

Urban water bodies and recreational opportunities in Finland

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Abstract— Urban water bodies provide recreational opportunities to residents such as swimming, boating, fishing and spending leisure time. The recreational opportunities offered by water bodies contributes to both physical and mental health. In Finland, there are almost unlimited possibilities to enjoy water bodies in urban areas by having 3.4 million hectares of inland water resources, e.g., lakes, ponds, and coastal wetland and 5.2 million hectares of marine waters. In this paper, we highlight the recreational values offered by these water areas in the urban context. We use water-based outdoor recreation statistics collected from the three provinces in Finland called Uusimaa, Pirkanmaa, and Pohjanmaa. As a result, we show that the demographic structure, access to the water areas are linked to the type of recreation activities such as swimming, fishing and boating. Thus, resulting in the well-being of people living in cities.

Keywords: Urban Water bodies, Recreational Opportunity, Natural Resources, Water Resources.

1. Introduction

The water bodies in urban areas offer a wide range of valuable ecosystem services such as water purification, climate change adaptation, biodiversity enhancement, and recreational services (Yu *et al.*, 2018). Therefore, these water bodies require attention and maintenance. This is to prevent ecological constraints such as biodiversity loss, habitat reduction, decreased water quality and insufficient water availability (Crooks *et al.*, 2011).

In Finland, water bodies have significant recreational and economic values. The production and trade that is dependent on hunting, fishing and recreational tourism are popular in the country (Juvonen and Kurikka, 2016). In Finland, the protection of water bodies which are located outside of the protected areas is strongly linked to the recreational value they provide to local people, whether directly e.g., through hunting, or indirectly through the quality of local lake water (Ministry of Agriculture and Forestry 2016). According to outdoor recreation statistics, in Finland over two-thirds of the population swim in natural waters every year. This makes swimming to be the second most popular outdoor recreation activity after walking in the country (Sievänen and Neuvonen, 2011). In addition, the recreation participation rates for fishing is slightly above 50%, and for boating, it is slightly below 50% (Vesterinen *et al.*, 2010).

In this paper, we highlight the recreational opportunities provided by water bodies urban areas by evaluating water-based outdoor recreation statistics collected from

three provinces in Finland including Uusimaa, Pirkanmaa, and Pohjanmaa. We have selected these provinces because Uusimaa is located near by the Gulf of Finland and Pohjanmaa is located near by the Gulf of Bothnia. In addition, Pirkanmaa is located between the other provinces with no access to sea and gulf areas. The location of the provinces allows us comparing Pohjanmaa and Uusimaa with access to gulf areas against each other; and comparing them against Pirkanmaa with no access to gulf or sea areas. The locations of these provinces are shown in the map of Finland in Figure 1.



Figure 1. The location of provinces.

2. Related works

Water bodies provide economic benefits and opportunities for nature-based recreation activities including fishing and swimming.

Lankia *et al.* (Lankia *et al.*, 2019) investigated the impact of water quality changes on swimming behavior and recreation benefits through a questionnaire-based study. Two types of data were collected including: 1) general information such as age, gender place of residence in Finland, distance to typical visiting swimming sites, number of visits per year and the travel cost; and 2) water quality perceptions that asked about water clarity such as water depth and visibility. Applying a combined method of travel costs (TC) and contingent behavior (CB), the study showed that the recreation value of a swimming trip based on the water quality was approximately 16 euros per trip. The hypothetical reduction in water quality to a level where water visibility is less than 1 meter with a lot of sludge, results in the decline of the recreation value to 9 euros per trip. Improving water quality in a way that the water visibility is more than 2 meters, and if there is no increase in sludge, increases the recreational value of each trip to 22 euros. The total annual recreation value of all swimming visits when improving the water quality enhances the recreational benefits by 53–80%. In contradiction, declining the water quality reduces the benefits approximately by 80%.

Vesterinen *et al.* (Vesterinen *et al.*, 2010) investigated the association between recreational participation in water activities and water quality. The water activities included swimming, fishing, and boating, while for water quality clarity was used as an indicator. This study first models

the water recreation participation and participation frequencies for each water activity. Then, it applies the travel costs (TC) method to estimate the value of one water recreation trip. The value of a water recreation trip was estimated using the TC method for the three recreational activities. Using method also the annual frequency of one-day trip from home to the last-visited water recreation site was estimated. The results show that water quality has no effect on boating. But improving water clarity increases the frequency of swimming and the number of fishers and fishing close to home waters. The distance to the nearest recreational water does not prevent participation in fishing or boating. An association between socioeconomic variables and water recreation participation was also found. The number of annual swimming trips and the number of fishers has increased with the improvement of water clarity.

