16 NAT/FI/000583) which focuses on the restoration of peatlands and small water bodies in Finland.

# 2. Case 1: Financial costs and employment effects of restoration

## 2.1. Background and aim

The general aim was to provide information on costs and employment effects of restoration. Information on these socio-economic impacts can be used in targeting the restoration measures cost-effectively and also in developing socially desirable restoration programs.

We first analysed the direct costs and employment effects caused by peatland and small water body restoration. Then, we estimated the opportunity costs of restoration in terms of timber production. Finally, we elaborated how different factors influence the direct cost of restoration on peatlands.

## 2.2. Materials and methods

The analysis of direct costs and employment effects was done for restoration measures carried out on the state-owned land in Hydrology LIFE project. In the project, around 5 400 hectares of peatlands were restored in conservation areas and 242 hectares in commercial forests during 2017–2023. Tree removal from ditch lines was conducted at 72 sites, on a total of approximately 2 150 hectares. Trees were removed for sale from 49 sites. Streams were restored in 22 sites covering about 30.5 km. The surface of ponds was raised at eight sites (230 ha). (Metsähallitus 2023, unpublished data)

The employment effects were calculated based on project's realized personnel costs which were translated to person work years assuming €17.5 per hour salary, 7.5 hour per working day, and 235 working days per year. The employment effect related to the external assistance costs was roughly assessed using official input-output data 2020 provided by Statistics Finland. The transportation industry from the input-output table was selected to represent 'restoration industry'.

The opportunity costs of peatland restoration were assessed in terms of net present value (NPV) of timber production by using Motti simulations (Rana et al. submitted manuscript). The data included totally 2029 peatland stands from three different landscapes (Mujejärvi, Olvassuo, Salamajärvi). We simulated four management options for the stands including enhanced timber production, restoration, production of bioenergy, and no actions. Enhanced timber production was used as a reference option.

To get further insight we analyzed how different factors influence the cost of peatland restoration using data provided by Metsähallitus (Metsähallitus 2023, unpublished data). The data included originally 93 sites, but one site has missing values, and therefore, it was dropped from the final analysis.

We used a standard linear regression model in which the costs of restoration per hectare (€/ha) was the dependent variable (Table 1). The cost of restoration varied from €66.75/ha to $3 237.79/ha among the sites in the data. The explanatory variables can be seen in Table 1. Restored area (ha) was used to capture the potential scale effect. A dummy variable which captured influence of outliers (*DOut*) was also used following Juutinen et al. (2022a). In these outlier sites the cost of restoration were clearly higher than in the other sites.

**Table 1.** Variable description (n=92).

| Variable name | Description | Mean | S.D. | Min | Max |
|---|---|---|---|---|---|
| Cost | Cost of peatland restoration (€/ha) | 899.80 | 564.80 | 66.75 | 3 237.79 |
| Resto_ha | Restored area (ha) | 59.6 | 60.05 | 2.7 | 281.8 |
| TreeR_ha | Area of ditch lines from which trees have been removed (ha) | 23.0 | 34.6 | 0 | 190.3 |
| TreeS_ha | Area from which trees have been removed for timber sale (ha) | 14.4 | 24.7 | 0 | 130.2 |
| TreeS_m3 | Volume of removed trees for timber sale (m3) | 35.2 | 56.1 | 0 | 356.2 |
| Ran | Coastal region | 0.17 | 0.38 | 0 | 1 |
| Järvi | Lake region | 0.53 | 0.50 | 0 | 1 |
| Pohj | Northern Ostrobothnia and Kainuu | 0.22 | 0.41 | 0 | 1 |
| Lappi | Lapland | 0.09 | 0.28 | 0 | 1 |

## 2.3. Results

The total cost of restoration efforts conducted in the state-owned land were approximately €6.8 million (Table 2). External assistance accounted for the largest share of the costs (76%). The share of personnel and travel costs were 22.5%, whereas the share of the other costs was marginal (1,6%). Most costs were caused by restoration work and tree removal for sale. Planning costs were 9.5% and monitoring costs 1,2% of the total costs.

It is worth noting that the income from the timber sale (totally €3.4 million) was clearly higher than the costs of tree removal for timber sale.

**Table 2.** Costs of restoration of peatlands and small water bodies in state owned land by actions and cost categories (€). Source: Metsähallitus 2023, unpublished data.

| Action | Personnel | Travel | External assistance | Other[a] | Total |
|---|---|---|---|---|---|
| Restoration plans | 560 386 | 64 917 | 8 026 | 18 074 | 65 1403 |
| Restoration of peatlands in conservation areas | 434 906 | 103 863 | 2 843 577 | 23 692 | 3 406 038 |
| Tree removal for timber sale | 123 181 | 24 203 | 1 907 866 | 26 612 | 2 081 862 |
| Restoration of peatlands in commercial forest | 2 440 | 1 029 | 57 271 | - | 60 740 |
| Restoration of small water bodies | 122 096 | 25 168 | 366 266 | 25 610 | 539 141 |
| Monitoring after restoration | 56 222 | 16 587 | - | 11 554 | 84 363 |
| Total | 1 299 231 | 235 767 | 5 183 007 | 105 542 | 6 823 547 |

[a] Includes consumables and other costs.
Source: Metsähallitus 2023, unpublished data.

Personnel costs translated approximately to 42.1 person work years. Similarly, the external assistance costs translated to 40.9 persons per year. Including the multiplier effect resulted in 66.7 persons per year, respectively.

The results of opportunity costs analysis showed that with 2% interest rate NPV decreased 7.8% due to the restoration compared with the enhanced timber production. In contrast, with 3% and 4% interest rate the NPV increased 0.1% and 7.8%, respectively.

To analyse the determinants of restoration costs we estimated two model specifications (Table 3). In model 1, the area of removed trees for timber sale (*TreeS_ha*) and the volume of removed trees (*Trees_m3*) were treated as continuous variables. In model 2, a dummy variable was included (*DTreeS*) which equalled to one if trees were removed for sale at the site, and zero otherwise. In addition, we used interaction terms by multiplying this dummy variable with the area of removed trees for timber sale (*TreeS2_ha*) and the volume of removed trees (*TreeS2_m3*).

**Table 3.** Estimation results (n=92).

| Variable | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | **Coefficient** | **Standard error** | **Coefficient** | **Standard error** |
| Constant | ***792.495 | 67.882 | ***717.123 | 75.240 |
| DOut | ***1 466.21 | 248.831 | ***1 456.620 | 242.877 |
| Rest_ha | ***-3.397 | 0.826 | ***-3.578 | 0.673 |
| TreeR_ha | ***2.573 | 1.030 | ***2.731 | 0.939 |
| TreeS_ha | ***8.759 | 1.279 | | |
| TreeS_m3 | ***3.455 | 0.927 | | |
| DTreeS | | | ***258.056 | 94.865 |
| TreeS2_haa | | | ***6.603 | 1.038 |
| TreeS2_m3a | | | ***2.329 | 0.856 |
| Ran | 26.156 | 92.661 | 95.504 | 103.777 |
| Pohj | *-161.269 | 91.934 | -143.510 | 92.249 |
| Lappi | ***-346.600 | 82.637 | ***-369.154 | 71.027 |
| R-squared | 0.689 | | 0.711 | |

*, **, *** Significant at 10%, 5%, and 1% level. [a]Interaction term with the *DTreeS* dummy which equal to 1 for sites in which trees have been removed for timber sale.

The results of model 1 show that on average restoration of peatland site located in Lake region without tree removal cost about €792 per hectare (Table 3). The costs of the outlier sites were about €1 466 per hectare.

The scale effect was significant so that the larger the restoration area was the smaller were the unit costs. One hectare increase in the restoration area reduced the unit costs about €3.4.

In contrast, the tree removal increased costs. One hectare increase of tree removal from ditch lines increased the unit cost about €2.6. The increase was clearly higher (€8.7/ha) when trees were removed for timber sale. In addition, increase in the volume of removed trees for timber sale increased the unit costs (€3.5/$m^3$).

Restoration was less expensive in northern Ostrobothnia and Kainuu (€161) and Lapland (€346) compared with sites located the Lake region. The results of the model 2 were similar

to the results of model 1 except that the model 2 indicated higher unit costs for sites from which trees are removed for timber sale (€256).

## 2.4. Discussion

Restoration is costly. Most of the costs (89%) are caused by restoration measures such as ditch blocking and tree removals, but costs are also caused by planning and monitoring. Restoration also has employment effects. Restoration planning and monitoring etc. seem to employ relatively more people than the restoration measures performed as purchasing services. Carrying out restoration measures is largely capital-intensive machine work. However, the employment effects of the restoration can be significant if the restoration is carried out on a large scale.

In many restoration sites, the income from the sale of timber can significantly reduce the net cost of restoration. In addition, the opportunity costs of timber production may be negligible. The restoration with tree removal for timber sale may even be more profitable option than enhanced timber production, particularly at low interest rate level.

There is a large variation in the unit costs of peatland restoration among restoration sites. The unit costs depend, for example, the volume of removed trees. In the northern Finland the unit costs seem to be smaller than in the southern Finland. Importantly however the data used in the analysis do not include all relevant variables such as length of ditches for example, and therefore, the results may have suffered omitted variable bias.

# 3. Case 2: Citizens' awareness, beliefs, and attitudes towards restoration at two-time occasions

## 3.1. Background and aim

The general aim was to produce information about how citizens perceive restoration and how their views have changed during the project. It is important to know and understand citizens' views in order to develop and implement restoration measures and programs that are socially accepted.

We studied citizens' awareness, beliefs, and attitudes towards the restoration of peatlands and small water bodies through surveys conducted in the beginning and the end of the project.

## 3.2. Materials and methods

The surveys were carried out as a web-based surveys in spring 2018 and 2023. The surveys were openly accessible through Otakantaa.fi-website which is an online service maintained and produced by the Ministry of Justice as a channel of democratic influence. The surveys were advertised in social media (Twitter, Facebook) and in media releases. Notice that the survey respondents may not represent Finnish people in general.

The questionnaires included a total of 18 questions and a possibility for an open answer. The questionnaires were identical among years except for a question concerning EU restoration law that was added in 2023 ("*The objectives brought by the EU's restoration regulation are too high for Finland*").

At the beginning of the survey, respondents were asked whether they had any experience in peatland or small water body restoration. A 4-point scale *no experience – only a little experience – some experience – lots of experience* was used. The following 13 question represented statements related to the restoration, and a 5-point Likert scale *strongly disagree – somewhat disagree – neither disagree nor agree – somewhat agree – strongly agree* was used. Each statement also included an option *I do not know*. Finally, respondents were asked whether they own any agricultural or forestry land and how they obtained the information from the survey.

Number of responses was almost identical in both years, 198 in 2018 and 197 in 2023. The distribution of the responses were tested using a Chi-Square test to see whether there was any statistical difference between years 2018 and 2023.

## 3.3. Results

The results of the surveys were surprisingly similar between the two years. Statistical significance was found only in one statement: *"Restoration of peatlands and small water bodies should be limited to state lands"*.

The majority of respondents considered restoration of peatlands and small water bodies being an important way to protect biodiversity and improve the quality of nierby water bodies (Figure 1). The restoration was also seen to have other benefits, as the majority of respondents agreed with the statements that restoration of peatlands and small water bodies

improves opportunities for recreational use and improves conditions for the tourism industry. The restoration of peatlands was not perceived as harmful to forestry. Nearly 90% of respondents agreed that tax money could be used more to restore peatlands and small water bodies. In addition, respondents disagreed with the statement that the money used to restore peatland and small water bodies should be used for other environmental protection. Most of the respondents disagree with the statement that restoration peatlands and small water bodies should be limited to the state-owned land and agreed with the statement that the restoration should be supported more on private lands.

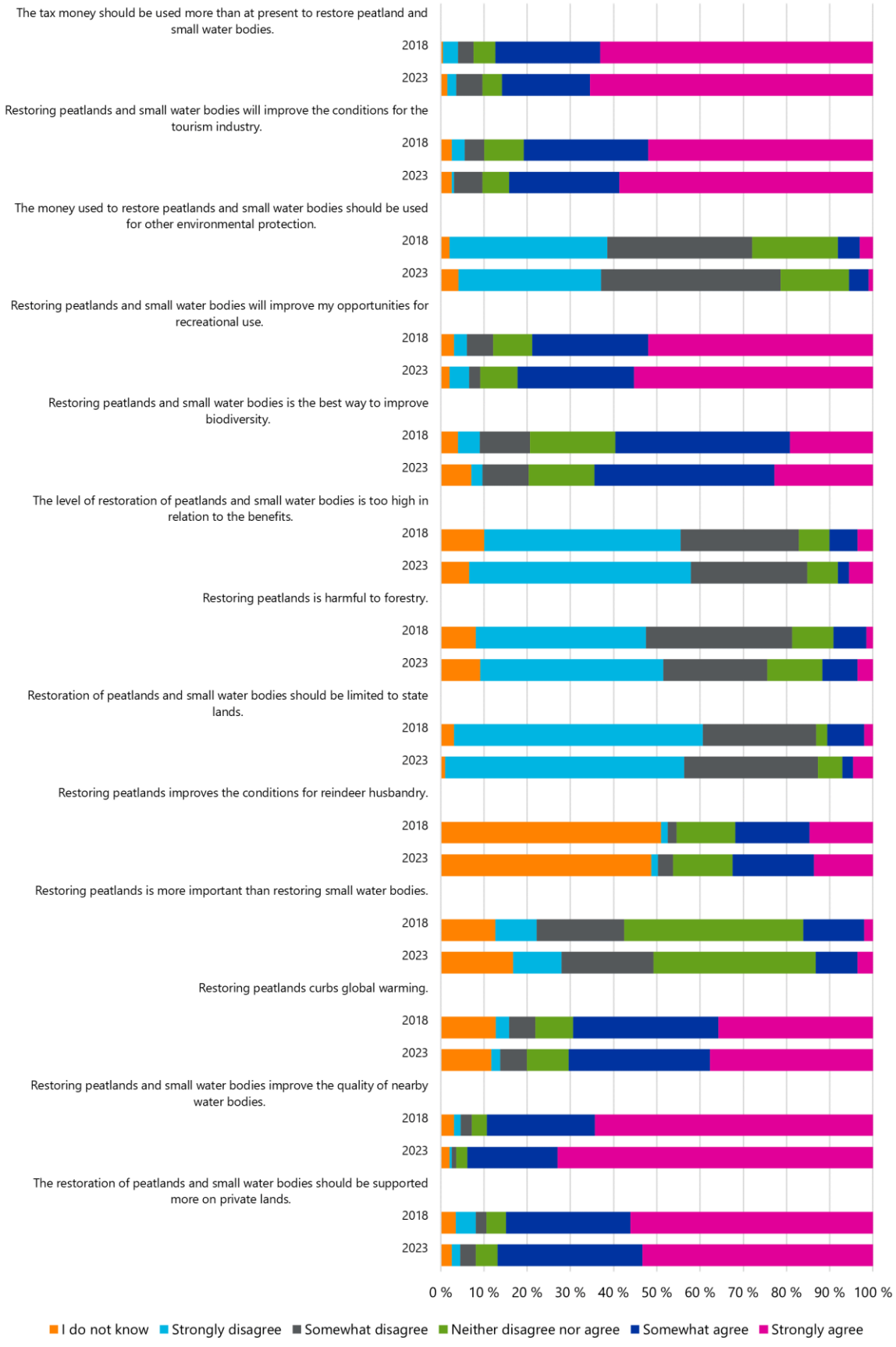



**Figure 1**. The distribution of responses to the statements in the Otakantaa survey. (n=197, 2018; n=198, 2023).

The respondents were also asked how they obtained information from the web-based survey. In both years, the most effective way to reach them was through social media (Figure 2). Its share notably increased in the year 2023, whereas project website and work were less important sources compared to the survey in 2018. In the same way, friends and colleagues were more important sources in 2023. Newspaper articles were not an effective way to reach the respondents in either year.

