Valuing recreational ecosystem service flow in Finland

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Abstract

In this study we defined the spatial allocation for the value of recreation ecosystem services in Finland. The Finnish National Outdoor Recreation Demand Inventory, a representative survey dataset of Finnish recreationists and their recreation visits (last close-to-home visit and overnight nature trip), allowed us to estimate the annual number of recreation trips to various area types: 1) areas used based on everyman's right, 2) state-owned recreation and nature conservation areas, and 3) leisure homes and their surroundings. To obtain the values for recreation visits to each area type in different parts of Finland, we applied the aggregate travel cost method. GIS was used to map the regional visits as well as their value. The results emphasize the relative importance of close-to-home recreation compared to overnight nature trips in terms of the total number of visits and their values. The spatial allocation of the value of close-to-home visits followed population density, while the type of ecosystem had a minor role. The majority of the close-to-home recreation benefits were obtained from areas that are used based on everyman's right. Our approach offered an example of how to utilize national recreation data, which are also available in some other European countries, to define and map the value of recreational ecosystem services.

Introduction

Ecosystem services provide the benefits people obtain from ecosystems (Millennium Ecosystem Assessment (MA) 2005). Since the first categorization of ecosystem services in MA, several other slightly different categorizations have appeared. In the most recent of these, the Common International Classification of Ecosystem Goods and Services CICES (www.cices.eu), ecosystem services are grouped under three themes: provisioning, regulation and maintenance, and cultural services. The recreation benefits considered in this article belong to cultural services, implying that ecosystems provide nonmaterial benefits for people. Including recreation and ecotourism in ecosystem services aims at recognizing that people often choose where to spend their leisure time partly based on the characteristics of the natural or cultivated landscapes in a particular area (MA 2005, Gee & Burkhard 2010). Therefore, analysis of the benefits of cultural ecosystem services must consider the ecosystem as much as the relationship between the individual and the environment, including personal and social driving forces that influence the demand side (Gee & Burkhard 2010).

Fisher, Turner & Morling (2009) suggested that ecosystem services are those aspects of ecosystems utilized (actively or passively) to produce human well-being. Recreation benefits jointly result from the recreational environment provided by different ecosystems, inter alia forests, meadows, or a vista, together with multiple inputs such as human, social, and built capital inputs, including conventional goods and services, e.g. equipment, time allocation and access (Boyd and Banzhaf, 2007). The economic value of ecosystem services refers to the value of the benefits an individual obtains from consuming the services provided by an ecosystem, including use and non-use values. In the case of recreation, the share of the economic value accounted for by the ecosystem may not be easily identified. Partly for this reason, the interest of past studies has been in the value of recreation visits. In this study we also focused on the use value produced by recreation visits typically spread over a wide range of ecosystems. However, we aimed to define the role of human inputs and ecosystems.

There have been previous attempts to map cultural ecosystem services (Norton et al. 2012), and recreation services in particular (Jones et al. 2010, Sen et al. 2011, Vihervaara et al. 2012). Mapping has been based on ecosystem characteristics, on the level of use, or on the economic value of the use. The scale of analysis has been national as well as local (Phaneuf et al. 2008, Hein 2006) or site specific (Baerenklau et al 2010), depending on the policy context. Here, we were interested in national-scale mapping of the value of recreation benefits. A national approach provides

transferability of the value estimates (Jones et al. 2010), offering an alternative approach to the meta-analysis of several site-specific studies in transferring monetary values. A national approach may also supply the information needs of national environmental accounting. In several previous studies on environmental accounting, it has been stated that the shortage of non-market values for natural environments prevents their inclusion in accounting and the development of environmental accounting in general (e.g. Goio et al. 2008). To provide information for accounting, Boyd and Banzhaf (2007) recommended focusing assessment on the current flow of the services.