Lankia et al. (2020) carried out a national-level accounting study for nature-based recreation in Finland using the United Nations System of Environmental Accounting – Experimental Ecosystem Accounts (SEEA EEA). This research investigates how recreational services as one of the cultural ecosystem services could be integrated into an ecosystem accounting framework at the national level. The research suggests a model to describe how this type of accounting is constructed and how different national data sources assist in recreational accounting in physical and monetary terms. The research calculates the monetary value of outdoor recreation based on consumer surplus estimates achieved by applying the travel cost method. As a result, in Finland, there are almost unlimited possibilities to enjoy natural areas because of the right of public access for recreational purposes. Based on the research, natural areas in Finland such as forests, parks, and water areas, e.g., wetlands are used for recreation with 75% of recreational visits include aquatic environments, lakes, ponds, rivers, streams, and marine and coastal environments.

Wahlroos et al., 2015 (Wahlroos et al., 2015) evaluated the design of two urban wetlands in the city of Vihti, Nummela region in Southern Finland. The two wetlands were designed to have enough spaces for amphibian and waterfowl habitat; and attract people. These wetlands were monitored and compared to study the vegetation establishment, water quality improvement, animal settlement, and people's recreation. Water quality was measured and monitored continuously at the inflow and outflow of the Gateway wetland from November 2012 to December 2013. The results showed that in the second year vegetation was self-established. The number of plants reached 102 species with 97% native plants after 5 years. The results of wildlife observation also showed that breeding amphibians and water birds were successful just after constructing the wetlands. These wetlands became successful breeding grounds for amphibians and birds and offered recreation values to people.

Most of the studies in the literature consider the economic concerns of wetlands and ecosystem accounting methods. Some research investigates the role of water quality on recreational values. Other studies explore the biodiversity concerns in wetlands or study the impact of recreational opportunities of water areas. In this paper, we contribute by highlighting the recreational opportunities provided by

water areas. We also show the relation between the amount of water bodies, access to water areas; and the population structures of the urban areas are linked with the types of water-based recreational activities in the cases of swimming, fishing and boating for three provinces of Uusimaa, Pirkanmaa and Pohjanmaa in Finland.

3. The Data

3.1. The three provinces

Uusimaa: Uusimaa is Finland's largest province in terms of population and includes Helsinki as the capital city in the country. This province is located on the coast of the Gulf of Finland and hosts more than 1.3 million residents. The nature of Uusimaa is diverse and consists of different natural elements including water areas, a long coastline with hundreds of islands, vast forests, and national parks such as Nuuksio and Ekenäs Archipelago. The province includes a large number of inland waters from various types of lakes, wetlands, rivers, streams and ponds. For examples, the Vantaa River and the Lohjanjärvi Lake provide a wide variety of freshwater habitats, offering various water-based recreations such as swimming and boating (Uusimaa 2021).

Pirkanmaa: Pirkanmaa is in a central part of Finland and has the second largest population in the country after Uusimaa with about 520,000 residents. The natural structure of Pirkanmaa includes agricultural areas and lakes. The freshwater in this province is above the Finnish average which is about 14% of the total area of the province. This is due to the flow of large lakes and watershed in this area, such as Näsijärvi which is the largest lake in the province with a size of 256 km² and with boat cruising services. Today, due to the reduction of wastewater in the forest industry, the water quality in this area has improved (Pirkanmaa 2021).

Pohjanmaa: Pohjanmaa is a province in western Finland, which is located on the coast of the Bothnia Gulf and hosts a population of about 180,000 people. Water plays an important role in shaping the landscape of Pohjanmaa. The natural structure of the Pohjanmaa is strongly influenced by rising continuous sea levels with velocities of 5-8 mm per year. The Luodonjärvi is also the largest lake in Pohjanmaa, with an area of 68 km², which is an artificial lake, that was built in 1962 to secure access to raw water (Pohjanmaa 2021).

3.2. The datasets

We apply the outdoor recreation statistics for the three provinces of Uusimaa, Pirkanmaa and Pohjanmaa from the following three sources: i) Outdoor Recreation Statistics (Outdoor Recreation Statistics, Luke). This data which is shown in Table 1, presents the national-level information on the amount of outdoor recreation by the adult population in Finland. While, the age range of the adult population is from 15 to 74 years old; the outdoor activities include swimming, fishing and boating.