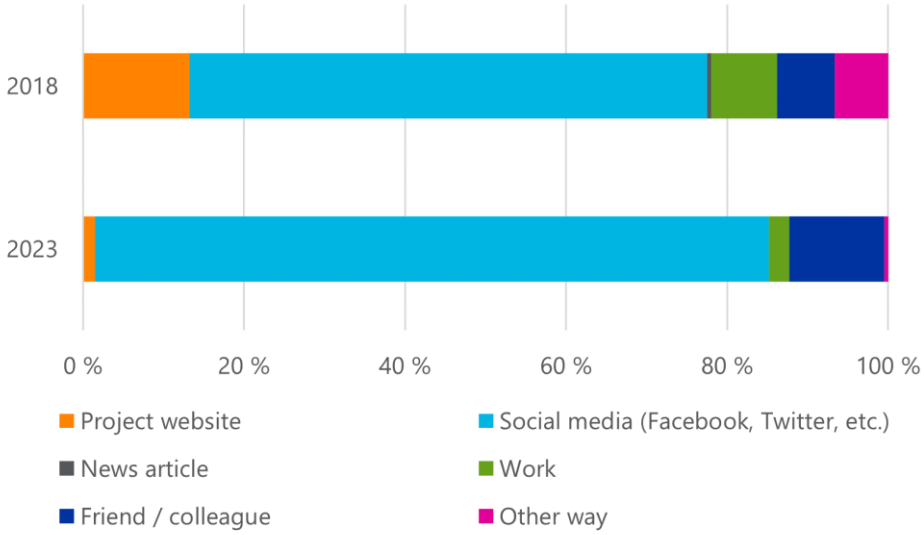



**Figure 2.** The distribution of responses to the question "How did you find out about this Otakantaa survey?" (n=196).

## 1.1. Discussion

Overall, the results showed a positive attitude towards restoration of peatlands and small water bodies in both years. Respondents considered the restoration being an important way to protect biodiversity and improve nearby environment. Allmost all respondents agreed that tax money could be used more to the restoration and the actions should be supported on private lands increasingly. The majority of respondents believed that the restoration would improve their opportunities for recreational use while having a positive impacts on the tourism industry. The respondents' awareness, beliefs, and attitudes had not changed much during the five years.

# 4. Case 3: Citizens' willingness to pay for the restoration of peatlands and small water bodies

## 4.1. Background and aim

We examined the willingness to pay (WTP) values which Finnish people hold concerning restoration efforts in peatlands and small water bodies. The aim of was to produce information on people's preferences towards restoration and WTP as taxes for restoration efforts at a national level. Restoration is costly and the associated benefits are typically public goods. Private landowners may not have the incentive to conduct restoration efforts in their land without compensation. The study was carried out by using a discrete choice experiment.

## 4.2. Materials and methods

We used discrete choice expriments (DCE) to examine Finnish people's preferences towards peatland and small body restoration. The studied attributes were the size of restoration program (hectares), share of peatlands and small bodies in the program (as %), land ownership (% of private and public lands) and proximity of the restoration sites to the respondent (Table 4).

**Table 4.** An example of a choice card used in the WTP survey.

| Scenario | Restoration program 1 | Restoration program 2 | Current situation |
|---|---|---|---|
| **Size of restoration program** | Medium (10%) | Limited (5%) | No additional program |
| **Share of peatlands and small water bodies in the program** | 50% peatlands<br>50% small water bodies | 25% peatlands<br>75% small water bodies | No effect on the current situation |
| **Share of state-owned and private lands in the program** | 90% state-owned<br>10% private | 50% state-owned<br>50% private | No effect on the current situation |
| **Restoration sites located in my proximity** | No | Yes | No effect on the current situation |
| **Additional tax for my household per year** | 10 € | 200 € | 0 € |

The survey was developed in the fall of 2018 in cooperation with experts from Metsähallitus. An online pilot version of the survey was sent to 210 randomly selected respondents in mainland Finland. The 42 pilot responses showed that there was no need for major changes in the survey. The survey mode was changed thereafter to a national internet panel to ensure enough representative responses for analysis. The national survey was conducted in February 2019 and it resulted in 509 responses (a response rate of 12% ).

Models and statistical tests are presented in Juutinen et al. 2023 (submitted manuscript).

## 4.3. Results

The respondents preferred any restoration alternative over the current situation. On average, the respondents were willing to pay €28 (year/household) more for a medium sized restoration program and €43 more for a large restoration program than for a limited program. Peatlands were considered more important restoration targets than small water bodies. Respondents also preferred restoration on public land over private land. Targeting 90% of restoration efforts on private land reduced WTP by €30.5 compared to targeting 50% of efforts on private land and targeting 10% of restoration efforts on private land increased WTP by €24.3. The proximity of restoration activities had no statistically significant effect on choice. The respondents reported that the maximum distance of what they considered as proximate was on average 11.6 kilometres, but it varied greatly from one kilometre to 100 or even 500 kilometres.

The marginal WTP was approximately €305 annually per household for a limited restoration program (restoration of 5% of potential sites) targeted equally on public and private lands (50%/50%) on small water bodies that are not near the respondents.

Preferences for the program attributes were heterogeneous. Female respondents, respondents living in the capital area (Helsinki-Uusimaa) and highly educated respondents were willing to pay more for restoration than other respondents.

Utilizing the marginal WTP values we created six scenarios to illustrate the economic welfare effects (in terms of CV) of different restoration programs. The aggregate CV were compared with the cost estimates of the ongoing Helmi program, which aims at restoring about 59,000 ha of peatlands in Finland between 2021 and 2030.

Scenario analysis showed that the examined restoration programs generated significant welfare effects. The annual WTP values varied from €335 to €427 per household. The highest effects were associated with programs targeted at the restoration of public peatlands. The value of the ongoing Helmi restoration program was higher than the associated costs in the cost-benefit analysis. Hence, the restoration of peatlands and small water bodies was found to be socially desirable. Detailed results are presented in Juutinen et al. (2023, submitted manuscript).

## 4.4. Discussion

We found clear evidence that Finnish people are willing to pay for the restoration of peatlands and small water bodies. Restoration efforts on these ecosystems have positive economic welfare effects despite the high heterogeneity in preferences among the respondents. There is a preference for large restoration programs over small ones, peatland restoration over small water bodies, and state-owned lands over private lands. Nevertheless, the proximity of restoration sites to the respondents' homes does not have a significant effect on restoration preferences. The observed heterogeneous restoration preferences underline the need to consider the 'winners' and 'losers' of the restoration programs to increase the support for restoration in society.

# 5. Case 4: Restoration in national parks in Finland

## 5.1. Background and aim

We studied citizens' preferences and values towards the restoration of peatlands and small water bodies in Finnish national parks. The general aim was to provide information on whether and how much restoration influences recreational and tourism opportunities in national parks.

The principal aims of the national parks are to safeguard biodiversity and to offer recreational possibilities for visitors. Since nature conservation is the primary task, management must be adapted in such a way that it does not risk conservation. Due to great differences in location, size and nature of national parks, they are highly different in terms of services, accessibility and the number of visits (Metsähallitus 2016).

The national parks where restoration was carried out in Hydrology LIFE project are presented in Table 5.

**Table 5.** National parks where restoration was carried out as part of Hydrology LIFE.

| National Park | Area ($km^2$)[a] | Visits in 2022[b] |
|---|---|---|
| Helvetinjärvi | 50 | 46 300 |
| Kauhenva-Pohjankangas | 67 | 27 900 |
| Kurjenrahka | 31 | 61 800 |
| Lauhanvuori | 59 | 21 300 |
| Nuuksio | 56 | 306 700 |
| Oulanka | 285 | 176 400 |
| Pyhä-Häkki | 13 | 17 900 |
| Salamajärvi | 65 | 25 200 |
| Seitseminen | 46 | 43 500 |
| Sipoonkorpi | 24 | 134 400 |
| Teijo | 34 | 94 800 |
| Tiilikkajärvi | 35 | 18 400 |
| Valkmusa | 19 | 22 800 |
| Total | 784 | 997 400 |

[a]https://www.metsa.fi/maat-ja-vedet/suojelualueet/kansallispuistot/kansallispuistotaulukot/
[b]https://www.metsa.fi/vapaa-aika-luonnossa/kayntimaarat/kayntimaarat-maastossa/

## 5.2. Materials and methods

### 5.2.1. Survey design

The survey consisted of five sections. In the first section, respondents were asked about the opinions and attitudes they associate with national parks in Finland utilizing different statements. The second section contained questions related to respondents' visits to national parks during the last 12 months in terms of the number of visits and overnight stays. Respondents were also asked about the usual activities during their visits. In the third section,

respondents were briefly described the proposed restoration and park management developments, i.e., restoring peatlands and streams and increasing the number of trails in national parks. The subsequent questions inquired about the general awareness of restoration and park maintenance and their importance and desirability.

The fourth section of the survey contained the choice experiment (CE) where respondents were represented different scenarios on peatland restoration, stream restoration and park maintenance (Table 6). The CE was designed to examine the trade-offs that people are willing to accept based on hypothetical scenarios over restoration and park management in national parks. The CE consisted of 36 different and separate choice sets with two development alternatives A and B and Status quo as a reference (Table 7). Respondents were asked to choose the most appealing scheme out of the given alternatives. The 36 choice sets were divided into six groups, with each respondent receiving six choice sets. Regarding the scenarios, the underlying idea was that a respondent would pay for restoration and park maintenance implementations through taxes for the next ten years covering all national parks. The final section of the questionnaire collected the usual socio-economic background details such as gender, age, occupation, education and income level.

**Table 6.** Attribute levels of the choice experiment (CE) used in the national parks survey.

| Attribute | Level |
|---|---|
| Peatland restoration | No change[a] |
| | Increase 0.5–20 ha / national park |
| | Increase 21–50 ha / national park |
| Stream restoration | No change[a] |
| | Increase 0.5–5 km / national park |
| | Increase 6–20 km / national park |
| Hiking trails and maintenance | No change[a] |
| | New accessible trail (length 1–2 km) |
| | New nature trail (length 3–5 km) |
| | New hiking trail with resting places (length 5–10 km) |
| Increase in taxes | 0[a], 15, 30, 60, 120, 240, 480 (€/year) |

[a]Current status as a reference level

**Table 7.** An example of a choice card used in the national parks survey.

| Scenario | Option A | Option B | Status quo |
|---|---|---|---|
| **Peatland restoration** | *Increase in the wider areas*<br><br>*(increase 21–50 ha / national park)* | *Increase only in the areas with the most valuable peatland ecosystems*<br><br>*(increase 0,5–20 ha / national park)* | *No change* |
| **Stream restoration** | *Increase only in the areas with the most valuable stream ecosystems*<br><br>*(increase 0,5–5 km / national park)* | *Increase in the wider areas*<br><br>*(increase 6–20 km / national park)* | *No change* |
| **Hiking trails and maintenance** | *No change* | *New guided nature trail*<br><br>*(length 3–5 km)* | *No change* |
| **Increase in taxes (€/year)** | 60 € | 60 € | 0 € |

### 5.2.2. Data

The survey was directed at people over 18 years old living in mainland Finland. We pre-tested the questionnaire with a pilot survey covering 200 respondents in November 2022. Based on the responses and feedback from the pilot survey, we made some clarifications and changes to the questionnaire. The main survey was then conducted online in December 2022. Practical data collection was organized by a commercial survey company IROResearch Oy utilizing their representative panel of voluntarily registered people. The total number of respondents was 2 000. The respondents were randomly selected from the panel members accounting for the representativeness of the sample.

The share of women and men was relatively even in the dataset emphasizing slightly more female respondents (Table 8). However, the largest share of respondents was over 65 years old whereas younger respondents were notably underrepresented. Since the respondents were older, the number of pensioners was higher as well compared to other occupations. Highly educated people with a degree from either college, university of applied science or university were overrepresented in the data.

**Table 8.** Characteristics of respondents in the national parks sample.

| | **Study (n=2 000)** |
|---|---|
| Gender (%) | |
| Female | 51.0 |
| Male | 49.0 |
| Age (%) | |
| 18–24 | 2.9 |
| 25–34 | 5.8 |
| 35–44 | 8.1 |
| 45–54 | 14.2 |
| 55–64 | 23.4 |
| Over 65 | 45.8 |
| Highest education (%) | |
| Comprehensive school | 5.1 |
| Upper secondary school | 9.3 |
| Vocational school | 17.8 |
| University of applied science | 34.0 |
| University | 33.8 |
| Present occupation (%) | |
| Employed | 38.7 |
| Unemployed | 4.0 |
| Student | 4.9 |
| Pensioner | 50.2 |
| Other | 2.3 |

### 5.2.3. Model specification

The CE data were analyzed using an Error Components Multinomial Logit (MNL) model for a panel data structure. The model specification allows repeated choices by each respondent and correlation among the non-status quo alternatives. In our model status quo (SQ) was coded as 'one' for the reference alternative and 'zero' for the development options A and B. Respondent's preference for SQ reflects their preference for a current state without any given development. The error component was specified to account for substitution patterns between the development alternatives. More information and technical details of the Error Components MNL model for panel data can be found, e.g., in Juutinen et al. (2022), Train (2009), Espinosa-Goded et al. (2010) and Economic Software Inc. (2020).

## 5.3. Results

### 5.3.1. Respondents' beliefs and attitudes

The first part of the survey inquired about the beliefs and attitudes of the respondents related to the national parks as outdoor recreation destinations. A total of 23 statements were represented for the respondents (Figure 3). According to the responses, the national parks in Finland were considered pleasant recreation destinations that improve people's awareness of

nature and conservation. They had a positive impact on regional attractions, and they were perceived as safe places for visitors. However, respondents thought that the parks were not easily accessible by public transport and did not require more services or cultural offerings. Major of the respondents agreed that the maintenance cost of the national parks should not be charged to visitors.