In a previous analysis of recreation ecosystem services on a national scale, Norton et al. (2012) suggested a resource-based approach in which ecosystems are qualitatively evaluated as producers of cultural services. In Great Britain, Jones et al. (2010) applied a national aggregation of site-based recreation surveys applying travel cost methods. However, site-specific approaches do not fit the context of open public access in Nordic countries. When all natural areas are open for public recreation, the collection of site-specific information is impossible. As an alternative, we developed an approach based on population-based data from a national inventory of the recreational use of nature. The approach is also worth developing from a European perspective, as national inventories of outdoor recreation have been conducted in several European countries (Sievänen et al. 2008), and they can provide an information base for the analysis of cultural ecosystem services and recreation in particular.

The objective of this study was to define the spatial distribution of recreation visits in Finland and the non-market value of these visits. We focused on the recreation value produced by Finnish households utilizing forest, water or agricultural ecosystems in Finland. Although we focused on value, here we also discuss the role of ecosystem services and their institutional provision as a component of this value. The ultimate objective was to test the applicability of national recreation inventory data for mapping recreation value and generating information enabling the transfer of value estimates in various decision-making situations in Finland.

The second Finnish National Outdoor Recreation Demand Inventory (LVVI2) provided the data for this study (Sievänen & Neuvonen 2011). The data enabled us to derive regional estimates of the annual number of recreation visits. The heterogeneity of the visits was taken into account by dividing them into close-to-home visits and overnight nature trips. Furthermore, various area types were examined in the analysis, which were as comparable as possible with the area types in geographical data. These area types were: 1) areas used for recreation based on everyman's right, regardless of who owns the land (including municipal recreation areas); 2) state-owned recreation

and nature conservation areas such as national parks; and 3) leisure homes and their surroundings. For the valuation of recreation visits we applied the travel cost method, which is a widely used revealed preference method for valuing recreation benefits based on actual behavior. To obtain the value for recreation visits to each area type we used a variation of the travel cost method (e.g. Vesterinen 2010, Pouta & Ovaskainen 2006) that aggregates visited destinations. Contrary to the traditional travel cost model focusing on a specific site, we modeled the demand for visits to a representative site, which was a combination of destinations defined by the last visits of individuals in our sample rather than on any single area. The estimated demand functions provided us with value information on visits to each area type. The annual value for each region (NUTS 3) was calculated by estimating the median number of visits at the population level and multiplying it by estimated value per predicted visit. The use and value information were mapped on a regional level.

Supply of and demand for recreation services in Finland

Outdoor recreation in Finland is characterized by 'everyman's right', the traditional free right of access to land and waterways, no matter who owns the land (Everyman's right 2012). Everyman's right basically covers walking, skiing, and cycling freely in the countryside, temporary camping, gathering wild foods and flowers, fishing with a rod and line, and using water areas for boating and swimming. Free access is excluded to only a few areas, such as strict nature reserves and military areas used by the Finnish Defense Forces.

Beyond everyman's right, some areas are particularly provided for recreation, including recreational facilities such as hiking trails, ski tracks, camping sites, and cooking shelters, among others. These areas include seven national hiking areas and 37 national parks. In hiking areas, commercial forestry is limited, and nature conservation and outdoor recreation are taken into consideration. Many areas also have a visitor center, tourist center, or rental cabins. National parks are characterized by their diverse and unique natural features. The primary purpose of national parks is to protect the original biotic and abiotic features of the natural environment, including heritage landscapes (The Principles of Protected Area Management in Finland, 2000). The management principles of national parks emphasize the importance of creating opportunities for recreation, hiking, and experiencing nature. A wide variety of recreational facilities are therefore provided in many national parks. Both hiking areas and protected areas on state land are mainly located in

northernmost Finland, while only very scattered and small areas are available in southern and central Finland.