Table 1. Water-based recreation in the provinces. The percentage (%) of activity participation of adult population.

Activity	Uusimaa	Pirkanmaa	Pohjanmaa
Swimming	72.2	70.6	67.2
Fishing	36.8	42.6	43.8

Boating	48.4	48.4	53.3
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ii) The publicly available information from the webpages of the Regions Council of Uusimaa, Pirkanmaa and Pohjanmaa (Councils of Pirkanmaa, Pohjanmaa and Uusimaa, 2021).

Table 2. The population and water information of the provinces.

	Uusimaa	Pirkanmaa	Pohjanmaa
Population	1,703,633	520,532	180 311
Pop. density (as./km ²)	187,3	41,41	23,26
Water area (km ²)	470,91	2,027.78	181,48
Sea area (km ²)	6 490,97	-	10 256,25
Inland water	1011	2552	655

iii) The Statistic Finland in which the data is shown in Table 3. This data presents the population age structure for the three provinces.

Table 3. Population age structure (Statistics Finland, 2020).

Age	Uusimaa	Pirkanmaa	Pohjanmaa
0-17	19.6%	18.8%	20.5%
18-64	62.8%	59.5%	56.3%
65+	17.6%	21.7%	23.2%

4. Data Analysis

The studies show that in Finland about 75% of the total near-the-house recreational visits of residents include visiting some kind of water environment, i.e., sea, lake, river, and pond (Lankia et al. 2020). This translates to some kind of water-based recreation activity such as swimming and fishing. For instance, the presence of National Parks such as Nuksio which is located in Uusimaa alone has 38 lakes and small ponds have led to a significant increase in water-based recreational opportunities (Uusimaa 2021). In addition, water areas, sea, lakes, rivers and ponds are important recreational environments for Finns with swimming, boating and fishing being Finland's most popular outdoor activities (Sievänen and Neuvonen, 2011). To further explore the recreation opportunities provided by the waters in Finland, we carry out the following analysis.

Water-based recreation: According to the information provided in Table 1, the percentage of water-based recreation activity including swimming, fishing and boating for the three provinces are slightly different.

1) *The case of swimming:* The rate of participation in swimming in Uusimaa is higher than in Pirkanmaa and Pohjanmaa (Table 1). This could be due to the presence of more inland waters in Uusimaa and also due to the better access to sea areas in this province (Table 2). In addition, in Uusimaa the type of access to water areas is more diverse (Uusimaa 2021). Indeed, this province has various beaches, archipelagos, waterways, lakes, wetlands, and ponds. This makes people spend their time on beaches more than in other provinces, and therefore the activity of swimming in this province is more than the other two provinces. The Pohjanmaa province has less percentage of swimming activities. This less statistic is because of the least existence of the inland waters (i.e., 655) among the three provinces (Table 2). This could be also due to the least population in this province (i.e.,

180,000 people) compared to the others (Pohjanmaa 2021). The participation rate in swimming in Pirkanmaa also is higher than in Pohjanmaa. This is because, Pirkanmaa has the highest inland waters (Table 2), higher population than Pohjanmaa and improved water quality (Pirkanmaa 2021). However, the swimming rate of the province is less than Uusimaa, that is sources from the population number of Pirkanmaa that is one-third of Uusimaa (Table 3).

2) *The case of fishing:* The rate of participation in fishing in Pohjanmaa is higher than the other two provinces (Table 1). This could be from the good access to the Bothnia gulf and the presence of inland waters in Pohjanmaa Province (Table 2). Instead, In Uusimaa, the participation rate in fishing is relatively lower than in the other two provinces. According to (Sievänen and Neuvonen, 2011), in recent years, fishing has lost its popularity among people living in big cities, especially in southern Finland. In addition, in Pirkanmaa participation rate in fishing is higher than in Uusimaa (Table 1). The large number of inland waters in the Pirkanmaa (Table 2) seems to provide more fishing opportunities for residents.

3) *The case of boating:* In Pohjanmaa, the participation rate in boating activity is higher than the other two provinces (Table 1). This could be due to the vicinity of the Gulf of Bothnia, which provides boating opportunities for the people of the province. In addition, based on data from (Sievänen and Neuvonen, 2011), the number of participants in boating has increased, especially in the elderly group and those who live in rural areas. Surprisingly, the boating activity rates in Uusimaa and Pirkanmaa are equal (Table 1). Indeed, Uusimaa offers access to divers water areas including seas. Pirkanmaa also however does not offer close access to sea areas because of its geographical location (Figure 1), but in this province freshwater resources such as lakes, rivers, wetland and ponds are plentiful. Moreover, although the population in Uusimaa is higher than in Pirkanmaa, but since Pirkanmaa has almost 2.5 times more inland waters than Uusimaa, therefore, this may have been the reason for having an equal rate of participation in boating.