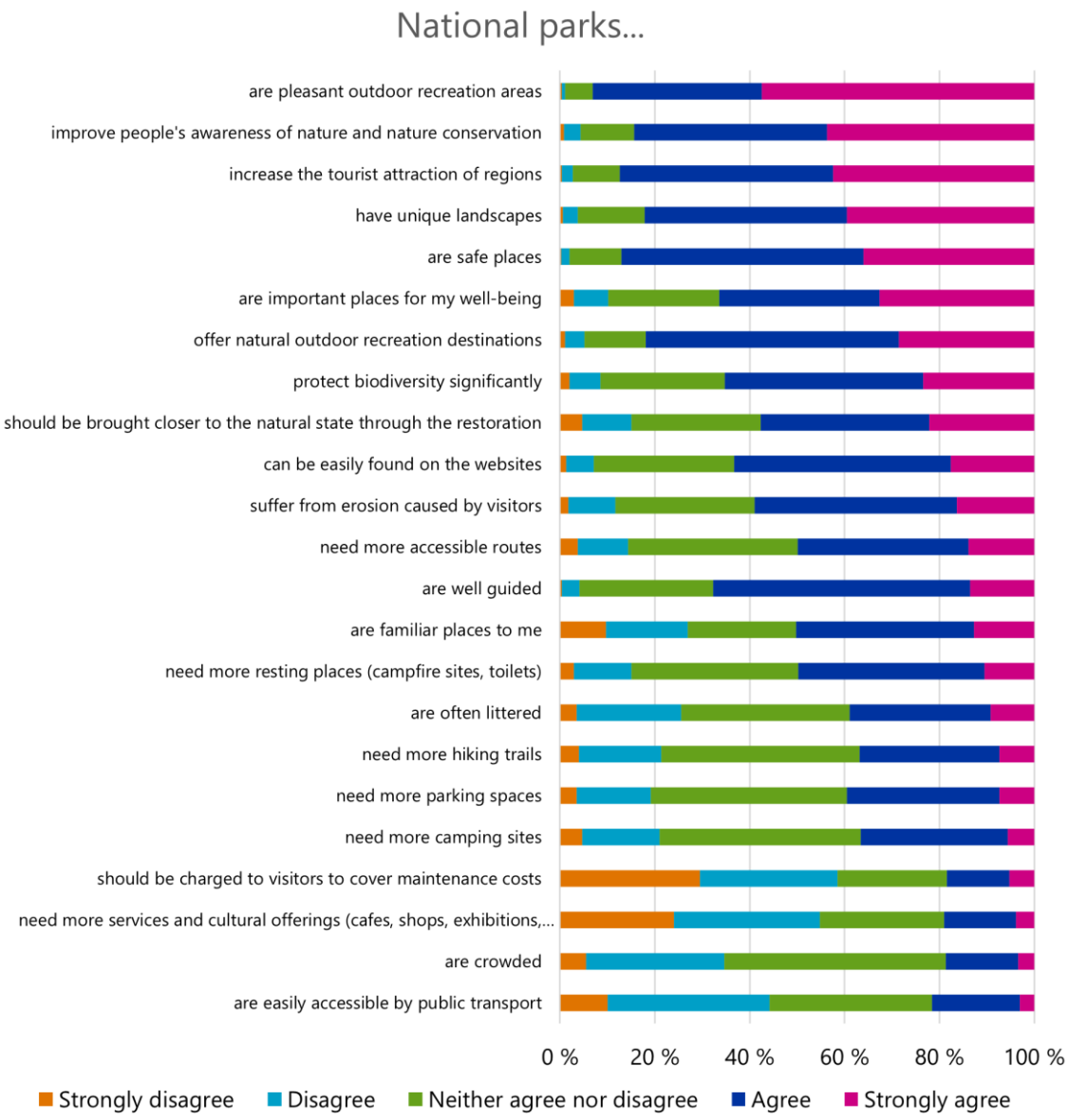



**Figure 3.** The beliefs and attitudes of the respondents.

The respondents were then asked whether they had visited some national park during the previous 12 months and if that visit included an overnight stay. In total of 905 (45%) respondents told they had visited some national park in the previous year. These respondents made 3 476 visits in total of which 2 433 (70%) occurred in summer (between May to September). Out of all visits, 553 (16%) of them included an overnight stay emphasizing the summer. The average number of visits during the summer was 2.7 times, whereas the average number was 1.2 times in winter (between October to April).

Besides the frequencies of visits, the respondents were also inquired about the activities they carried out during their visits to the national park. Respondents were asked to mark a maximum of three as the most important options among 12 suggestions. It was also possible to name activities outside the list using an open question. We scored the results so that the most important activity received three points, the second two points and the third one point (Figure 4). The most popular activities among the respondents were hiking and being in nature enjoying the scenery. On the other hand, group activities such as group exercises or events did not rise as important reasons to visit national parks.


**Figure 4.** The most important activities respondents marked in the national park survey. Activities were scored as the most important = 3 points, second = 2 points, and third = 1 point and then summed together.

The third part of the questionnaire examined how the respondents considered the restoration of peatlands and streams in national parks. Before further questions, the respondents were asked whether they were aware of the restoration actions already taken in the parks to improve biodiversity (Figure 5). Over 50% of them knew peatlands and streams had been restored in the national parks, of which some had seen restored areas themselves. On the other hand, 40% of the respondents did not know about restoration beforehand.

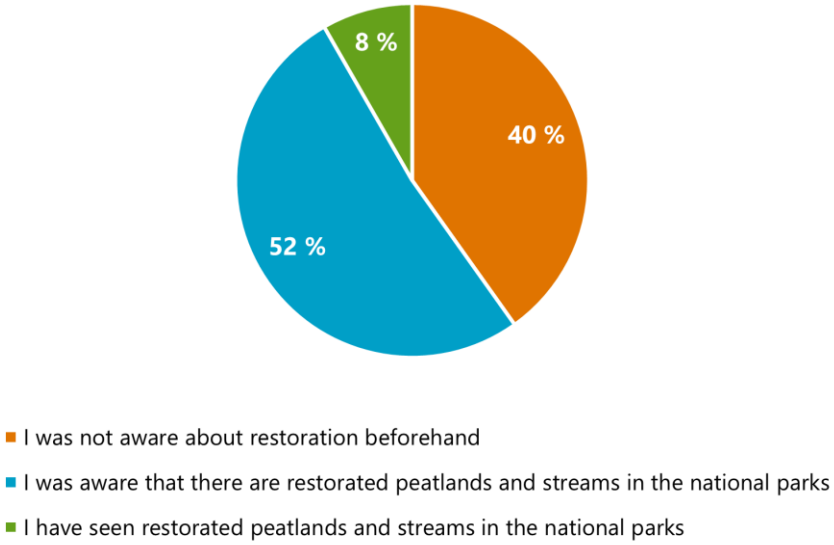



**Figure 5.** The distribution of responses to the question "How familiar are you with the restoration of peatlands and streams in the national parks?" (n=2 000).

### 5.3.2. Choice analysis

#### Structure of analysis and decscription of variables

The CE analysis was conducted in two phases. First we examined respondents' preferences for the attribute variables SQ, PeatValue, PeatWide, StreamValue, StreamWide, TrailAccess, TrailNature, TrailHike and Taxes (Table 7). We also estimated marginal willingness to pay (WTP) for the attribute variables to reveal their relative importance. In the second phase of the analysis, we examined how individually specific factors were associated with respondents' preferences. For this purpose, we constructed interaction variables by multiplying the SQ with individually specific variables. The variables used in the interactions included gender [MALE], occupation [RETIRED], university education [UNIV], the lack of knowledge about restoration [NOKNOW] and three activities [HIKE], [ENJOY] and [OBS] carried out during previous visits (Table 9). The activities were dummy coded based on their ranking for the three most important options. In the model, 'one' indicated respondents who chose a certain activity to be the most important and 'zero' other respondents who did not either choose the activity as the first choice or answer the question. Besides chosen variables, we tested the impact of residence and other activities such as cycling, skiing and fishing, but they were not statistically significant.

**Table 9.** Variables used in the choice analysis in the national park survey.

| Variable[a] | Description | Mean | Std.Dev. |
|---|---|---|---|
| | **Attributes** | | |
| SQ | Current state, no actions will be implemented. | | |
| PeatValue | Peatland restoration is targeted only at the most valuable ecosystems. | | |
| PeatWide | Peatland restoration is targeted at a wider area. | | |
| StreamValue | Stream restoration is targeted only at the most valuable ecosystems. | | |
| StreamWide | Stream restoration is targeted at a wider area. | | |
| TrailAccess | The number of accessible trails (1-2 km) will be increased. | | |
| TrailNature | The number of nature trails (3-5 km) will be increased. | | |
| TrailHike | The number of hiking trails (10-15 km) will be increased. | | |
| Taxes | The amount of tax collected from citizens for the next ten years. | | |
| | **Individually specific variables** | | |
| MALE | Respondent is a male | 0.49 | 0.50 |
| UNIV | Respondent has a degree from a university | 0.33 | 0.47 |
| RETIRED | Respondent is retired | 0.50 | 0.50 |
| NOKNOW | Respondent has no knowledge about restoration beforehand | 0.40 | 0.49 |
| HIKE | Respondent has ranked hiking the most important activity | 0.23 | 0.42 |
| ENJOY | Respondent has ranked being in nature and enjoying the scenery as the most important activity | 0.12 | 0.33 |
| OBS | Respondent has ranked observing nature as the most important activity | 0.02 | 0.15 |

[a]Variables are dummy coded except Taxes, which is treated as a continuous variable.

### Respondents' preferences for increased restoration and new trails in national parks

We found that every attribute variable had a statistically significant influence on the respondents' utility (Table 10). The negative coefficient of SQ indicated that the respondents preferred a change to the current status rather than choosing the status quo. As expected, the coefficient of Taxes was negative as well since the increase in taxes would decrease the general utility of respondents. Other than that, respondents considered the restoration of peatlands and streams improving their utility. The coefficients of peat and stream restoration were at the same level. The larger restoration programs improved utility (slightly) more than the smaller programs. Also, the trail attributes were welfare improving. Hiking trails had the strongest positive coefficient out of the trails whereas accessible trails and nature trails had the same outcome.

**Table 10.** Results of choice analysis for national parks without interaction terms.

| | Coefficient | Standard Error |
|---|---|---|
| SQ | ***-0.6127 | 0.1406 |
| PeatValue | ***0.5059 | 0.0352 |
| PeatWide | ***0.5884 | 0.0318 |
| StreamValue | ***0.5441 | 0.0361 |
| StreamWide | ***0.6122 | 0.0365 |
| TrailAccess | ***0.3045 | 0.0411 |
| TrailNature | ***0.3055 | 0.0429 |
| TrailHike | ***0.4395 | 0.0393 |
| Taxes | ***-0.0105 | 0.0002 |
| SIGMA[a] | ***4.8620 | 0.1569 |
| Log-likelihood | -9 365.34 | |
| Pseudo R2 | 0.29 | |
| AIC | 18 750.7 | |
| No of choices | 12 000 | |
| No of groups | 2 000 | |

*, **, *** significant at the levels 0.1, 0.05 and 0.01 respectively.

[a] Mean coefficient and standard error for standard deviations of latent random effects (i.e., error components).

We calculated the marginal WTP for each attribute (Table 11). Respondents were willing to pay approximately €58 for a development alternative taking place in the national parks. The most preferred implementation was the restoration of streams in wider areas (€58.49) whereas the restoration of peatlands had nearly the same result (€56.22). The marginal WTP for accessible trails and nature trails were equal (€29.10 and €29.19) whereas the WTP for hiking trails was notably higher (€41.99).

**Table 11.** The marginal willingness to pay (WTP) for the park attributes (€/year/individual).

| Attribute | Mean | Standard Error |
|---|---|---|
| SQ | ***58.5368 | 13.2018 |
| PeatValue | ***48.3431 | 3.2102 |
| PeatWide | ***56.2233 | 2.7252 |
| StreamValue | ***51.9906 | 3.2673 |
| StreamWide | ***58.4942 | 3.5301 |
| TrailAccess | ***29.0973 | 4.0215 |
| TrailNature | ***29.1892 | 4.0820 |
| TrailHike | ***41.9903 | 3.7903 |

*, **, *** significant at the levels 0.1, 0.05 and 0.01 respectively.

**Individually specific factors**

The results of the EC model with inreaction terms followed the previous results (Table 12). However, SQ had a stronger negative coefficient (main effect) due to the interaction terms. The individually specific variables were targeted at explaining SQ more in-depth. Based on the results, males [MALE] and retired [RETIRED] had positive coefficients indicating they were more likely to prefer the current state in the national parks to any development scenarios compared with other respondents. Besides, respondents who did not know about restoration [NOKNOW] beforehand seemed to stick more likely to the current status than respondents who had heard about or seen restored areas. In contrast, high education [UNIV] and important activities had strong negative coefficients indicating their positive impact on respondents' preferences towards development scenarios. Hiking [HIKE] and enjoying nature [ENJOY] as the most important activities to do in the national parks had a relatively similar effect on the respondents' preferences whereas the effect of observing nature [OBS] had the strongest coefficient out of all variables.

**Table 12.** Results of choice analysis for national parks with interaction terms.

| | Coefficient | Standard Error |
|---|---|---|
| SQ | ***-0.9300 | 0.2772 |
| PeatValue | ***0.5051 | 0.0352 |
| PeatWide | ***0.5863 | 0.0317 |
| StreamValue | ***0.5425 | 0.0362 |
| StreamWide | ***0.6111 | 0.0367 |
| TrailAccess | ***0.3052 | 0.0412 |
| TrailNature | ***0.3056 | 0.0429 |
| TrailHike | ***0.4389 | 0.0393 |
| Taxes | ***-0.0104 | 0.0002 |
| SQ*MALE | ***0.9539 | 0.2338 |
| SQ*UNIV | ***-1.3611 | 0.2543 |
| SQ*RETIRED | ***0.7626 | 0.2355 |
| SQ*NOKNOW | ***1.3200 | 0.2440 |
| SQ*HIKE | ***-1.5878 | 0.3024 |
| SQ*ENJOY | ***-1.3910 | 0.3791 |
| SQ*OBS | ***-2.4375 | 0.8821 |
| SIGMA[a] | ***4.8620 | 0.1569 |
| Log-likelihood | -9 288.19 | |
| Pseudo R2 | 0.30 | |
| AIC | 18 610.4 | |
| No of choices | 12 000 | |
| No of groups | 2 000 | |

*, **, *** significant at the levels 0.1, 0.05 and 0.01 respectively.

[a] Mean coefficient and standard error for standard deviations of latent random effects (i.e., error components).