Beyond these recreation services open to everyone, every seventh Finnish household owns a leisure home (Free-time residences 2000, 2001). These are typically used by the owner's family and adult children, or by siblings with their families. In this way, about 40% of the Finnish population has the opportunity to spend time in a cottage on a regular basis. Two-thirds of the leisure homes are located in the same province as the primary residence of the owner, with one-third being located in the same municipality as the primary residence. A typical, but not the only possible location for a leisure home is by a lake or the sea. Leisure homes are concentrated on the south coast and in the lake district of central and eastern Finland.

The ecosystems for recreation vary between these institutional settings. The average distance to forest is 700 m, and forest is encountered on approximate in 90% of recreation visits (Sievänen & Neuvonen 2011). Important ecosystems for recreation also include lakes and the sea: the average distance from home to a water body is 2 km, and water is present at the destination one-third of close-to-home recreation visits.

In the natural environment, with an abundance of recreation opportunities, the participation rates in recreation are high: 96% of the population participates in outdoor recreation at least once a year and the average number of recreation visits is 167 per year. An average Finn annually participates in approximately 8 nature trips with overnight stays for outdoor recreation, while the rest of the visits take place close to home. The most popular activities are walking, swimming in natural waters, cycling, and just being in nature with no special activity.

Methods

DATA

To analyze the value of recreation and nature tourism and its spatial distribution, we used data from the National Outdoor Recreation Demand Inventory (LVVI2) by the Finnish Forest Research Institute. Statistics Finland was assigned to conduct the LVVI2 population survey in 2009 and 2010. Data collection was performed three times per year, in winter, spring, and fall, with a total of six survey rounds.

A random sample of Finns aged 15 to 74 years was drawn from the Census of Finland. In each round, 4000 respondents (24 000 in total) were contacted. The data were collected using a web-

based survey supported by a mail questionnaire (mixed-mode method). After sending the first request to respond to the Internet survey, a reminder was sent, and after that a mail questionnaire (including a possibility to answer the web survey) was sent to those who had not completed to the Internet survey. The fourth contact was a reminder postcard for those who had not returned the mail questionnaire. The response rate was 37%, and data were consequently received from 8895 respondents. Of these, 23% completed the questionnaire via the Internet and 14% by mail. A short telephone interview was conducted as a non-response study including two questions related to outdoor recreation participation. The interviews targeted non-respondents from the autumn 2010 survey (n = 301, response rate 41.8%) and revealed that they did not differ from the respondents in terms of their participation in outdoor recreation.

Variables describing the socioeconomic background of the respondents were obtained either from the survey questionnaire (e.g. employment status, household size, and monthly household income) or from registers (e.g. residential region, gender, and age). Table 1 compares the study participants with the general Finnish population regarding general socio-demographic variables.

Table 1. Descriptive statistics for the study sample and the Finnish population.

	In study sample		In population[a]
Variable	Mean	SD	Mean
Household gross income, €	3900	2400	3300
Gender (0 = female, 1 = male)	0.45		0.49
Age, years	47	17.0	42
Employed (0 = no, 1 = yes)	0.56		0.61
Lives in an urban area (0 = no, 1 = yes)	0.68		0.69
Household size, persons	2.5	1.4	2.8
NUTS 2, % of total 15–74-year-old population living in the region:			
Southern	49%		50%
Western	25%		25%
Eastern	13%		12%
Northern	12%		12%

a) Statistic Finland 2013.

To reduce the response burden, about two-thirds (69%) of the respondents were asked in more detail about their most recent close-to-home recreation visit and around one-third (31%) about the most recent nature trip. Thus, information on day visits and overnight trips was obtained from 6131 and 2761 respondents, respectively.

The respondents were asked if they had made at least one recreation visit or trip during the previous 12 months. This information formulated the variable describing the participation rate for close-to-home visits or nature trips. If the respondent had made such a visit or trip, more information on the latest trip was requested. Information on how many days ago the previous visit or trip had taken place and on the intended timing of the next visit was used to estimate the annual number of close-to-home recreation visits and nature trips for each respondent.

