People's knowledge, opinions and interest about small waters in their neighborhood in Turku, Söderhamn and Tallinn

Heawater Deliverable D.C3.2
Summary report on the stakeholder awareness survey results

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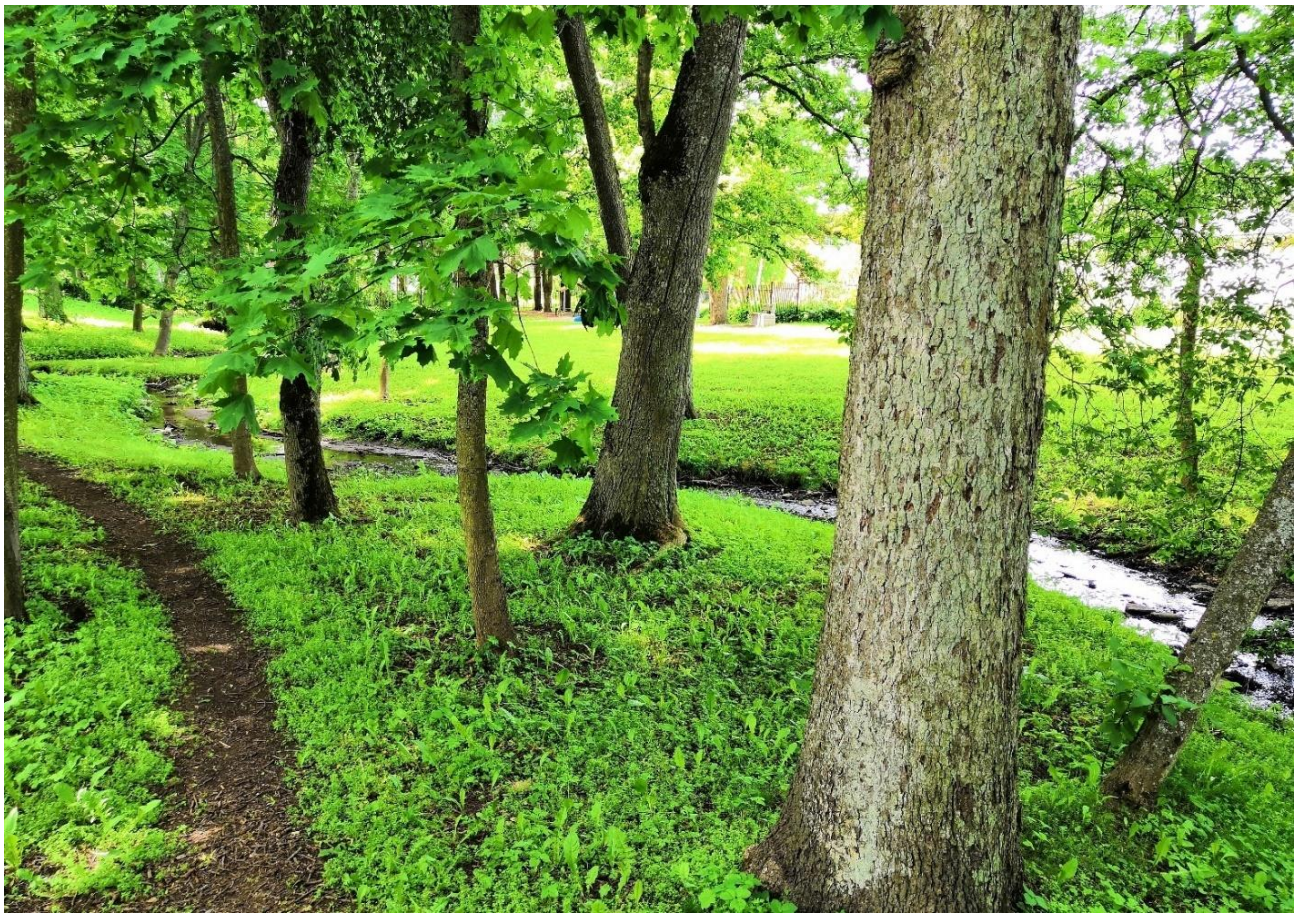

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Photo in the cover by Ljudmila Vesikko (SYKE)

1. Introduction

In cities, human activities have significant and direct impacts on the state of urban nature. This also applies to the status of urban water bodies and small waters. Rainwater often ends up untreated in urban streams and other urban water bodies, degrading their condition. In addition to the quality of stormwater, problems can also be caused by rapid and extreme fluctuations in their volumes. Heavy rains, which are becoming more frequent as a result of climate change, may contribute to increasing stormwater floods, thus affecting the lives of people and the rest of urban life. Long rainless summer seasons, in turn, can drain at least smaller urban streams. Although city streams are often close to people living in cities, they can nevertheless receive very little attention. Therefore, many people do not comprehend the impact of small and everyday human activities on their condition.

The surveys presented in this report were a part of the international Heawater project (Achieving healthier water quality in urban small rivers of the Baltic Sea catchment by restoration of water bodies and preventing of nutrients and hazardous substances inflow from watershed), an EU project funded by the Interreg Central Baltic Programme 2018–2021. Participants in the project were the City of Tallinn (the leading partner), Tallinn University of Technology in Estonia, the municipality of Söderhamn in Sweden, the Finnish Environment Institute (SYKE) and Turku University of Applied Sciences (TUAS) in Finland.

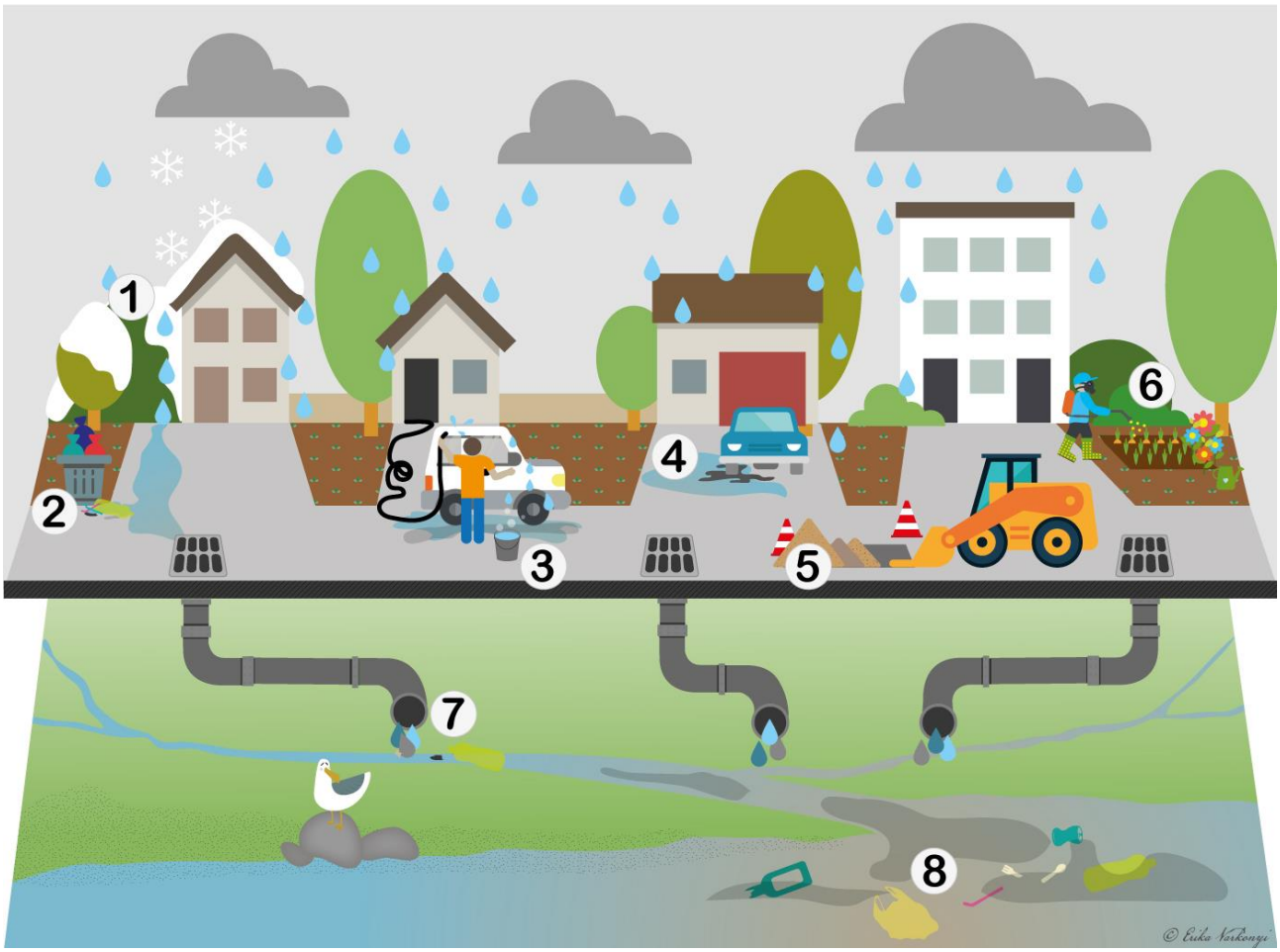
The overall goal of the Heawater project was to demonstrate possible and sustainable solutions to achieve better water quality in small, urban watercourses around the Baltic Sea. In addition, the aim was to raise awareness of the benefits of better water quality in small urban streams and the impact of streams on human well-being. The target areas of the project were the city of Turku in Finland, the municipality of Söderhamn in Sweden and the city of Tallinn in Estonia.

As part of the Heawater project, surveys were conducted in Turku, Söderhamn and Tallinn on the attitudes and willingness of residents to improve the condition of small waters and the sustainable management of stormwater in their area. The method used was the contingent valuation method, which aims to quantify the impact of environmental change on people's well-being using a carefully designed survey (see for example Champ et al. (2003)). A scenario is created for the survey to assess willingness to pay (WTP). In this project, the scenario described what environmental changes would be seen in small urban waters after new and more sustainable restoration measures. The environmental changes described were reduced flooding, an improved water status, increased recreational opportunities, increased spawning grounds for fish and more diverse habitats for birds, mammals and insects in water front. For the implementation of the presented scenario, respondents were asked if they were willing to pay a monthly (or annual) payment in the future. The results of the surveys were used to evaluate the overall benefits of improving the status of small waters. The overall environmental benefits could then be compared with an estimate of the cost of measures to achieve this change.

This report describes the implementation of the surveys in all three pilot areas in three countries. This report also compares some of the data between countries and briefly shows the results of light social cost-benefit analysis made in the project for these areas. This report describes the implementation of the surveys in all three pilot areas in three countries. More detailed descriptions of the surveys can be found in the country specific Deliverables (Lehtoranta et al. 2020a, 2020b, 2020c; Deliverable 3.1.1 Estonia, Deliverable 3.1.2 Finland and Deliverable 3.1.3 Sweden) on the target country's language. Attachments to these Deliverables include the full survey material for each area and more detailed results. Summary report of the CBA's for these pilot areas can be found in Deliverable 3.1.4 (Lehtoranta et al. 2020d). The English version of the Turku questionnaire can be found in Appendix 4 in this Deliverable.

1.1. Content of the surveys

The surveys also served as a communication tool, as in addition to the 25 questions, they contained a large amount of up-to-date information on small urban waters and their status, as well as stormwater management in each survey area. The survey texts followed the same pattern in all three areas but were tailored to suit each target area. The surveys also told about stormwaters in general and about sustainable stormwater solutions, as stormwater affects the state of small urban waters. All surveys used the same images drawn in the Heawater project for surveys and environmental education purposes. The images illustrated the formation of stormwater and aspects that can influence its quality, as well as different stormwater treatment practices. These images are presented in Appendix 4. The surveys also included a number of questions about respondents' attitudes, opinions and level of knowledge. These attitudinal and background questions are essential in the contingent valuation method. These questions and their answers have been discussed in more detail in the country-specific deliverables (please, see Lehtoranta et al. 2020a-c; Deliverable D.T2.1.1 in Estonian, D.T2.1.2 in Finnish, and D.T2.1.3 in Swedish) and they are also compiled in English in Appendix 1, 2 and 3.



1. Metals and other hazardous substances from building roofs are released into run-off water
2. Litter from waste receptacles may fall into run-off water and be carried along with it
3. Car washing soaps, among other things, run untreated from residential yards into the watercourse and can be hazardous to living organisms
4. Oil or other substances can leak from poorly maintained vehicles into run-off water
5. Soil from construction work is often carried away by run-off water
6. Pesticides and excess nutrients are easily carried by run-off water into watercourses
7. Run-off water from drainage pipes usually end up untreated in brooks and rivers
8. Litter and hazardous substances are also carried by brooks and rivers into lakes and the sea

Figure 1.1. Illustration used in the questionnaires about stormwaters and how peoples' activities influence them.

2. The results of the Turku survey

Turku, located in southwestern Finland with a population of almost 200,000, is the oldest city in Finland. In addition to the Aura River and the Archipelago Sea flowing through the city, there are numerous small watercourses in the city area. The most significant of Turku's small waters are the city streams Jaaninoja and Kuninkoja, but there are also many ditches and small ponds in the urban area, which can be locally significant for biodiversity and people's well-being. The water quality and biota of Jaaninoja and Kuninkoja have been studied since the beginning of the 21st century. Based on the biota studies, the ecological status of both streams would be classified as inadequate or poor. According to the water quality studies, the water quality of the streams has deteriorated, especially due to stormwater from streets and industrial areas, as well as construction sites. Both streams have been restored, for example as trout habitats. If the water quality of Kuninkoja and Jaaninoja were to improve, they would be better suited than at present for crabs and trout, as well as many other species. The state of urban watercourses is greatly affected by the way the city treats stormwater and snowmelt.

The survey was conducted both as a paper questionnaire and as an Internet questionnaire at the end of 2018. The study area was the city of Turku, as indicated in Figure 2.1. The basic population of the study comprised the inhabitants of this area, and the sample was based on approximately 28,000 residential buildings in the area. The questionnaire was sent as a random sample to one adult per household and was limited to native Finnish speakers. Altogether, 1,200 people randomly sampled from the Population Register Centre were sent a survey based on the listed building codes. The area was delimited in advance according to the postal codes, so that the distance of the respondents' homes from the city streams of Turku would not be too great.

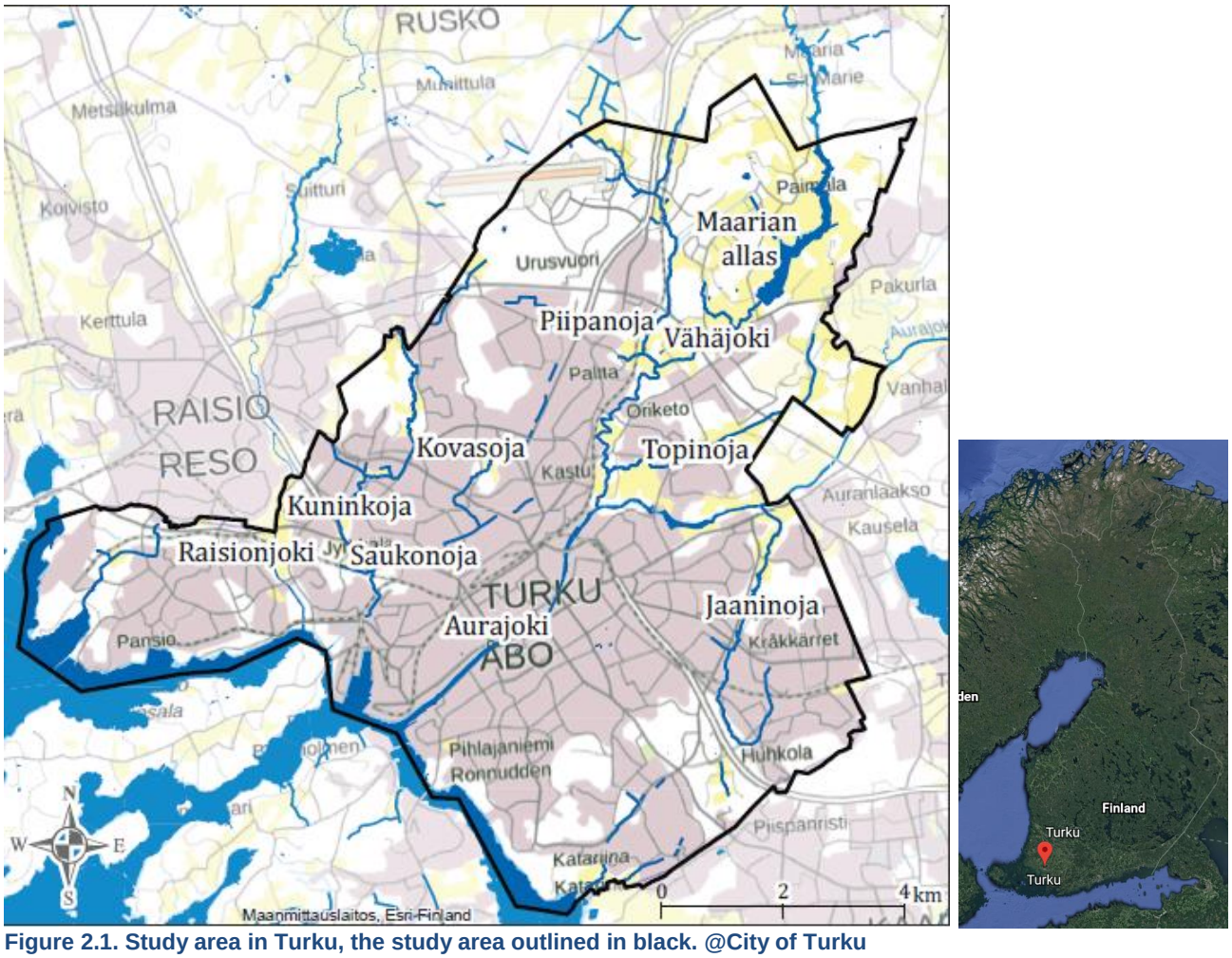


Figure 2.1. Study area in Turku, the study area outlined in black. @City of Turku

The questionnaire was tested in September 2018 by sending it by e-mail to 15 employees of the City of Turku. Based on the comments received from the testers, a few questions were refined. In order to increase the response rate and representativeness, respondents were contacted a total of four times: first by sending a paper questionnaire, then with two reminder cards and finally again by sending a paper questionnaire. All questionnaire materials for Turku can be found in Finnish in Deliverable D.T2.1.2 (Lehtoranta et al. 2020b). The English version of the Turku questionnaire can be seen in Appendix 4.

The cover letters were signed by the Mayor of Turku Minna Arve and the Finnish Environment Institute's Director of Marine research center Paula Kankaanpää. Questionnaires were sent between October 2018 and January 2019. Internet questionnaires were open until January 8th, 2019. Time table of the mailings was as follows:

1st mailing: Paper questionnaire and cover letter 1 were received around Oct 29th and time to answer until Nov 11th.

2nd mailing: Reminder card 1 was received around Nov 8th and time to answer until Nov 25th.

3rd mailing: Reminder card 2 was received around Nov 26th and time to answer until Dec 9th.

4th mailing: Paper questionnaire and cover letter 2 were received around Dec 10th and time to answer until Dec 31st.

In the second, third and fourth mailings, most of those who had already responded by then were removed from the recipients list.

In total, 465 responses were received. After eliminating multiple replies from the same persons, inadequately completed questionnaires and clear protest responses, the final data set comprised 438 respondents, representing a response rate of 36.5%. Such a response rate can be considered good. Of these, 349 (80%) responded on paper and 89 (20%) via the Internet.

The study area comprised the city of Turku (excluding the archipelagos and northern Turku), as shown in Figure 2.1, and this was already decided in the project application. The target group was the Finnish-speaking adult population of the area, i.e. persons aged 18 to 79 years. The share of adults in the population of Turku was estimated to be about 80% (Tilastotieto Turusta 2020).

About 54% of the respondents were women and the average age of the respondents was approximately 56 years. The mean age was thus slightly higher than that of all survey recipients (Table 2.1). Similarly, the proportion of female respondents was slightly higher than in the whole sample (n = 1,200).

Table 2.1. A Comparison of the sample and the respondents

	Turku*	Sample n=1200	Respondents n=438
Share of women	52,2%	51,3%	53,9%
Average age at the time of survey		49,7	55,6

**) Tilastotietoa Turusta 2020 https://www.turku.fi/turku-tieto/tilastot/tilastotietoja-turusta#V%C3%A4est%C3%B6,%20asuminen%20ja%20koulutus*

2.1 Use of urban streams and perceived water quality in Turku

Majority of respondents (64%) lived in detached houses, one in five in semi-detached or terraced houses and more than one-tenth in a block of flats. Half of the respondents said they lived less than a kilometer from the city stream, but just over a tenth could not say.

The survey also asked what the respondents thought about the current water quality of Turku city streams. Only one in 100 respondents considered their condition to be excellent and only four in 100 even considered it good. About a quarter of respondents thought they were in a satisfactory state and a fifth thought they were in an inadequate state. Almost one in ten considered them to be in poor condition. Nearly half of respondents could not say in what state they thought they were. The distribution of responses is shown in Figure 2.2. Based on the responses, water quality was perceived slightly differently regionally. Respondents living with postal codes 20500–20540 thought the condition of urban streams to be slightly better than the respondents in other areas. The difference was statistically significant.

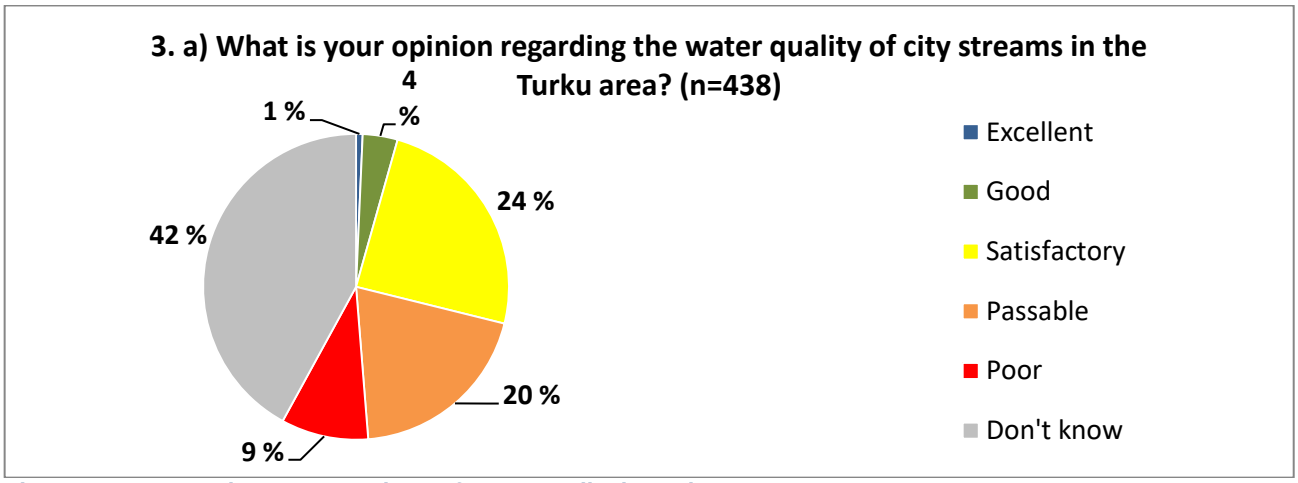


Figure 2.2. Respondents' perceptions of water quality in Turku streams.

The questionnaire also surveyed how Turku residents use different types of areas for recreation. The most popular among the respondents was outdoor activities along the Aura River and the next most popular one was the seaside. However, almost a quarter of respondents also reported spending time on the shores of the city streams almost weekly (Figure 2.3).

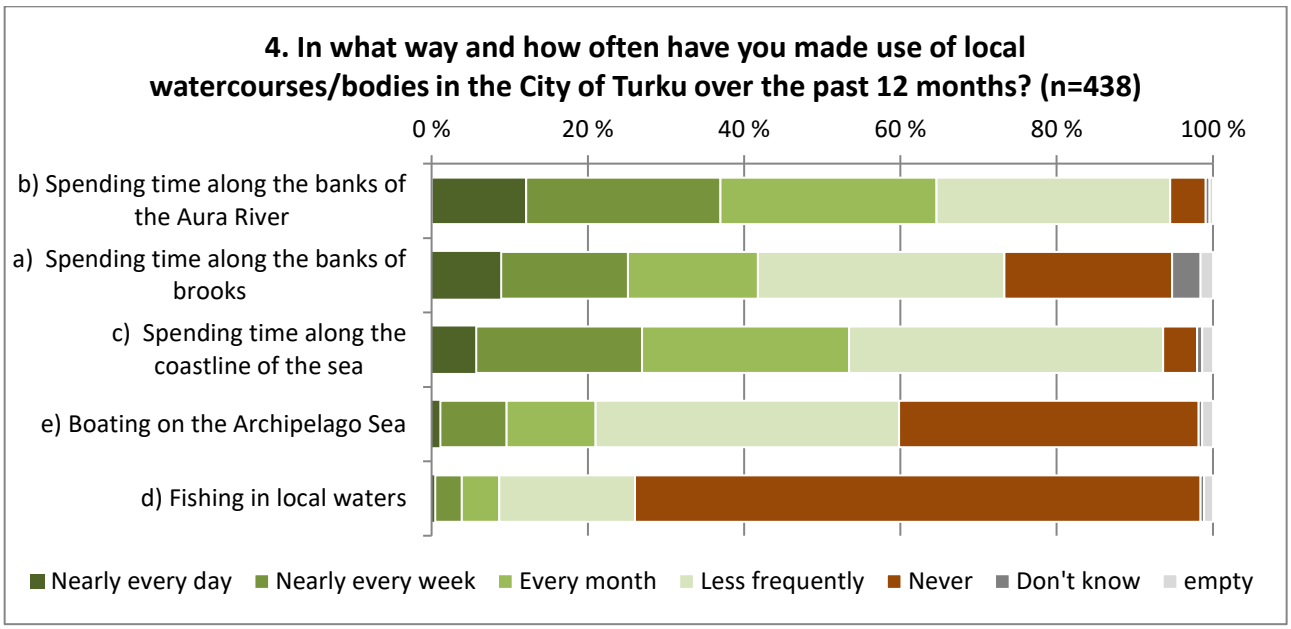


Figure 2.3. Recreational activity related to urban waters during the past year.

At the beginning of the survey, recipients were asked to consider whether the public financing of the various locally important topics should be changed. The purpose of the question was to assess the importance of funding for the protection of urban streams in relation to other important public expenditure issues in the area. Out of the given options, the protection of the Archipelago Sea was seen as very important by around 70% of respondents. Just over 20% of respondents thought improvement of the state of city streams was very important.

About nine in ten respondents were also concerned about the state of the Archipelago Sea (Figure 2.4). About half of the respondents were concerned about the condition of city streams. However, a clear majority felt that Turku city streams should be more prominent in the cityscape and that they are important to them.

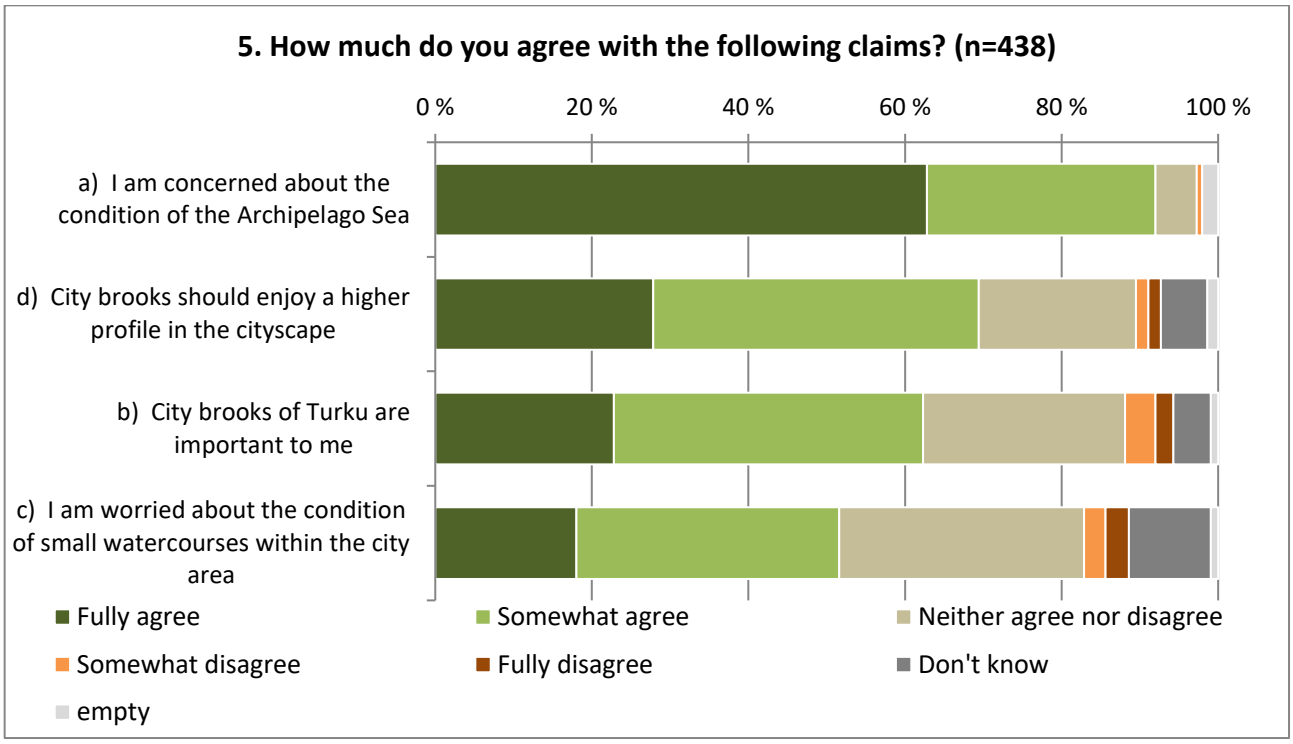


Figure 2.4. Respondents' views on the state of the sea and city streams.