## 5.4. Discussion

Overall, respondents considered national parks as safe and pleasant outdoor recreation destination that improves people's awareness of nature and conservation. The parks were seen offering unique landscapes and being an important part of attracting tourists to the regions. However, the majority of respondents agreed that there is no need for an increased number of services or cultural offerings in the parks whereas access by public transport could be something to improve. In Finland, "Everyman rights" are a fundamental part of Finnish culture which may have been affecting respondents' strong objection regarding the possibility that visitors should be charged to cover the maintenance costs of the national parks (Juutinen et. al. 2014). Despite the objection to additional fees, the majority of respondents accepted that taxes can be targeted for the restoration and maintenance of national parks.

In general, respondents thought the restoration of peatlands and streams was widely accepted and important even though many of them were unaware of the previously restored areas or plans to be executed in the future. The results also indicated the respondents considered restoration actions more important than the increase of the number of trails and they would be willing to pay notably more to support conservation rather than park maintenance. Besides restoration, longer hiking trails (10–15 km) seemed to be more favorable among respondents than accessible trails or nature trails. Hiking was the most important activity to do in the national parks in general.

The activities affected the preferences of respondents. People who were active hikers or enjoyed being in nature and observing it were more likely to support restoration and conservation in the national parks.

Individually specific factors revealed that men and older respondents were more likely to oppose changes in the national parks compared to women and younger respondents. It has been noticed in previous visitor studies that the share of women in national parks has overcome the share of men. On the other hand, women have tended to be more active to participate in surveys. In the same way, the average age of visitors has increased emphasizing especially over 65 years old who were overrepresented in this study as well (Konu et al. 2021). We also noticed that not being aware of restoration in national parks was more likely to reduce willingness to support restoration actions. This highlights the importance of information and guidance for people.

The results show that restoration in national parks provide valuable benefits to the citizens. However, it is not straightforward to compare these benefits to the costs of restoration. In a related study which considered restoration of peatlands and small wated bodies at national level, Juutinen et al. (2023, submitted manuscript) showed that the benefits of restoration clearly exceed the costs in the Helmi program.

# 6. Case 5: Restoration in Nuuksio National Park

## 6.1. Background and aim

Nuuksio National Park has become a popular destination for outdoor recreation ever since it was established in 1994. In 2022, the park reached over 306,000 visitors making it one of the most popular national parks in Finland. Nuuksio is accessible within easy reach of the Helsinki metropolitan attracting visitors from around Finland and abroad. The national park spreads over the area of Espoo, Vihti, and Kirkkonummi municipalities while Helsinki is approximately 35 kilometers away from the most popular destinations. The area is reachable by public transport; although many visitors prefer their vehicles to visit the park.

Nuuksio offers versatile opportunities for outdoor recreation having over 30 kilometers of marked hiking trails and several spots for camping and resting. In addition to basic services and activities, the area has some entrepreneurs offering activities such as canoeing, fat bike cycling and snowshoeing. The cities of Espoo and Helsinki maintain several outdoor recreation areas in the vicinity of Nuuksio. Solvalla sports college and the Finnish Nature Centre Haltia are also located right next to the national park.

The terrain of Nuuksio National Park varies from high hills to gorges and nature is diverse. The park has a variety of mires, herb-rich and mesic heath forests and more than 80 ponds and lakes. Lakes vary from brown-water ponds to clear lakes with rocky shores.

A large part of the forests in the national park has previously been felled, thus the forests are not in a natural state. Nevertheless, some areas have been allowed to recover without human intervention. Efforts have also been made to bring nature closer to the natural state by restoring peatlands and streams. There is however a need to increase restoration from the current level (Lehtonen 2017).

To elaborate restoration in the national parks more in-depth, we conducted a survey in the summer of 2022 targeted at the visitors of Nuuksio National Park. The study aimed to examine the visiting preferences and frequencies in terms of restoration and expanding the park.

## 6.2. Materials and methods

### 6.2.1. Survey design

The survey was divided into five sections following the same structure as the previous national parks questionnaire. The first section studied the beliefs and attitudes respondents associate with Nuuksio National Park by presenting statements about the area. The second part asked how often a respondent had visited Nuuksio in the past 12 months, how far they came from and by which vehicle, how long they spent in the park, and which activities they did during their visit. The third section enquired about the respondents' awareness of the implemented restoration and how desirable and important the future actions of restoration of peatland and streams as well as an expansion of the national park with nearby forests would be.

The fourth part examined how the potential implementation of peatland restoration and stream restoration along with the national park's expansion by adding nearby forest to the

park would affect the respondents' recreation values. Each attribute (peatland restoration stream restoration, size of the park) had two levels including no change and increased level (Table 13). From the three attributes, seven development scenarios were drawn up. The scenarios were divided into two versions of a questionnaire with one alternative considering the nearby forests being the same in both versions. Each respondent was represented four development scenarios, i.e., choice cards (Figure 6). In the choice cards it was asked how many times the respondent would visit Nuuksio National Park in the coming 12 months in summer (May to September) and winter (October to April) if each of the development scenarios was implemented. Finally, the last section of the survey inquired about the socio-economic characteristics of respondents such as gender, age, education, occupation and income level.

**Table 13.** Attributes and their levels used in the Nuuksio National Park survey.

| Attribute | Level |
|---|---|
| Peatland restoration | No change |
| | Increase 12 ha |
| Stream restoration | No change |
| | Increase 2.9 km |
| Size of the park | No change |
| | Add 900 ha nearby forests |


**Figure 6.** An example of a choice card presented for respondents in the Nuuksio National Park survey.

### 6.2.2. Data collection

The survey was conducted 6.6.–3.9.2022 in Nuuksio National Park by interviewing entering and leaving visitors. The target group consisted of the visitors of Nuuksio National Park over the age of 18 who were able to answer the questionnaire in Finnish. Since the questionnaire inquired about potential future visits during the next 12 months, the respondent needed to have at least a theoretical possibility to visit Nuuksio more often. Foreign tourists were therefore excluded from the survey sample. Notice that also non-Finnish-speaking Finnish visitors were excluded from the sample.

The data was collected from the most popular areas of Nuuksio National Park; Haukkalampi and Kattila as well as remoter locations such as Siikaniemi and Valklammentie. The total amount of days in the park was 21 but the survey was freely available in the Finnish Nature Center Haltia over the period.

An interviewer was in Nuuksio varyingly, emphasizing mornings and evenings and some weekends. Approximately ten responses were expected to be carried out each day, but only 105 responses were eventually collected totally. Haukkalampi turned out to be the most favourable destination thus most of the responses were collected from there (Table 14). The visitor survey by Metsähallitus took place at the same time in the park and affected the collection days.

It was a challenge to attract people to take part in the survey. Several visitors declined by saying they were there for the first time and did not have enough information about restoration or the park overall. Other common reasons to refuse were haste, ignorance, little or no interest in the topic, or the time required to answer the questionnaire. There were also plenty of tourists during the collection period who were excluded from the target group.

**Table 14.** The responses by the interview locations in Nuuksio National Park.

| Interview location | Responses | % |
|---|---|---|
| Haukkalampi | 99 | 94 |
| Kattila | 1 | 1 |
| Siikaniemi | 0 | 0 |
| Valklammentie | 1 | 1 |
| The Finnish Nature Centre Haltia | 4 | 4 |
| Total | 105 | 100 |

Table 15 represents the distribution of respondents' gender, age, highest education and present occupation. The share of women (54%) was slightly higher in comparison with men (46%) whereas the age distribution empathized 25–34 years old (34%). The average age of respondents was 41 years, yet the most typical age was 29 years. Respondents with an academic degree (lower or higher) were overrepresented in the data being a total of 60%. The results are in line with the previous visitor survey by Metsähallitus (Lehtonen 2017).

Major of the respondents arrived at the national park from the vicinity of Nuuksio. A total of 86% came from Espoo, Vihti, Kirkkonummi, Helsinki or Vantaa. Individual visitors arrived also from further parts of Finland (14%).

**Table 15.** Respondents' socio-economic characteristics in the Nuuksio National Park sample.

| | **Study (n=104)** |
|---|---|
| **Gender (%)** | |
| Female | 53.9 |
| Male | 46.1 |
| **Age (%)** | |
| 18–24 | 19.2 |
| 25–34 | 33.7 |
| 35–44 | 10.6 |
| 45–54 | 12.5 |
| 55–64 | 9.6 |
| Over 65 | 14.4 |
| **Highest education (%)** | |
| Comprehensive school | 4.9 |
| Upper secondary school | 19.4 |
| Vocational school | 11.7 |
| University of applied science | 17.5 |
| University | 43.7 |
| **Present occupation (%)** | |
| Employed | 62.5 |
| Unemployed | 4.8 |
| Student | 15.4 |
| Pensioner | 16.3 |
| Other | 1.0 |

### 6.2.3. Model specifications

In this study, we considered how often respondents had visited Nuuksio National Park during the previous 12 months and how many visits they planned to make in the future under different development scenarios of restoration and expanding the national park. In the recreational demand analysis, we applied a Travel Cost-Contingent Behaviour (TC-CB) model which can observe both current and potential future outdoor recreation activity. We used a panel data format, i.e. a random effects model, in the Negative Binomial model to estimate how quality attributes affect the number of visits and the Latent Class (LC) Poisson model to examine the differences in behavioral responses to changes in park reconstruction among respondents. Technical details of the TC-CB approach in panel data format can be found, for example, in Hynes and Greene (2013) and (2016) as well as Cameron and Trivedi (1998) and Bertram et al. (2020).

## 6.3. Results

### 6.3.1. Descriptive results

Respondents' beliefs and attitudes considering Nuuksio National Park as an outdoor recreation destination was examined using 23 statements and claims of the area (Figure 7). According to the responses, Nuuksio was generally considered a pleasant outdoor recreation destination for visitors of all ages, and it was seen as an important place in terms of well-being. The park was perceived as a safe place for visitors. The respondents also thought that Nuuksio improved the attraction of the capital region. On the other hand, there was no significant urge to increase the number of services in the park including hiking trails and resting places.

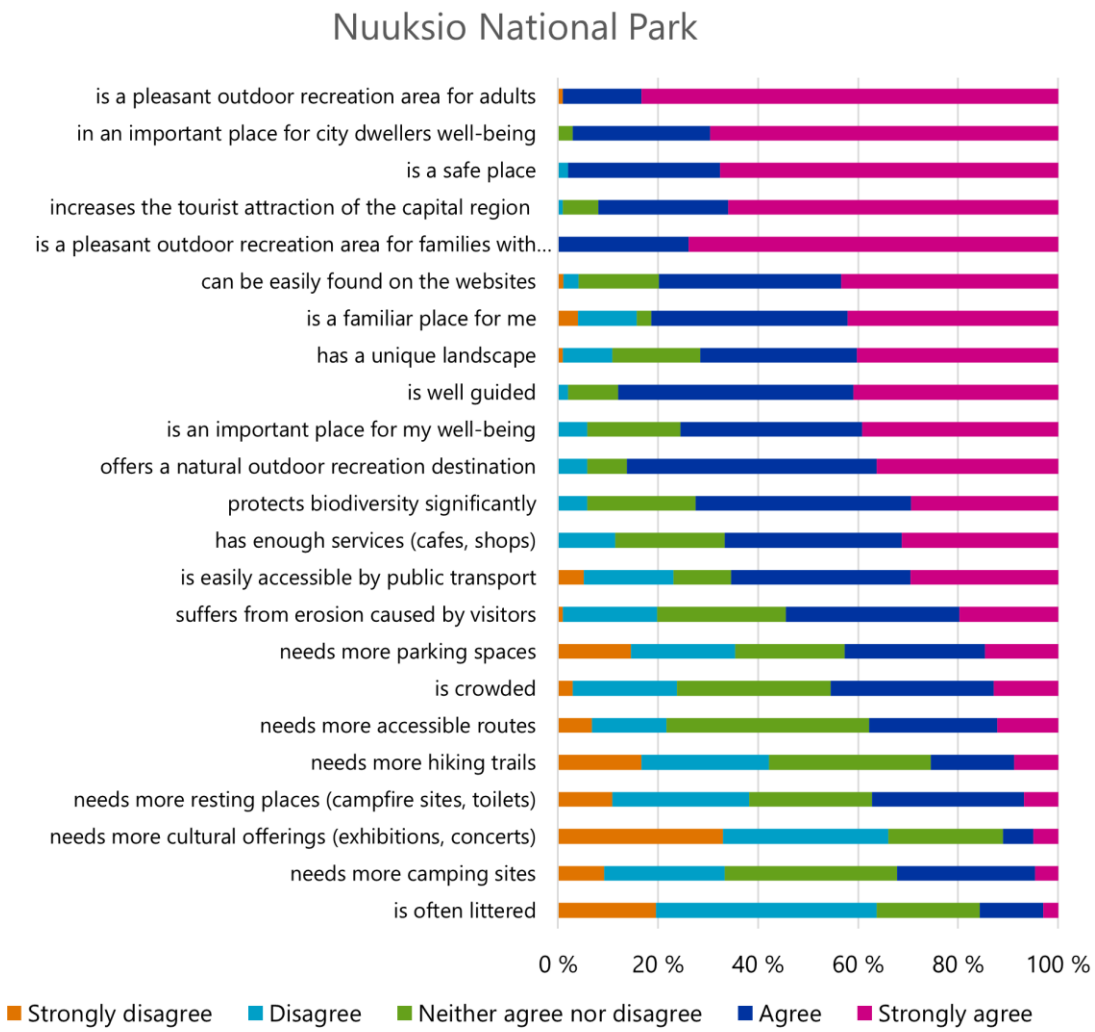



**Figure 7.** The beliefs and attitudes of the respondents (n=103).

Respondents were then asked which activities they did during their visit to Nuuksio National Park and were requested to mark a maximum of three of the most important options among 12 suggestions. They were also able to tell activities outside the list with an open question. We scored the results so that the most important activity received three points, the second two points and the third one point (Figure 8). The most popular activities during a visit were just being in nature and enjoying the scenery as well as walking in the park. Besides, the

possibility to relax and eat snacks was important for the respondents. Other activities included, among others, canoeing, swimming and camping.