The measured characteristics of the most recent close-to-home recreation visit or nature trip were the duration of the visit or length of the trip, activities, companions, the mode of transportation, the destination region and destination type, the distance to the destination, and the facilities and services available at the destination. The number of previous visits was also recorded.

NUMBER OF VISITS AND TRIPS

In this study we determined the aggregate number of close-to-home visits and nature trips (trip days) per region (NUTS 3; see Appendix 1). The total number of close-to-home visits was obtained regionally by multiplying the adult population from Statistics Finland by the proportion of participants in our sample and by the median number of close-to-home visits based on our data. The distribution of close-to-home visits was presented according to the destination type. The classification of destinations was constructed so that it corresponded to the available spatial information on existing recreation resources. The first destination type represented private areas or areas owned by municipalities, where the use was based on public access (everyman's right), while the second type comprised state-owned areas provided for recreation and nature protection, and third area type was leisure homes and their surrounding areas.

The number of overnight nature trips was obtained by multiplying the adult population by the proportion of participants in our sample and the median number of trips. The total national number of nature trips was distributed among the destination regions based on the distribution of destinations in the data. The number of trips was further divided according to three area types similar to those used for close-to-home visits.

The following descriptive statistics provide a general overview of the visits and trips. Three quarters (75%) of the close-to-home visits lasted 0.25–2.0 hours and two-thirds of the visits (68%) took place within walking distance from the starting point, which in most cases was the place of residence of the respondents. The average duration of a day visit was 2.1 hours and the standard deviation was 2.37 hours. The average length of overnight trips was 5.2 days and the standard

deviation 6.48 days. The average distance travelled was 296 km, but more than half (57%) of the trips were to destinations closer than 200 km from the respondents' permanent residence.

VALUATION

The per-trip value of both close-to-home visits and nature trips was estimated with the travel cost method. This method is based on the idea that even if there is no explicit price for recreation, an individual visiting a recreation site has to face costs from travelling to the site and back. Utilizing the fact that individuals travel different distances to recreation sites, and the number of recreation trips they make varies, the demand curve for recreation trips can be determined on the basis of travel costs and other relevant variables affecting the trip frequency. The value of a trip is then calculated on the basis of the demand curve.

The frequency data for the travel cost models were obtained from the survey questions related to the last recreation trip the respondents had made. With regard to close-to-home recreation visits, the dependent variable was the number of visits by the respondents to the last-visited site during the previous 12 months. For overnight nature trips, the dependent variable for the number of visits focused on the previous 5 years.

For dependent variables measured in counts, such as the number of trips here, the Poisson regression model is often used. It is based on a discrete distribution and limits the values of the dependent variable to be non-negative integers. The model additionally assumes that the conditional mean equals the variance. However, this is often not the case with recreation demand, as the 'number of trips' variable is skewed and the variance is often larger than the mean, implying overdispersion of the data. The problem of overdispersion can be solved with a negative binomial model, which allows the variance to differ from the mean. This model is thus often preferred with this type of data and was also applied in this study.

The negative binomial distribution has a probability mass function:

$$\Pr[Y = y] = \frac{\Gamma(y + 1/\alpha)}{\Gamma(y\ +1)\Gamma(1/\alpha)} \cdot \left(\frac{1/\alpha}{\mu + 1/\alpha}\right)^{1/\alpha} \cdot \left(\frac{\mu}{\mu + 1/\alpha}\right)^{y} \quad (1)$$

where μ is the mean number of trips, Γ a gamma probability density function for y_i and α a gamma distributed parameter. The mean number of trips is $E(Y) = \mu$, and the variance is now

$Var(Y) = \mu(1+\alpha\mu)$. α is interpreted as an overdispersion parameter. If it is zero, no overdispersion exists and the model returns to a Poisson model, while if it is larger than zero overdispersion exists.

Due to the truncated nature of the data, a zero-truncated version of the negative binomial model was used to estimate the close-to-home recreation visit model.