2.2 Stormwater and their sustainable management in Turku

The quantity and quality of urban stormwater is crucial to the state of city streams. Usually, stormwater ends up in city streams, rivers or the sea, untreated through sewers on the streets. A picture was drawn for the survey to illustrate this direct relationship between stormwater and natural waters. It was also intended to communicate which human activities have a particular impact on stormwater quality. The picture and explanatory texts are on page 5 of the questionnaire (Appendix 4).

Respondents were also briefly told about the formation of stormwater. They were then asked if they had ever heard of stormwater. Most respondents said they already knew what stormwater meant (Figure 2.5). However, a quarter responded that there was something new to them in the text and picture presented to them. Only two out of 100 respondents had no idea what stormwater meant and over a tenth did not answer the question.

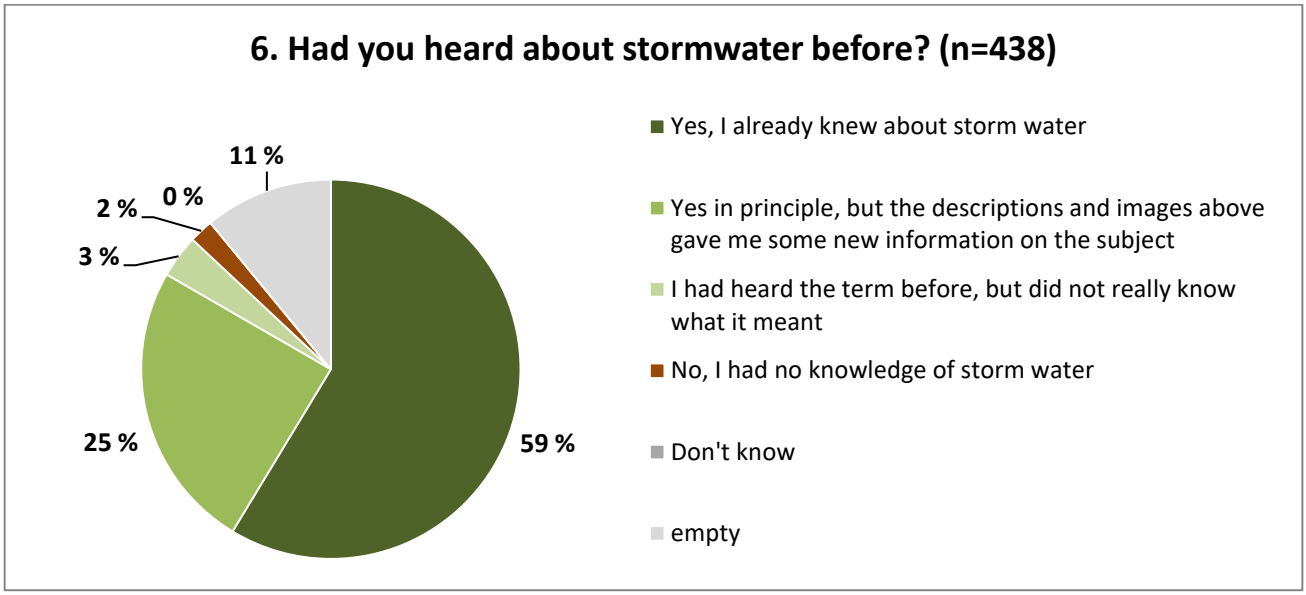


Figure 2.5. Familiarity of stormwater among the respondents

Recipients were then asked for their views on the various claims concerning city streams and stormwater (Figure 2.6). Respondents prioritized improving the living conditions of trout and river crab. About half also believed they could influence the state of the city streams through their own actions. Only one-third thought that the amount or quality of stormwater was not a problem in Turku. Nearly a fifth felt that urban floods had increased in the past ten years. However, for the most part, respondents were not indifferent what happens to stormwater when they are directed off the streets. Half of the respondents could not assess whether the water quality of urban streams has improved in Turku in recent years.

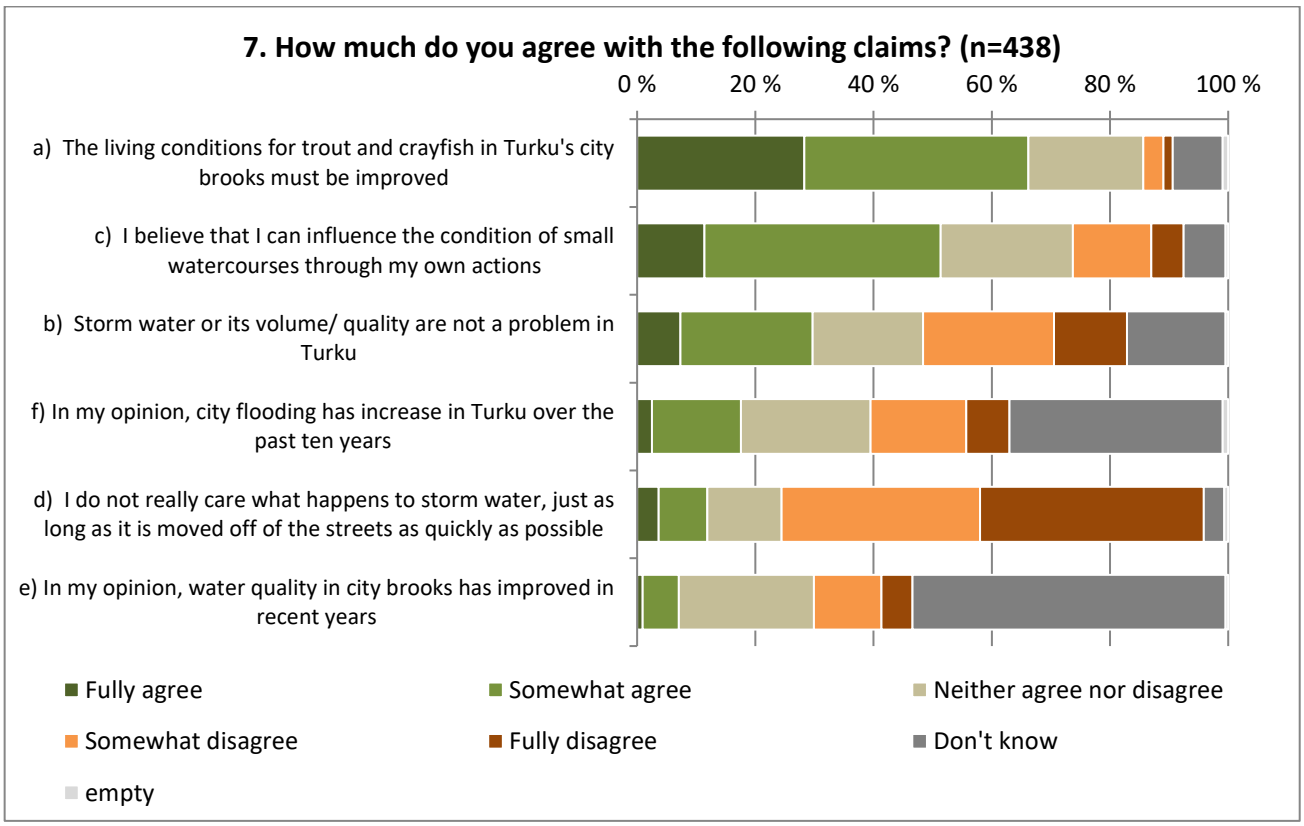


Figure 2.6. Respondents' opinions about the city streams and stormwaters

Recipients were further elaborated on the effects sustainable management of stormwater could have. They were asked if natural stormwater management could make a difference for themselves or for the inhabitants of the area. Almost 70% of respondents believed that it could have a major or moderate positive impact on the image and reputation of the area (Figure 2.7). More than half expected large or moderate positive effects on their own nature experience, the well-being of Turku people and the attractiveness of Turku. Almost half thought that it could have a positive impact on their recreational visits in city streams. For all alternatives, 6–24% did not believe that sustainable stormwater management would have such effects.

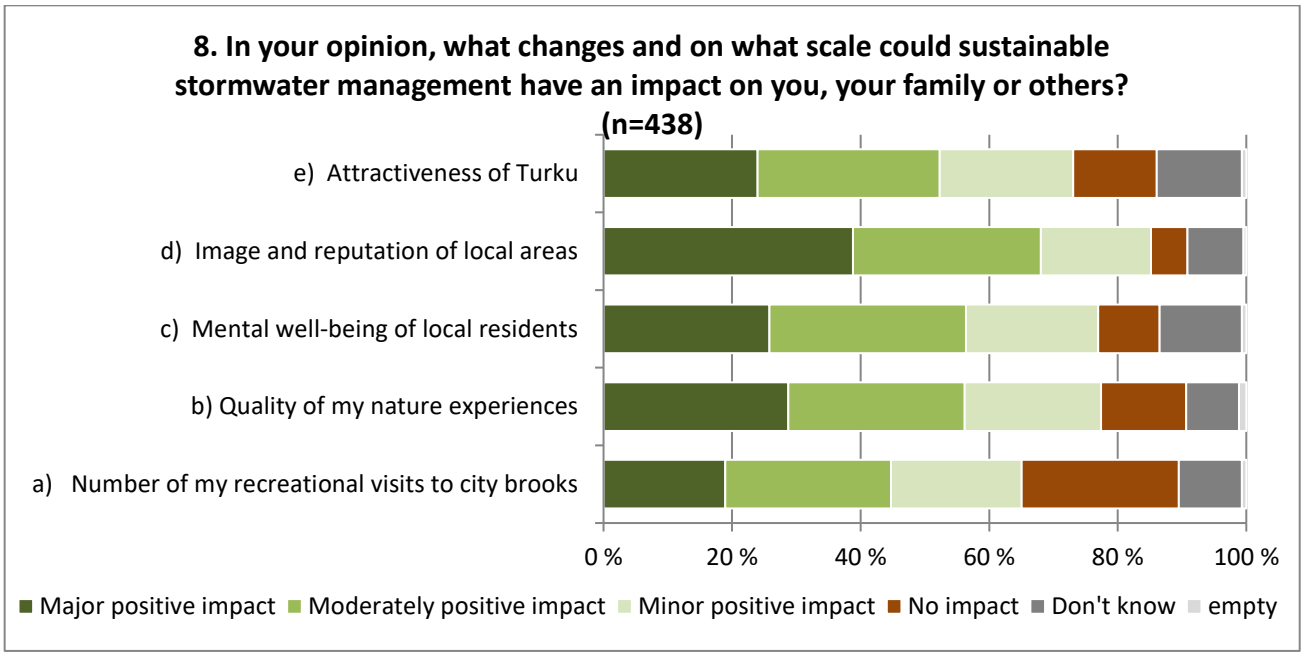


Figure 2.7. Respondents' opinions about the effects of sustainable stormwater management

2.3 Willingness to contribute in Turku

One of the most important purposes of the survey was to estimate the willingness of residents to personally contribute to the costs of protecting urban streams. Approximately 60% of all respondents would at least consider paying a voluntary city stream fee in 2019–2028 to improve the condition of Turku city streams and their surroundings (Figure 2.8).

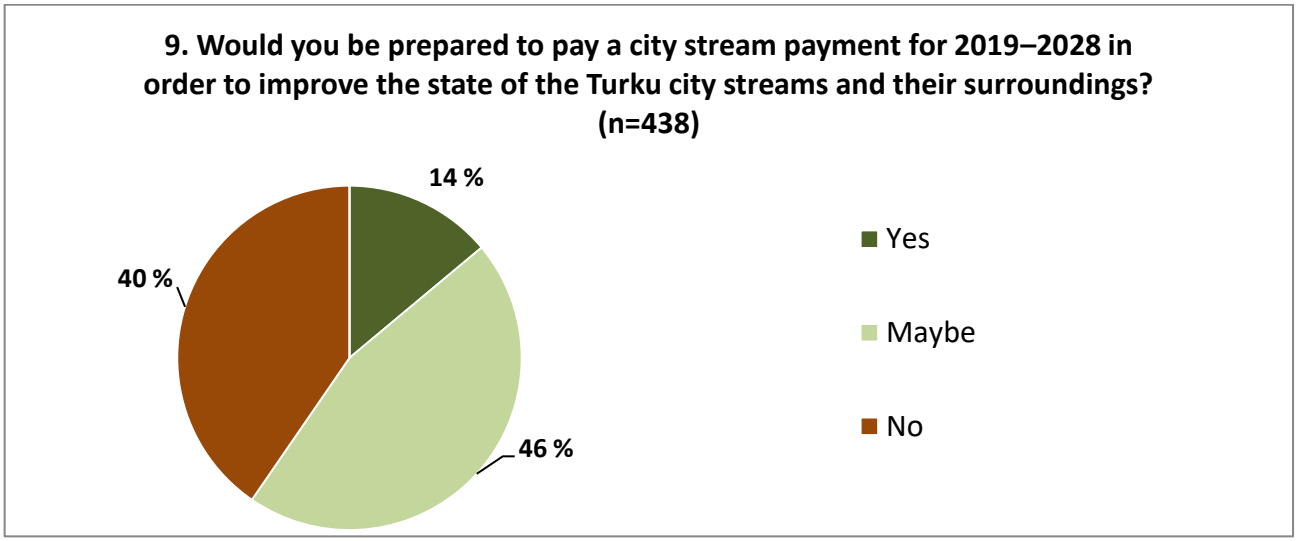


Figure 2.8. Respondents' willingness to pay for the improvements of the city streams.

Those who replied “Yes” or “Maybe” to the willingness to pay question were then asked how certain they would be about paying different amounts each month for the next ten years. Based on the results, the respondents were on average willing to pay a voluntary city stream fee of EUR 12.20–32.00 per year in 2019–2028. The lower and upper values of average willingness to pay were calculated in two different ways (Kristrom 1990; Turnbull 1976).

Factors related to the respondents or their attitudes that together contributed to the positive willingness to pay were analysed using a regression model. The model explained respondents’ willingness to pay some positive monthly city stream fee over the next ten years. Based on the results, the willingness to participate was increased by the following factors: perceiving the protection of the Archipelago Sea as very important, belonging to younger age groups of respondents and considering water, stormwater or wastewater fees as the best way to raise funds for more sustainable stormwater treatment and urban stream improvement. In addition to these, the willingness to participate was increased by the respondent's higher income level and having Jaaninoja as the nearest stream.

2.4 Reasons for willingness and unwillingness to pay in Turku

The most important reason for willingness to pay was most often the prevention of nutrients and other harmful substances entering city streams. The next most important reason stated was the desire for better conditions for biota in and around urban streams, and the prevention of urban floods by natural methods (Figure 2.9).

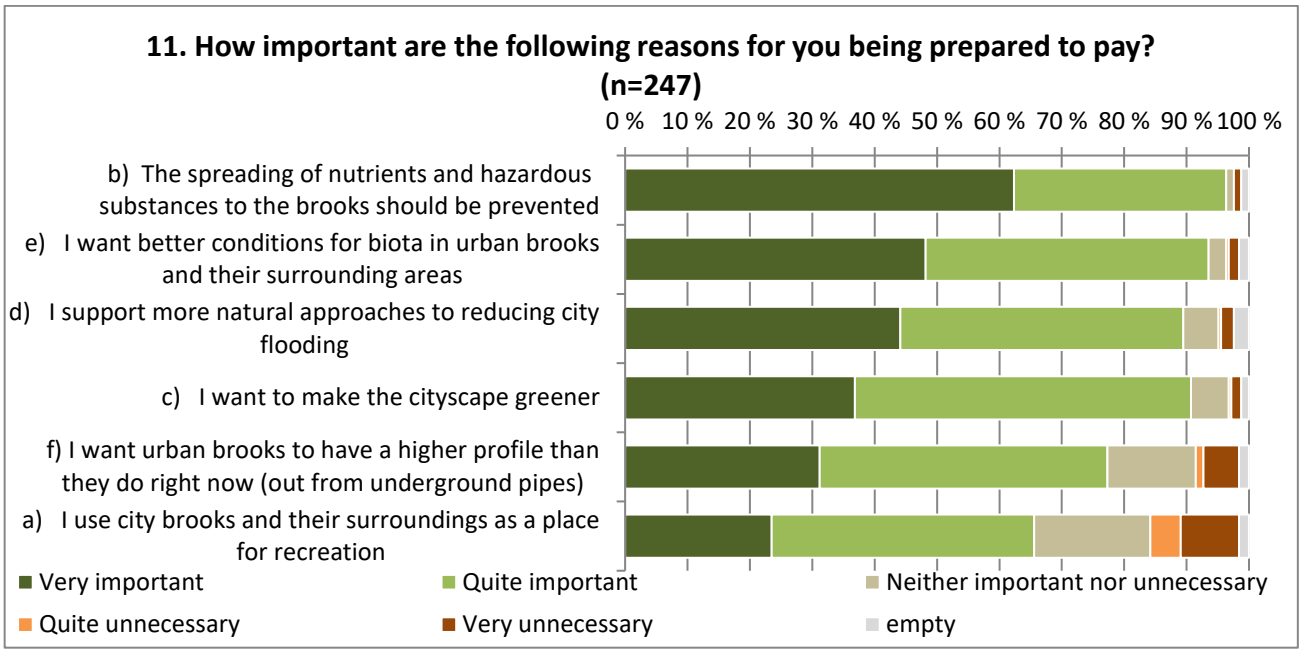


Figure 2.9. Reasons for willingness to pay

The most common reason for non-payment was that the recipient would already pay a stormwater fee. In Turku, a separate stormwater fee on properties was introduced in November 2018. Many believe that previously paid taxes and mandatory charges should also be directed towards the care and protection of city streams (Figure 2.10).

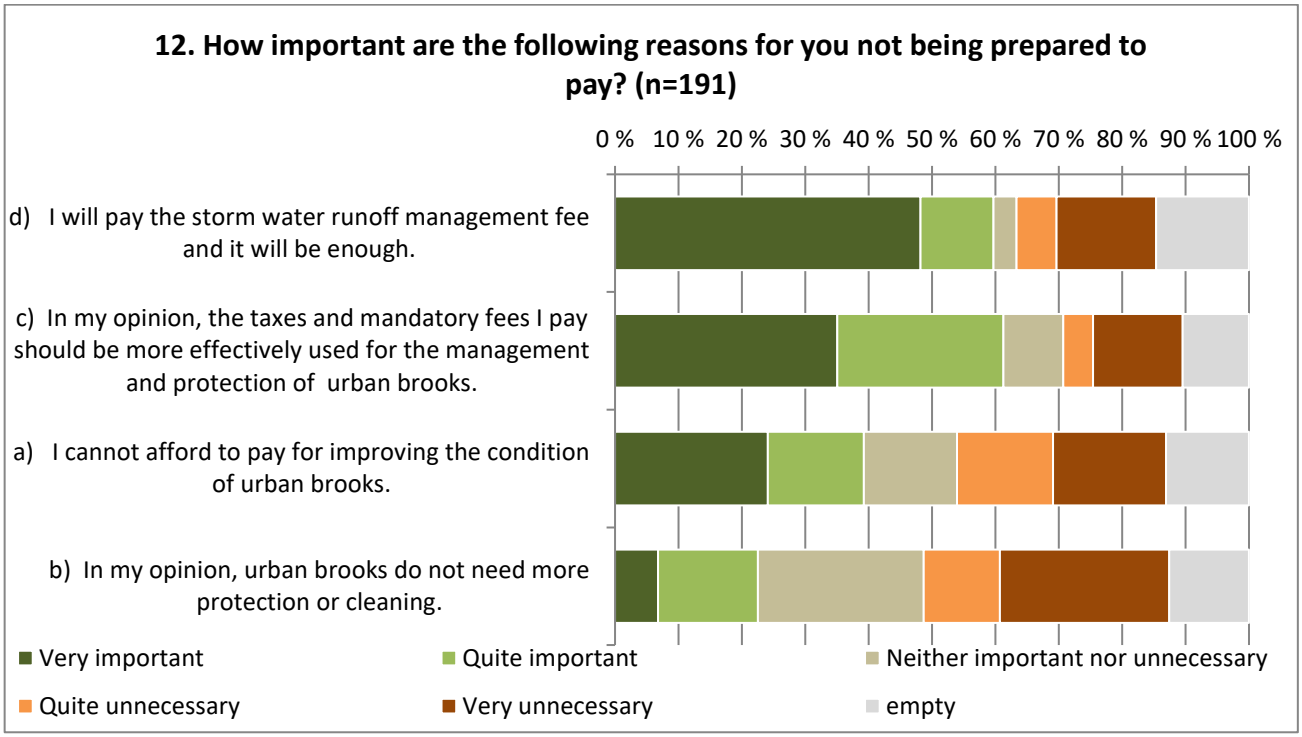


Figure 2.10. Reasons for unwillingness to pay

2.5 Fundraising in Turku

Respondents were asked what would be the best way to raise money from citizens for more natural treatment of stormwater and for improving the condition of urban streams. The most popular method was to raise funds as part of the water, stormwater or wastewater fees (Figure 2.11). This approach was favored by more than half of all respondents and even more by those willing to pay (65%). Compared to those not willing to pay, those who were willing to pay more often chose to pay as part of their water or sewage charges. The popularity of voluntary payment was slightly higher among non-contributors (27%) than among those who were willing to pay (24%). The least popular method was tax increase, which was considered the best practice by 8% of respondents, more by those willing to pay than non-paying.

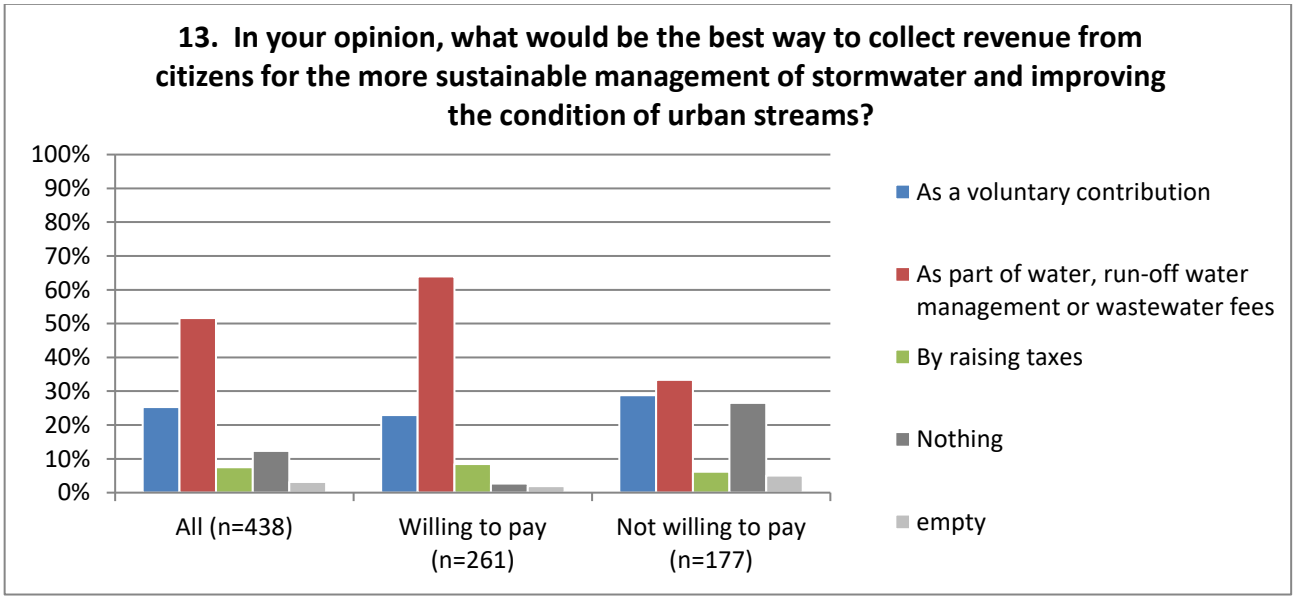


Figure 2.11. Preferred ways for raising funds for more sustainable treatment of stormwater and improving the condition of urban streams

The survey also sought to discover respondents' activity in dealing with city streams or stormwater related events. At the same time, it was important to remind respondents that small everyday actions can have an impact. Only a few respondents had participated in a stream restoration work. However, one third had collected litter from streams or their surroundings (Figure 2.12).

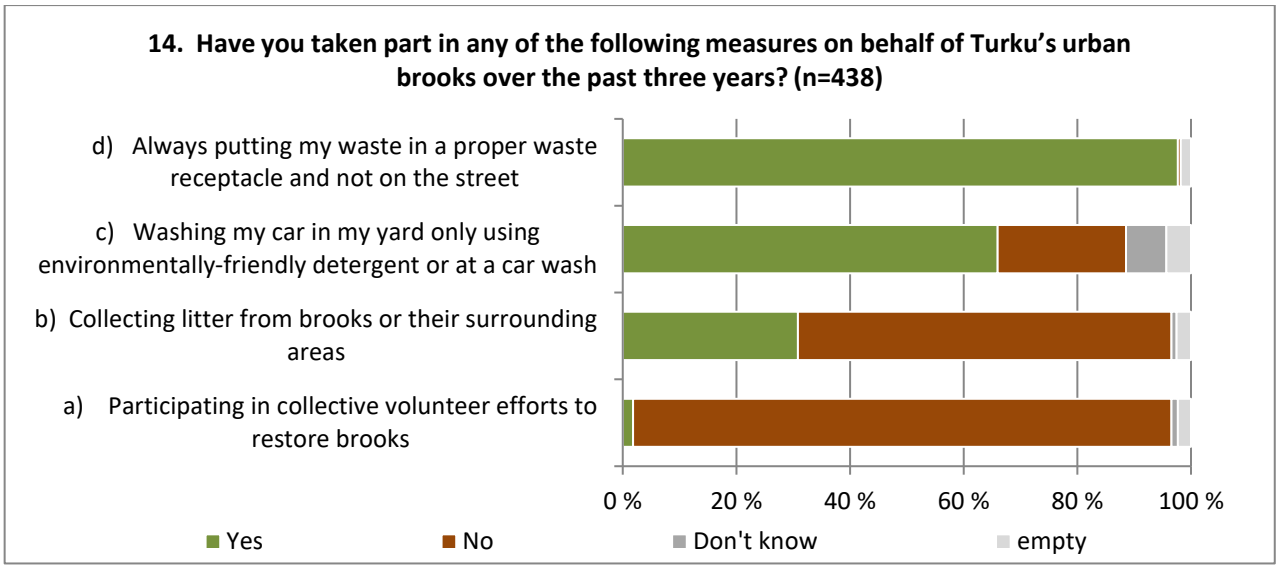


Figure 2.12. What actions have the respondents taken regarding urban streams.

As shown in figure 2.13 almost 90% of respondents thought that raising funds through the Archipelago Sea Conservation Fund was a good idea. Even more received at least some new information on city streams through this survey. Almost as many also believed they would pay more attention to city streams' condition in the future. Almost 80% of respondents were also more concerned about the state of the city streams after responding to the survey. Over 70% of respondents had also received at least some new information on stormwater through the survey. About half of the respondents also felt it was important, at least to some extent, that the payment could be targeted to improve the condition of an individual city stream.

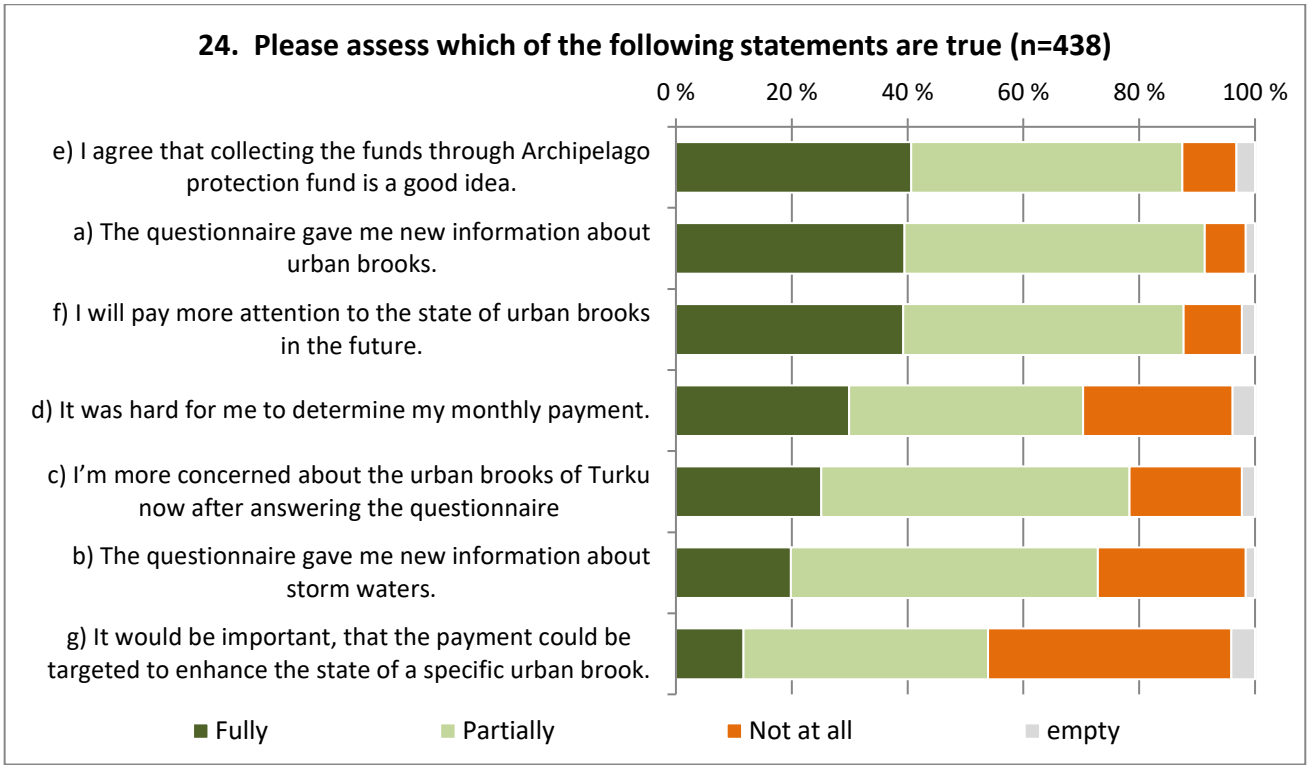


Figure 2.13. Opinions of the respondents regarding the waters of the area.