Population structure: The amount of recreational activity is directly related to the number of population in a region. The higher the population, the higher the recreation activity.

1) *Uusimaa:* According to Table 3, the age structure in Uusimaa is slightly younger than in Pirkanmaa and Pohjanmaa. This is obvious from the age ranges of 18-64 years old which is the highest among other provinces. The age range of 65+ years old also has the lowest percentage. In addition, based on Statistics Finland (Statistics Finland, 2020), the percentage of population growth from the year 2010 to 2015 was +0.9%, +0.7%, and -0.1% for Uusimaa, Pirkanmaa and Pohjanmaa, respectively. The highest absolute population growth also observed in Uusimaa by 15,400 and in Pirkanmaa by 3,014 (Statistics Finland, 2020). Based on these data the population growth rate in Uusimaa is higher than in the other two provinces. This is also shown in Table 1, by the higher percentage of different recreational activities

desired by youngers such as swimming and boating with 72.2% and 48.4%, respectively. Furthermore, in Uusimaa the population density is 187,3 which is higher than the other provinces (Table 2). The amount of swimming is also the highest in this province (Table 1).

2) *Pohjanmaa*: In Pohjanmaa, the population is older than Uusimaa and Pirkanmaa. Based on Table 3, the age range of +65 years old in the province is 23.2%. Actually, the elders and aged persons in Finland prefer fishing and boating instead of young people, e.g., students are more interested in swimming (Vesterinen et al., 2010, Sievänen and Neuvonen, 2011). The population in Pohjanmaa also is almost 9.45 times and 2.88 times less than of Uusimaa and Pirkanmaa, respectively. However, the participation in water-based activities in the case of fishing and boating are higher than the other two provinces (Table 1). This is due to the access to Bothnia Gulf and its coastline in this province, which offers considerable water-based recreational services for the residents of the province.

3) *Pirkanmaa*: In Pirkanmaa, the age range of +65 years old in the province is 21.7% (Table 3). This statistic is higher than Uusimaa and less than Pohjanmaa. The activity rates in case of fishing and boating is indeed corresponds to these statistics (Table 1). The activity percentage in case of fishing is higher than Uusimaa and less than Pohjanmaa. In case of boating, the activity percentage is less than Pohjanmaa but equal to Uusimaa that could be because of higher population number in Uusimaa. The age range of 18-64 years old for Pirkanmaa is also less than Uusimaa but higher than Pohjanmaa. Accordingly, this corresponds to swimming percentage in the three provinces by Pirkanmaa having less percentage than Uusimaa and higher rate than Pohjanmaa.

5. Discussion and Conclusion

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Water bodies by providing recreational opportunities, play an important role on the vitality of cities and citizens well-being. The examples these opportunities include fishing, swimming, wildlife viewing and walking. Hence, it is important to preserve wetlands as valuable ecosystem services. In this paper, we evaluated the water-based recreation data collected the outdoor recreation statistics and used the population density and age structure as well as the information about three provinces in Finland called Uusimaa, Pirkanmaa and Pohjanmaa. However, there were following few *limitations* to estimate water-based recreation in the three provinces. First, in the outdoor recreation statistics data there was no exact information on the total number of visits to the water areas. Second, there was no information for the frequency of visits for all of the activities. Third, there was also no accurate information on the number of visits that come from other provinces or the visits made by tourists. Finally, the number of visits made by age groups 0-14 or 75+ years old were not considered.

Although, in our paper we used a small amount of data but we highlighted the role and significance of water areas such as wetlands on providing opportunities for nature-based recreation services using the available data for the three provinces. We showed the relation between the amount of water bodies and access to water areas; as well as the demographic structures of the urban areas are linked with the types of water-based recreational activities such as swimming, fishing and boating. Therefore, since recreational activities are directly linked with people's health and well-being it is mandatory to preserve the water areas including their qualities and clarities. This could be by calling authorities attention to the importance of the topic and enhancing public awareness about the benefits and recreational values they offer. Public awareness about the recreational benefits would support the protection and maintaining of these natural and valuable resources.