In the survey, information on the visit or trip expenditures was elicited by asking the respondents to separate their personal travel, accommodation, and activity expenditures (e.g. rental and participation fees, access fees, permit, equipment). In both of the models, the travel cost variable was created from reported travel expenses incurred from the visit or trip. Reported travel expenses from traveling by private car and by public transport were summed and the average cost per kilometer was calculated. The average kilometer cost was then used in both of the models as the kilometer cost for those respondents who had mainly used a private car or public transport to travel to the recreation destination. The travel cost variable was set to zero for walkers and cyclists. The time cost was not included, because it is usually measured on the basis of hourly wages, and only five percent of respondents reported that if they had not undertaken the trip they would have instead been working for a salary.

The estimated demand model allows us to define the value of a recreation trip, i.e. the consumer surplus per trip. The consumer surplus can be calculated by integrating the above demand curve between the actual travel cost (TC) and the choke price, when number of trips goes to zero. In the case of a negative binomial model, the consumer surplus per trip is simply (Haab & McConnell 2002):

$$\frac{CS}{Y} = -\frac{1}{\beta_{TC}}, \tag{2}$$

where β_{TC} is the coefficient of the travel cost variable and Y the expected number of recreation visits.

To obtain value estimates for visits to various area types the most important independent variables in addition to the travel cost variable are interaction variables between travel cost and destination type (everyman's right area, state-owned land, and leisure home). Interaction variables were used to calculate the destination type-specific values for trips. Furthermore, sociodemographic variables were included in the models.

When calculating the consumer surplus of recreation trips to different destination types, the coefficient β_{TC} was replaced by the sum of β_{TC} and the coefficients of the interaction variable between the travel cost and the destination type in question $\beta_{TC*destination\ type}$:

$$\frac{CS}{Y} = -\frac{1}{\beta_{TC} + \beta_{TC*destinationtype}} \quad (3)$$

SPATIAL ANALYSIS

The analysis started with the identification of natural and semi-natural areas that can be considered as green areas freely open to recreational use according to the Finnish legal concept of everyman's right. Finnish national CORINE Land Cover 2006 data (25 m x 25 m grid) were used to extract these areas according to a criterion developed to roughly identify areas potentially providing recreation ecosystem services (Söderman et al. 2011). All pixels of desired classes touching each other were merged to form separate green areas, after which all areas smaller than 1.5 ha were removed to obtain areas of the recommended size for recreational use (Niemelä et al. 2010, Söderman et al. 2012). Protection areas on state land were extracted from Finland's database of protection areas, and hiking areas on state land from the VIRGIS database on recreation opportunities. These were united to form the state land data layer. This layer was clipped out of the former layer of green areas potentially suitable for recreation. As a result, a data layer of areas used based on everyman's right was created. Finally, leisure homes were derived from the Finnish Population Register. All three data layers of destinations of recreation visits and nature trips were then linked with region (NUTS 3) data. The land area of the areas used based on everyman's right and protection areas on state-owned land was calculated per region, as well as the number of leisure homes. Mapping of the use and value of recreation ecosystem services was conducted using ArcGIS 9.3.1 Desktop software.

Recreational use and value data were combined with spatial data to allow their mapping. Data on state-owned land use could not be visualized in a spatially explicit way due to the small size of state land areas in most of Finland, and were therefore instead presented region-wise. This also applies to leisure home data, because the exact location of leisure homes cannot be mapped due to privacy regulations. In this article, the data are mapped according to the proportion of visits and trips to different destinations in each region, and no spatially explicit locations of any destination layer are shown.

Results

RECREATIONAL USE OF NATURE

The total number of close-to-home visits in Finland during the study period was 369.2 million. The recreational use of nature, close-to-home visits and nature trips are reported per region in Appendix 2, and the average figures for use across all regions are presented in Table 2.