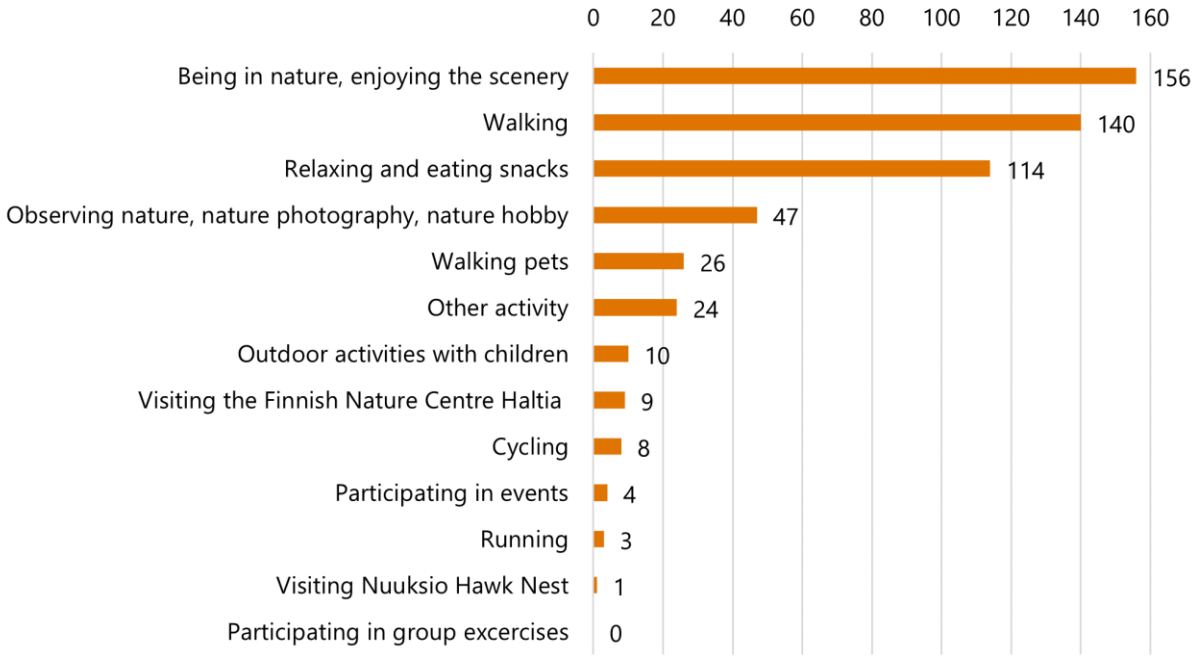



**Figure 8.** The most important activities respondents marked in Nuuksio National Park survey. Activities were scored as the most important = 3 points, second important = 2 points and third important = 1 point.

According to the reported visits by the respondents, the average number of visits was 7 times during the last year. Most of the respondents visited the area in summer (between May to September) whereas slightly more than half of them had not visited Nuuksio in winter (between October to April) (Figure 9).

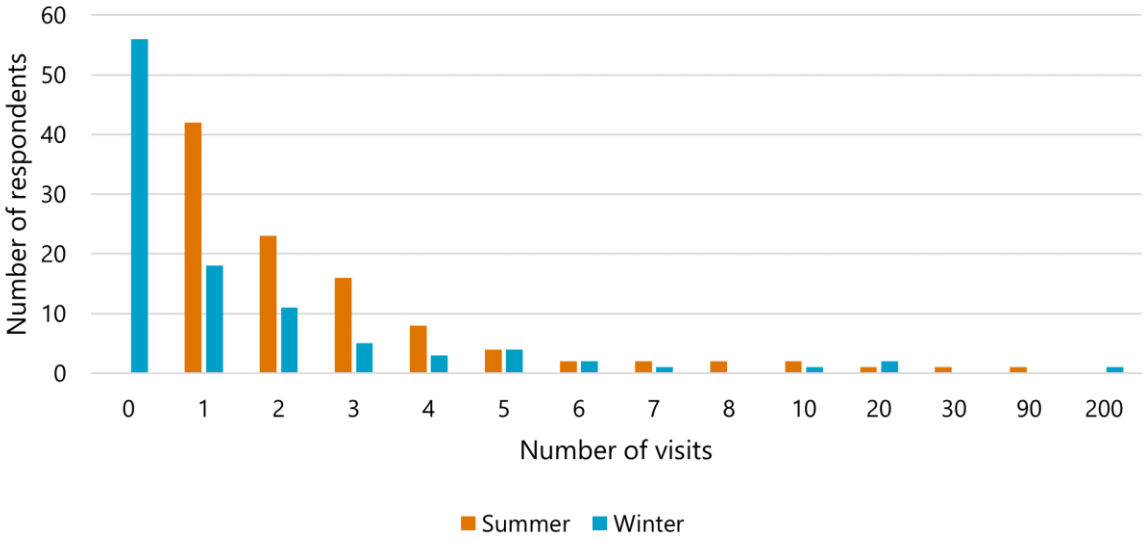



**Figure 9.** The number of visits during the previous 12 months reported by respondents in Nuuksio National Park survey (n=104).

Respondents were also asked to estimate the distance between their homes and the national park (Figure 11). The average distance was 34 kilometers whereas the furthest visit was about more than 300 kilometers away. Few of the respondents lived near the national park making the shortest distance some kilometers only.

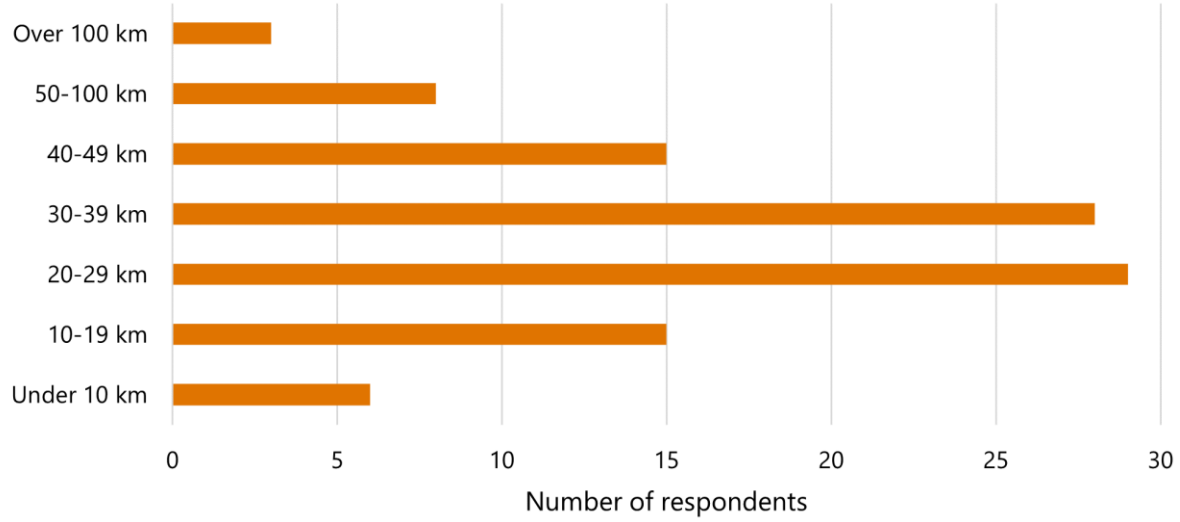



**Figure 10.** The distance between home and Nuuksio National Park estimated by respondents (n=104).

The questionnaire inquired how the visitors of Nuuksio National Park considered the park's restoration of peatlands and streams. Respondents were briefly told about the plans to increase the area of restoration and expand the national park by joining nearby forests in the area. The plans of the developments were represented with the help of maps in the questionnaire and additional map about the park. During the survey, respondents were also asked whether they were aware of the restoration actions already taken in the park to improve biodiversity.

The results revealed that the respondents were not very aware of the restoration activities conducted in Nuuksio (Figure 11). More than half of them were completely unaware of the implemented actions in the area. However, a majority of the respondents still considered the restoration of peatlands and streams to be acceptable whereas slightly less accepted the joining of nearby forests.

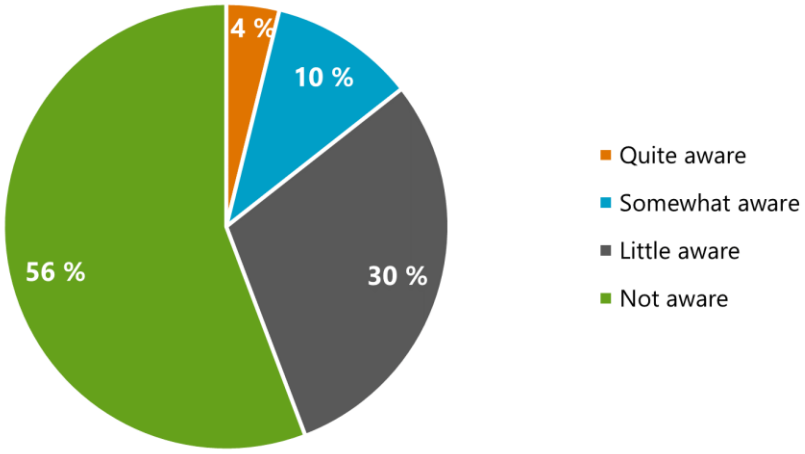



**Figure 11.** The distribution of responses to the question "How much did you know before about the restoration of peatlands and streams in Nuuksio National Park?" (n=104).

### 6.3.2. Variables used in the recreational demand analysis

The panel data was compiled by combining the number of visits in the previous 12 months reported by the respondents and the number of potential visits that could occur in the future if each of the development alternatives was implemented. Hence, the response variable, i.e., the total number of visits for 12 months and potentially the next 12 months, VISITS received only integer values larger or equal to zero (Table 16).

**Table 16.** Descriptive statistics of the response variable VISITS used in the analyses that combine the total number of visits in the past 12 months and upcoming 12 months under different scenarios of restoration.

| Scenario | Objective[a] | | | VISITS | | |
|---|---|---|---|---|---|---|
| | Peatland | Stream | Forest | Mean | Std.Dev. | n |
| Scenario 0[b] (status quo) | 0 | 0 | 0 | 7.20 | 28.69 | 104 |
| Scenario 1 | 1 | 0 | 0 | 4.54 | 2.92 | 13 |
| Scenario 2 | 0 | 1 | 0 | 5.47 | 4.97 | 15 |
| Scenario 3[c] | 0 | 0 | 1 | 5.10 | 3.53 | 30 |
| Scenario 4 | 1 | 1 | 0 | 4.79 | 2.64 | 14 |
| Scenario 5 | 1 | 0 | 1 | 5.75 | 5.88 | 16 |
| Scenario 6 | 0 | 1 | 1 | 5.93 | 5.50 | 15 |
| Scenario 7 | 1 | 1 | 1 | 5.93 | 4.70 | 15 |

[a] 0=Objective will not be implemented, 1=Objective will be implemented.
[b] Reported number of visits in the past 12 months.
[c] Scenario was represented in both versions of the questionnaire.

The models used in the analysis included three attribute variables: PEATLAND, STREAM and FOREST. They described whether the restoration of peatland or stream would be implemented, or some nearby forest would be added to Nuuksio National Park. Besides, we added a binary variable CB-DUMMY to indicate whether the response captured an actual or hypothetical situation to reveal the potential hypothetical bias related to the CB scenarios. In addition,

the independent variables also involved individual specific variables to capture the respondents' heterogeneous preferences (Table 17).

**Table 17.** The variables used in the random effects and latent class models.

| Variable[a] | Description | Mean | Std.Dev. |
|---|---|---|---|
| | **Attributes** | | |
| PEATLAND | Peatland restoration will be increased up to 12 ha. | | |
| STREAM | Stream restoration will be increased up to 2.9 km. | | |
| FOREST | 900 ha of nearby forests will be joined to Nuuksio National Park. | | |
| CB-DUMMY | A variable that indicates whether the visit is real or hypothetical; 1=actual visits, 0=hypothetical visits. | | |
| | **Individually specific variables** | | |
| DISTKM | The distance in km between home and Nuuksio National Park, self-reported by the respondents. | 33.50 | 30.99 |
| MALE | Respondent is a male. | 0.45 | 0.50 |
| BUS | Respondent arrived by public transport. | 0.17 | 0.37 |
| HIGHEDU | Respondent has a lower or higher academic degree as the highest education. | 0.59 | 0.49 |
| ONLYDEST | Nuuksio National Park is the only destination for the trip. | 0.88 | 0.33 |

[a] All variables are dummy coded except DISTKM which is continuous.

The variable DISTKM was the main explanatory variable in the models in relation to valuation indicating the distance between the home and Nuuksio National Park. We expected the coefficient to be negative implying that those living closer to Nuuksio would visit the park more often than visitors living further away since the cost of traveling rises as the distance increases. The questionnaire inquired how the respondents reached the national park and whether Nuuksio was the sole purpose of their trip. The binary variable BUSS defined public transport (bus and/or train) as the means of transport and ONLYDEST described the impor-tance of Nuuksio National Park concerning the entire trip. In addition, we used MALE to indicate the gender of respondents and HIGHEDU to describe the highest level of education.

### 6.3.3. Random effects model

We started the analysis by using a negative binomial regression with random effects. According to the results, none of the development alternatives (PEATLAND, STREAM and FOREST) had a statistically significant coefficient (Table 18). This indicated that the realization of peatland restoration, stream restoration or adding nearby forests to the national park did not have a substantial impact on the visit frequency of an average respondent. The current state [Constant] was seen as a more favourable option instead, according to its strongly positive and significant coefficient. However, distance [DISTKM] had a negative and significant coefficient as expected, implying a reduction in the number of visits as the distance increases. Other variables were not found to be significant in the model.

**Table 18.** Results of the random effects model.

| | Coefficient | Standard Error |
|---|---|---|
| Constant | ***2.7186 | 0.9820 |
| PEATLAND | 0.0450 | 0.3053 |
| STREAM | 0.0704 | 0.2455 |
| FOREST | 0.1317 | 0.2896 |
| DISTKM | *-0.0074 | 0.0044 |
| CB_DUMMY | -0.2221 | 0.3341 |
| MALE | 0.2472 | 0.2781 |
| BUS | -0.0507 | 0.4399 |
| HIGHEDU | 0.0462 | 0.3220 |
| ONLYDEST | 0.3812 | 0.4561 |
| a[a] | ***5.9328 | 1.4083 |
| b[a] | **1.5947 | 0.7752 |
| Log-likelihood | -519.2 | |
| AIC | 1062.4 | |
| No of choices | 219 | |
| No of groups | 101 | |

*, **, *** significant at the levels 0.1, 0.05 and 0.01 respectively.

[a] a and b are estimated parameters of the beta distribution which define the random effects specification of the negative binomial model (Mäntymaa et al. 2021; Bertram et al. 2020).

### 6.3.4. Latent class model

The random effects model is not that suitable for analyzing preference heterogeneity thus we utilized a LC model to examine the differences among respondents. We tested several versions of the model with a different number of latent classes and various regressors of a demand model to identify the version for analyzing the heterogeneity of respondents' preferences. We found the approach with two classes and nine regressors was the most appropriate (Table 19). We could not find variables to explain the class membership models that would have improved the results.