3 The results of the Söderhamn study

Söderhamn is a 400-year-old town at the bottom of Söderhamn Bay. The city has developed along the Söderhamnsån River, and the river has always been important for the city's traffic, fishing and trade. The catchment area of Söderhamnså is 92.3 km². Söderhamn is home to about 26,000 people. Söderhamnsån flows through woodlands, agricultural land and residential areas. Heavy rains and melting snow easily cause flooding, as the flow increases sharply because there are very few flow-compensating lakes in the catchment area. Both the river and the bay are impacted by a high loading of solids and high nutrient concentrations, resulting in eutrophication. With stormwater, harmful substances also end up in the river and bay. Söderhamn Bay is particularly sensitive to environmental impacts because it is both narrow and shallow.

The water quality of Söderhamn has been studied since the 1970s, and in 2018 an extensive study was carried out on the state of Söderhamnså water. According to the latest classifications, the ecological status of Söderhamn Bay is poor and that of Söderhamnså is moderate. However, trout breed in Söderhamnså.

The survey area in Söderhamn was already defined in the project application. A random sample of addresses for 1,200 people from Söderhamn was ordered by JP Postitus Oy from Data Refinery Oy. The gender distribution was set equal, so 600 women and 600 men were included in the sample. The survey was aimed at residents living around Söderhamnsån and the inner part of Söderhamnsfjärden (Figure 3.1), and the postal code areas were used to delimit the area. Because of the aim to include the northern part of Söderhamnsfjärden, the questionnaire was also sent to residents with the postal code 82691, even though some of these lived far from Söderhamnsån. The survey was targeted at people in the age range of 18–79 years and at one respondent per household. However, as the survey progressed, it became apparent that some of the addresses (n = 266) were out of date. The company that collected the address and name information was requested to provide new personal and address information for these addresses.

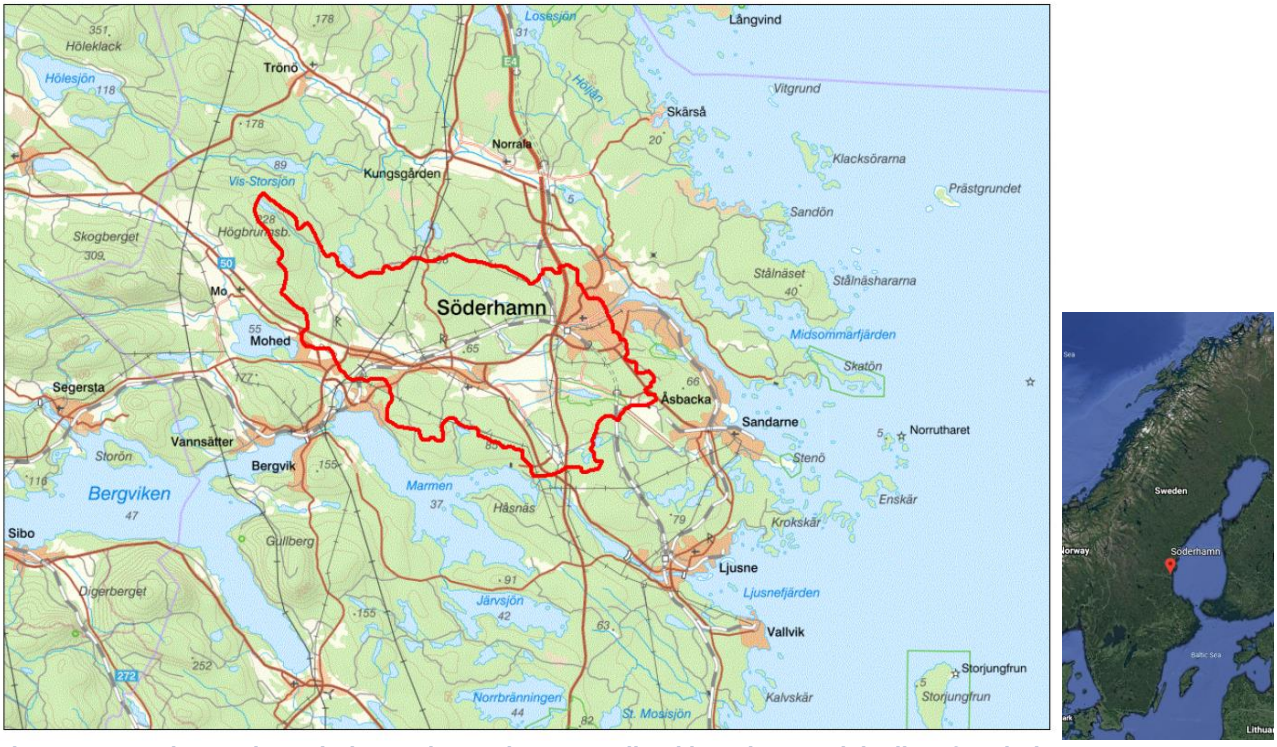


Figure 3.1. Study area in Söderhamn the study area outlined in red. @Municipality of Söderhamn

The Finnish Environment Institute (SYKE) designed and otherwise executed and managed the questionnaire in cooperation with the municipality of Söderhamn. The questionnaire was tested in March and April 2019 by sending it to a several residents in Söderhamn. Based on the comments received from the testers, minor changes were made to a few questions. The survey was conducted in Söderhamn in summer 2019, in Swedish, and both as a paper and an Internet questionnaire.

In order to increase the response rate and representativeness of the data, respondents were contacted a total of four times: first by sending them a paper questionnaire, then with two reminder cards and finally again by sending a paper questionnaire. All questionnaire materials for the Söderhamn study can be found in Swedish in Lehtoranta et al. (2020c). as attachments. The cover letters and reminder cards were signed by John-Erik Jansson, Chairman of the Municipal Board of Söderhamn.

Internet questionnaires were open until the end of August 2019, and the last paper responses were read on 11.9.2019. The survey materials were sent as follows:

• Paper questionnaire and cover letter 1 mailed May 5th
• Paper questionnaire and cover letter 1 with new fixed addresses mailed June 12th

• First reminder card to the original addresses mailed June 12th
• First reminder card to the new addresses mailed July 1st

• Second reminder card to the original addresses mailed June 24th
• Second reminder card to new addresses mailed July 15th

• Second paper survey and cover letter 2 to the original addresses mailed July 2nd
• Second paper survey and cover letter 2 to the new addresses mailed August 1st

In the second, third and fourth mailings, most of those who had already responded by then were removed from the recipients list. In total, 475 responses were received. After eliminating empty replies (16), double replies (17) and 28 replies from the postal code 82661, which was outside of the study area, the final data set comprised 424 respondents, representing a response rate of 35.3%, which can be considered good. A total of 348 (82%) responded on paper and 76 (18%) via the Internet.

3.1 Use of waters and perceived water quality in Söderhamn

Majority of respondents (55%) lived in detached houses, one in three in apartment buildings and one in ten in semi-detached or terraced houses.

It was asked in the survey what the respondents thought about the current water quality on Söderhmansån and Söderhamnsfjärden. Only one in 100 respondents considered their condition to be excellent. About one in ten considered them good. Respondents seemed to think that Söderhamnsfjärden was in a better state than the Söderhamnsån, as can be seen in figure 3.2. More people were unsure about the state of the Söderhamnsfjärjden (32%) than about the state of the Söderhamnsån (23%).

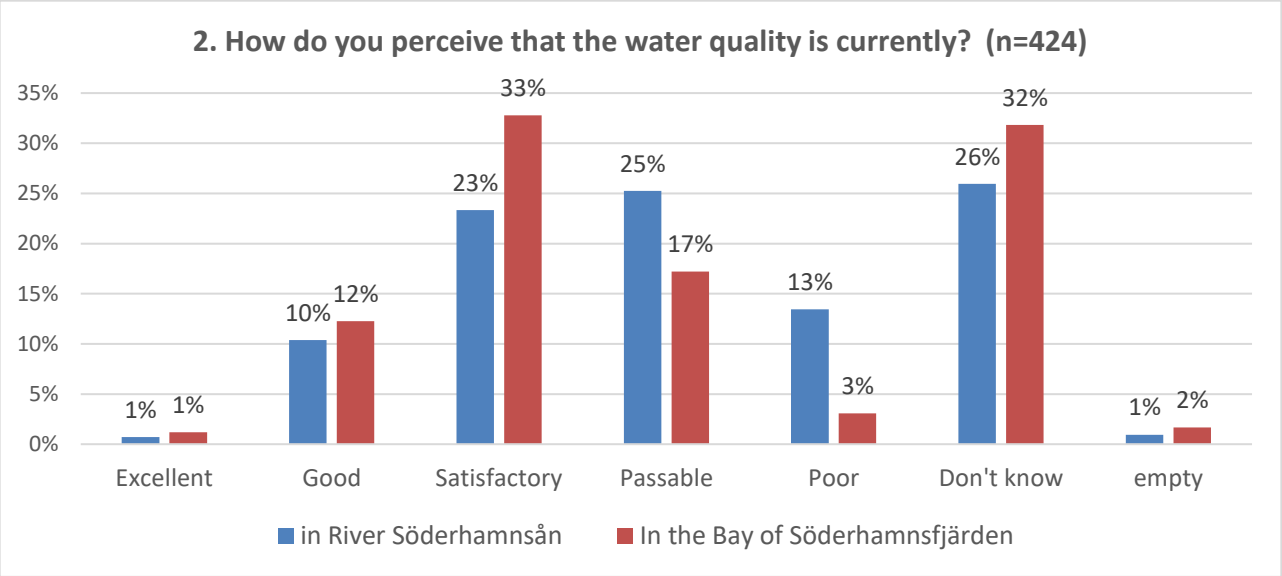


Figure 3.2. Respondents' perceptions of water quality in Söderhamn.

Next it was asked how the residents use Söderhamnsfjärden and Söderhamnsån and nearby areas for recreation. The most popular among the respondents was exercising, jogging etc. and the next most popular one was just spending time and socializing along the river (see figure 3.3).

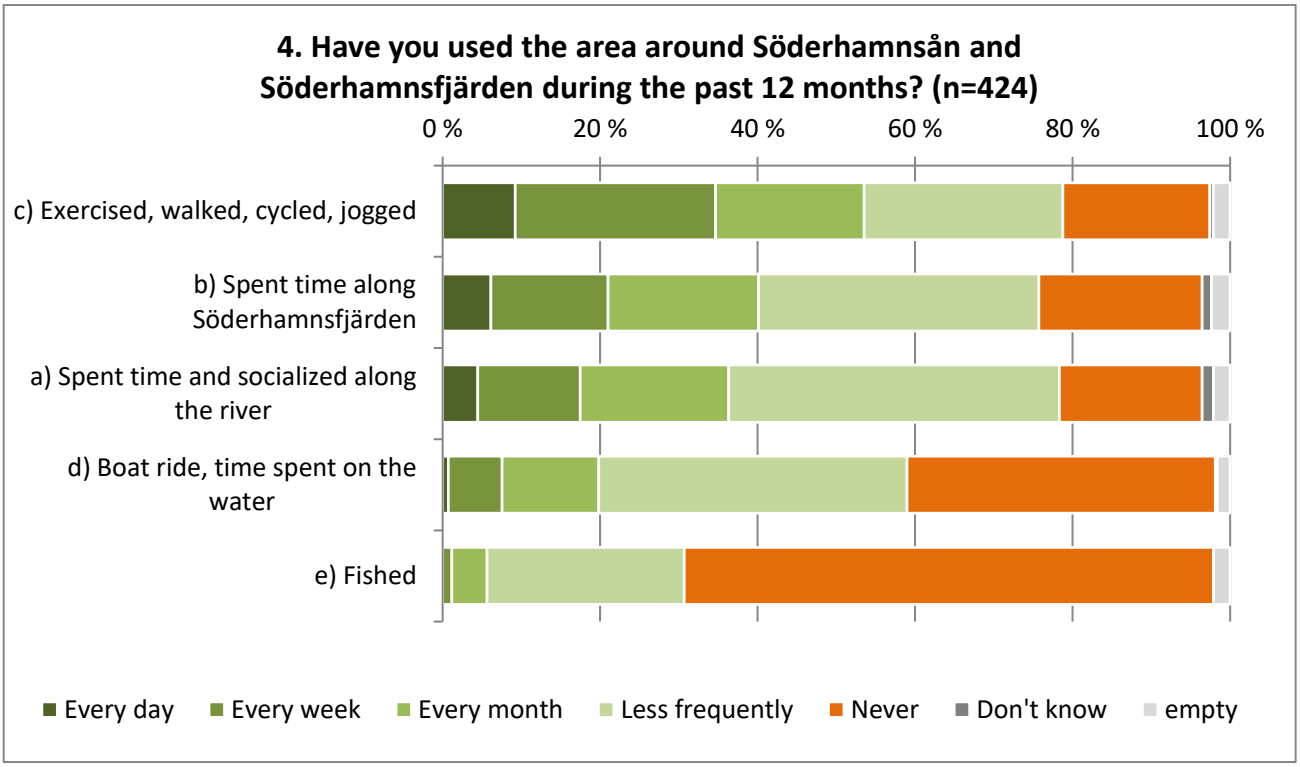


Figure 3.3. Respondents' outdoor habits during the past year.

At the beginning of the survey, recipients were asked to consider whether the public financing of the various locally important topics should be changed. The purpose of the question was to assess the importance of improvement of the water quality in Söderhamnså in relation to other important public expenditure issues in the area. Out of the given options, over 70% of respondents thought that it would be very important to direct tax payments into maintaining the municipal street and road network. Almost 40% of respondents thought that it would be very important to improve the water quality of Söderhamnså. The majority of respondents felt that the Söderhamnså is important to them and about half was worried about its state (Figure 3.4). A smaller proportion of respondents was concerned about the state of the archipelago.

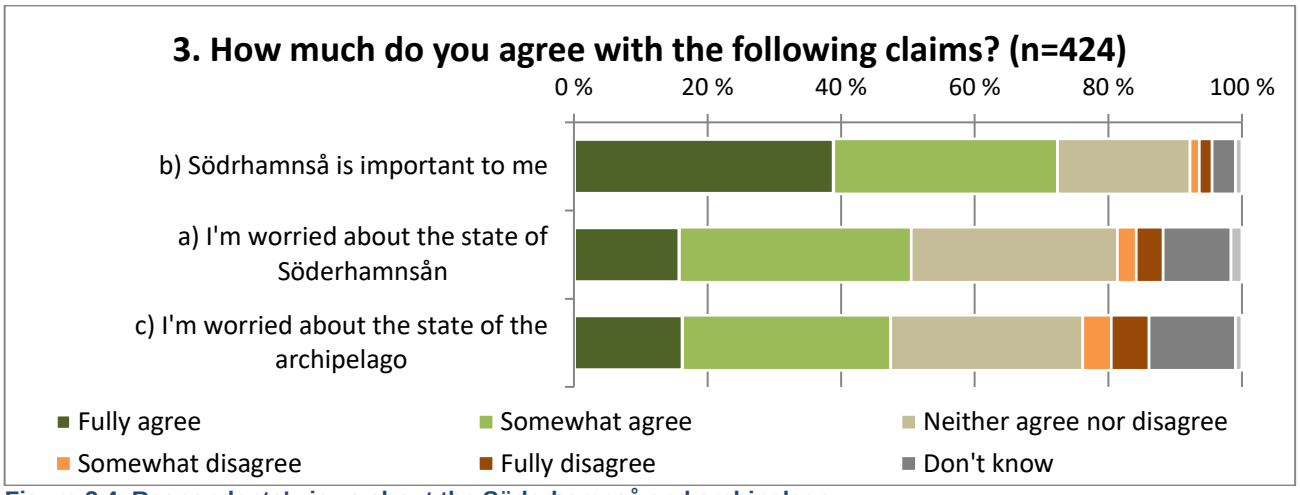


Figure 3.4. Respondents' views about the Söderhamnså and archipelago.

3.2 Stormwaters and their sustainable management in Söderhamn

The quantity and quality of urban stormwater is crucial to the state of Söderhamnså and therefore also Söderhamnsfjärden. Usually, stormwater ends up in city streams, rivers or the sea, untreated through sewers on the streets. A picture was drawn for the survey to illustrate this direct relationship between stormwater and natural waters. It gave examples about which human activities have an impact on stormwater quality. Respondents were also briefly told about the formation of stormwater. They were then asked if they had heard of stormwater before. Most respondents said they already knew what stormwater meant (Figure 3.5). However, about one-fifth of the respondents said that there was something new to them in the text and picture presented in the survey. Only two out of 100 respondents had no idea what stormwater meant and about one-tenth of the respondents did not answer the question.

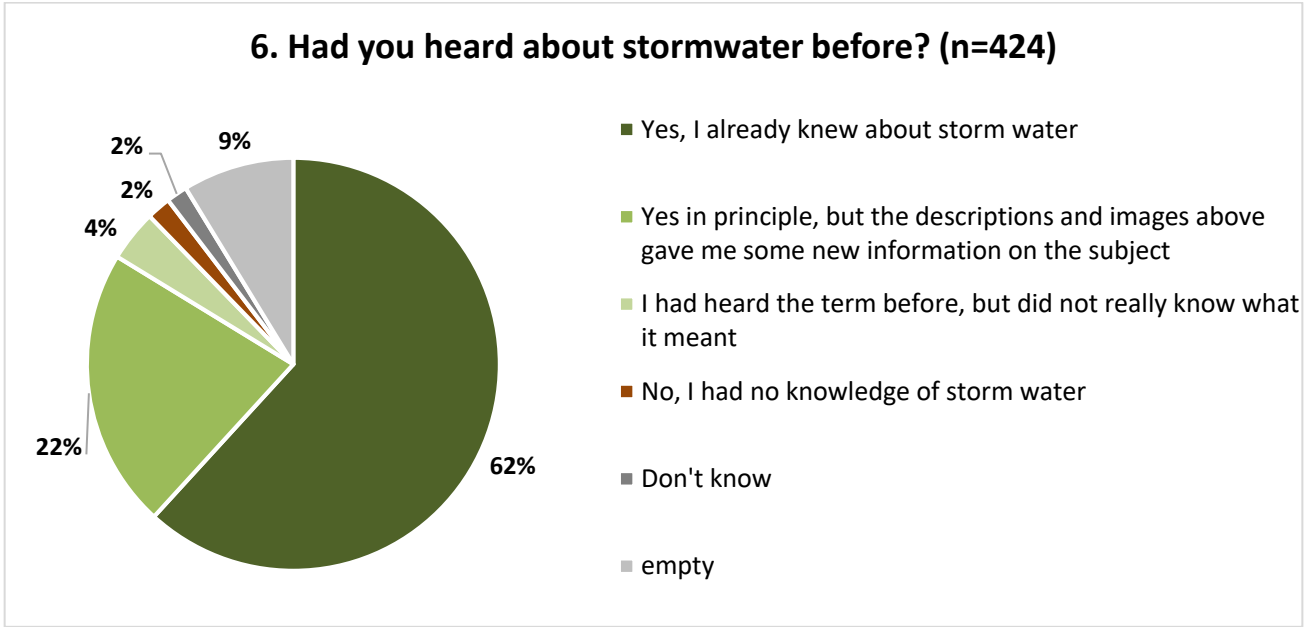


Figure 3.5. Familiarity of stormwater for Söderhamn residents.

Recipients were then asked for their views on the various claims concerning the river and stormwater (Figure 3.6). Respondents prioritized improving the living conditions of fish such as trout. Little less than 40% of respondents also believed they could influence the state of the river through their own actions. About 12% of respondents thought that there is no problem with the water quality of the river.

Only little more thought the same about flooding around Söderhamnsån. In fact, nearly 20% of respondents felt that the flooding had increased during the last decade.

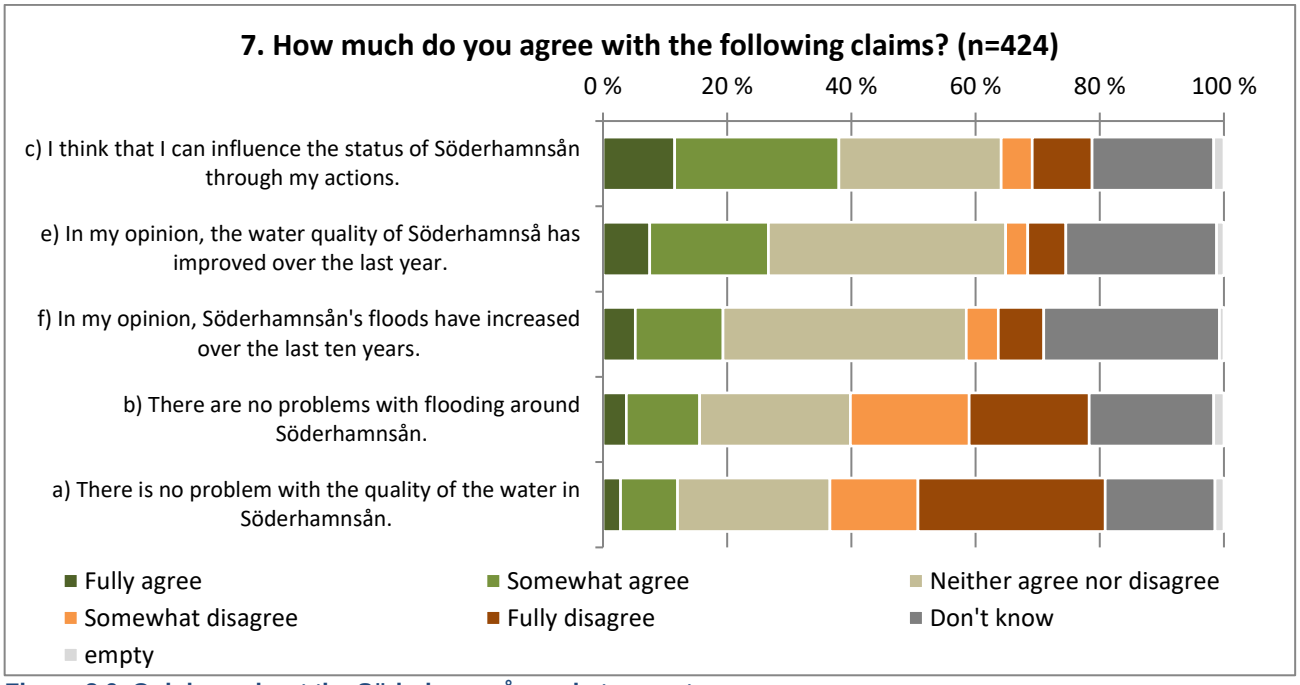


Figure 3.6. Opinions about the Söderhamnsån and stormwaters.

Recipients were further elaborated on the effects sustainable management of stormwater could have. The texts of the topic and the pictures drawn by the project can be found on page 7 of the questionnaire (Appendix 4). Respondents were asked if natural stormwater management could make a difference for themselves or for the inhabitants of the area. Nearly 70% believed that they could have a major or moderate positive impact on the attractiveness of Söderhamn (Figure 3.7). More than half expected large or moderate positive effects on the nature experiences and the well-being of people. About half thought that it could have a positive impact on the amount of their recreational visits to the river and its' green areas. For all alternatives, 4–10% did not believe that natural stormwater management would have such effects.

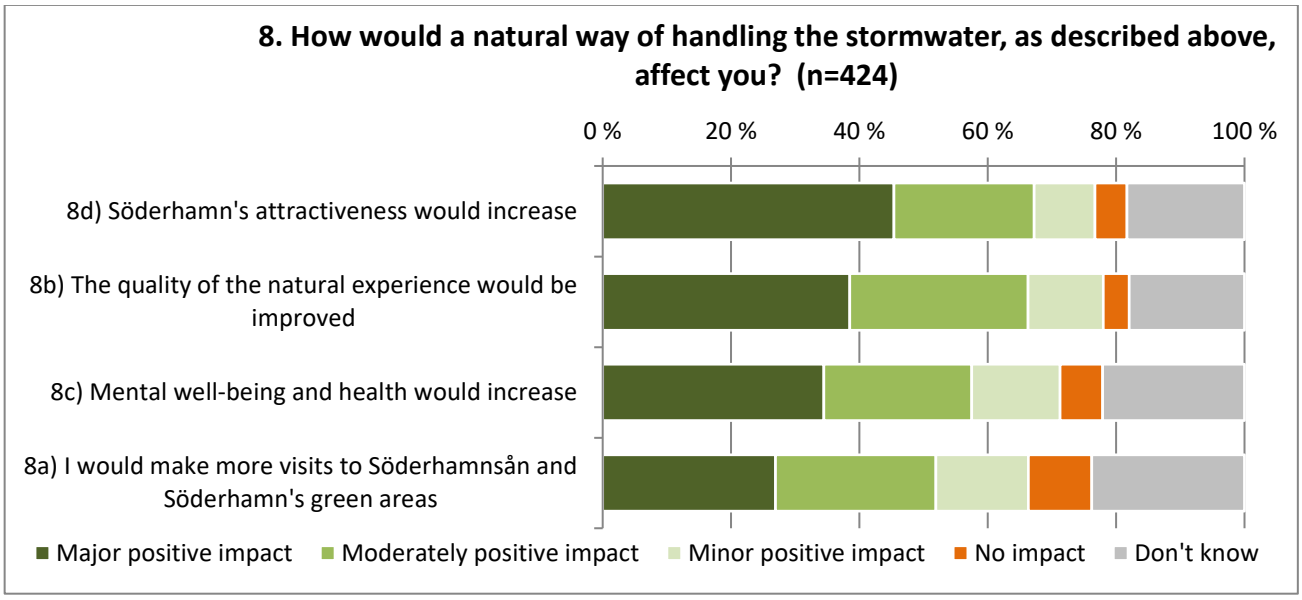


Figure 3.7. Opinions about the effects of natural stormwater management.

3.3 Willingness to pay for stormwater management in Söderhamn

The starting point for the study was the stormwater strategy developed in 2018 for Söderhamn. The Heawater project sought to determine the non-market benefits that arise from sustainable stormwater management. The research method used was the contingent valuation method, one of the stated preferences methods.

The aim of the study was to produce a monetary estimate of the well-being of residents for the implementation of the stormwater strategy over the next ten years. In order to assess the positive environmental changes brought about by the implementation of the strategy, a valuation survey was conducted, which produced an estimate of the lower and upper value of the total benefits. Thus, one of the main purposes of the survey was to identify the willingness of residents to contribute to the implementation of the stormwater strategy through a stormwater fee. The results concerning benefits and costs are described in more detail in Lehtoranta et al. (2020c) in Swedish and in Lehtoranta et al. (2020d) in English.

The willingness to participate was determined in the survey by two questions: would the respondent be prepared to participate in stormwater charges at all and, if so, what monthly amount during 2019–2028 would they be willing to pay. Over half of all respondents (58%) would at least consider paying a stormwater fee between 2019 and 2028 to increase the more sustainable ways of handling stormwaters (Figure 3.8).

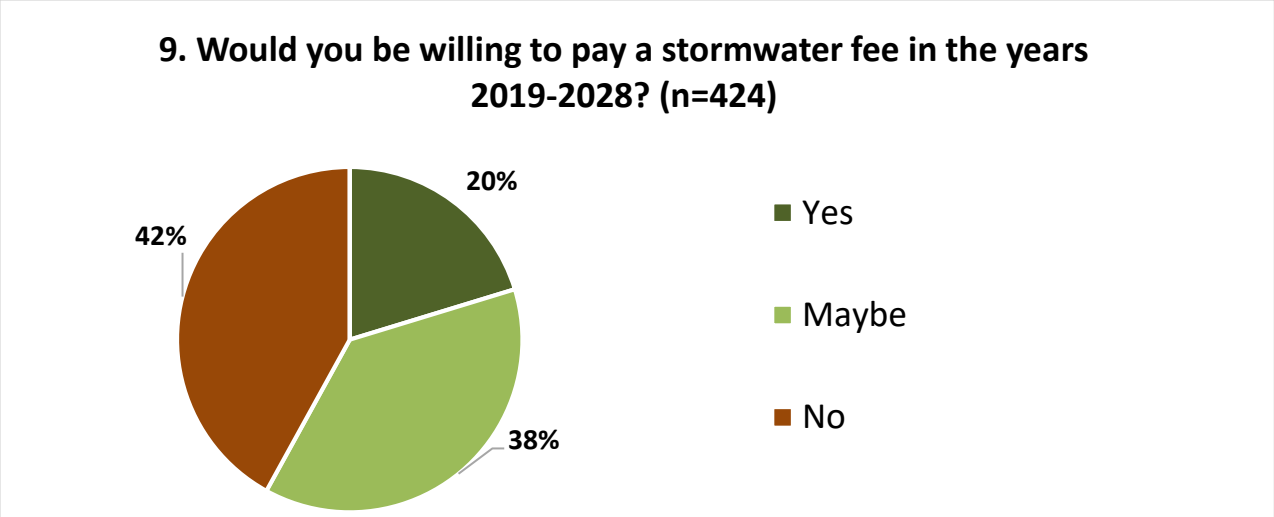


Figure 3.8. Willingness to pay the annual stormwater fee

Respondents who were willing or potentially willing to pay were then asked how much they would pay each month for the next ten years.

Based on average willingness to pay according to the age group, it is possible to estimate the willingness to pay of the entire adult population in Söderhamn. About 40% of the respondents were unwilling to pay a stormwater fee. The willingness to pay for this group was assumed to be EUR 0. The total willingness to pay is estimated at about EUR 0.41 to EUR 0.51 million per year for ten years. The benefit assessment reflects the annual benefit to residents that would be achieved by sustainable stormwater management in Söderhamn. During the whole ten-year period, this would amount to EUR 4 million. Note that the benefit estimates are not discounted to the present value.

The most important reason for willingness to pay was most often the desire to improve the natural life in and around the Söderhamnså. The next most important reasons stated were the desire to get a greener city and to support more natural ways of managing stormwater to reduce the risk of flooding (Figure 3.9).