Although there was some variation in the participation rates and times in close-to-home recreation, the main driver of variation in the total number of visits was the population per region, which thus indicates the importance of green areas in the most populated parts of the country. When the close-to-home recreation visits were further divided into area types, the importance of everyman's right could be seen from the regional distribution (Figure 1). In every region, the areas used based on everyman's right received considerably more visits than state-owned areas or leisure homes.

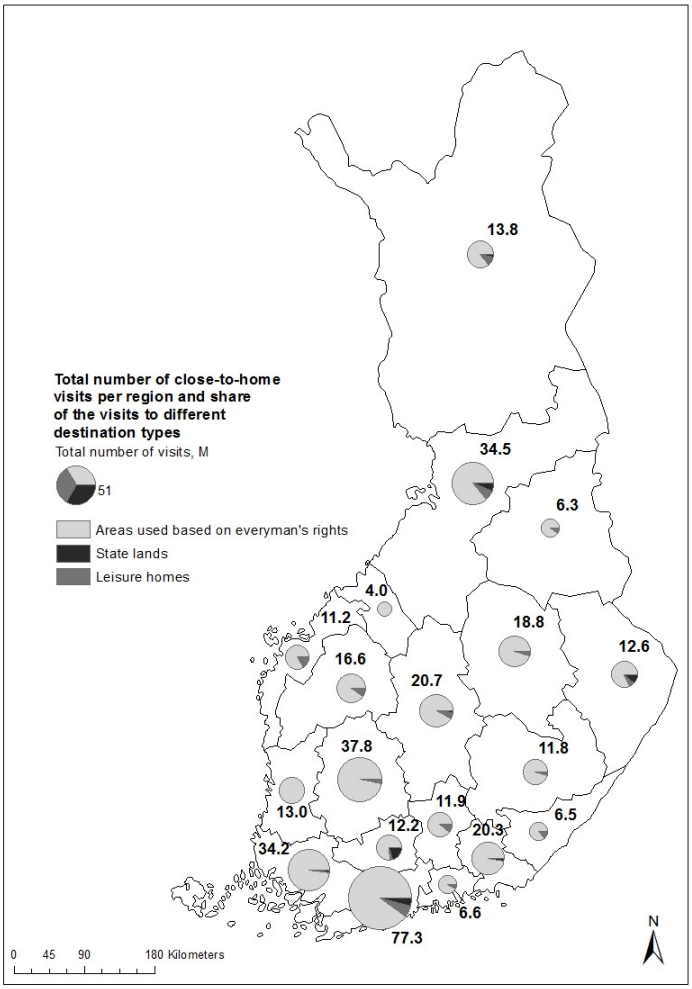

Figure 1. Total number of close-to-home recreation visits (based on individual medians per region) and the destination types of visits.

The total number of nature trips was 3.4 million. Appendix 2 presents the number of nature trips according to the destination region. In nature trips beyond the most populated areas, such as the Uusimaa Region, the most resource-rich areas in northern Finland, particularly Lapland, were emphasized. The areas used based on everyman's right were the most important destinations, as on average 53% of trips targeted these areas (Table 2). However, particularly in central and eastern parts of the country, as well as in the south-west coastal regions, the total number of trips to leisure homes was considerable (Figure 2). In the northern part of the country, the areas that are considered important based on the recreation resources, i.e. state-owned areas such as national parks, received about one-third of the number of trips. In northern Finland, nature tourism relies on large tourism centers, but also on leisure homes and cottages. The relatively high importance of everyman's right areas in other parts of the country than the north is very natural, as state-owned land areas are very scarce.