**Table 19.** Results of the latent class model.

| | Class 1 | | Class 2 | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| Constant | ***2.0359 | 0.5036 | ***1.4746 | 0.2516 |
| PEATLAND | **0.3532 | 0.1730 | -0.0240 | 0.0981 |
| STREAM | 0.2708 | 0.1735 | -0.0321 | 0.0973 |
| FOREST | 0.3386 | 0.2123 | 0.0405 | 0.1051 |
| DISTKM | ***-0.0689 | 0.0048 | ***-0.0082 | 0.0021 |
| CB_DUMMY | 0.2661 | 0.2746 | ***-0.3673 | 0.1363 |
| MALE | 0.1675 | 0.1429 | ***0.2536 | 0.0768 |
| BUS | ***-1.2623 | 0.1678 | -0.1160 | 0.1219 |
| HIGHEDU | ***-0.5064 | 0.1776 | 0.0228 | 0.0785 |
| ONLYDEST | ***3.1819 | 0.4153 | 0.1970 | 0.1852 |
| Estimated prior probabilities for class membership | | | | |
| Class 1 | ***0.14 | | | |
| Class 2 | ***0.86 | | | |
| Log-likelihood | -559.05 | | | |
| Pseudo R2 | 0.87 | | | |
| AIC | 1 160.1 | | | |
| No of choices | 222 | | | |
| No of groups | 101 | | | |

*, **, *** significant at the levels 0.1, 0.05 and 0.01 respectively.

The distance [DISTKM] had negative and statistically significant coefficients in both latent classes implying the decreasing effect on the number of visits when distance increases. When comparing the coefficients between the classes, the effect of the distance reduces the probability of visiting the national park faster in class 1 than in class 2 (class 1: $\beta$=-0.06894, class 2: $\beta$=-0.00824). On the other hand, PEATLAND had a positive and significant coefficient only in class 1 indicating that peatland restoration would attract the respondent in class 1 to visit Nuuksio more often than other respondents. Other management alternatives were not found to be statistically significant. The variable CB-DUMMY had a negative and statistically significant coefficient only in class 2 meaning that a mere transition from SQ to either CB scenario would not reduce the assessed number of trips to Nuuksio.

The significance of the rest of the independent variables varied between the classes. The variable MALE had positive coefficients in both classes but was statistically significant only in class 2, meaning that on average men in that class would visit the park more often than women. In turn, arriving by bus [BUS] had a strongly negative coefficient in class 1 with a statistical significance that indicated public transport would reduce the number of visits faster than other transport alternatives such as cars. Higher education [HIGHEDU] seemed to decrease the number of visits in class 1 as well, according to its negative and significant coefficient. Also, the positive coefficient of ONLYDEST was statistically significant in class 1. Therefore, a visit to Nuuksio as the sole purpose of a trip was more likely to increase the probability of visits among this class.

### 6.3.5. Estimated number of visits

We calculated the estimated number of visits to class 1 and class 2 using the coefficients presented in Table 17. First, we calculated the number of visits without any development scenarios implemented, i.e., the status quo (SQ). We multiplied the coefficients of statistically significant regressors by their average values for both classes excluding the effect of three development alternatives. As a result, the annual number of visits of classes 1 and 2 at the SQ level varied from 6.33 to 3.12 respectively (Table 20). Thus, those respondents living nearer Nuuksio National Park (class 1) would visit more often than those arriving further away (class 2).

Then we examined the effect of the coefficients of PEATLAND, STREAM and FOREST separately to obtain their individual impact (Table 20). However, it is noteworthy that only PEATLAND had a significant coefficient in the LC model. As outcomes for class 1, implementing peatland restoration, stream restoration and adding nearby forests would result in 9.01, 8.30 and 8.88 annual visits, respectively. Therefore, the respondents in class 1 estimated they would visit the park more often in the future if each management objective would be realized. In contrast, the annual visits of class 2 would be 3.05, 3.02 and 3.25 after each improvement. The realization of all objectives would simultaneously increase the visits of class 1 to 16.57 per year while the figure for class 2 would remain at the same level being 3.07.

Using the previous estimations for the distance from home to Nuuksio, we determined a trip value for both classes. We assumed the average cost of a private car to be €0.30/km based on a similar study by Mäntymaa et al. (2022). The average value of a visit to class 1 was 14.51 km suggesting a monetary value of €4.35. Correspondingly, the average value of a visit for class 2 was 121.36 km with a monetary value being €36.41. The results indicated that the respondents in class 2 were willing to travel further to Nuuksio while the respondents in class 1 valued shorter distances more.

In class 1, the total number of visits would increase by 161.8% from the SQ level if all three changes were realized simultaneously (Table 18). In contrast, the same figure for class 2 would be slightly negative -1.6%. The largest increase in visits by implementing one of the objectives is caused by the restoration of peatlands in class 1 (42.3%) whereas the only positive change in class 2 would be adding nearby forests to the national park (4.2%). In general, the proportional changes in class 2 are negligible.

**Table 20.** Estimated visits for the latent classes by objectives realized.

| Objectives realized | Number of visits per year | |
|---|---|---|
| | Class 1 | Class 2 |
| None (SQ) | 6.33 | 3.12 |
| Peatland restoration | 9.01 | 3.05 |
| Stream restoration | 8.30 | 3.02 |
| Adding nearby forests to the national park | 8.88 | 3.25 |
| All objectives | 16.57 | 3.07 |

## 6.4. Discussion

The more in-depth analysis related to visiting activity in Nuuksio National Park revealed two classes based on respondents' heterogeneous preferences. As expected, a large proportion of the respondents would visit Nuuksio irrespective whether more peatlands or streams were restored, or nearby forests were joined to the national park. Even though observing nature was one of the most important activities, only a handful of people had seen restored areas, while many were not aware of the actions in the first place. However, some respondents might increase their frequency of visits if the development actions were realized.

A notable difference between the latent class 1 and 2 was the effect of distance from home to Nuuksio. In class 1, the number of visits decreased faster when distance increased indicating that the respondents in this class were more likely to live closer to the park. Those belonging to class 2 arrived already further afield, so the distance had not the same impact on their visit frequency. In addition, class 2 was characterized by the fact that implementing the development actions did not affect their visits in the future unlike in class 1.

Other independent variables tended to affect more class 1 rather than class 2. Understandably, arriving by public transport reduced the number of visits since it usually requires more time and is less flexible compared to cars. High education had also a negative impact which might be a result of the fact that highly educated people typically have more options to visit due to higher incomes but also have less time to travel any further away. Nevertheless, many respondents told Nuuksio was the sole purpose of their trip implying that the park has been seen as a preferred option among the other destinations.

The heterogeneity analysis revealed useful information, but it must be considered that the sample size was small. It was challenging to perform reliable statistical analyses since the model captured small changes in variables. Even though the management goals did not have a notable impact on the visiting activity, they were still seen as widely acceptable indicating that people encourage enhancing and securing biodiversity values in Nuuksio.

# 7. Conclusions

Restoration of peatlands and small water bodies has become a significant topic of public discussion especially after the EU's Commission proposed a new Nature Restoration Law to restore ecosystems and build up resilience continent-wide. We examined the costs of restoration and studied how citizens in Finland consider the current and future demand on restoration of peatlands and small water bodies and what are their opinions and preferences for restoration in national parks.

Restoration incurs costs, mostly due to restoration measures but also due to planning and monitoring. The funds used for restoration should therefore be used cost-effectively so that the restoration produces as much benefit as possible while minimizing costs. A more detailed assessment of the costs is however difficult because the unit costs vary a lot between different sites. In the future, cost monitoring should be done at a more detailed level than before in order to prioritize and target the restoration measures more cost-effectively. In this work, some additional light was gained on the factors that determine the costs, but due to the shortcomings of the available data, the results remained quite general in terms of practical restoration planning.

Priorization and targeting of restoration is also important regarding opportunity costs of restoration. In some peatland sites the restoration may be more profitable option than the enhanced timber production. Restoration could be allocated such sites if their restoration provides significant ecological benefits.

Restoration has employment effects. The employment effects of the restoration can be significant if the restoration is carried out on a large scale, especially in remote areas. Such a large program may be implemented due to the EU's restoration law.

Despite the fact the restoration has been an important topic lately, the Otakantaa-survey did not point any significant changes in knowledge or opinions of citizens during the last five years. The majority of respondents considered the restoration of peatlands and small water bodies having positive effects on the nature and biodiversity and thus improving opportunities for recreational use. Interestingly, the respondents were ready to use more tax money for restoration. The recent public debate about the high costs of restoration for Finland has thus not seemed to weaken citizens' attitude towards the use of tax funds for restoration. Many of respondents supported that the restoration actions should be done increasingly on private lands. However, it is worth to notice that the survey was openly accessible through the internet which might have led to emphasize citizens with positive attitude towards restoration and conservation.

The nationwide survey provided more detailed information on people's willingness to pay for the restoration of peatlands and small water bodies. The potential restoration programs considered in the study provided significant benefits or welfare effects, and the annual WTP values varied from €335 to €427 per household. For the nationwide Helmi restoration program in Finland, the benefits exceeded the costs. There was a preference for large restoration programs over small ones, peatland restoration over small water bodies, and state-owned lands over private lands, whereas the proximity of restoration sites to the respondents' homes did not have a significant effect on restoration preferences. Nevertheless, the large heterogeneity

in responses underlines a need to consider the 'winners' and 'losers' of the restoration programs to increase the social acceptance of restoration in society.

The survey on national parks in Finland revealed the restoration of peatlands and streams in national parks was widely accepted and important even though many of respondents were unaware of the previously restored areas or plans to be executed in the future. The results also indicated that the respondents considered restoration actions more important than the increase of the number of trails and they would be willing to pay notably more to support conservation rather than park maintenance. The preferences were heterogenous. For example, respondents who were active hikers or enjoyed being in nature and observing it were more likely to support restoration and conservation in the national parks. Individually specific factors revealed that men and older respondents were more likely to oppose changes in the national parks compared to women and younger respondents. We also noticed that not being aware of restoration in national parks was more likely to reduce willingness to support restoration actions. This highlights the importance of information and guidance for people.

The study on Nuuksio National Park showed that a large proportion of the respondents would visit Nuuksio irrespective whether more peatlands or streams were restored, or whether nearby forests were joined to the national park or not. Therefore, the restoration does not seem to have an impact on nature tourism in the short term. Even though observing nature was one of the most important activities, only a handful of people had seen restored areas, while many were not aware of the restoration actions in the first place. However, some respondents living closer to the national park might increase their frequency of visits if the development actions were realized. Even though the management goals did not have a notable impact on the visiting activity, they were still seen as widely acceptable indicating that people encourage enhancing and securing biodiversity values in Nuuksio. It must be noticed however that the results must be interpreted with caution because the sample size was small.

All in all, people tended to support restoration of peatlands and small water bodies and accepted the use of tax money to meet the restoration goals. Public opinion on restoration has seemed to stay relatively stable over the last years encouraging actions to be implemented all around Finland.

# References

Aapala, K., Similä, M. & Penttinen, J. (eds). 2013. Ojitettujen soiden ennallistamisopas. Metsähallituksen luonnonsuojelujulkaisuja. Sarja B 188. Metsähallitus. Vantaa. 301 pp.

Bertram, C., Meyerhoff, J., Rehdanz, K. & Wüstemann, H. 2020. Contingent behavior and asymmetric preferences for baltic sea coastal recreation. Environmental and Resource Economics 75(1): 49–78. 10.1007/s10640-019-00388-x.

Cameron, A.C. & Trivedi, P.K. 1998. Regression Analysis of Count Data. Econometric Society Monographs No 30. Cambridge University Press. New York.

Economic Software. Inc. 2020. NLOGIT. Version 6. Reference Guide.

Espinosa-Goded, M., Barreiro-Hurle, K. & Ruto, E. 2010. What do farmers want from agri-environmental scheme design? A choice experiment approach. Journal of Agricultural Economics 61: 259–273.

Hynes, S. & Greene, W. 2013. A Panel travel cost model accounting for endogenous stratification and truncation: A latent class approach. Land Economics 89: 177–192. 10.3368/le.89.1.177.

Hynes, S & Greene, W. 2016. Preference heterogeneity in contingent behaviour travel cost models with onsite samples: A random parameter vs. a latent class approach. Journal of Agricultural Economics 67: 348–367. 10.1111/1477-9552.12143.

Juutinen, A., Kosenius, A-K. & Ovaskainen, V. 2014. Estimating the benefits of recreation-oriented management in state-owned commercial forests in Finland: A choice experiment. Journal of Forest Economics 20: 396–412.

Juutinen, A., Immerzeel, B., Pouta, E., Lankia, T., Artell, J., Tolvanen, A., Ahtiainen, H. & Vermaat, J. 2022a. 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.

Juutinen, A., Haeler, E., Jandl, R., Kuhlmey, K., Kurttila, M., Mäkipää, R., Pohjanmies, T., Rosenkranz, L., Skudnik, M., Triplat, M., Tolvanen, A., Vilhar, U., Westin, K. & Schueler, S. 2022b. Common preferences of European small-scale forest owners towards contract-based management. Forest Policy and Economics 144: 102839.

Kareksela, S., Ojanen, P., Aapala, K., Haapalehto, T., Ilmonen, J., Koskinen, M., Laiho, R., Laine, A., Maanavilja, L., Marttila, H., Minkkinen, K., Nieminen, M., Ronkanen, A.-K., Sallantaus, T., Sarkkola, S., Tolvanen, A., Tuittila, E.-S. & Vasander, H. 2021. Soiden ennallistamisen suoluonto-. vesistö-. ja ilmastovaikutukset. Vertaisarvioitu raportti. Suomen Luontopaneelin julkaisuja 3b/2021. 108 pp.

Konu, H., Neuvonen, M., Mikkola, J., Kajala, L., Tapaninen, M. & Tyrväinen. L. 2021. Suomen kansallispuistojen virkistyskäyttö 2000–2019. Metsähallituksen luonnonsuojelujulkaisuja. Sarja A 236. Metsähallitus. Vantaa. 133 pp.

Lehtonen, L. 2017. Nuuksion kansallispuiston kävijätutkimus 2015–2016. Metsähallituksen luonnonsuojelujulkaisuja. Sarja B 229. Metsähallitus. Vantaa. 74 pp.

Metsähallitus. 2016. Principles of Protected Area Management in Finland. Nature Protection Publications of Metsähallitus. Series B 217. Metsähallitus. Vantaa. 134 pp.

Metsähallitus. 2023a. National Park Tables. https://www.metsa.fi/maat-ja-vedet/suojelualueet/kansallispuistot/kansallispuistotaulukot/ (accessed 20 March 2023).

Metsähallitus. 2023b. The number of visits in National Parks. https://www.metsa.fi/vapaa-aika-luonnossa/kayntimaarat/kayntimaarat-maastossa/ (accessed 20 March 2023).

Mäntymaa, E., Jokinen, M., Juutinen, A., Lankia, T. & Louhi, P. 2021. Providing ecological. cultural and commercial services in an urban park: A travel cost–contingent behavior application in Finland. Landscape and Urban Planning 209: 104042.

Mäntymaa, E., Jokinen, M., Louhi, P. & Juutinen, A. 2022. Visitors' heterogeneous preferences for urban park management: The case of a city park in Oulu. Finland. Urban Forestry & Urban Greening 77: 127751.