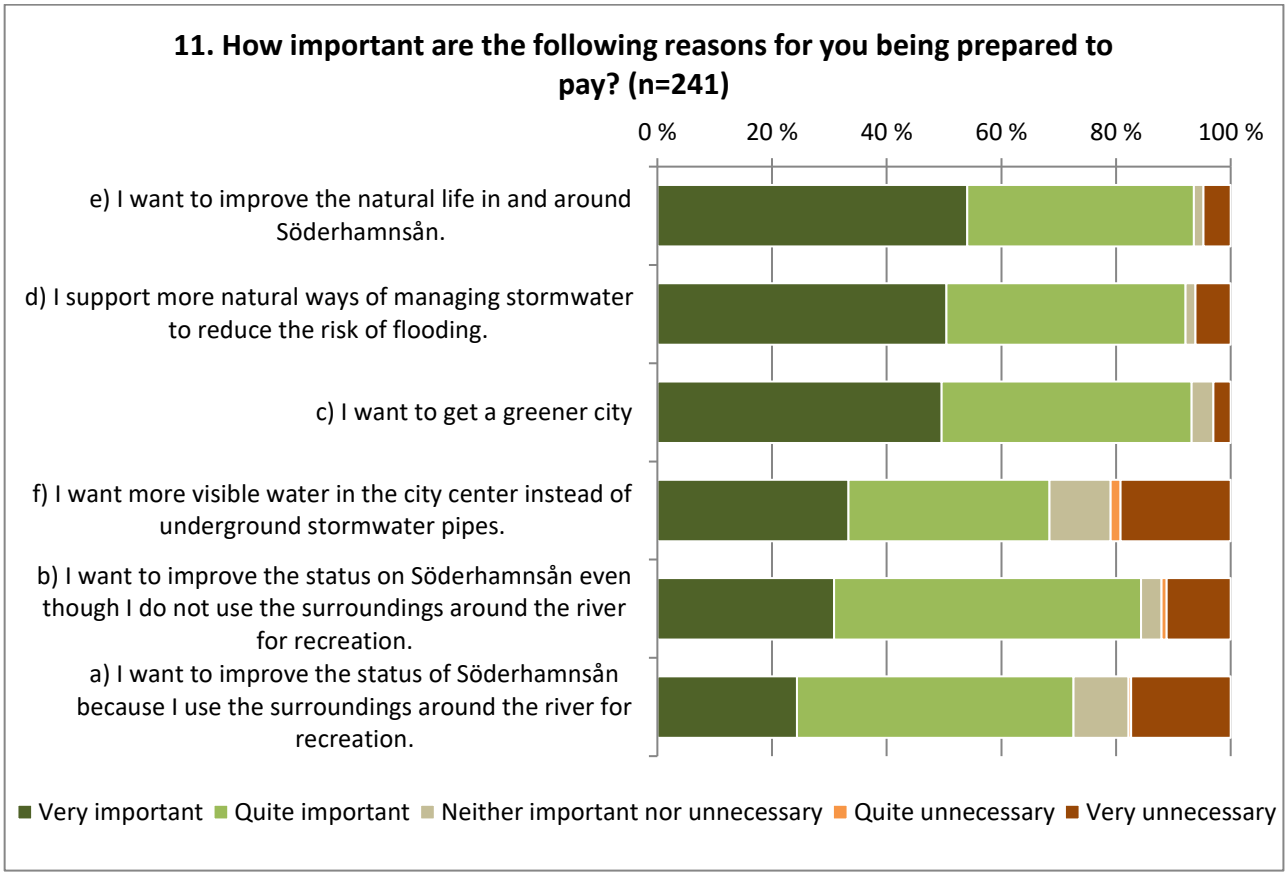


Figure 3.9. Causes for being prepared to pay and their importance.

The most common reason for non-payment was that respondents felt they could not afford to pay. The second most common reason was that they felt that the Söderhamnsån does not need any more measures to protect against flooding or purification of the water (Figure 3.10).

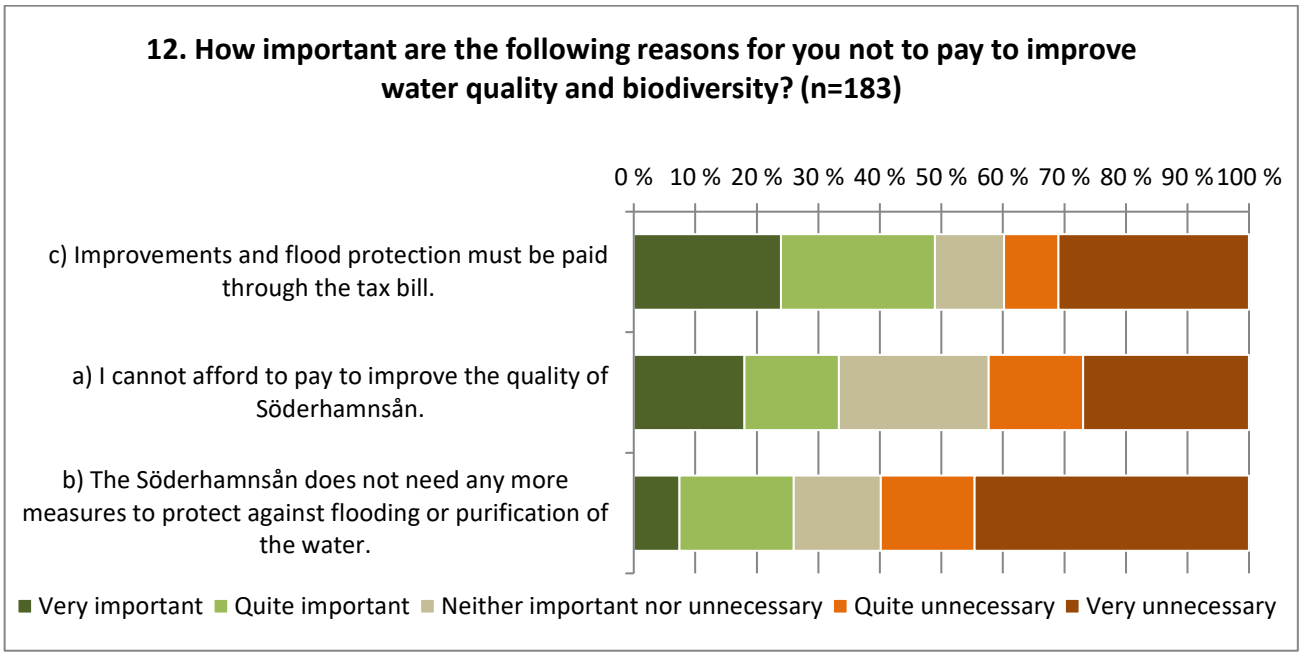


Figure 3.10. Causes for not being prepared to pay and their importance.

3.5 Fundraising in Söderhamn

Respondents were asked the best way to raise money from citizens for more natural treatment of stormwater. There were clear differences between those willing and unwilling to pay (Figure 3.11). Those willing to pay favored the raising of VA tariff (42%) where as those unwilling to pay favored none of the suggested mechanisms (46%). The popularity of voluntary payment was slightly higher among those willing to pay (20%) than among those who were unwilling to pay (12%). The tax increase was second most popular for both groups, those willing and unwilling to pay.

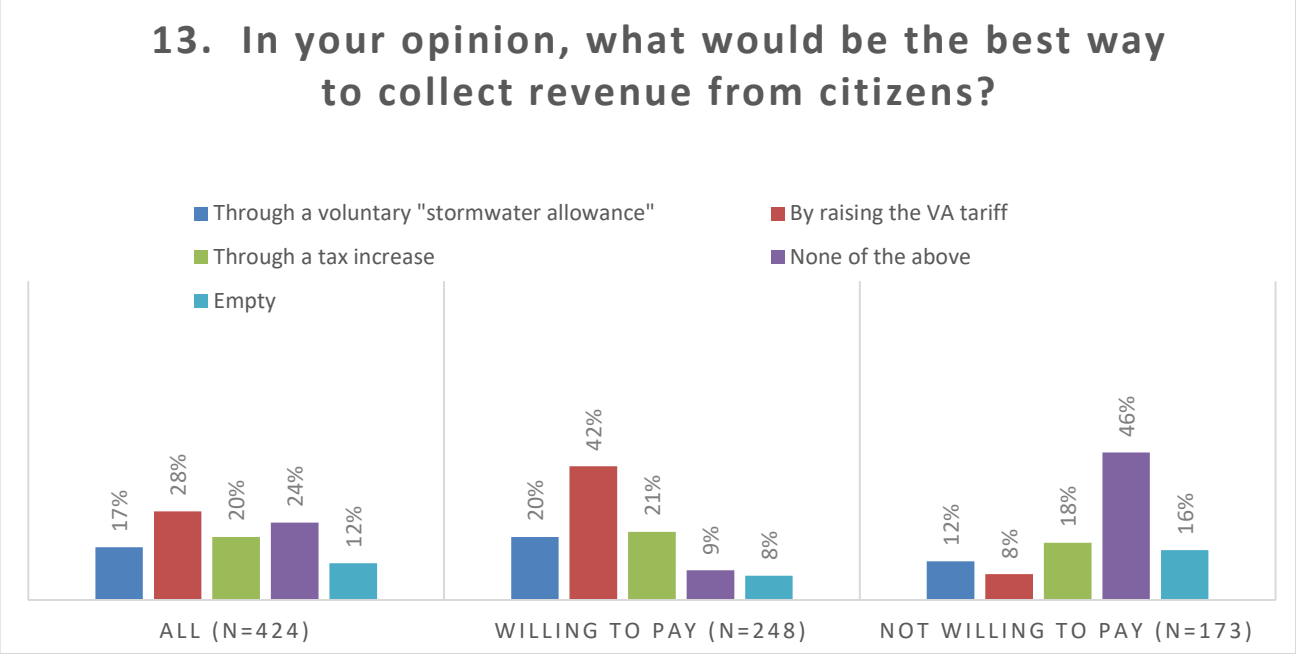


Figure 3.11. Preferred ways for raising funds for more natural treatment of stormwater and improving the condition of urban streams

The survey also sought to discover respondents' activity in dealing with Söderhamnsån or stormwater events. At the same time, it was important to remind them that small everyday actions can have an impact. Only 5% of respondents had participated in volunteer work to restore Söderhamnsån. (Figure 3.12).

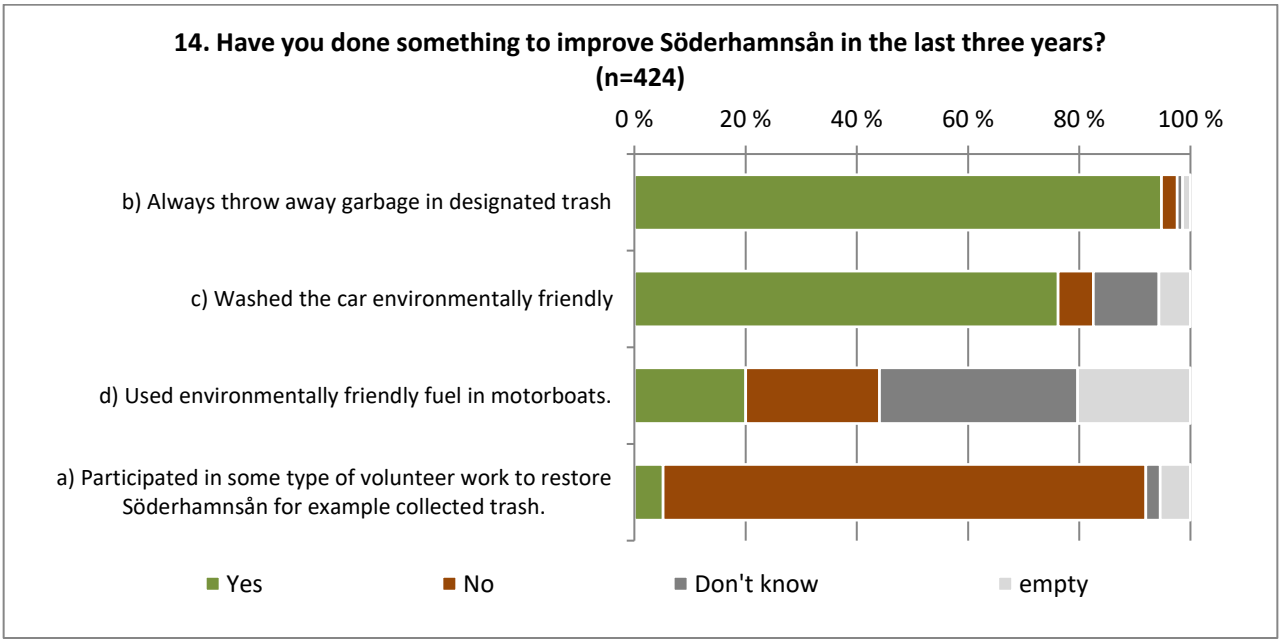


Figure 3.12. Respondents' actions to improve the state of the river.

Over 80% received at least some new information about Söderhamnsån through this survey and almost as many about stormwater. Almost as many also said they would be more interested in Söderhmansån and stormwater in the future. About 60% was more concerned about the state of the Söderhamnsån after responding to the survey. Little less than 50% of respondents thought that raising funds through a stormwater fee would be a good idea. (Figure 3.13.)

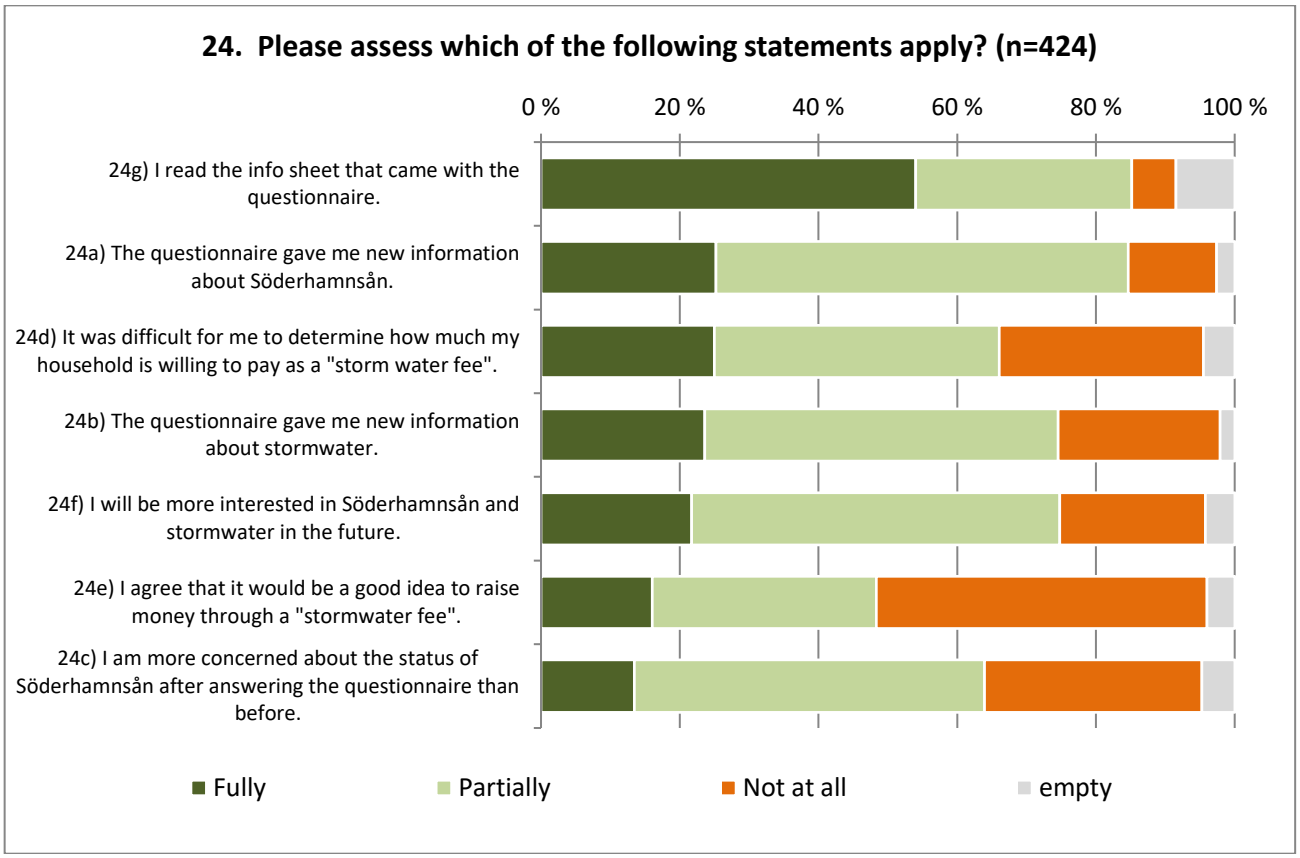


Figure 3.13. Opinions regarding the matters involved in the questionnaire.

4. The results of the Tallinn survey

Tallinn, the capital of Estonia, has a population of about 445,000. The Pirita River is the longest of the 16 rivers and streams in the Tallinn city area and it is more than 100 km long. Many of the streams are shorter than ten kilometres and some of them have been moved to run through pipes under the city. In the past, streams served as wastewater passageways and discharge points, but today, they are mainly used as stormwater ways. As a result, the natural catchment area of some streams has increased and the hydrology and water quality have changed. According to measurements, the ecological status of the water of the Mustjõe and Tiskre streams is poor. The water quality of Lake Harku, from which the Tiskre stream originates, is also poor. The water quality of the Mustjoki River has deteriorated, especially due to the contaminated stormwater discharged into it from streets, industrial areas and construction sites. Monitoring of the water quality of the Mähe River did not begin until 2019, but its condition also appears to be poor.

4.1 Study area and survey execution in Tallinn

As shown in Figure 4.1, the survey was targeted at residents of three residential areas, namely Pirita, Haabersti and Kristiine. The areas were selected based on the small surface waters located in them. The Mähe stream (Mähe oja) runs in the Pirita area and the Mustjõe and Tiskre streams are in the Haaberst area. The Kristiine area was also selected for the study because the Mustjõe stream runs underground in this area and most of the stream's catchment area is in this area.

The survey was conducted only in Estonian as a paper and Internet survey in early 2020. The survey was targeted at a random sample of city residents aged 18–80 years, one person per household. The sample (n = 2,500) was divided between three selected areas according to the known population: Pirita (467 people), Haabersti (1190 people) and Kristiine (843 people). In addition, the sample was targeted at 1509 (60%) Estonian-speaking and 991 (40%) Russian-speaking recipients. SYKE received addresses from the Estonian Ministry of the Interior (Siseministeeriumi infotehnoloogia- ja arenduskeskus). The Finnish Environment Institute was responsible for preparing the surveys with the help of local partners, while mailing of the survey was handled by JP Postitus Oy.

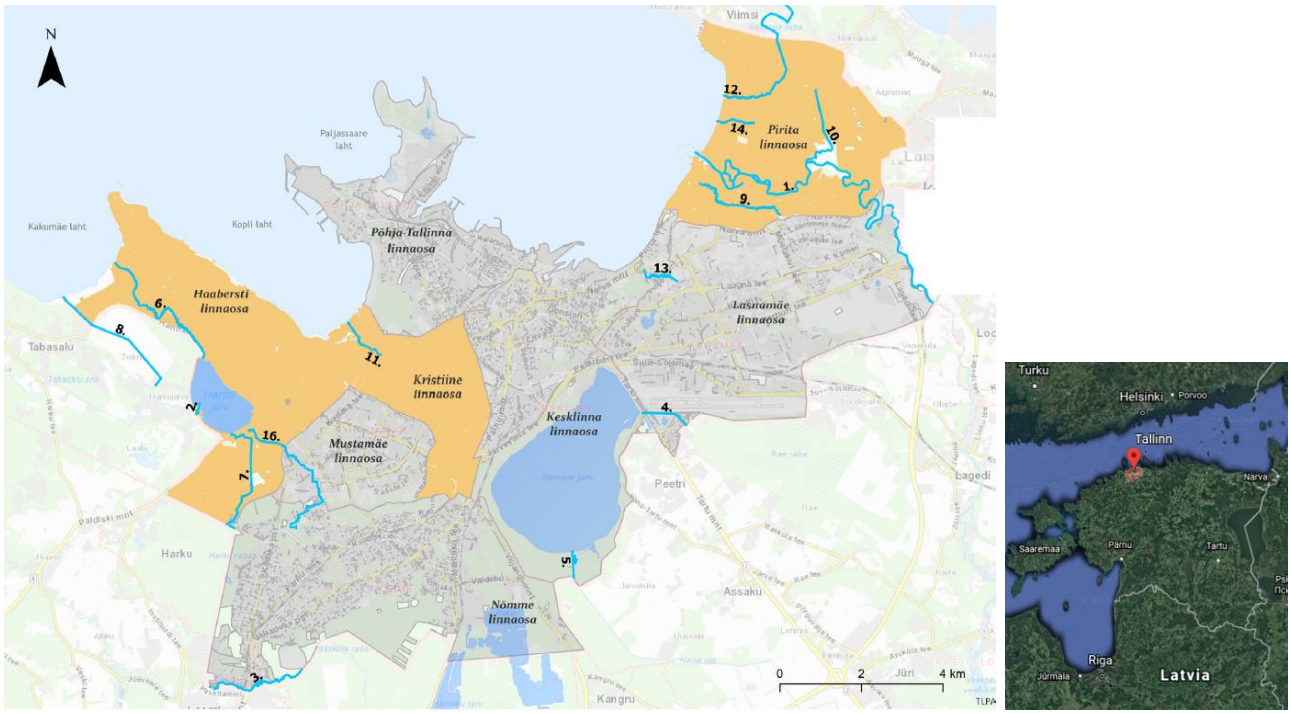


Figure 4.1. Three study areas, Haabersti, Kristiine and Pirita, in Tallinn @City of Tallinn

The questionnaire was tested in November 2019 by employees of the City of Tallinn by sending it to a total of ten people. Based on the comments received from the testers, a few questions were refined. To increase the response rate and representativeness of the data, respondents were contacted three times. First, a paper questionnaire with a cover letter was mailed to the recipients in March 2020. The cover letter was signed by the Mayor of Tallinn, Mihhail Kõlvart, and it described the ongoing survey and provided the address of the Internet survey. Those who had not yet responded to the questionnaire were reminded once or twice with a reminder card. The tentatively planned fourth contact was nevertheless not made, as the number of responses had already decreased significantly in the third round of the survey. The Internet survey was kept open until the end of May 2020. In addition, a short questionnaire was sent to several non-respondents (n = 400) in June 2020 to ask for the reasons that contributed to their non-response.

Time table of the mailings was as follows:

1st mailing: Paper questionnaire and cover letter 1 were received around February 28th and time to answer until March 15th.

2nd mailing: Reminder card 1 was received around March 20th and time to answer until March 31th.

3rd mailing: Reminder card 2 was received around April 9th and time to answer until April 20th.

Thus, respondents were contacted three times between February and April 2020.

4.2 Basics about the respondents in Tallinn

In total, 323 responses were received. After eliminating empty replies, double replies and protest replies, the final data had 311 respondents, representing a response rate of 12.4%. The response rate can be considered quite low.

The response rate was higher among Estonian-speakers than among Russian-speakers (16% vs. 7%). As the number of responses was slightly lower than expected, it was necessary to compare the obtained data with the sample / population by other means. Perhaps the COVID-19 pandemic at the time affected either the mailing of questionnaires or willingness to respond.

Slightly more than half of the respondents (54%) returned the questionnaire by mail and 46% returned their answers electronically. During the survey, several communication campaigns were carried out by the City of Tallinn. In all three sub-study areas of Tallinn, articles on the Heawater project and research were published in local journals. In addition to these, the topic was covered on the Internet, TV and radio.

Tables 4.1-4.3 summarize basic information about the respondents and this information was compared with the population to assess the goodness of the data. About 58% of respondents were female and the average age of the respondents was about 53 years. The share of Estonian speakers among the respondents was clearly higher than the share of native speakers of Russian. The survey questionnaires were only sent in Estonian, which most certainly explains the difference. Families with children accounted for about 39% of respondents, and only a small proportion of respondents (about 2%) reported being a member of an environmental organization (Table 4.1). A total of 38% of the respondents had a master's degree and 3% of the respondents had a doctoral degree.

Most respondents (66%) lived in an apartment building, one in four in detached houses and less than a tenth in semi-detached or terraced houses. The average household income was asked as a categorical variable. Based on the responses, the median household income (gross) was about EUR 1,200 to EUR 1,799 per month in 2019. Responses were received from all three regions, as shown in Table 4.2. In relation to the population, the response rate was higher in the Pirita than in the Kristiine district.

Table 4.1. General information on the respondents

	Respondents (n = 311)
Native language: Estonian	79.1%
Native language: Russian	20.9%
Women	58.1%
Families with children	39.0%
Average age	52.9 years
Member of an environmental organization	2.3%

Table 4.2. Distribution of the respondents in the three sub-areas of the study.

Sub-area	Respondents	Percentage of the whole study area
Haabersti	153	49%
Kristiine	84	27%
Pirita	74	24%
Total	311	100%

Table 4.3. Age groups of respondents

Age group (years)	Respondents	Percentage
18–29	24	9%
30–39	56	20%
40–49	64	23%
50–59	43	15%
60–69	49	18%
70–79	49	18%
80–93	18	6%
Total	279	100%

4.3 Use of waterways and perceived water quality in Tallinn

Two out of three respondents said they lived less than two kilometres from a city stream, but 7% couldn't say. The survey also asked how respondents felt about the current water quality of Tallinn's city streams or waters. Throughout the study area, only one respondent rated their condition as excellent and only five out of a hundred as good. About one-fifth thought they were in a satisfactory state. Most (43%) considered their condition passable. Their state was considered to be in poor condition by 2% of respondents. Less than a third could not say what state they thought the urban streams were in.

Water quality was perceived slightly differently between the districts. In the Haabersti district, two out of three considered the water status to be passable, while in the Pirita district more than 40% considered the water status to be satisfactory. In the Kristiine district, on the other hand, more than half could not assess the state of the waters. (Figure 4.2.)

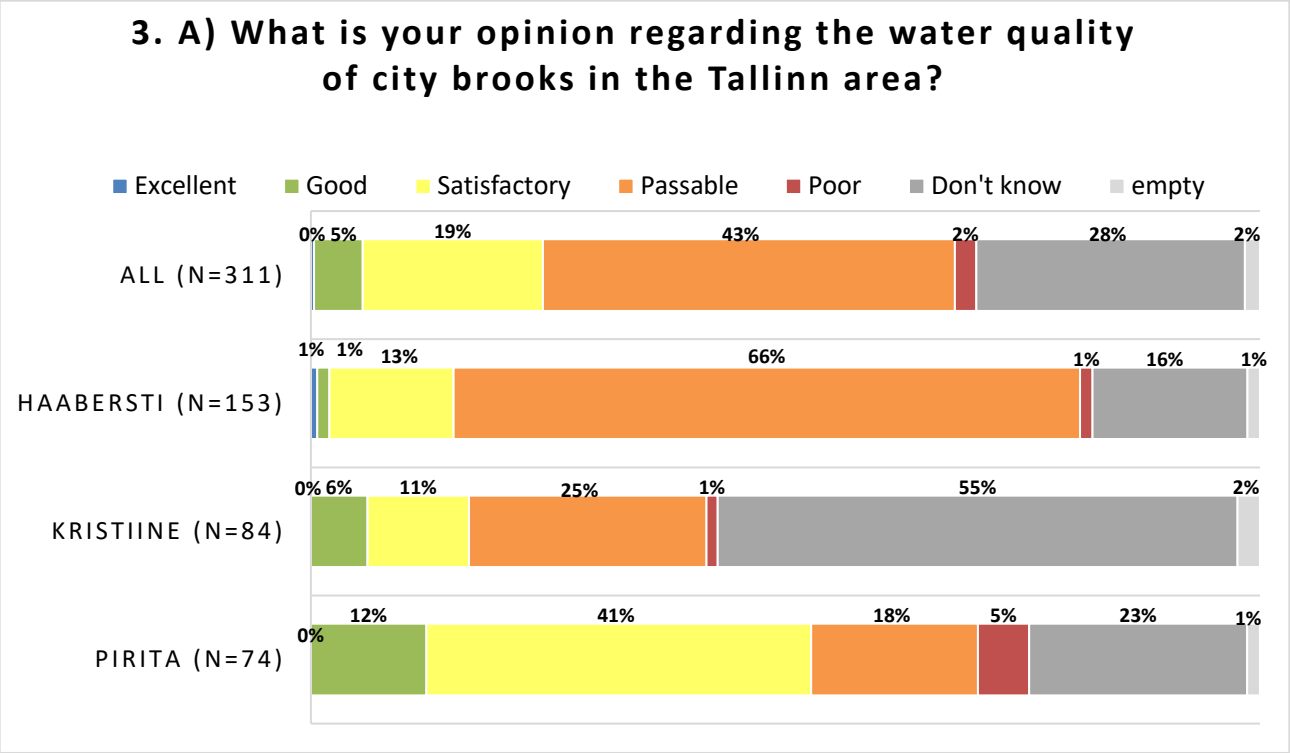


Figure 4.2. Respondents' perceptions of the water quality of Tallinn's urban streams.

The survey also mapped how Tallinn residents use different types of areas for recreation. The most popular among the respondents was spending time by the streams, which was done weekly by more than 10% of the respondents. The next most popular was outdoor activities by the sea, then at ponds and Harku Lake (Figure 4.3).