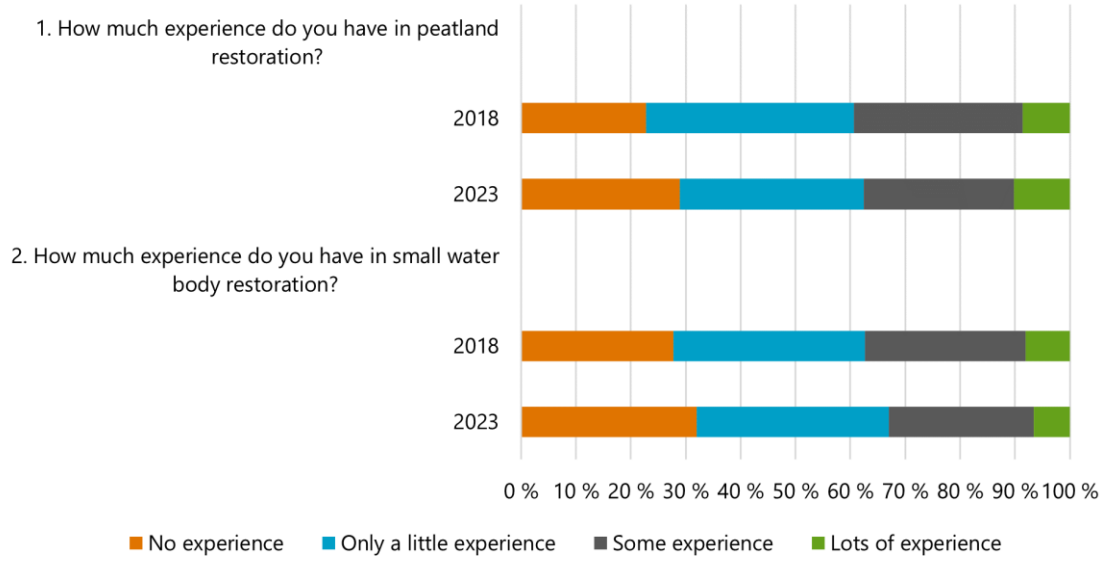
Train, K. 2009. Discrete choice methods with simulation. 2nd ed. Cambridge university press. Cambridge.

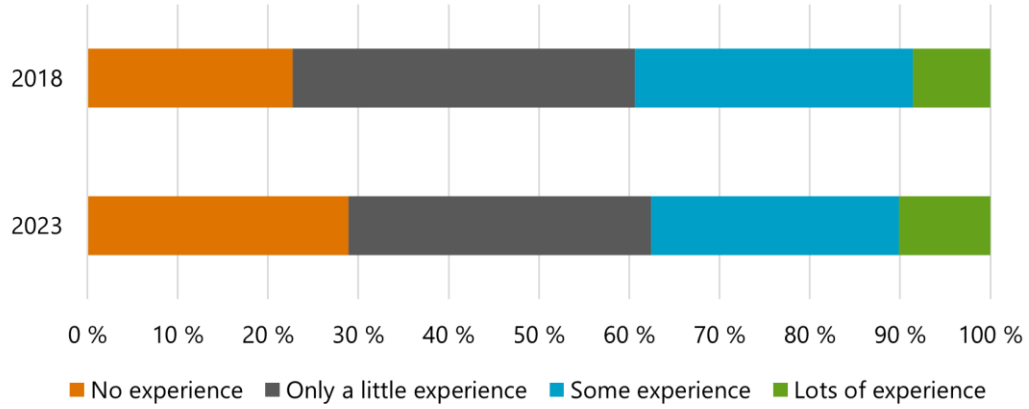
# Appendix

The comparison of the Otakantaa survey results between years 2018 and 2023.

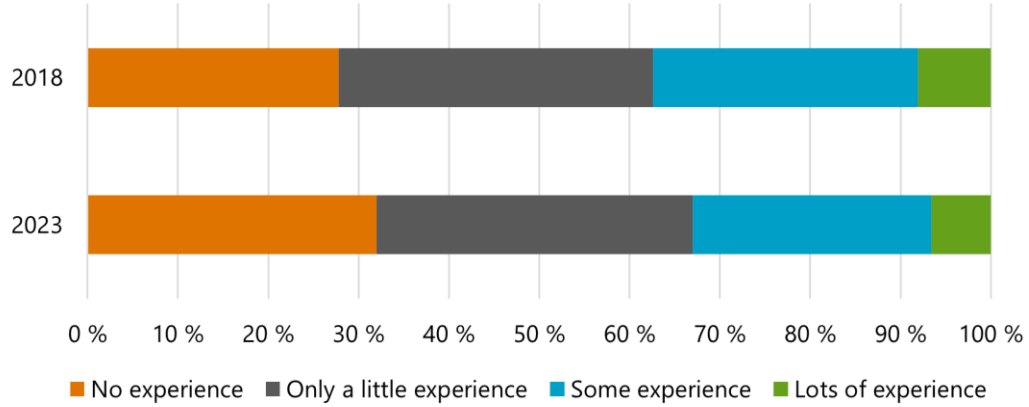
| Question | 2018 (N=198) | | 2023 (N=197) | | |
|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | $\chi^2$ |
| 1. How much experience do you have in peatland restoration? | 2.25 | 0.905 | 2.19 | 0.969 | 0.4483 |
| 2. How much experience do you have in small water body restoration? | 2.18 | 0.931 | 2.08 | 0.920 | 0.7584 |
| 3. The tax money should be used more than at present to restore peatland and small water bodies. | 4.38 | 1.039 | 4.37 | 1.115 | 0.5531 |
| 4. Restoring peatlands and small water bodies will improve the conditions for the tourism industry. | 4.15 | 1.206 | 4.28 | 1.139 | 0.2515 |
| 5. The money used to restore peatlands and small water bodies should be used for other environmental protection. | 1.98 | 1.062 | 1.87 | 0.954 | 0.2703 |
| 6. Restoring peatlands and small water bodies will improve my opportunities for recreational use. | 4.10 | 1.269 | 4.20 | 1.202 | 0.5382 |
| 7. Restoring peatlands and small water bodies is the best way to improve biodiversity. | 3.45 | 1.288 | 3.50 | 1.391 | 0.3943 |
| 8. The level of restoration of peatlands and small water bodies is too high in relation to the benefits. | 1.65 | 1.181 | 1.64 | 1.154 | 0.2547 |
| 9. Restoring peatlands is harmful to forestry. | 1.74 | 1.091 | 1.79 | 1.237 | 0.2852 |
| 10. Restoration of peatlands and small water bodies should be limited to state lands. | 1.62 | 1.053 | 1.67 | 1.029 | 0.0188 |
| 11. Restoring peatlands improves the conditions for reindeer husbandry. | 1.88 | 2.051 | 1.93 | 2.026 | 0.9504 |
| 12. Restoring peatlands is more important than restoring small water bodies. | 2.41 | 1.266 | 2.23 | 1.349 | 0.5042 |
| 13. Restoring peatlands curbs global warming. | 3.55 | 1.677 | 3.63 | 1.630 | 0.9809 |
| 14. Restoring peatlands and small water bodies improve the quality of nearby water bodies. | 4.39 | 1.124 | 4.59 | 0.910 | 0.4402 |
| 15. The restoration of peatlands and small water bodies should be supported more on private lands. | 4.19 | 1.287 | 4.25 | 1.122 | 0.6287 |
| 16. Do you own agricultural or forestry land? | 1.47 | 0.602 | 1.52 | 0.667 | 0.2849 |
| 17. The objectives brought by the EU's restoration regulation are too high for Finland.[a] | … | … | 1.85 | 1.372 | … |

[a] Question appeared only in the survey of the year 2023.

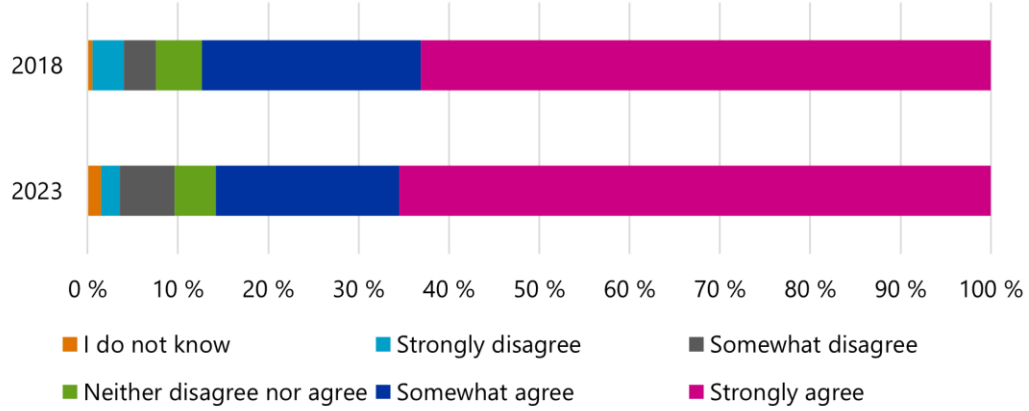




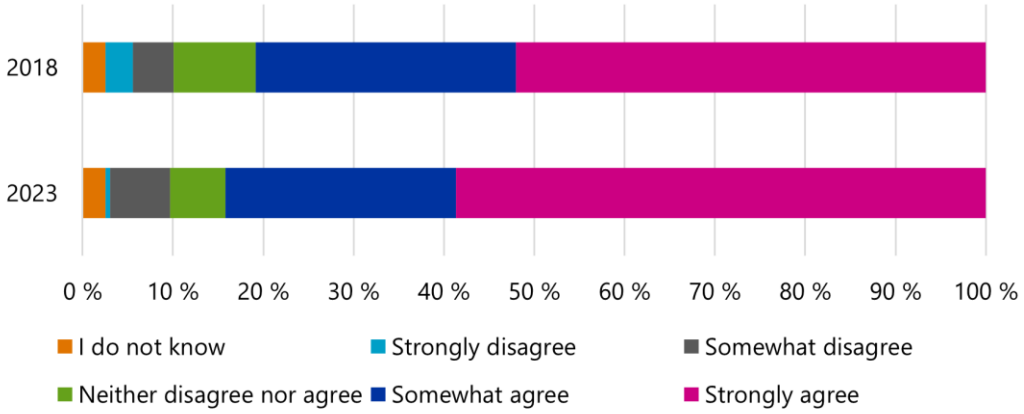

Distribution to the question "How much experience do you have in peatland restoration?" $\chi^2$=0.4483.



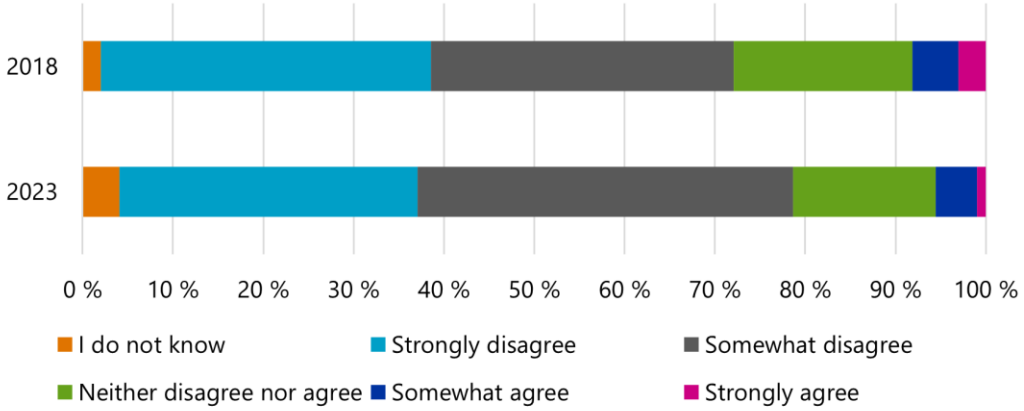

Distribution to the question "How much experience do you have in small water body restoration?" $\chi^2$=0.7584.



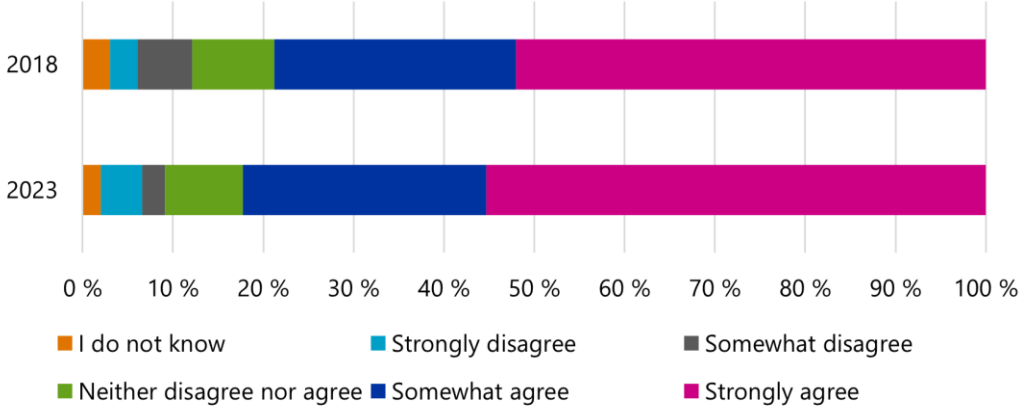

Distribution to the question "The tax money should be used more than at present to restore peatland and small water bodies." $\chi^2$=0.5531.



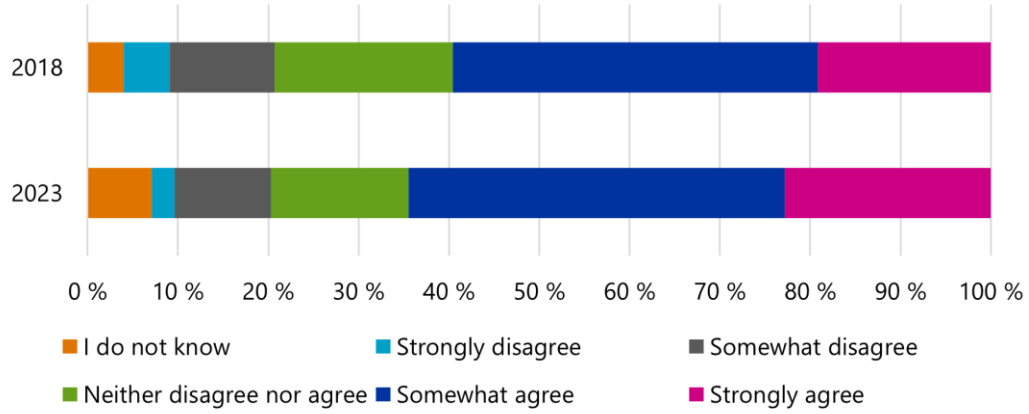

Distribution to the question "Restoring peatlands and small water bodies will improve the conditions for the tourism industry." $\chi^2$=0.2515.