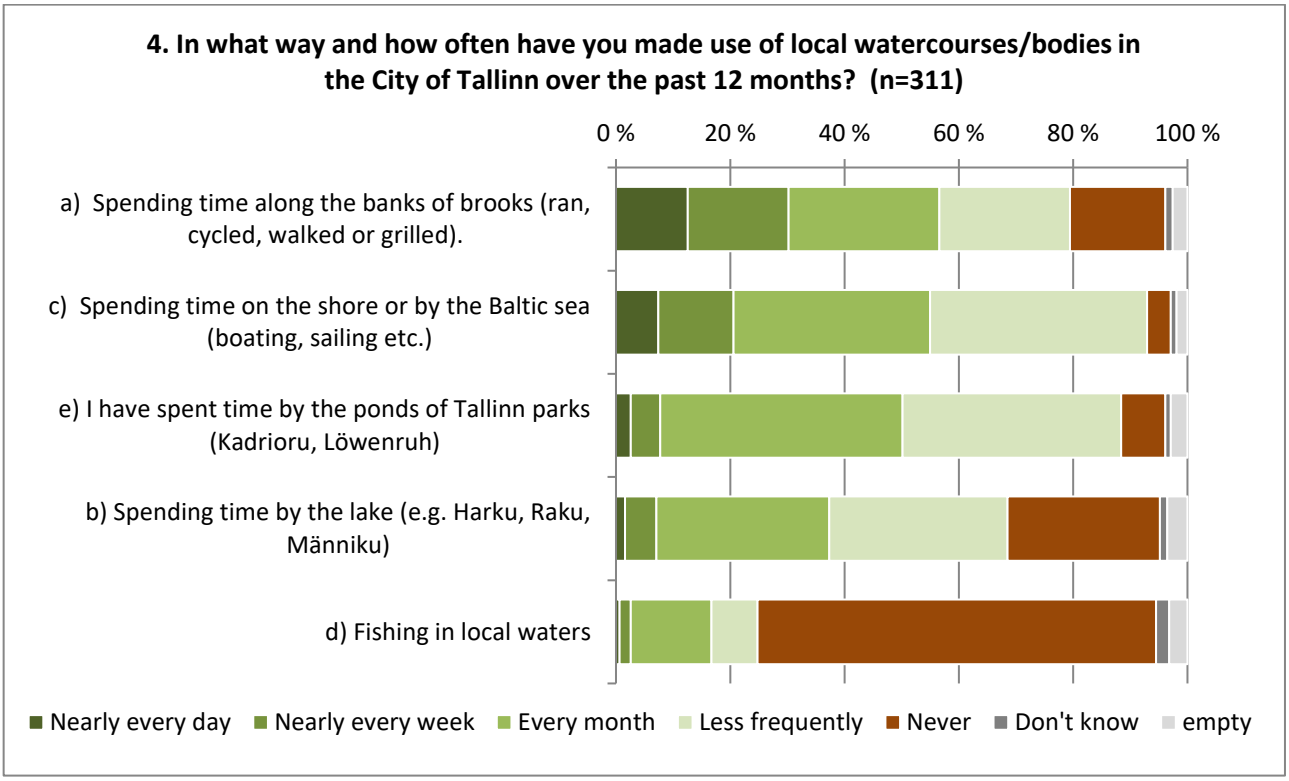


Figure 4.3. Respondents' outdoor habits during the last year.

At the beginning of the survey recipients were asked whether social funding for various topics considered important in the area should be changed. The purpose of the question was to assess how the respondents perceived the importance of funding for the protection of small urban waters in relation to other important and publicly funded issues in the region. By far the most important of the options presented was the protection of the Baltic Sea, which was very important to more than half of the respondents. Improving the water quality of urban streams was very important to 38% of respondents.

Later in the survey they were asked for opinions related to nearby waters. About eight out of ten respondents were concerned about the state of the Baltic Sea (Figure 4.4). Almost as many thought city streams should be a more visible part of the cityscape. More than three out of four were also concerned about the condition of Tallinn's city streams in general. About 70% felt that urban streams were important to them, but a fifth neither agreed or disagreed with this.

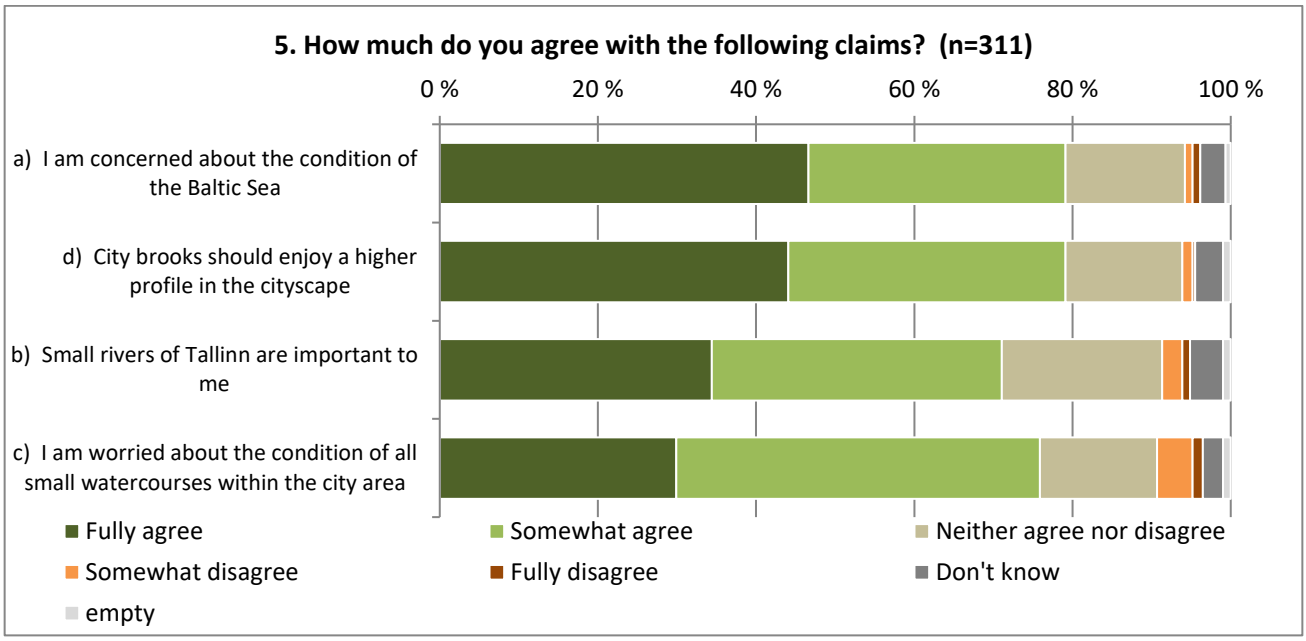


Figure 4.4. Respondents' opinions on the state of the Baltic Sea and urban water bodies.

4.4 Stormwaters and their sustainable management in Tallinn

The quantity and quality of urban stormwater is crucial to the state of city streams. Usually, stormwater ends up in city streams, rivers or the sea, untreated through sewers on the streets. A picture was drawn for the survey to illustrate this direct relationship between stormwater and natural waters. It was also intended to communicate which human activities have a particular impact on stormwater quality.

Respondents were also told about the formation of stormwater. They were then asked if they had ever heard of stormwater. Most respondents said they already knew what stormwater meant (Figure 4.5). However, over third responded that there was something new to them in the text and picture presented to them. Only two out of 100 respondents had no idea what stormwater meant and over a tenth did not answer the question.

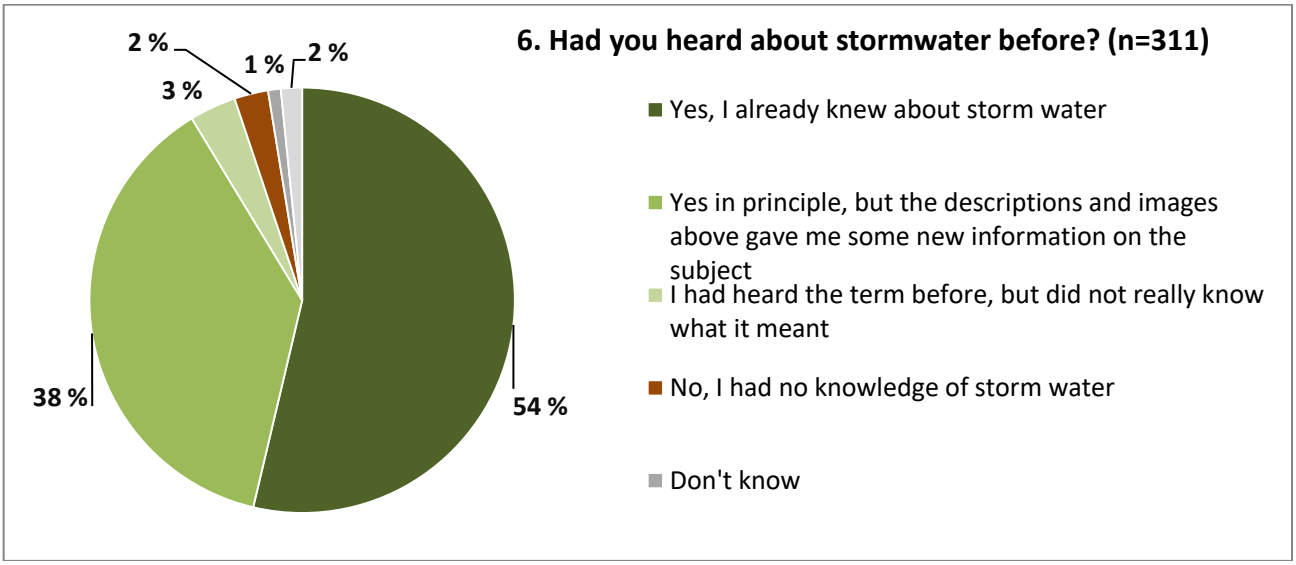


Figure 4.5. Familiarity of stormwater among the respondents

About 40% of respondents thought that untreated stormwater should not be discharged directly into urban natural waters. One-tenth fully and 29% to some extent thought that they could influence the state of urban streams through their own actions. Almost as many believed that urban floods had increased over the past ten years. Only one in ten respondents felt that the quantity or quality of stormwater was not a problem in Tallinn. Even fewer thought that the condition of city streams had improved in recent years. (Figure 4.6)

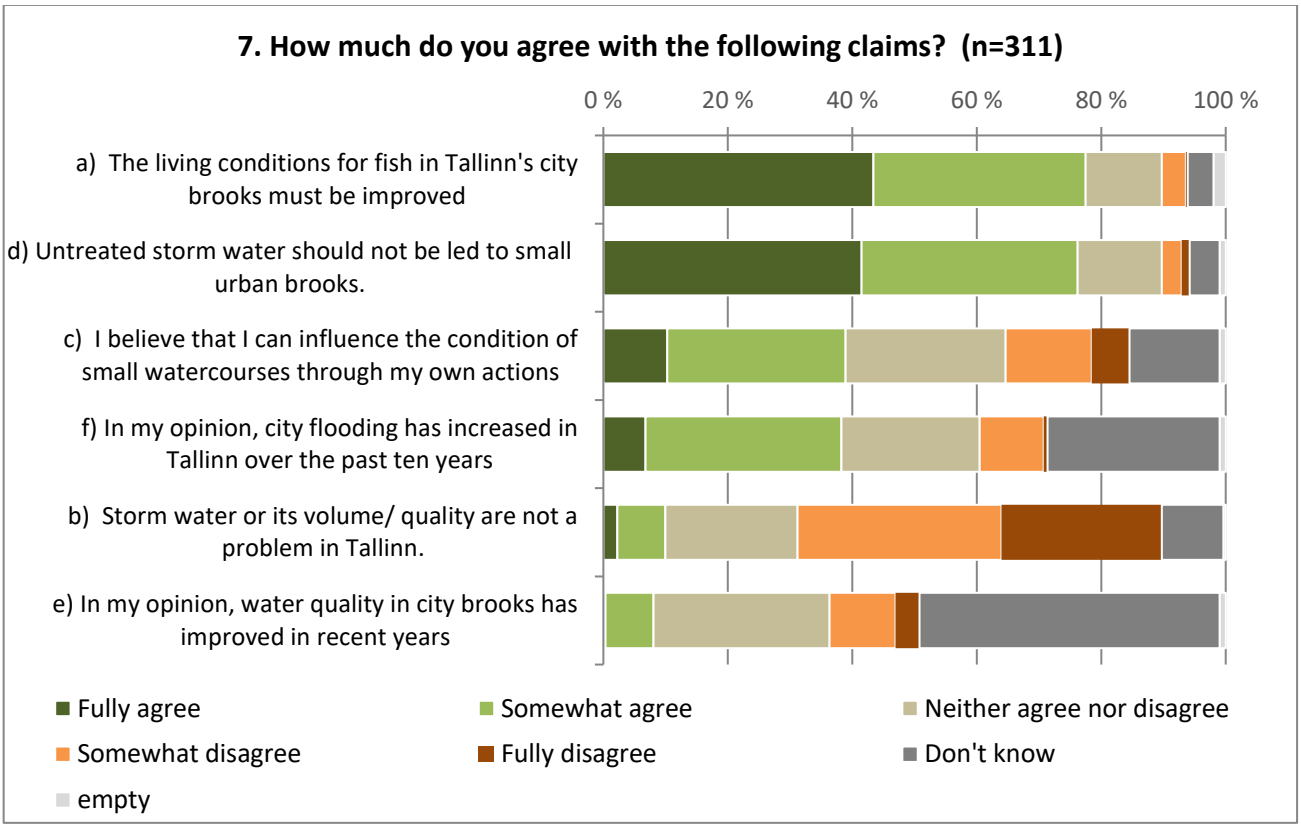


Figure 4.6. Respondents' opinions on urban water bodies and stormwater

Respondents were described in more detail on the effects that sustainable management of stormwater could have. The texts of the topic and the images drawn in the Heawater project can be found on page 7 of the questionnaire (Appendix 4).

Respondents were asked if sustainable water management could make a difference for themselves or for the inhabitants of the district. Almost 80% believed that it would have major or moderate positive impact on the attractiveness of Tallinn (Figure 4.7). Equally many assumed it would have major or moderate positive effects on the city's image and reputation. About 70% assumed that it would have the same effects on their own nature experience as well as on the mental well-being of the citizens'. Slightly less than half of the respondents assumed that it would have a large or moderate positive effect on the number of their recreational visits to city streams. For all options, 3% to 17% did not believe that natural stormwater management would have such effects.

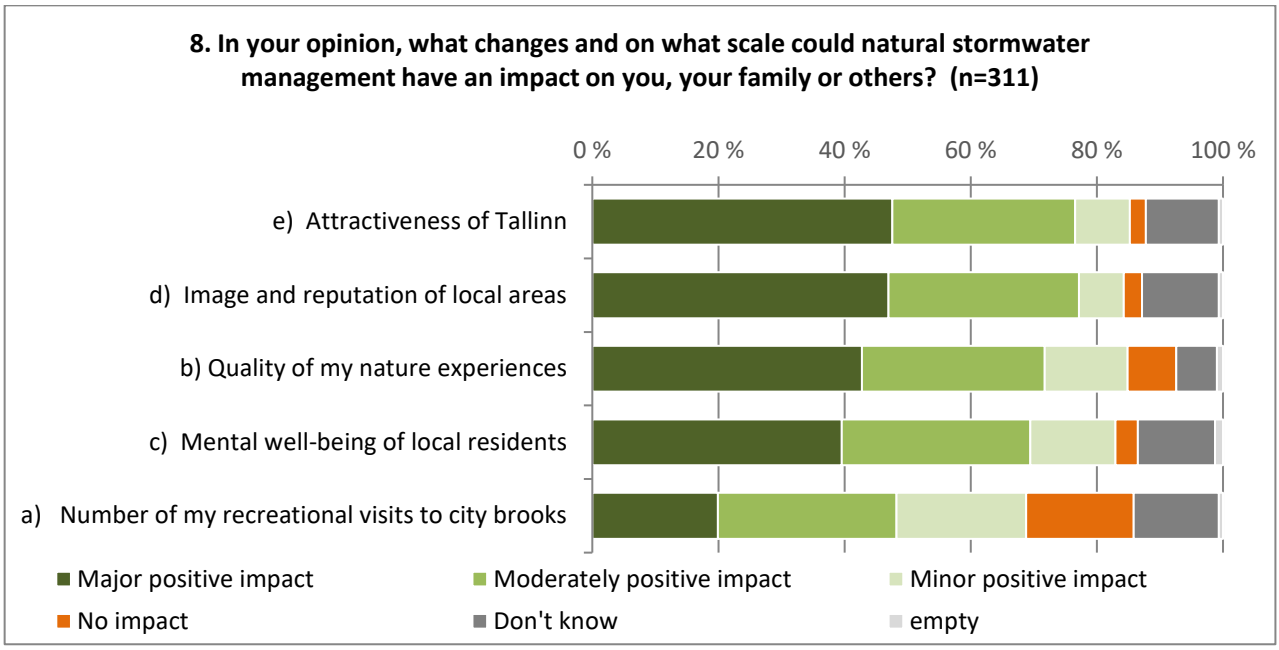


Figure 4.7. Opinions of respondents on the effects of sustainable stormwater management

4.5 Willingness to contribute in Tallinn

One of the most important purposes of the survey was to estimate the willingness of residents to pay a stormwater tax for more sustainable management of stormwater. Approximately 70% of all respondents would at least consider paying such tax in 2019–2028 to improve the condition of Tallinn's city streams and their surroundings (Figure 4.8).

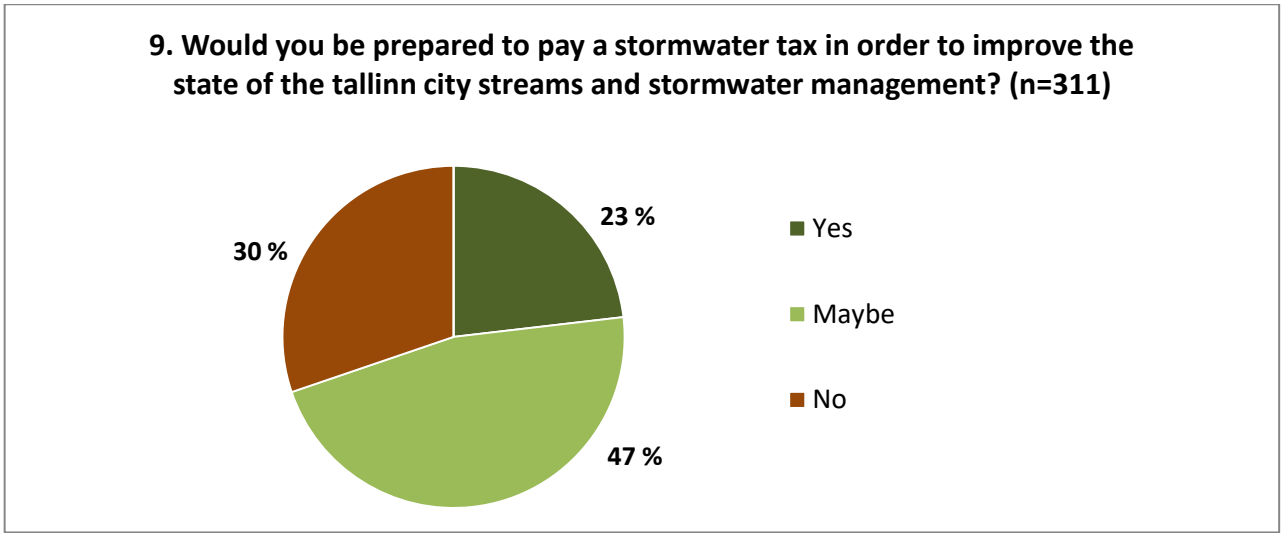


Figure 4.8. The willingness of respondents to pay for the improvement of urban water status

Those who replied “Yes” or “Maybe” to the willingness to pay question were then asked how certain they would be about paying different amounts each month.

Factors related to the respondents or their attitudes that together contributed to the positive willingness to pay were analysed using a regression model. Based on the results, the willingness to participate was increased by the following factors: whether the survey provided the respondent with new information on stormwater, the respondent's age (younger respondents were more willing to pay than older ones) and if the respondent lived in the Pirita district.

For those who were definitely or possibly willing to pay the most important reason for this was the fact that the respondent uses city streams for recreation (Figure 4.9). The next most important topic was the reduction of urban floods by sustainable approaches. Just over one-third of respondents willing to pay considered it very important that the city's stormwater system should be made more efficient because they wanted a greener cityscape or because the respondent felt that nutrients and other harmful substances should be prevented from entering urban streams. A quarter of respondents indicated that a very important reason for their willingness to pay was that city streams should be more visible in the cityscape.

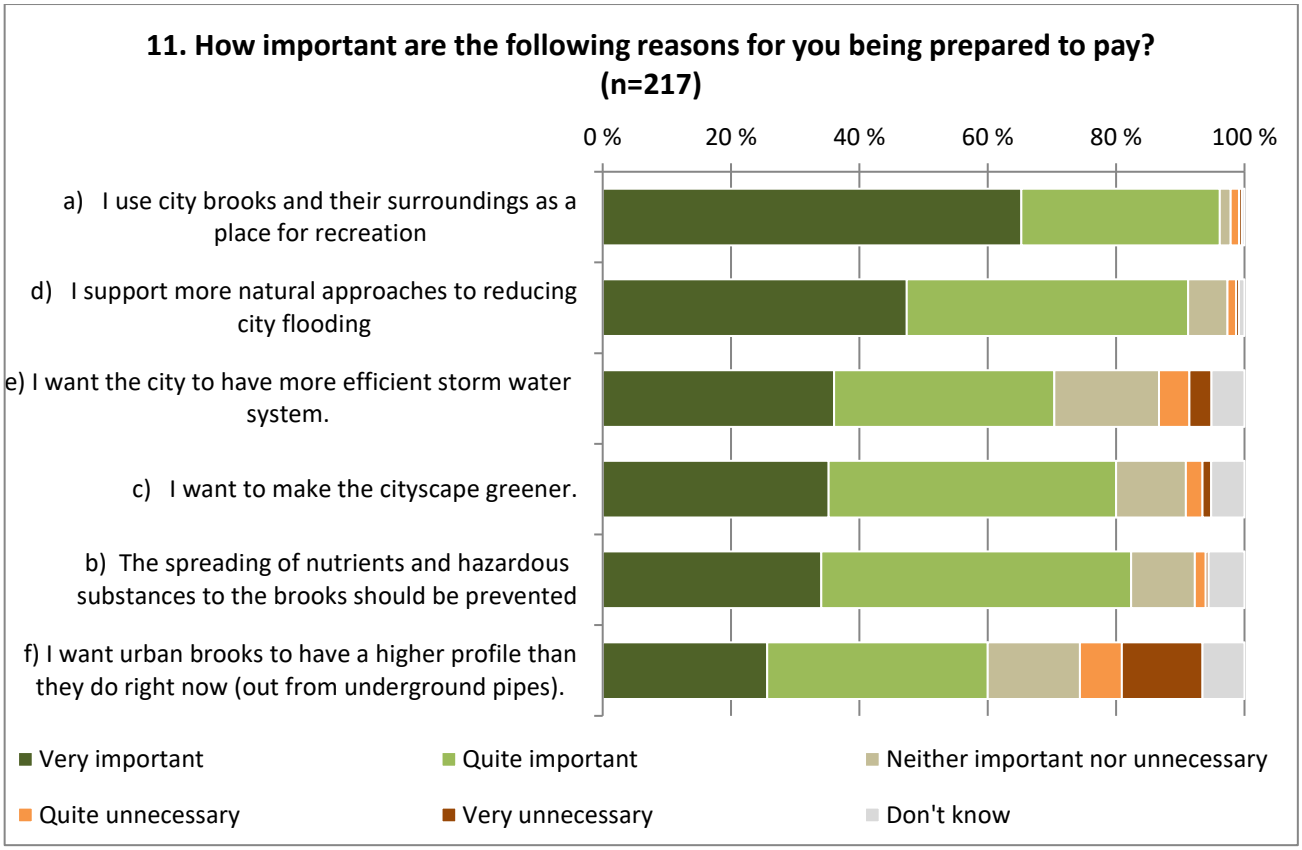


Figure 4.9. Reasons for willingness to pay.

For those who would not be willing to pay, the most important reason for this was that they felt that current taxes and mandatory payments should be directed more towards the management and protection of urban streams (Figure 4.10). About half said that they could not afford to pay a stormwater tax like the one presented. However, less than one-fifth of respondents unwilling to pay thought that small urban waters would not need protection.

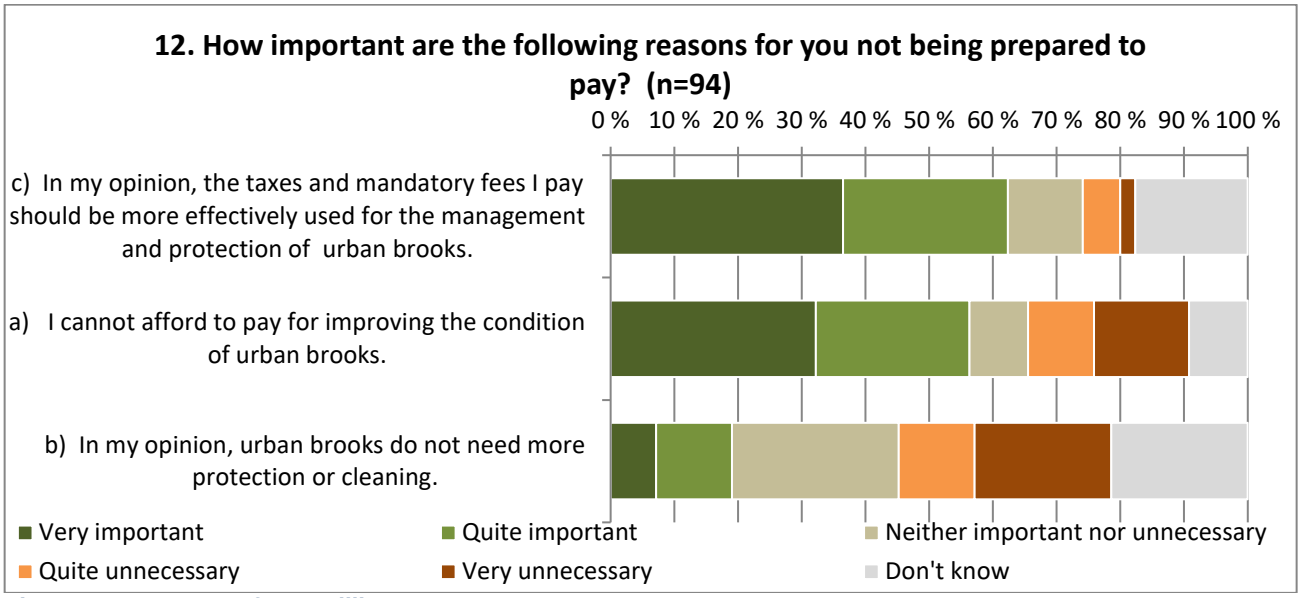


Figure 4.10. Reasons for unwillingness to pay.

4.6 Fundraising in Tallinn

Recipients were asked what would be the best way to raise money from citizens for more natural treatment of stormwater and for improving the condition of urban streams. The most popular method was to raise funds as part of the water or wastewater management fees (Figure 4.11). This approach was favored by more than two out of three of all respondents and even more by those willing to pay (77%). Compared to those not willing to pay, those who were willing to pay more often chose to pay as part of their water or wastewater charges. The popularity of voluntary payment was higher among non-contributors (44%) than among those who were willing to pay (18%). The least popular method was tax increase, which was considered the best practice by 1% of respondents, more by those willing to pay than non-paying.

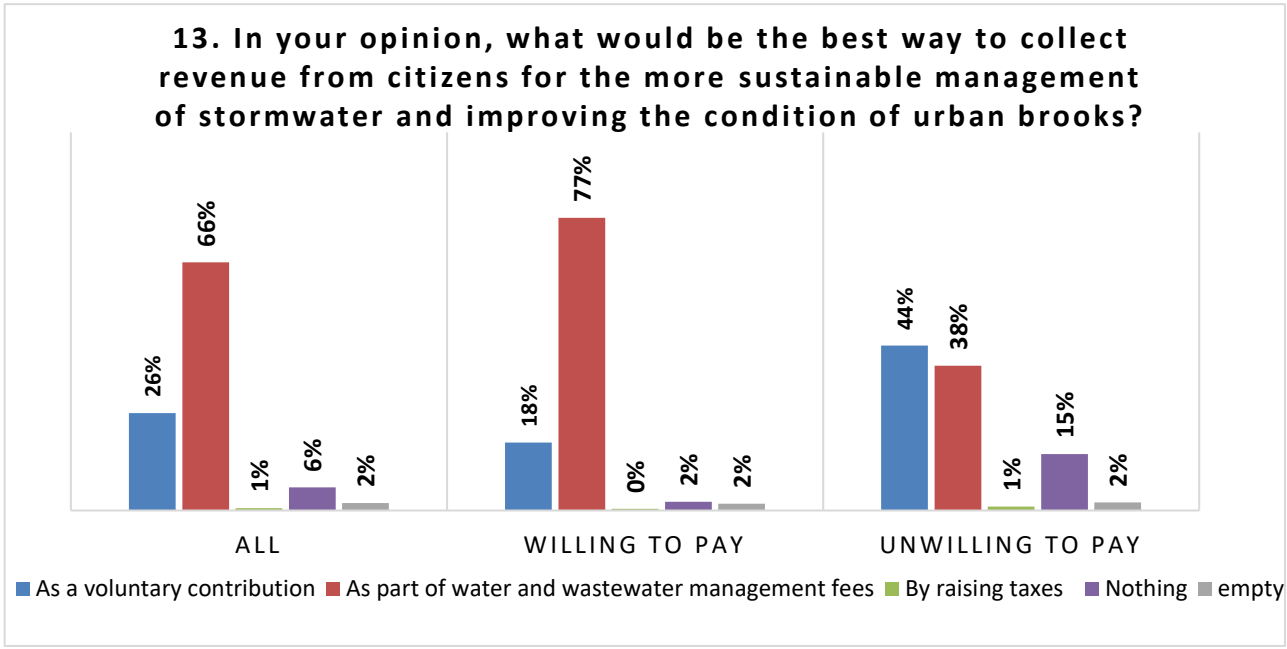


Figure 4.11. Preferred ways for raising funds for more sustainable treatment of stormwater and improving the condition of urban streams

The survey also sought to discover respondents' activity in dealing with city streams or stormwater measures. At the same time, it was important to remind respondents that small everyday actions can have an impact. Two out of three responded that they wash their cars in the carwash or using only

environmentally friendly detergents when washing it in the yard. Almost 40% of respondents had participated in the Tallinn theme day “Let's do it!” And an equal number said that they had collected litter from streams and seashores (Figure 4.12).

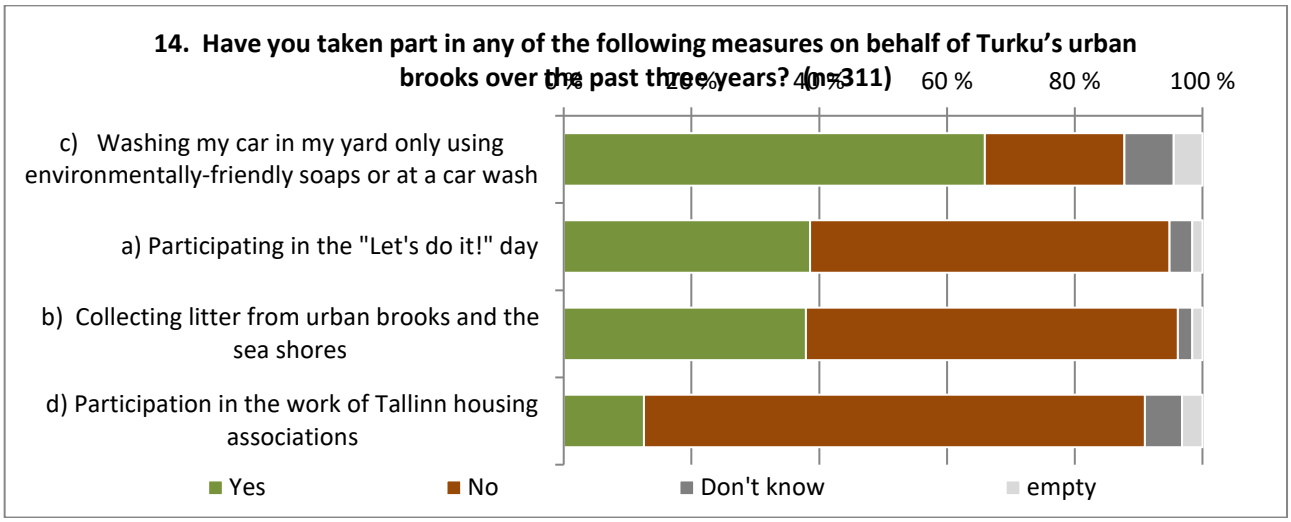


Figure 4.12. What actions have the respondents taken regarding urban waters?

As shown in Figure 4.13 almost 70% of respondents thought that collecting a stormwater tax would be a good idea. Even more received at least some new information on city streams through this survey. Almost as many also believed they would pay more attention to city streams’ condition in the future. Nearly 85% were also more concerned about the state of the city streams after responding to the survey. About 80% of the respondents had also received at least some new information about stormwater through the survey. Nearly as many also felt it was important, at least to some extent, that the payment could be targeted to improve the condition of an individual city stream.

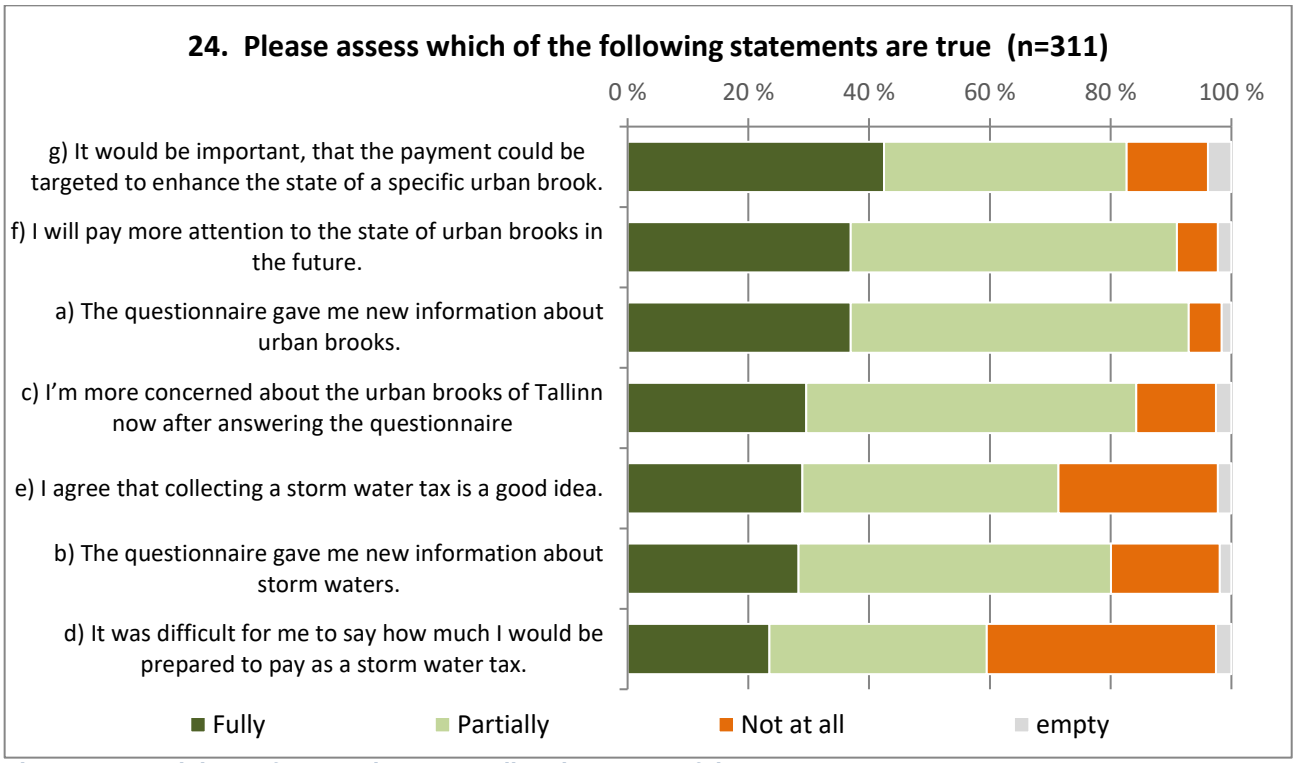


Figure 4.13. Opinions of respondents regarding the waters of the area.

5. Comparison of attitudes in three study areas

Table 5.1 summarizes the basics on mailing the surveys. In total, the survey was sent to about 5,000 people and nearly 1,200 responded. However, it is likely that at least some of the people who ultimately did not respond have still browsed through the paper survey and read the images and info texts in them. It can also be assumed that the paper survey has been browsed by several other people living in the same household as well, whether the survey was answered or not. Therefore, the communicative value of paper-based surveys in particular should not be assessed solely on the basis of the number of responses. Likewise, the more appealing the visual appearance of a printed product, the more tempting it is for the recipient.

Table 5.1 Basics about the mailings of the surveys in three study areas

	Duration of the survey	Recipients / Respondents	Responded by mail / internet	Number of mailings
Turku Finland	10/2018 – 01/2019	1,200 / 438 (36,5%)	80% / 20%	4
Söderhamn Sweden	05/2019 – 09/2019	1,200 / 424 (35,3%)	82% / 18%	4
Tallinn Estonia	03/2020 – 05/2020	2,500 / 311 (12,4%)	54% / 46%	3

As the questionnaire was also strongly awareness raising material, in addition to the questions, the respondents were also informed about the urban small waters and their state in each area. These texts followed the same pattern in all areas, but they were tailored to suit each pilot area. The surveys also educated about stormwater and natural stormwater solutions, as stormwater plays a crucial role in the state of small urban waters. All surveys used the same drawings of stormwater formation and quality as well as different stormwater treatment practices. Images were drawn for the surveys and to be used in other awareness raising purposes in the project. These images can be found in the Appendix 4 survey.

The surveys included several questions about respondents ’attitudes, opinions, and level of knowledge. These attitudinal and background questions are essential in the contingent valuation method.

In the end, the surveys were almost identical in all three pilot areas in terms of questions. Nevertheless, for all questions, a comparison of the results between the pilot areas is not advisable. For many questions, the state of the water bodies in the area in question will certainly have an impact on how respondents responded to the questions and these states may vary between pilot areas. However, the answers to questions that describe the respondent’s opinions or attitudes can be compared, at least to some extent, with the results from other pilot areas. The answers to most interesting such questions for all three pilot areas are presented next.

At the beginning of the surveys, people were asked how concerned they were about the condition of urban small waters in their area (Figure 5.1). In Tallinn respondents were agreeing with this a bit more than in Turku and Söderhamn.

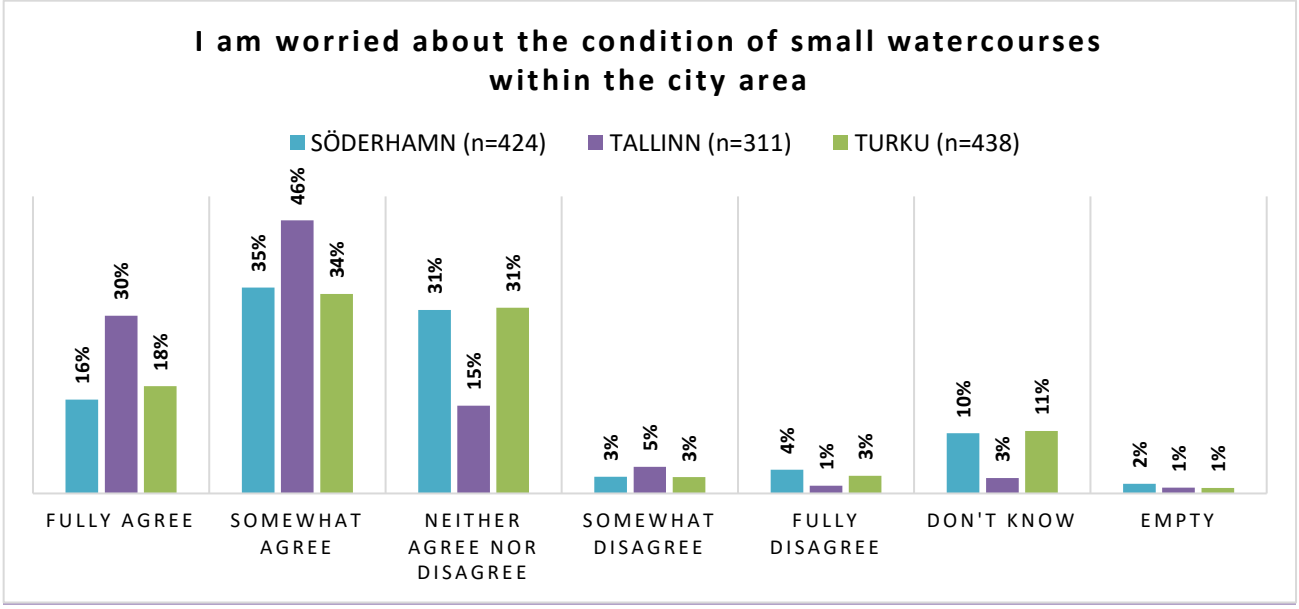


Figure 5.1. Opinions of respondents regarding the condition of small waters of the area.

The respondents were then told general information about stormwater and asked if stormwater was already a familiar concept to them. In all areas, a vast majority of the respondents knew what stormwater is. In Tallinn, however, it was felt somewhat more than in other areas that the survey had brought them at least some new information about stormwater. (Figure 5.2).

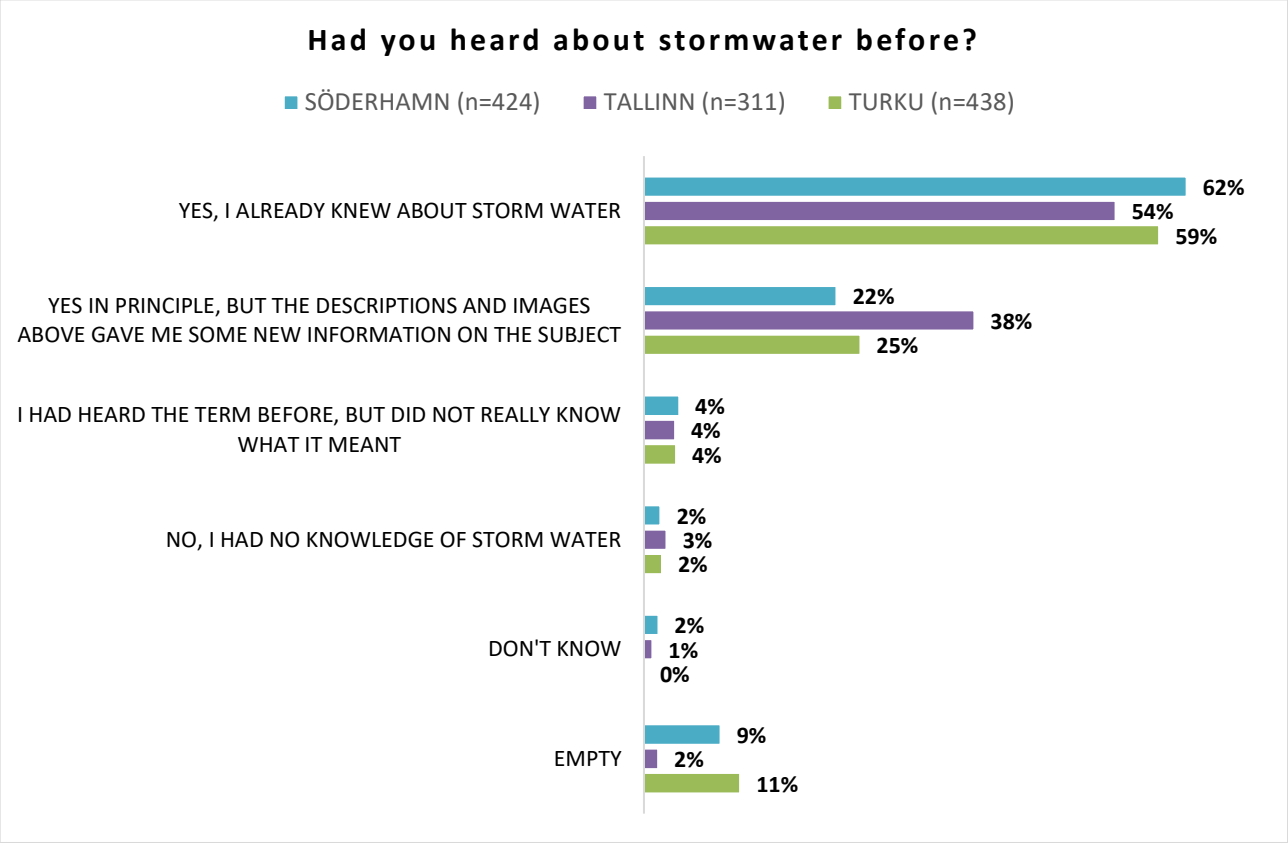


Figure 5.2. Familiarity of stormwater in the study areas.

Respondents were also asked how they agreed that they could influence the status of urban small waters through their own actions. Here, the study areas were at times clearly different. However, some differences may be explained by geographical differences between the areas. In Söderhamn, for example, the upper reaches of the waters also have e.g. agriculture, unlike in Turku or Tallinn,

which may partly explain why recipients in Söderhamn were clearly more likely to be skeptical of the impact of their own actions. Recipients in Turku thought more often than others, that their own actions could have an impact on the condition of small waters. (Figure 5.3).

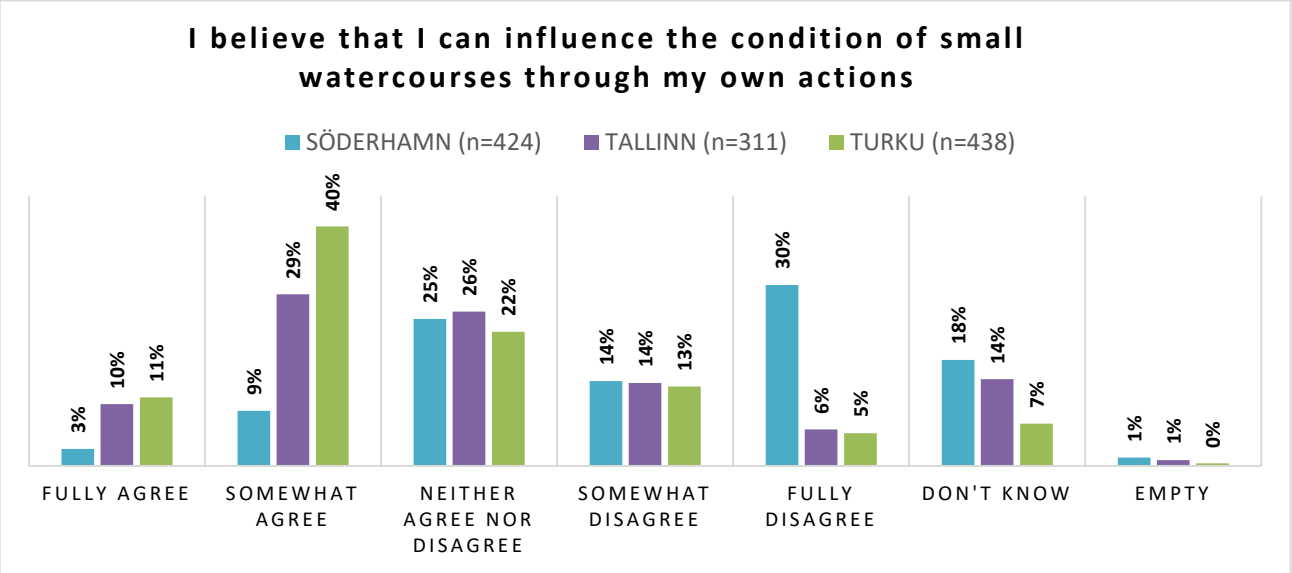


Figure 5.3. Respondent's belief they can influence the condition of watercourses through their own action in each study area.

Recipients were also asked what kind of changes and on what scale could natural stormwater management have on them, their family or others living in the area. Respondents were asked to assess the various potential impacts and the potential magnitude of these impacts. In some respects, the differences between the pilot areas can also be explained by the differences in water bodies in the different pilot areas. In Söderhamn and Tallinn respondents believed these to have greater positive effects than respondents in Turku thought. However, Turku's city streams are smaller and less visible on a large scale, which may partly explain this. Nevertheless, significant numbers of respondents in all areas believed that natural stormwater management could have a wide range of positive effects on residents. (Figure 5.4).

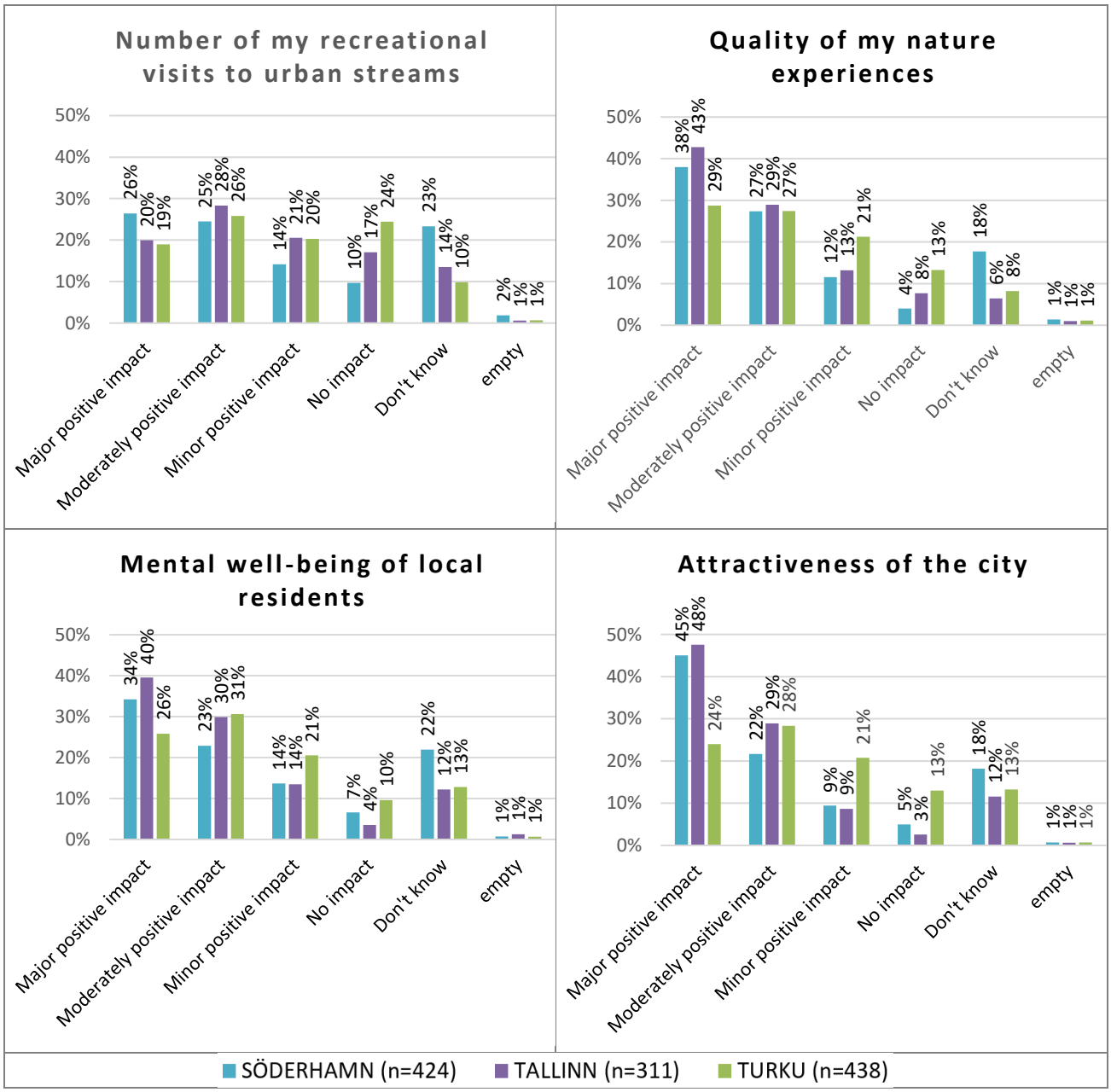


Figure 5.4. Opinions of respondents in each study area on the effects of natural stormwater management

As the method of payment was assumed to influence the extent of willingness to participate, a separate question concerning this was included in the surveys. That is, respondents were asked to rate what they thought would be the best way to fund urban water management or more sustainable stormwater management (Figure 5.5). Although the approach to different forms of financing can be very cultural, the option “as part of water, stormwater or wastewater management fees” received the most support in all countries, although in Tallinn and Turku it was clearly more popular than in Söderhamn.

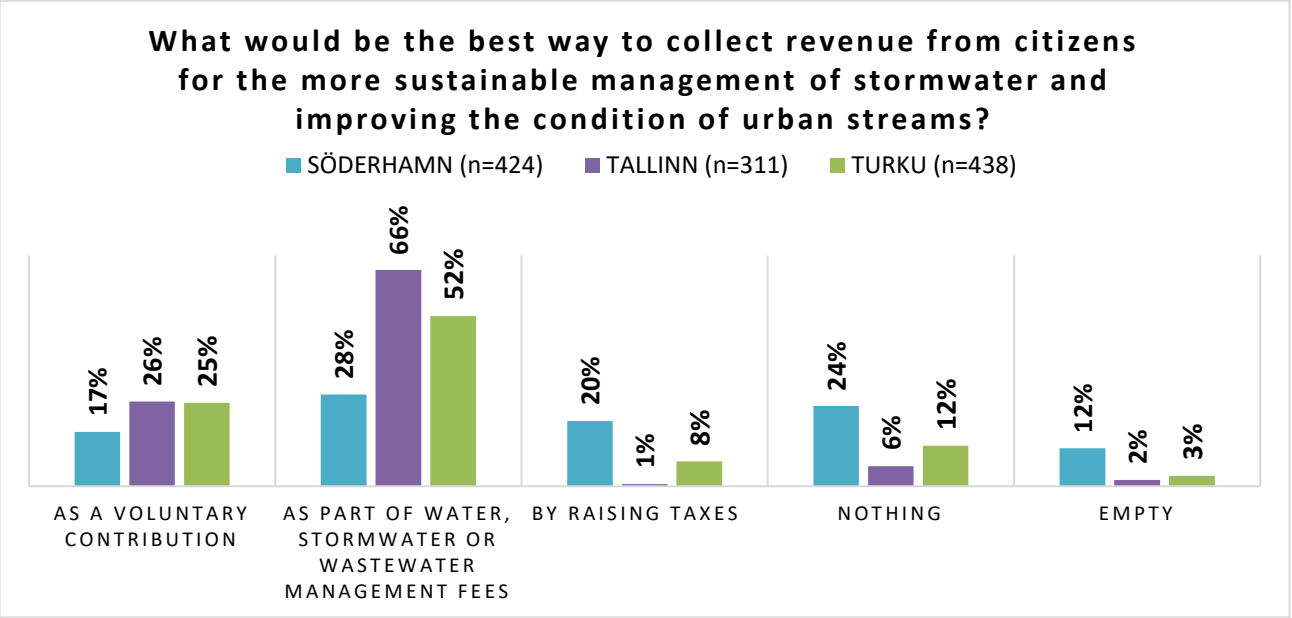


Figure 5.5. Preferred ways for raising funds for more sustainable treatment of stormwater and improving the condition of urban streams

In the end of the survey the recipients were asked if they received new information from the survey about small urban waters or stormwater. Especially in Turku and Tallinn, the survey had brought considerably new information to respondents about small urban waters but also about stormwater (Figures 5.5 and 5.6).

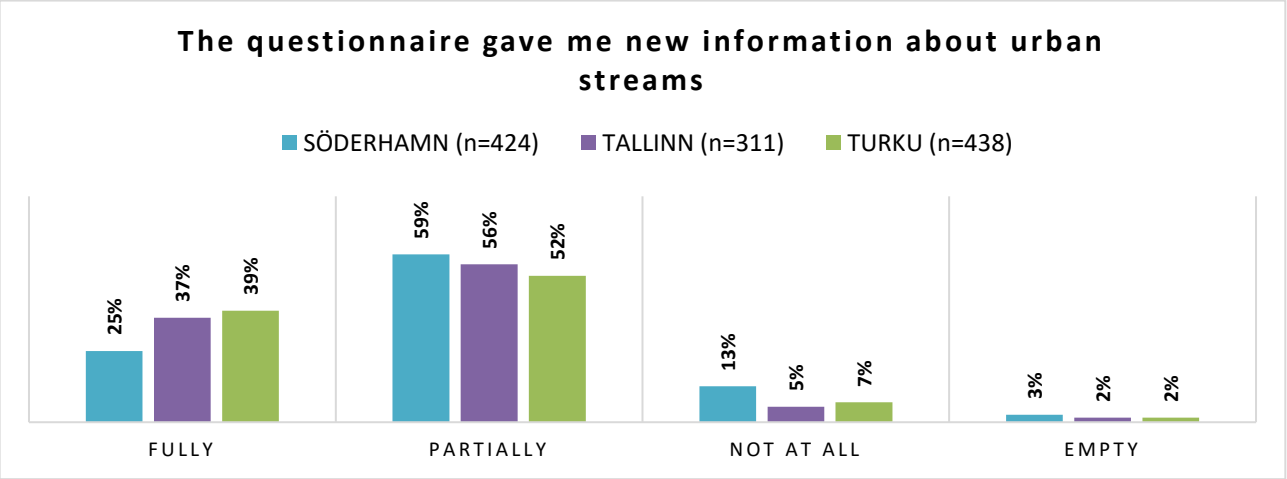


Figure 5.5. Did questionnaire provide new information about urban streams in each study area?

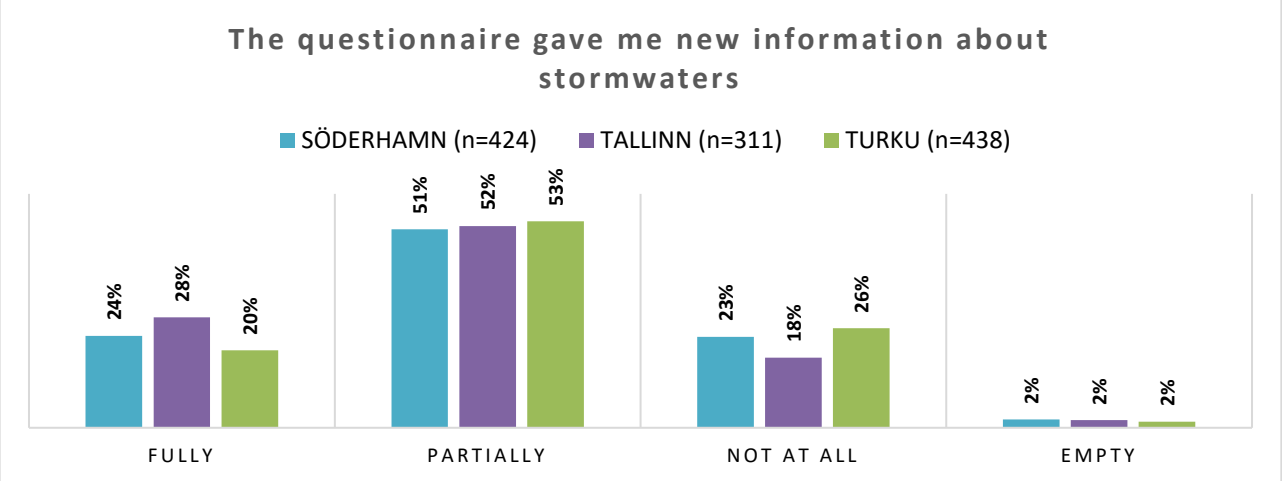


Figure 5.6. Did questionnaire provide new information about stormwater in each study area?