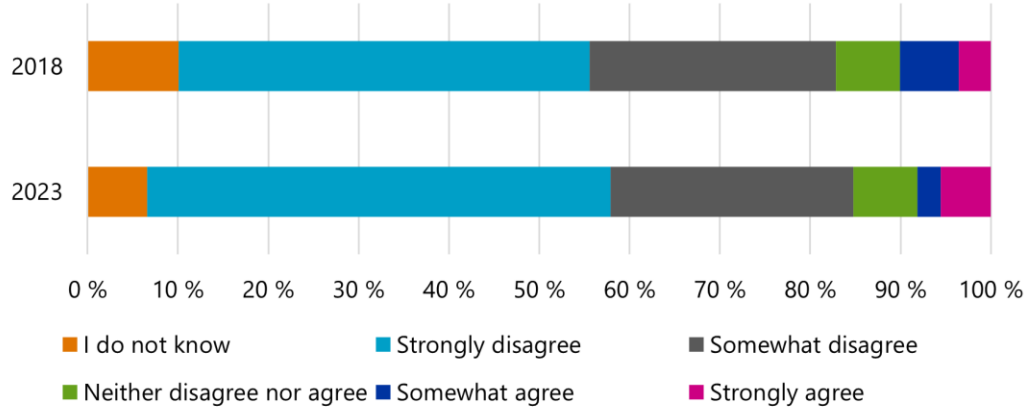

Distribution to the question "The money used to restore peatlands and small water bodies should be used for other environmental protection." χ2=0.2703.



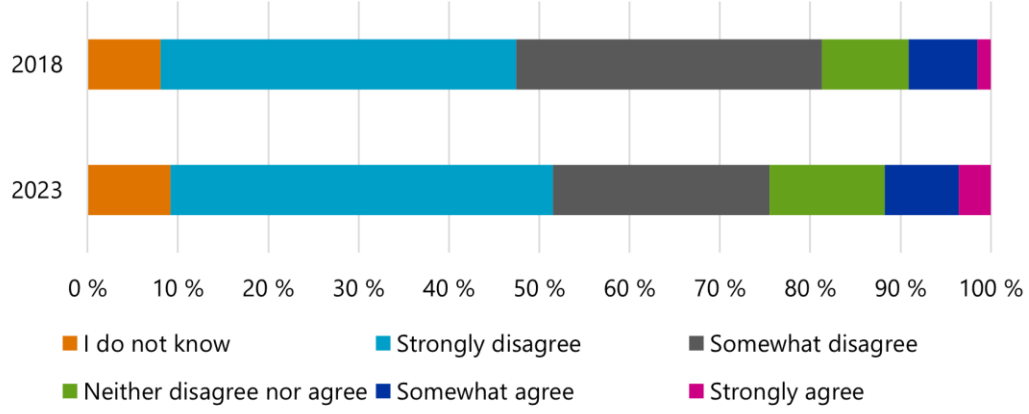

Distribution to the question "Restoring peatlands and small water bodies will improve my opportunities for recreational use." χ2=0.5382.



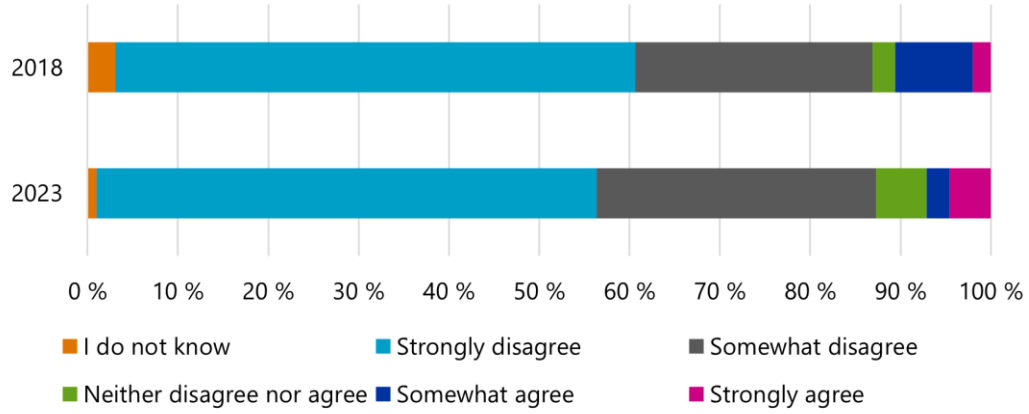

Distribution to the question "Restoring peatlands and small water bodies is the best way to improve biodiversity." $\chi^2$=0.3943.



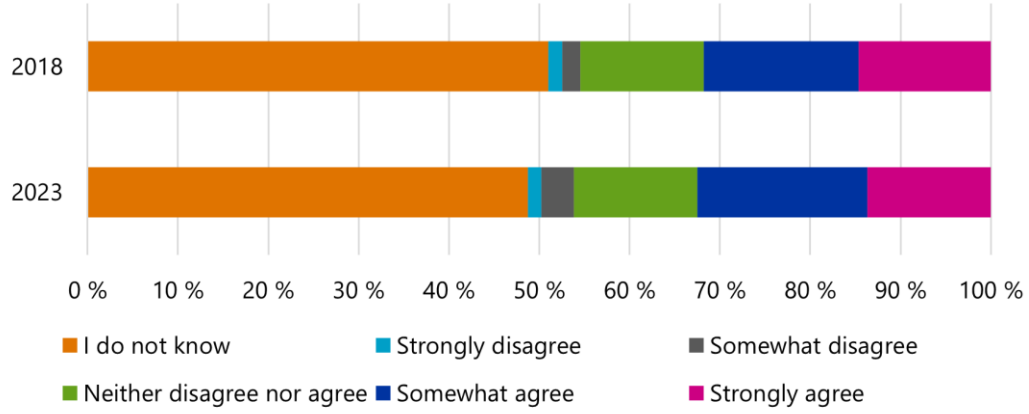

Distribution to the question "The level of restoration of peatlands and small water bodies is too high in relation to the benefits." $\chi^2$=0.2547.



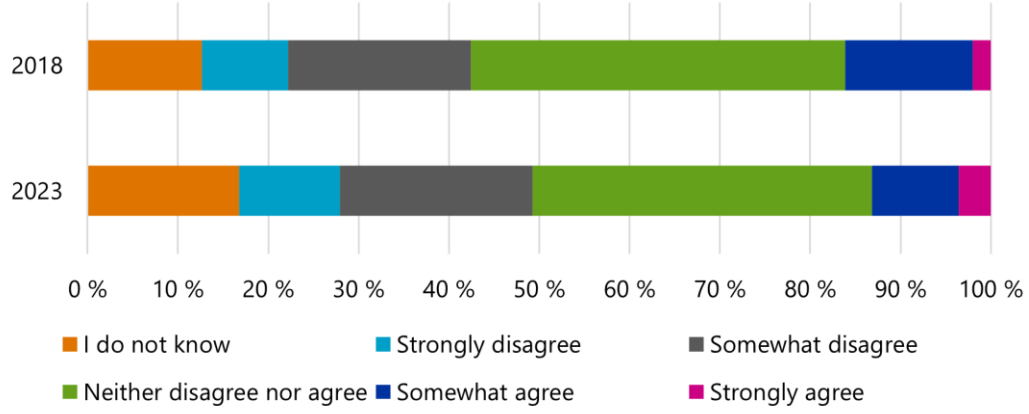

Distribution to the question "Restoring peatlands is harmful to forestry." $\chi^2$=0.2852.



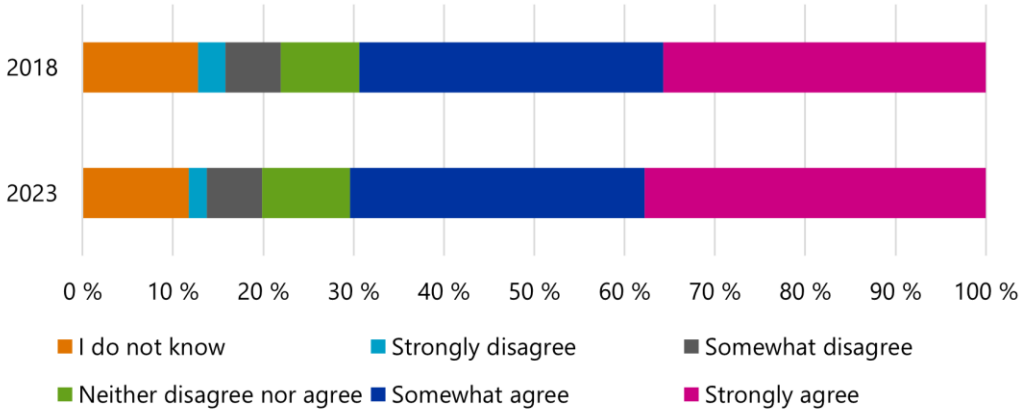

Distribution to the question "Restoration of peatlands and small water bodies should be limited to state lands." $\chi^2$=0.0188.



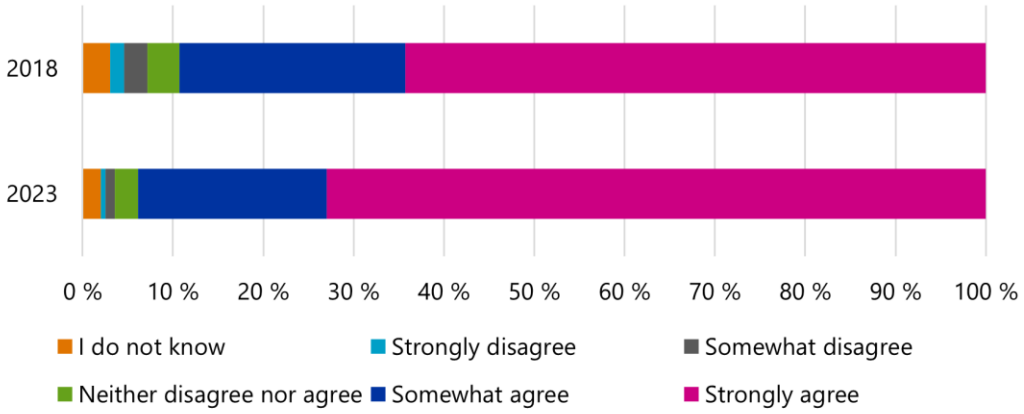

Distribution to the question "Restoring peatlands improves the conditions for reindeer husbandry." χ2=0.9504.



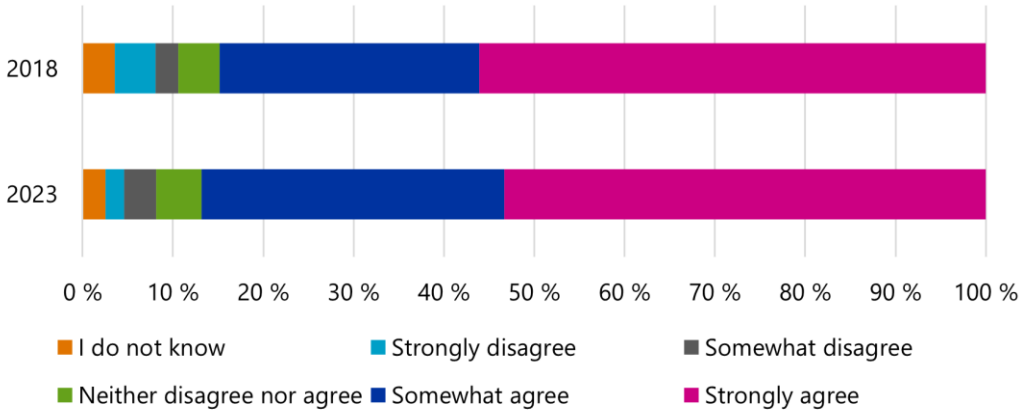

Distribution to the question "Restoring peatlands is more important than restoring small water bodies." χ2=0.5042.



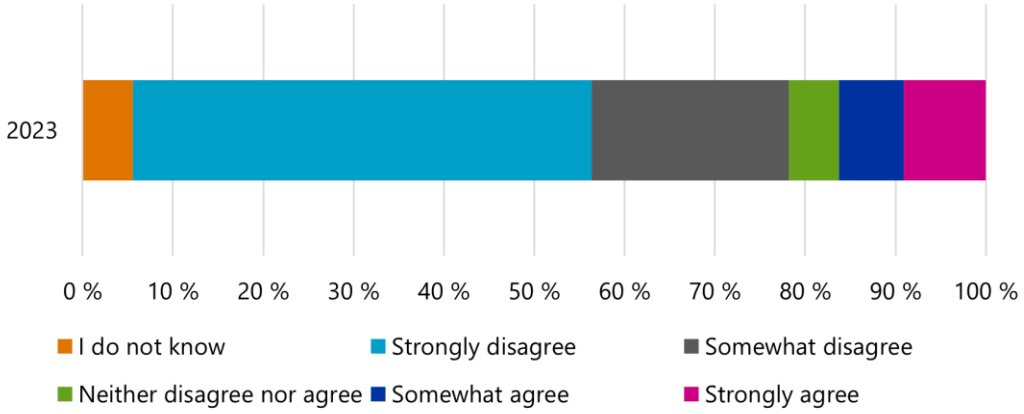

Distribution to the question "Restoring peatlands curbs global warming." $\chi^2$=0.9809.



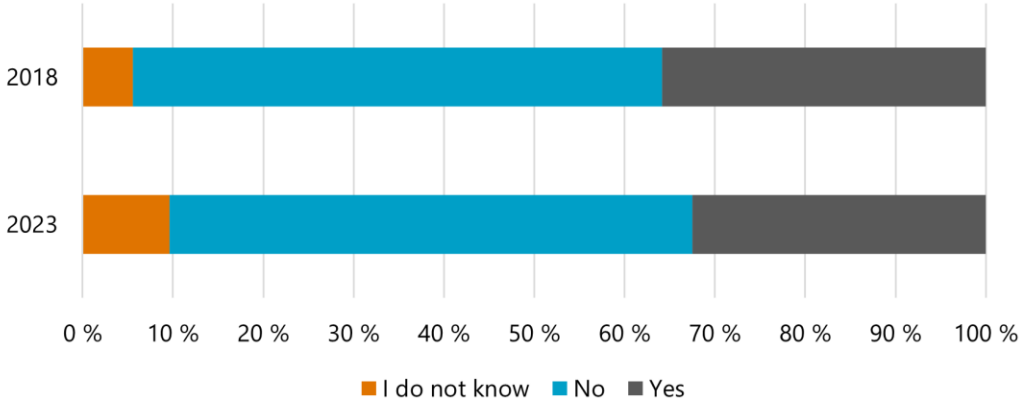

Distribution to the question "Restoring peatlands and small water bodies improve the quality of nearby water bodies." $\chi^2$=0.4402.




Distribution to the question "The restoration of peatlands and small water bodies should be supported more on private lands." $\chi^2$=0.6287.




Distribution to the question "The objectives brought by the EU's restoration regulation are too high for Finland." The question appeared only in the survey of the year 2023.




Distribution to the question "Do you own agricultural or forestry land?" $\chi 2=0.2849$.

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