In addition, it was asked whether the respondent would pay more attention to small urban waters in the future. Again, clearly more people in Turku and Tallinn believed that this would happen compared to Söderhamn, where the Söderhamnså River is already a very central part of the cityscape. (Figure 5.7).

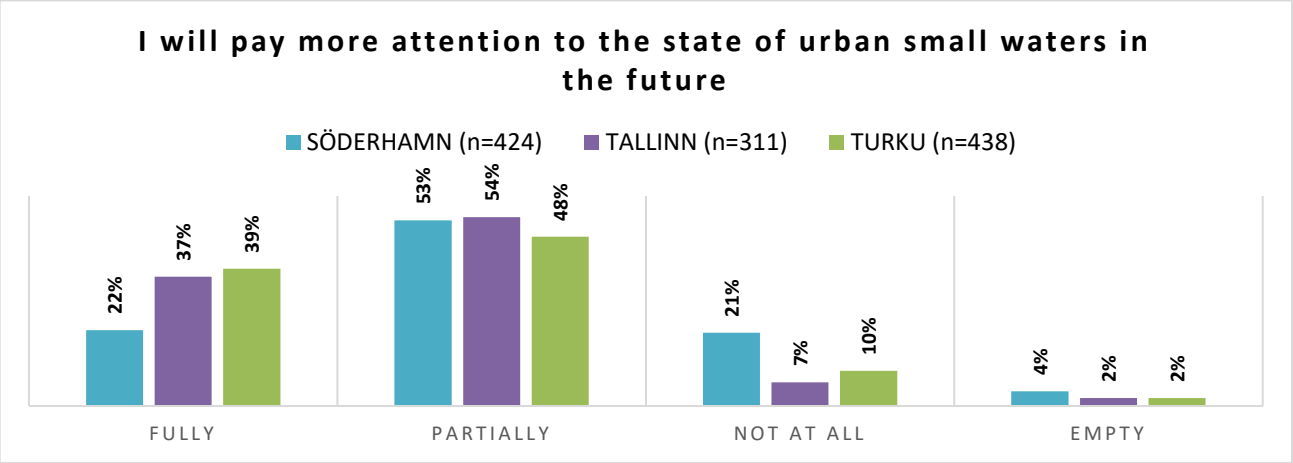


Figure 5.7. Will respondents pay more attention to urban streams in the future in each study area?

In all three study areas, the estimated total benefits of urban water improvement would clearly outweigh the total costs over ten years, usually many times over. It can also be said that in all the areas, a large proportion of respondents had an interest in the issues addressed and a significant proportion were also willing to participate in improving the situation.

People received significantly new information about the urban small waters and stormwaters from the questionnaire materials sent to them. it is also probable that much more people have familiarised with the paper material then just those who answered the questionnaire. This combined with the fact that clear majority responded by paper questionnaire further confirms the importance of making such surveys also in paper format, paying attention to their appearance and providing information in them. Also asking about something makes people think about the matter more thoroughly than if they would just be told about the subject. Also, the extensive data received by random sampling of the survey recipients provides decision makers with a broader view of citizens attitudes and opinions than they might otherwise get from random contacts by citizens.

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Appendix 1. Turku questionnaire results

n=438

1. How important do think the following matters being promoted by public funding are in Turku right now?	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	Don't know	empty
a) Promoting schoolchildren's access to recreational activities in after-school clubs	37%	41%	11%	4%	1%	3%	3%
b) Protection of the Archipelago Sea	67%	27%	2%	1%	0%	0%	2%
c) Improving the city's cycling route network	30%	43%	16%	5%	2%	2%	3%
d) The renovation and expansion of the Wäinö Aaltonen Museum	4%	27%	34%	18%	6%	7%	3%
e) Restoration of city brooks (e.g. Jaaninoja, Kuninkoja and Topinoja)	24%	47%	16%	4%	2%	5%	2%

2. Do you live near any brooks (within 1 km)?	
Yes	51%
No	35%
Don't know	13%
empty	1%

3. a) What is your opinion regarding the water quality of city brooks in the Turku area?	
Excellent	1%
Good	4%
Satisfactory	24%
Passable	20%
Poor	9%
Don't know	42%
empty	1%

4. In what way and how often have you made use of local watercourses/bodies in the City of Turku over the past 12 months?	Nearly every day	Nearly every week	Every month	Less frequently	Never	Don't know	empty
a) Spending time along the banks of brooks	9%	16%	17%	32%	21%	4%	2%
b) Spending time along the banks of the Aura River	12%	25%	28%	30%	5%	0%	0%
c) Spending time along the coastline of the sea	6%	21%	26%	40%	4%	1%	1%
d) Fishing in local waters	0%	3%	5%	17%	72%	0%	1%
e) Boating on the Archipelago Sea	1%	8%	11%	39%	38%	0%	1%
f) Other (specify):	3%	2%	2%	1%	1%	5%	86%

5. How much do you agree with the following claims?	Fully agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Fully disagree	Don't know	empty
a) I am concerned about the condition of the Archipelago Sea	63%	29%	5%	1%	0%	0%	2%
b) City brooks of Turku are important to me	23%	39%	26%	4%	2%	5%	1%
c) I am worried about the condition of small watercourses within the city area	18%	34%	31%	3%	3%	11%	1%
d) City brooks should enjoy a higher profile in the cityscape	28%	4%	20%	2%	2%	6%	1%

6. Had you heard about stormwater before?	
Yes, I already knew about stormwater	59%
Yes in principle, but the descriptions and images above gave me some new information on the subject	25%
I had heard the term before, but did not really know what it meant	4%
No, I had no knowledge of stormwater	2%
Don't know	0%
empty	11%

7. How much do you agree with the following claims?							
	Fully agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Fully disagree	Don't know	empty
a) The living conditions for trout and crayfish in Turku's city brooks must be improved	28%	38%	19%	3%	2%	8%	1%
b) Stormwater or its volume/ quality are not a problem in Turku	7%	22%	19%	22%	12%	17%	0%
c) I believe that I can influence the condition of small watercourses through my own actions	11%	40%	22%	13%	5%	7%	0%
d) I do not really care what happens to stormwater, just as long as it is moved off of the streets as quickly as possible	4%	8%	13%	34%	38%	3%	1%
e) In my opinion, water quality in city brooks has improved in recent years	1%	6%	23%	11%	5%	53%	0%
f) In my opinion, city flooding has increase in Turku over the past ten years	3%	15%	22%	16%	7%	36%	1%

8. In your opinion, what changes and on what scale could natural stormwater management have an impact on you, your family or others?						
	No impact	Minor positive impact	Moderately positive impact	Major positive impact	Don't know	empty
a) Number of my recreational visits to city brooks	24%	20%	26%	19%	10%	1%
b) Quality of my nature experiences	13%	21%	27%	29%	8%	1%
c) Mental well-being of local residents	10%	21%	31%	2%	13%	1%
d) Image and reputation of local areas	6%	17%	29%	39%	9%	0%
e) Attractiveness of Turku	13%	21%	28%	24%	13%	1%

9. Would you be prepared to pay a city brook payment for 2019–2028 in order to improve the state of the Turku city brooks and their surrounding areas?	
Yes	14%
Maybe	46%
No	40%
empty	0%

10. How much would you be prepared to pay for a city brook payment?						
	I would definitely pay	I would most likely pay	I'm not sure if I would pay	I would most likely not pay	I would definitely not pay	empty
0,50 €/month (6,00 €/a)	42%	16%	4%	2%	6%	31%
1,00 €/month (12,00 €/a)	34%	14%	6%	2%	7%	36%
2,00 €/month (24,00 €/a)	21%	15%	12%	3%	10%	38%
4,00 €/month (48,00 €/a)	7%	12%	16%	10%	13%	43%
8,00 €/month (96,00 €/)	2%	5%	14%	12%	21%	44%
16,00 €/month (192,00 €/a)	1%	1%	9%	12%	32%	45%
32,00 €/month (384,00 €/a)	0%	0%	5%	8%	41%	46%
More than 32 €/month	0%	0%	2%	3%	22%	74%

11. How important are the following reasons for you being prepared to pay?						
	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	empty
a) I use city brooks and their surroundings as a place for recreation	14%	27%	13%	6%	8%	32%
b) The spreading of nutrients and hazardous substances to the brooks should be prevented	40%	25%	2%	0%	2%	31%
c) I want to make the cityscape greener.	23%	37%	6%	2%	2%	31%
d) I support more natural approaches to reducing city flooding	28%	32%	5%	1%	3%	31%
e) I want better conditions for biota in urban brooks and their surrounding areas.	30%	31%	5%	1%	3%	31%
f) I want urban brooks to have a higher profile than they do right now (out from underground pipes).	19%	30%	13%	1%	6%	31%
g) Other reason (please specify):	4%	0%	0%	0%	6%	89%

12. How important are the following reasons for you not being prepared to pay?						
	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	empty
a) I cannot afford to pay for improving the condition of urban brooks.	15%	15%	12%	12%	11%	35%
b) In my opinion, urban brooks do not need more protection or cleaning.	4%	12%	15%	14%	18%	37%
c) In my opinion, the taxes and mandatory fees I pay should be more effectively used for the management and protection of urban brooks.	21%	23%	7%	5%	10%	35%
d) I will pay the stormwater runoff management fee and it will be enough.	27%	13%	5%	8%	10%	38%
e) Other reason	3%	1%	0%	0%	7%	89%

13. In your opinion, what would be the best way to collect revenue from citizens for the more sustainable management of stormwater and improving the condition of urban brooks?	
As a voluntary contribution	25%
As part of water, run-off water management or wastewater fees	52%
By raising taxes	8%
Nothing	12%
empty	3%

14. Have you taken part in any of the following measures on behalf of Turku's urban brooks over the past three years?				
	Yes	No	Don't know	empty
a) Participating in collective volunteer efforts to restore brooks	2%	95%	1%	2%
b) Collecting litter from brooks or their surrounding areas	31%	66%	1%	3%
c) Washing my car in my yard only using environmentally-friendly soaps or at a car wash	66%	23%	7%	4%
d) Always putting my waste in a proper waste receptacle and not on the street	98%	0%	0%	2%
e) Other	8%	1%	7%	84%

15. Gender	
Female	54%
Male	45%
Other	1%
empty	1%

16. Age	
Under 20 years	1%
20-29 years	6%
30-39 years	12%
40-49 years	11%
50-59 years	23%
60-69 years	26%
70-79 years	19%
80 years tai yli	1%
empty	2%

17. Families with children	
Families with children	21%
No children	79%
empty	0%

18. What type of residence do you live in?	
Detached house	64%
Semi-detached or terraced house	20%
Apartment building	14%
Other	1%
empty	1%

19. Postal code							
20100	6%	20320	10%	20550	0%	20810	8%
20200	1%	20360	8%	20610	5%	20880	3%
20210	2%	20380	6%	20700	2%	20900	0%
20240	3%	20500	0%	20720	3%	28380	0%
20250	3%	20520	0%	20740	8%	Empty	3%
20300	11%	20540	14%	20750	2%		

20. How long have you lived in the Turku area	
Less than a year	0%
1- 4 years	3%
5-9 years	3%
10-19 years	11%
20-29 years	9%
30-39 years	12%
40-49 years	12%
50 years tai yli	32%
empty	2%

21. What is your highest level of education?	
Basic school education	8%
Vocational qualification	29%
University degree/College graduate	9%
University of applied sciences or Bachelor's degree	26%
Master's degree	18%
Licentiate or doctoral degree	7%
Other	0%
empty	3%

22. Which of the following groups do you feel you belong to?	
Interested in water and nature through my occupation	11%
Interested in water and nature through my hobby(ies)	39%
Avid nature visitor (hunter, mushroom picker, berry picker, etc.)	42%
Other outdoor activities (cycling, running, etc.)	66%
Member of an environmental protection organisation or foundation	6%
Other	3%
None of the above	7%
empty	3%

23. What was your household's total pre-tax income per month for 2017?	
Less than 1000€/month	11%
1000-1999€/month	22%
2000-2599€/month	16%
2600-3199€/month	12%
3200-3799€/month	9%
3800-4799€/month	10%
4800-5799€/month	6%
5800-6799€/month	2%
6800-7799€/month	3%
More than 7800€	0%
empty	8%

24. Please assess which of the following statements are true				
	Fully	Partially	Not at all	empty
a) The questionnaire gave me new information about urban brooks.	39%	52%	7%	2%
b) The questionnaire gave me new information about stormwaters.	20%	53%	26%	2%
c) I'm more concerned about the urban brooks of Turku now after answering the questionnaire	25%	53%	19%	2%
d) It was hard for me to determine my monthly payment.	30%	40%	26%	4%
e) I agree that collecting the funds through Archipelago protection fund is a good idea.	41%	47%	9%	3%
f) I will pay more attention to the state of urban brooks in the future.	39%	48%	10%	2%
g) It would be important, that the payment could be targeted to enhance the state of a specific urban brook.	12%	42%	42%	4%

Appendix 2. Söderhamn questionnaire results

n=424

1. How important do you think it is that the following activities are paid for through taxes in Söderhamn?	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	Don't know	empty
a) Recreational activities for all school children	49%	34%	6%	2%	1%	4%	4%
b) Increased access to outdoor recreation, eg discounted rent on archipelago cottages for local residents, more opportunities to get out in the archipelago, expansion of hiking trails	16%	43%	25%	6%	3%	4%	4%
c) Extension of cycle and walkway	33%	41%	12%	4%	3%	3%	3%
d) Free bus trips for young people between 7 and 19 years	33%	33%	15%	7%	3%	5%	4%
e) Improvement of water quality in Söderhamnså	39%	36%	10%	1%	1%	9%	4%
f) Maintenance of the municipal street and road network	72%	23%	1%	0%	0%	1%	3%

2. How do you perceive that the water quality is currently?	in Söderhamnsån	In Söderhamnsfjärden
Excellent	1%	1%
Good	10%	12%
Satisfactory	23%	33%
Passable	25%	17%
Poor	13%	3%
Don't know	26%	32%
empty	1%	2%

3. How much do you agree with the following claims?	Fully agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Fully disagree	Don't know	empty
a) I'm worried about the state of Söderhamnsån	16%	35%	31%	3%	4%	10%	2%
b) Södrhamnså is important to me	39%	33%	20%	1%	2%	4%	1%
c) I'm worried about the state of the archipelago	16%	31%	29%	4%	6%	13%	1%

4. Have you used the area around Söderhamnsån and Söderhamnsfjärden during the past 12 months?	Nearly every day	Nearly every week	Every month	Less frequently	Never	Don't know	empty
a) Spent time and socialized along the river	4%	13%	19%	42%	18%	1%	2%
b) Spent time along Söderhamnsfjärden	6%	15%	19%	36%	21%	1%	2%
c) Exercised, walked, cycled, jogged	9%	25%	19%	25%	19%	0%	2%
d) Boat ride, time spent on the water	1%	7%	12%	39%	39%	0%	2%
e) Fished	0%	1%	4%	25%	67%	0%	2%
g) I have not visited the area around Söderhamnsån	7%	9%	7%	30%	13%	8%	26%
h) I have not visited the area around Söderhamnsfjärden	4%	4%	8%	29%	20%	8%	27%

5. Have you been affected by flooding in the last three years in Söderhamn?	
Yes	8%
No	91%
empty	1%

6. Had you heard about stormwater before?	
Yes, I already knew about stormwater	62%
Yes in principle, but the descriptions and images above gave me some new information on the subject	22%
I had heard the term before, but did not really know what it meant	4%
No, I had no knowledge of stormwater	2%
Don't know	2%
empty	9%

7. How much do you agree with the following claims?	Fully agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Fully disagree	Don't know	empty
a) There is no problem with the quality of the water in Söderhamnsån.	3%	9%	25%	14%	30%	18%	1%
b) There are no problems with flooding around Söderhamnsån.	4%	12%	24%	19%	19%	20%	2%
c) I think that I can influence the status of Söderhamnsån through my actions.	12%	26%	26%	5%	10%	20%	2%
d) It is important to improve the habitats for fish in Söderhamnsån, including trout.	50%	29%	12%	0%	1%	7%	1%
e) In my opinion, the water quality of Söderhamnså has improved over the last year.	8%	19%	38%	4%	6%	24%	1%
f) In my opinion, Söderhamnsån's floods have increased over the last ten years.	5%	14%	39%	5%	7%	28%	1%

8. How would a natural way of handling the stormwater, as described above, affect you?	No impact	Minor positive impact	Moderately positive impact	Major positive impact	Don't know	empty
a) I would make more visits to Söderhamnsån and Söderhamn's green areas	10%	14%	25%	26%	23%	2%
b) The quality of the natural experience would be improved	4%	12%	27%	38%	18%	1%
c) Mental well-being and health would increase	7%	14%	23%	34%	22%	1%
d) Söderhamn's attractiveness would increase	5%	9%	22%	45%	18%	1%

9. Would you be willing to pay a stormwater fee in the years 2019-2028?	
Yes	20%
Maybe	38%
No	41%
empty	1%

10. How much would you be willing to pay the stormwater fee?						
	I would definitely pay	I would most likely pay	I'm not sure if I would pay	I would most likely not pay	I would definitely not pay	empty
10 SEK/month	38%	19%	2%	2%	6%	33%
20 SEK/month	29%	16%	4%	2%	7%	42%
50 SEK/month	14%	15%	8%	5%	11%	48%
100 SEK/month	6%	8%	8%	8%	15%	55%
150 SEK/month	3%	3%	10%	9%	18%	57%
200 SEK/month	2%	2%	8%	8%	22%	58%
more than 200 SEK/month?	0%	0%	4%	6%	25%	65%

11. How important are the following reasons for you being prepared to pay?						
	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	empty
a) I want to improve the status of Söderhamnsån because I use the surroundings around the river for recreation.	14%	29%	6%	1%	16%	33%
b) I want to improve the status on Söderhamnsån even though I do not use the surroundings around the river for recreation.	19%	32%	3%	2%	11%	34%
c) I want to get a greener city	31%	29%	3%	1%	5%	32%
d) I support more natural ways of managing stormwater to reduce the risk of flooding.	29%	27%	2%	0%	8%	33%
e) I want to improve the natural life in and around Söderhamnsån.	32%	26%	2%	1%	7%	32%
f) I want more visible water in the city center instead of underground stormwater pipes.	20%	23%	8%	2%	16%	32%
g) Other reason (specify):	2%	0%	0%	0%	17%	80%

12. How important are the following reasons for you not being prepared to pay?						
	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	empty
a) I cannot afford to pay to improve the quality of Söderhamnsån.	11%	10%	15%	10%	17%	37%
b) The Söderhamnsån does not need any more measures to protect against flooding or purification of the water.	5%	12%	9%	10%	28%	37%
c) Improvements and flood protection must be paid through the tax bill.	16%	17%	8%	6%	21%	33%
d) Other reason:	2%	1%	0%	2%	17%	78%

13. In your opinion, what would be the best way to collect revenue from citizens?	
Through a voluntary "stormwater allowance"	17%
By raising the VA tariff	28%
Through a tax increase	20%
None of the above	24%
Empty	12%

14. Have you done something to improve the state of the Söderhamnsån in the last three years?				
	Yes	No	Don't know	empty
a) Participated in some type of volunteer work to restore Söderhamnsån for example collected trash.	5%	87%	3%	5%
b) Always throw away garbage in designated trash	95%	3%	1%	1%
c) Washed the car environmentally friendly	76%	6%	12%	6%
d) Used environmentally friendly fuel in motorboats.	20%	24%	36%	20%
e) Other, specify what	4%	3%	17%	75%

15. Gender	
Female	48%
Male	50%
Other	0%
empty	2%

16. Age	
Under 20 years	0%
20-29 years	3%
30-39 years	6%
40-49 years	8%
50-59 years	16%
60-69 years	21%
70-79 years	27%
80 years tai yli	14%
empty	4%

17. Families with children	
Families with children	17%
No children	83%
empty	0%

18. What type of residence do you live in?	
Detached house	55%
Semi-detached or terraced house	9%
Apartment building	31%
Other	1%
empty	4%

19. Postal code					
82600	0%	82636	5%	82660	0%
82630	5%	82637	9%	82670	13%
82631	10%	82639	10%	82691	0%
82632	8%	82640	3%	82692	4%
82634	2%	82650	14%	82693	0%
82635	4%	82636	12%	82695	0%
Empty	1%				

20. How long have you lived in Söderhamn?	
Less than a year	0%
1- 4 years	2%
5-9 years	4%
10-19 years	8%
20-29 years	14%
30-39 years	14%
40-49 years	14%
50 years or more	40%
empty	0%

21. What is your level of education?	
Basic school education	19%
Gymnasium	28%
Vocational training	24%
University degree/College graduate	26%
Licentiate or doctoral degree	1%
Other	2%
empty	4%

22. Which of the following groups do you feel you belong to?	
Interested in water and nature through my occupation	9%
Interested in water and nature through hobby (hunting, mushroom or berry picking, sport fishing)	46%
Visiting nature for relaxation	68%
Activities in nature such as cycling, running, kayaking	37%
Member of association working for nature conservation such as the Nature Conservation Association	8%
Other, specify:	6%
None of the above	10%

23. What was your household's total pre-tax income per month for 2018?	
Less than 10 000 SEK/month	8%
10 000–19999 SEK/month	34%
20 000–29999 SEK/month	23%
30 000–39 999 SEK/month	16%
40 000–49 999 SEK/month	7%
50 000–59 999 SEK/month	4%
60 000–69 999 SEK/month	1%
70 000 SEK/month or more	1%
Empty	7%

24. Please assess which of the following statements are true				
	Fully	Partially	Not at all	empty
24a) The questionnaire gave me new information about Söderhamnsån.	25%	59%	13%	3%
24b) The questionnaire gave me new information about stormwater.	24%	51%	23%	2%
24c) I am more concerned about the status of Söderhamnsån after answering the questionnaire than before.	13%	50%	31%	5%
24d) It was difficult for me to determine how much my household is willing to pay as a "stormwater fee".	25%	41%	29%	4%
24e) I agree that it would be a good idea to raise money through a "stormwater fee".	16%	32%	48%	4%
24f) I will be more interested in Söderhamnsån and stormwater in the future.	22%	53%	21%	4%
24g) I read the info sheet that came with the questionnaire.	54%	31%	6%	8%

Appendix 3. Tallinn questionnaire results

n=311

1. How important do you think it is that the following activities are paid for through taxes in Tallinn?	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	Don't know	empty
a) Promoting schoolchildren's access to recreational activities in after-school clubs	44%	37%	9%	3%	1%	5%	2%
b) Protection of the Baltic Sea	54%	34%	5%	1%	1%	3%	2%
c) Improving the city's cycling route network	40%	43%	9%	2%	1%	3%	2%
d) Improvement of highways	36%	48%	8%	3%	2%	3%	2%
e) Improving the water quality of city brooks ((e.g. Mustjõe, Mähe, Tiskre)	38%	43%	8%	3%	0%	5%	2%
f) Urban public transport development	41%	41%	10%	3%	1%	2%	1%

2. Do you live near any city streams (within 2 km)?	
Yes	67%
no	22%
Don't know	7%
Empty	4%

3. a) What is your opinion regarding the water quality of city brooks in the Tallinn area?	
Excellent	0%
Good	5%
Satisfactory	19%
Passable	43%
Poor	2%
Don't know	28%
empty	2%

4. In what way and how often have you made use of local watercourses/bodies in the City of Tallinn over the past 12 months?	Nearly every day	Nearly every week	Every month	Less frequently	Never	Don't know	empty
a) Spending time along the banks of brooks (ran, cycled, walked or grilled).	13%	18%	26%	23%	17%	1%	3%
b) Spending time by the lake (e.g. Harku, Raku, Männiku)	2%	5%	30%	31%	27%	1%	4%
c) Spending time on the shore or by the Baltic sea (boating, sailing etc.)	7%	13%	34%	38%	4%	1%	2%
d) Fishing in local waters	1%	2%	14%	8%	70%	2%	3%
e) I have spent time by the ponds of Tallinn parks (Kadrioru, Löwenruh)	3%	5%	42%	38%	8%	1%	3%
f) Other (specify):	5%	2%	4%	2%	1%	9%	77%

5. How much do you agree with the following claims?	Fully agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Fully disagree	Don't know	empty
a) I am concerned about the condition of the Baltic Sea	47%	32%	15%	1%	1%	3%	1%
b) Small rivers of Tallinn are important to me	34%	37%	20%	3%	1%	4%	1%
c) I am worried about the condition of all small watercourses within the city area	30%	46%	15%	5%	1%	3%	1%
d) City brooks should enjoy a higher profile in the cityscape	44%	35%	15%	1%	0%	4%	1%

6. Had you heard about stormwater before?	
Yes, I already knew about stormwater	54%
Yes in principle, but the descriptions and images above gave me some new information on the subject	38%
I had heard the term before, but did not really know what it meant	4%
No, I had no knowledge of stormwater	3%
Don't know	1%
empty	2%

7. How much do you agree with the following claims?							
	Fully agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Fully disagree	Don't know	empty
a) The living conditions for fish in Tallinn's city brooks must be improved	43%	34%	12%	4%	0%	4%	2%
b) Stormwater or its volume/ quality are not a problem in Tallinn.	2%	8%	21%	33%	26%	10%	0%
c) I believe that I can influence the condition of small watercourses through my own actions	10%	29%	26%	14%	6%	14%	1%
d) Untreated stormwater should not be led to small urban brooks.	41%	35%	14%	3%	1%	5%	1%
e) In my opinion, water quality in city brooks has improved in recent years	0%	8%	28%	11%	4%	48%	1%
f) In my opinion, city flooding has increased in Tallinn over the past ten years	7%	32%	22%	10%	1%	28%	1%

8. In your opinion, what changes and on what scale could natural stormwater management have an impact on you, your family or others?						
	Major positive impact	Moderately positive impact	Minor positive impact	No impact	Don't know	empty
a) Number of my recreational visits to city brooks	20%	28%	21%	17%	14%	1%
b) Quality of my nature experiences	43%	29%	13%	8%	6%	1%
c) Mental well-being of local residents	40%	30%	14%	4%	12%	1%
d) Image and reputation of local areas	47%	30%	7%	3%	12%	1%
e) Attractiveness of Tallinn	48%	29%	9%	3%	12%	1%

9. Would you be prepared to pay a stormwater tax in order to improve the state of the Tallinn city brooks and stormwater management?	
Yes	23%
Maybe	47%
No	30%
Empty	0%

10. How much would you be prepared to pay?						
	I would definitely pay	I would most likely pay	I'm not sure if I would pay	I would most likely not pay	I would definitely not pay	empty
0,25 €/month (6,00 €/a)	49%	7%	5%	1%	3%	35%
0,50 €/month (6,00 €/a)	41%	10%	5%	3%	5%	38%
1,00 €/month (12,00 €/a)	32%	10%	10%	5%	8%	35%
2,00 €/month (24,00 €/a)	16%	10%	13%	9%	13%	39%
4,00 €/month (48,00 €/a)	5%	7%	14%	14%	21%	39%
8,00 €/month (96,00 €/)	1%	4%	8%	16%	31%	40%
16,00 €/month (192,00 €/a)	0%	1%	6%	13%	41%	40%
More than 16 €/month	1%	1%	1%	6%	33%	58%

11. How important are the following reasons for you being prepared to pay?						
	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	Don't know
a) I use city brooks and their surroundings as a place for recreation	19%	25%	11%	5%	9%	5%
b) The spreading of nutrients and hazardous substances to the brooks should be prevented	49%	23%	1%	1%	0%	0%
c) I want to make the cityscape greener.	35%	32%	5%	1%	0%	1%
d) I support more natural approaches to reducing city flooding	26%	33%	8%	2%	1%	4%
e) I want the city to have more efficient stormwater system.	25%	36%	7%	1%	0%	4%
f) I want urban brooks to have a higher profile than they do right now (out from underground pipes).	27%	26%	12%	4%	3%	4%
g) Other reason (please specify):	5%	1%	1%	1%	0%	12%

12. How important are the following reasons for you not being prepared to pay?						
	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	Don't know
a) I cannot afford to pay for improving the condition of urban brooks.	13%	15%	8%	8%	10%	4%
b) In my opinion, urban brooks do not need more protection or cleaning.	4%	6%	10%	9%	15%	10%
c) In my opinion, the taxes and mandatory fees I pay should be more effectively used for the management and protection of urban brooks.	18%	25%	5%	3%	1%	6%
d) Other reason (please specify):	5%	1%	0%	0%	0%	6%

13. In your opinion, what would be the best way to collect revenue from citizens for the more sustainable management of stormwater and improving the condition of urban streams?	
As a voluntary contribution	26%
As part of water and wastewater management fees	66%
By raising taxes	1%
Nothing	6%
empty	2%

14. Have you taken part in any of the following measures or actions?				
	Yes	No	Don't know	empty
a) Participating in the "Let's do it!" day	39%	56%	4%	2%
b) Collecting litter from urban brooks and the sea shores	38%	58%	2%	2%
c) Washing my car in my yard only using environmentally-friendly soaps or at a car wash	66%	22%	8%	5%
d) Participation in the work of Tallinn housing associations	13%	78%	6%	3%
e) Other	11%	5%	11%	73%

15. Gender	
Female	58%
Male	39%
Other	3%
Empty	1%

16. Age	
Under 20 years	0%
20-29 years	7%
30-39 years	18%
40-49 years	20%
50-59 years	14%
60-69 years	16%
70-79 years	15%
80 years tai yli	6%
empty	4%

17. Families with chidren	
Families with children	39%
No children	61%
empty	2%

18. What type of residence do you live in?	
Detached house	25%
Semi-detached or terraced house	8%
Apartment building	66%
Other	0%
empty	1%

19. Postal code							
10100	1%	11400	0%	12600	1%	13500	32%
10600	15%	11900	8%	12900	0%	15300	0%
11200	0%	12000	9%	13100	0%		
11300	10%	12100	4%	13400	4%		

20. How long have you lived in Tallinn?	
Less than a year	0%
1- 4 years	2%
5-9 years	7%
10-19 years	12%
20-29 years	15%
30-39 years	11%
40-49 years	15%
50 years tai yli	35%
empty	2%

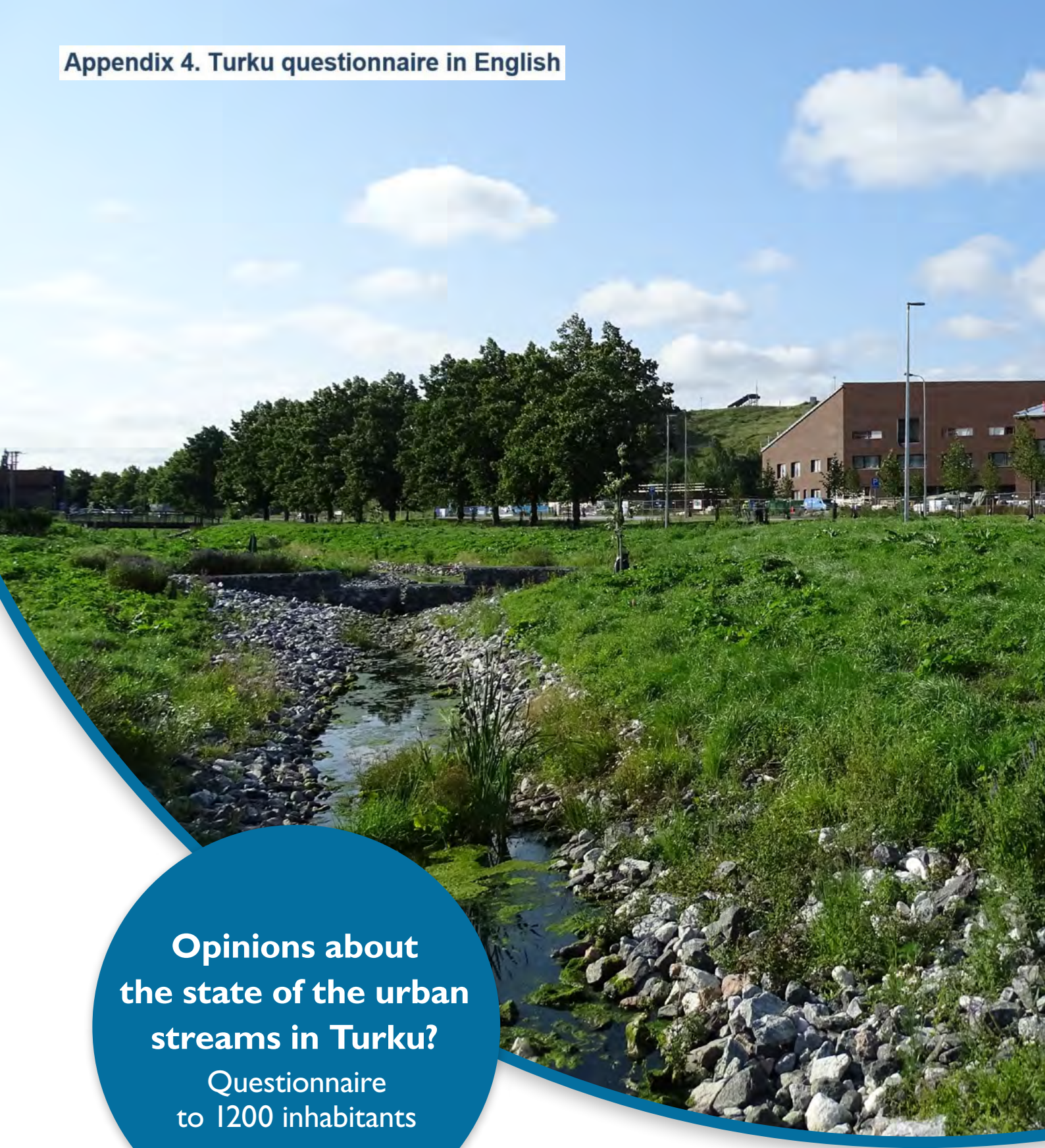
21. What is your highest level of education?	
Basic school education	1%
Secondary education	17%
Vocational qualification	9%
Applied higher education	13%
Bachelor's degree	15%
Master’s degree	36%
Doctorate	3%
Other	0%
empty	5%

22. Which of the following groups do you feel you belong to?	
Interested in water and nature through my occupation	15%
Interested in water and nature through my hobby(ies)	42%
Avid nature visitor (hunter, mushroom picker, berry picker, etc.)	55%
Other outdoor activities (cycling, running, etc.)	62%
Member of an environmental protection organisation or foundation	2%
Other	4%

23. What was your household's total pre-tax income per month for 2019?	
Less than 700€/month	15%
700-1199€/month	18%
1200-1799€/month	15%
1800-2399€/month	14%
2400-2999€/month	9%
3000-3999€/month	11%
4000-4999€/month	5%
5000-5999€/month	3%
More than 6000€	5%
empty	5%

24. Please assess which of the following statements are true.				
	Fully	Partially	Not at all	empty
a) The questionnaire gave me new information about urban brooks.	37%	56%	5%	2%
b) The questionnaire gave me new information about stormwaters.	28%	52%	18%	2%
c) I'm more concerned about the urban brooks of Tallinn now after answering the questionnaire	30%	55%	13%	3%
d) It was difficult for me to say how much I would be prepared to pay as a stormwater tax.	23%	36%	38%	3%
e) I agree that collecting a stormwater tax is a good idea.	29%	42%	26%	2%
f) I will pay more attention to the state of urban brooks in the future.	37%	54%	7%	2%
g) It would be important, that the payment could be targeted to enhance the state of a specific urban brook.	42%	40%	14%	4%

Appendix 4. Turku questionnaire in English



Opinions about the state of the urban streams in Turku?

Questionnaire to 1200 inhabitants

TURKU ÅBO

SYKE

heaWater PIDÄ LÄHIVEDET KUNNOSSA

Interreg Central Baltic

EUROPEAN UNION European Regional Development Fund

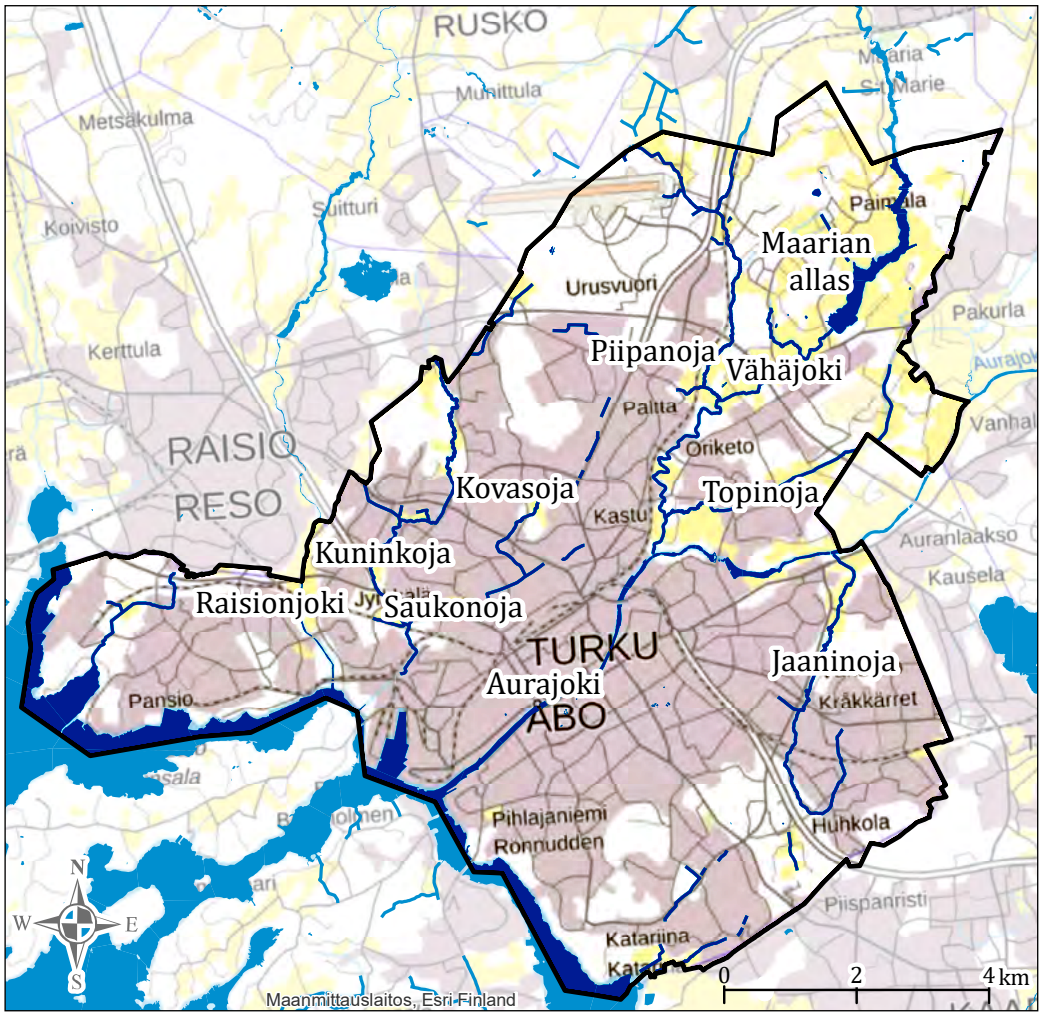
We are interested in your opinion and attitudes regarding the condition of small watercourses in the City of Turku area. There are no right or wrong answers to the questions, nor will your name be associated with any particular answers. All answers will be processed confidentially.

1 How important do think the following matters being promoted by public funding are in Turku right now?

▶*Mark only one response for each row.*

	Very important	Quite important	Neither important nor unnecessary	Quite unnecessary	Very unnecessary	Don't know
a) Promoting schoolchildren's access to recreational activities in after-school clubs	☐	☐	☐	☐	☐	☐
b) Protection of the Archipelago Sea	☐	☐	☐	☐	☐	☐
c) Improving the city's cycling route network	☐	☐	☐	☐	☐	☐
d) The renovation and expansion of the Wäinö Aaltonen Museum	☐	☐	☐	☐	☐	☐
e) Restoration of city brooks (e.g. Jaaninoja, Kuninkoja and Topinoja)	☐	☐	☐	☐	☐	☐

Below is a description of the subject area of this survey.



CITY BROOKS OF TURKU

In addition to the Aura River and sea, there are several small watercourses within the City of Turku area. The most important of these small watercourses are Jaaninoja and Kuninkoja, but there are also many streams, small ponds and creeks that may be vital to biodiversity and the enjoyment of people. Brooks are small, running watercourses, which collect water from an area approximately 10–100 square kilometres in size. Even the smallest channels, which have a continuous flow of water and are stocked with fish, are considered brooks.

Photo: Sari Väisänen, SYKE.

Photo: Sari Väisänen, SYKE.

2 Do you live near any brooks (within 1 km)?

☐ No
☐ Don't know
☐ Yes If you know the name of the brook/stream, please write it here: _____

_____

_____

3 a) What is your opinion regarding the water quality of city brooks in the Turku area?

▶ *Select only one response.*

☐ Excellent ☐ Good ☐ Satisfactory ☐ Passable ☐ Poor ☐ Don't know

b) Please explain why you feel the city brooks are in this condition: _____

_____

_____

_____

4 In what way and how often have you made use of local watercourses/bodies in the City of Turku, alone or with your family, over the past 12 months?

▶*Mark only one response for each row.*

	Nearly every day	Nearly every week	Every month	Less frequently	Never	Don't know
a) Spending time along the banks of *brooks*	☐	☐	☐	☐	☐	☐
b) Spending time along the banks of the *Aura River*	☐	☐	☐	☐	☐	☐
c) Spending time along the coastline of the *sea*	☐	☐	☐	☐	☐	☐
d) Fishing in local waters	☐	☐	☐	☐	☐	☐
e) Boating on the Archipelago Sea	☐	☐	☐	☐	☐	☐
f) Other (specify): _____	☐	☐	☐	☐	☐	☐

5 How much do you agree with the following claims?

▶*Mark only one response for each row.*

	Fully agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Fully disagree	Don't know
a) I am concerned about the condition of the Archipelago Sea	☐	☐	☐	☐	☐	☐
b) City brooks are important to me	☐	☐	☐	☐	☐	☐
c) I am worried about the condition of small watercourses within the city area	☐	☐	☐	☐	☐	☐
d) City brooks should enjoy a higher profile in the cityscape	☐	☐	☐	☐	☐	☐

CITY BROOKS IN THE TURKU AREA ARE, AT MOST, IN PASSABLE CONDITION

The water quality and biota of Jaaninoja and Kuninkoja have been studied in various monitoring periods since the beginning of the 2000s. Based on the results of biota studies, the ecological state of Kuninkoja and Jaaninoja can be classified as passable or poor. The studies found that brook water quality is particularly deteriorated by run-off water from streets, industrial areas and construction sites. Both brooks have been restored as habitats for such species as rainbow trout. If the water quality of Kuninkoja and Jaaninoja were to be improved, they would likely be better habitats for crayfish, rainbow trout and other species. The condition of brooks in the city area is largely affected by how the city handles its stormwater and meltwater.

Photo: Turku AMK.

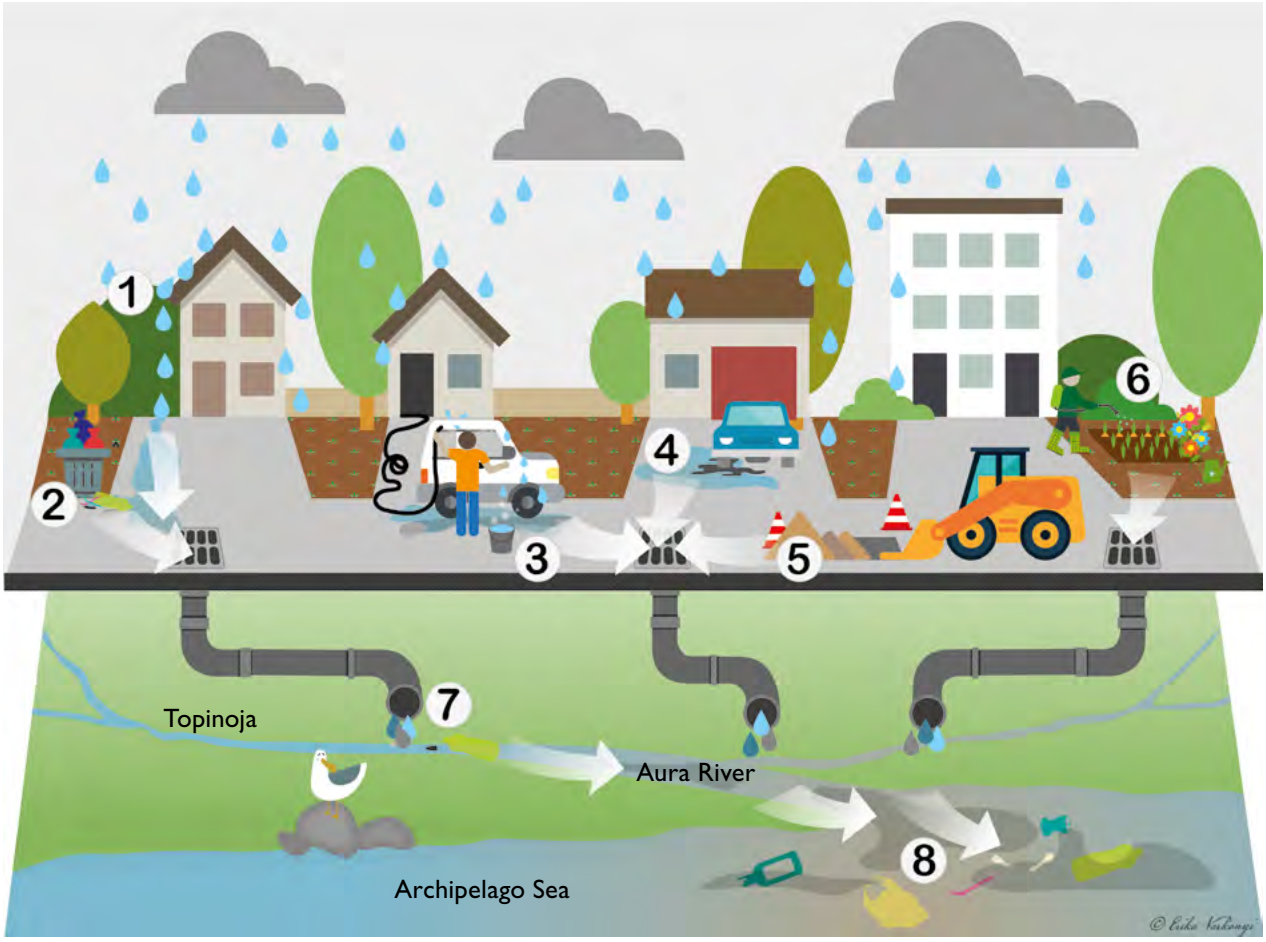
WHAT IS RUN-OFF WATER?

Run-off water is, for example, stormwater and meltwater from paved ground surfaces and building roofs that is not absorbed into the soil. Typically, run-off water is collected in street run-off drains, from which the run-off water ends up untreated in city brooks, rivers or the sea.

Run-off water from population centres, traffic, commerce and industry contain a variety of hazardous substances, which load and eutrophicate watercourses.

As cities become more densely populated, the percentage of paved and covered surface area further increases. In addition to this, winter precipitation and heavy summer rains are expected to increase with climate change. This means an increase in run-off water and the flooding and water quality problems that come with it. Run-off water does not simply stay within individual properties - it runs into drains or along street gutters, i.e. city run-off water systems. Previously, the maintenance of these systems was funded as part of wastewater fees. Beginning this year, these costs will also be covered by property-specific run-off water management fees.

Examples of how run-off water is formed and how human activity affects it.



1. Metals and other hazardous substances from building roofs are released into run-off water
2. Litter from waste receptacles may fall into run-off water and be carried along with it
3. Car washing soaps, among other things, run untreated from residential yards into the watercourse and can be hazardous to living organisms
4. Oil or other substances can leak from poorly maintained vehicles into run-off water
5. Soil from construction work is often carried away by run-off water
6. Pesticides and excess nutrients are easily carried by run-off water into watercourses
7. Run-off water from drainage pipes usually end up untreated in brooks and rivers
8. Litter and hazardous substances are also carried by brooks and rivers into lakes and the sea

6 Have you ever heard about run-off water before?

Select only one response.

☐ Yes, I already knew about run-off water
☐ I had a general idea about it, but the descriptions and images above presented me with some new information on the subject
☐ I had heard the term before, but did not really know what it meant
☐ No, I had no knowledge of run-off water
☐ Don't know

HOW CAN RUN-OFF WATER BE MANAGED?

The primary way to manage run-off water is to prevent it from forming. In practice, this means avoiding the use of impermeable surfaces such as asphalt in building and, instead, favouring vegetation and sand/gravel surfaces in yards and public spaces. Green roofs also help to reduce the volume of run-off water produced.

Using open channels to direct run-off water instead of pipes also helps to reduce the risk of flooding and increases biodiversity by providing habitats and thoroughfares for biota. Various natural run-off detention methods, such as wetlands and 'rain gardens' in yards, are used in an effort to slow the flow of water. This, in turn, reduces the problems brought about by flooding and erosion in city brooks. Detention areas can also be built in green strips along roadways and around the perimeters of parking lots.

Photo: City of Turku.

Photo: City of Turku.

7 How much do you agree with the following claims?

Mark only one response for each row.

	Fully agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Fully disagree	Don't know
a) The living conditions for rainbow trout and crayfish in Turku's city brooks must be improved	☐	☐	☐	☐	☐	☐
b) Run-off water or its volume/quality are not a problem in Turku	☐	☐	☐	☐	☐	☐
c) I believe that I can influence the condition of small watercourses through my own actions	☐	☐	☐	☐	☐	☐
d) I do not really care what happens to run-off water, just as long as it is moved off of the streets as quickly as possible	☐	☐	☐	☐	☐	☐
e) In my opinion, water quality in city brooks has improved in recent years	☐	☐	☐	☐	☐	☐
f) In my opinion, city flooding has increase in Turku over the past ten years	☐	☐	☐	☐	☐	☐

BENEFITS OF NATURALLY TREATING RUN-OFF WATER

In many cases, in 'conventional' run-off water management, water is directed from streets through pipes and straight drainage channels, which move the water quickly. When water flows quickly and there are no detention sites for it to 'rest', it may result in channel erosion and the channel itself may even dry out. Heavy rain, among others, can cause flooding in cities, because the water cannot be stored, thus resulting in water levels rising above verges.

In natural run-off water management, water detention sites, winding channels and thick vegetation slow the water flow, thus reducing, for example, the risk of flooding and channels drying out. A more even volume of water and flow rate in channels also creates better conditions for many organisms. Detention, soil infiltration and flowing through vegetation cleans stormwater and meltwater, so that when it ends up in city brooks it also improves their water quality. Thick vegetation makes for a more pleasant, diverse cityscape.

Conventional run-off water management

Natural run-off water management

8 In your opinion, what changes and on what scale could natural run-off water management have an impact on you, your family or others?

▶ *Mark only one response for each row.*

	No impact	Minor positive impact	Moderately positive impact	Major positive impact	Don't know
a) Number of my recreational visits to city brooks	☐	☐	☐	☐	☐
b) Quality of my nature experiences	☐	☐	☐	☐	☐
c) Mental well-being of local residents	☐	☐	☐	☐	☐
d) Image and reputation of local areas	☐	☐	☐	☐	☐
e) Attractiveness of Turku	☐	☐	☐	☐	☐

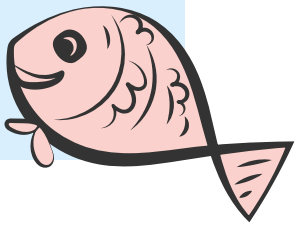
ADDITIONAL FUNDING IS NEEDED

In order to achieve the above-mentioned goals for minimising city flooding, improving the condition of city brooks and safeguarding the diversity of nature and biota in Turku, more wide-ranging and natural small watercourse/body restoration measures and run-off water management must be implemented.

Now, imagine that the citizens of Turku would be able to pay a voluntary 'city brook fee' over the next ten years to already existing Archipelago protection fund, which as funded water protection projects in the Archipelago sea and its vicinity. This would encourage the City of Turku, area businesses and residents to participate in comprehensively improving the condition of city brooks. The City of Turku would maintain existing run-off water systems, but the additional revenue gained from these 'city brook fees' would be put toward the more comprehensive restoration of city brooks and making some conventional run-off water solutions more natural.

After implementing new, more natural measures, the following changes would be evident in city brooks:

- Building flood plains will ensure that brooks do not flood their surroundings in a destructive manner and channel flow is maintained even during dry periods.
- The run-off water from newly built areas is directed through wetlands into brooks.
- Stepping stones, benches and waste receptacles are placed along brooks, where people can come to walk, relax or observe local nature.
- The brook and its surroundings form a complex habitat for different species, such as birds, mammals and insects.
- The number of migratory fish climbing the brook to spawn has increased.
- The brook winds and babbles.



9 Would you be prepared to pay a city brook fee for 2019–2028 in order to improve the biodiversity and water quality of Turku city brooks?

☐ Yes ☐ Maybe ☐ No ▶*VPlease go straight to question 13.*

10 How much would you be prepared to pay for a city brook fee?

▶*For each amount, indicate how much you would be willing to pay or not pay the amount in question. Take into account in your answer the fact that the money used would be separate from all your other expenses.*

Monthly fee over the next ten years	I would definitely pay	I would most likely pay	I am not sure I would pay	I would most likely not pay	I would definitely not pay
0.50 €/month **(i.e. 6.00 €/year)**	☐	☐	☐	☐	☐
1.00 €/month **(i.e. 12.00 €/year)**	☐	☐	☐	☐	☐
2.00 €/month **(i.e. 24.00 €/year)**	☐	☐	☐	☐	☐
4.00 €/month **(i.e. 48.00 €/year)**	☐	☐	☐	☐	☐
8.00 €/month **(i.e. 96.00 €/year)**	☐	☐	☐	☐	☐
16.00 €/month **(i.e. 192.00 €/year)**	☐	☐	☐	☐	☐
32.00 €/month **(i.e. 384.00 €/year)**	☐	☐	☐	☐	☐
Would you pay more than 32.00 €/ month? If so, how much? _____€/month	☐	☐	☐	☐	☐

11 How important are the following reasons for you being prepared to pay?

▶*Mark only one response for each row. Vastattuasi tähän kysymykseen, voit hypätä kysymyksen 12 yli.*

	Very important	Quite important	Quite inconsequential	Very inconsequential	Don't know
a) I want to improve the condition of small watercourses, because I use city brooks and their surroundings as a place for recreation.	☐	☐	☐	☐	☐
b) I want to improve the condition of small watercourses even though I do not use city brooks and their surroundings as a place for recreation.	☐	☐	☐	☐	☐
c) I want to make the cityscape greener.	☐	☐	☐	☐	☐
d) I support more natural approaches to run-off water management and reducing city flooding.	☐	☐	☐	☐	☐
e) I want better conditions for biota in small watercourses and their surrounding areas.	☐	☐	☐	☐	☐
f) I want small watercourses to have a higher profile than they do right now (out from underground pipes).	☐	☐	☐	☐	☐
g) Other reason (please specify): _____	☐	☐	☐	☐	☐

▶*Please go straight to question 12.*

Photo: Sari Väisänen, SYKE.

12 People might not be prepared to pay for improving or safeguarding the condition of city brooks for a variety of reasons. How important are the following reasons for <u>you not being prepared to pay</u> for improving the biodiversity and water quality of city brooks?

▶Mark only one response for each row.

	Very important	Quite important	Quite inconsequential	Very inconsequential	Don't know
a) I cannot afford to pay for improving the condition of small watercourses.	☐	☐	☐	☐	☐
b) In my opinion, small watercourses do not need more protection or cleaning.	☐	☐	☐	☐	☐
c) In my opinion, the taxes and mandatory fees I pay should be more effectively used for the management and protection of small watercourses.	☐	☐	☐	☐	☐
d) I will pay the stormwater run-off management fee and it will be enough.	☐	☐	☐	☐	☐
e) Other reason (please specify): _____	☐	☐	☐	☐	☐

13 In your opinion, what would be the best way to collect revenue from citizens for the more natural management of run-off water and improving the condition of city brooks?

▶Select only one response.

☐ As a voluntary contribution ☐ As part of water, run-off water management or wastewater fees ☐ By raising taxes ☐ Nothing

14 Have you taken part in any of the following measures on behalf of Turku's city brooks over the past three years?

▶Mark only one response for each row.

	Yes	No	Don't know
a) Participating in collective volunteer efforts to restore brooks	☐	☐	☐
b) Collecting litter from brooks or their surrounding areas	☐	☐	☐
c) Washing my car in my yard only using environmentally-friendly soaps or at a car wash	☐	☐	☐
d) Always putting my waste in a proper waste receptacle and not on the street	☐	☐	☐
e) Other (specify what): _____	☐	☐	☐

We need some further background information from each respondent so that we can describe the typical resident's attitudes. ***The information you provide is confidential*** *- it will not be possible to identify either yours or anyone else's individual answers from the published material.*

Please also answer the following questions so that we use your responses in our research!

15 Gender

☐ Female ☐ Male ☐ Other/No comment

16 Date of birth _____

17 Current size of your household, including yourself _____ adults and _____ children

18 What type of residence do you live in?

☐ Detached house ☐ Block of flats ☐ Semi-detached of terraced house ☐ Other, please specify _____

19 What is your post code? _____

20 How long have you lived in the Turku area? Approximately _____ years

21 What is your level of education?

☐ Basic school education
☐ Vocational qualification
☐ University degree
☐ University of applied sciences or Bachelor's degree
☐ Higher university degree
☐ Licentiate or doctoral degree
☐ Other, please specify _____

22 Which of the following groups do you feel you belong to?

▶ *You may select several options.*

☐ Interested in water and nature through my occupation
☐ Interested in water and nature through my hobby(ies)
☐ Avid nature visitor (hunter, mushroom picker, berry picker, etc.)
☐ Other outdoor activities (cycling, running, etc.)
☐ Member of an environmental protection organisation or foundation
☐ Other, please specify _____
☐ None of the above

23 What was your household's total pre-tax income per month for 2017?

☐ less than €1,000/month
☐ €1,000 – 1,999/month
☐ €2,000 – 2,599/month
☐ €2,600 – 3,199/month
☐ €3,200 – 3,799/month
☐ €3,800 – 4,799/month
☐ €4,800 – 5,799/month
☐ €5,800 – 6,799/month
☐ €6,799/month or more

24 Please assess which of the following statements are true.

▶Mark only one response for each row.

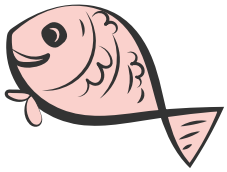
	Fully	Partially	Not at all
a) The questionnaire form gave me new information about urban streams.	☐	☐	☐
b) The questionnaire form gave me new information about storm waters.	☐	☐	☐
c) I'm more concerned about the urban streams now after answering the questionnaire	☐	☐	☐
d) It was hard for me to determine my household's yearly payment.	☐	☐	☐
e) I agree that collecting the funds through Archipelago protection fund is a good idea.	☐	☐	☐
f) I will pay more attention to the state of urban streams in the future.	☐	☐	☐
g) It would be important, that the payment could be targeted to enhance the state of a specific urban stream.	☐	☐	☐

25 a) How interesting was the topic of the survey? (4–10) _____

b) How would you rate this survey? (4–10) _____

If you have any thoughts regarding Turku's city brooks or improving their condition and biodiversity, or you would like to comment on this survey, please write your remarks in the field below.

Many thanks for your response!



Any contact information we obtain from the Population Register Centre Population Information System (P.O. Box 123, 00531 Helsinki, Reg. no. VRK/5131/2018-3) will not be disclosed. Your response will be treated as strictly confidential.

Finnish Environment Institute SYKE 2018.
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