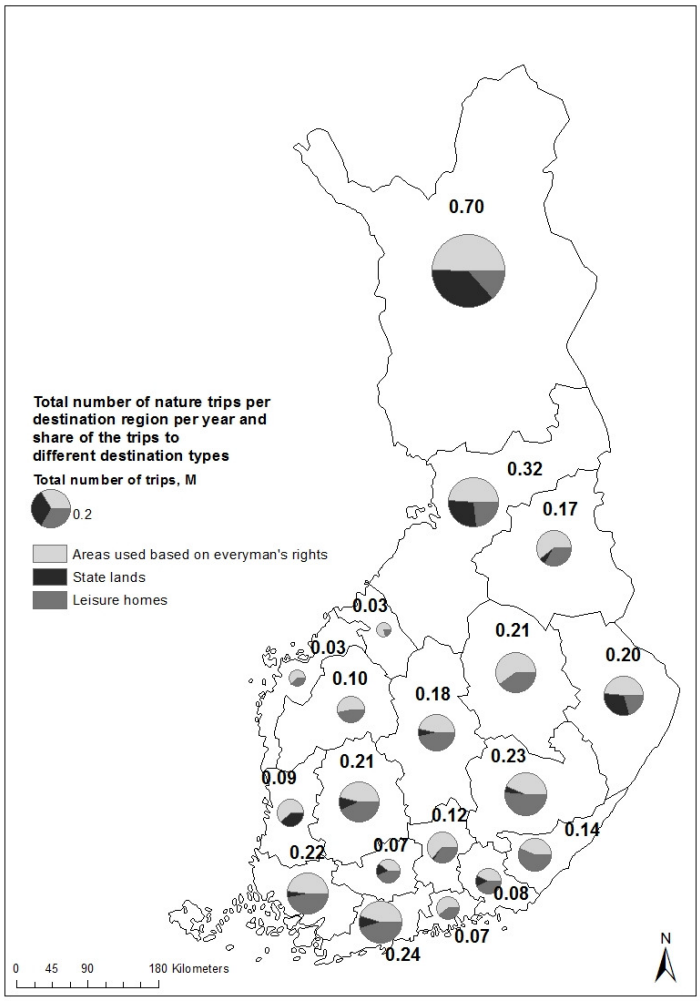

Figure 2. The total number of nature trips directed to each region and the proportion of trips to different destination types.

Table 2 also summarizes the average supply of recreation resources and the area-based figures for use. Of the total land area, 76% is available for recreation based on everyman's right, implying 29 visits per hectare per year in an average region. However, the hectare-based amount of use reveals that state-owned recreation and conservation areas are used on average more actively, as the annual number of visits was 48 on average per region.

Table 2. The number of visits and trips on average across regions.

	Mean across regions	Standard deviation
Close-to-home recreation		
Population, mill.	210 805	230 625
Participation, %	96	2
Close-to-home visits per year, individual median	100	19
Total number of close-to-home visits, mill.	19	17
Proportion of visits based on everyman's right, %	91	6
Proportion of visits to state-owned areas, %	3	5
Proportion of visits to leisure homes, %	6	5
Nature trips		
Total number of nature trips to a region, mill.	0.18	0.15
Proportion of nature trips based on everyman's right, %	53	10
Proportion of nature trips to state-owned areas, %	11	13
Proportion of nature trips to leisure homes, %	36	14
Areas		
Areas used based on everyman's right % (of total land area)	76	10
State-owned areas % (of total land area)	3	6
Leisure homes	24 877	11 844
Annual visits and trips per hectare, areas used based on everyman's right	29	40
Annual visits and trips per hectare, state-owned areas	48	100
Annual visits and trips per leisure home	48	49

VALUATION

Table 3 presents the travel cost models for estimating the value of a close-to-home visit and a nature trip. For both of the visits, separate models were estimated for each region. In the close-to-home recreation models, the regions are the home regions of the respondents, while in the nature trip models they are destination regions for the trips.

The dependent variable was the number of trips to the last-visited destination during the previous 12 months.

In both close-to-home visits and nature trips, as demand theory predicts, the travel costs negatively affected the number of trips. This allowed us to derive an ordinary demand curve for both types of

visits, and consumer surplus estimates could be calculated. Beyond the consumer surpluses, the models provide information on the demand for visits and trips in various population groups.

Table 3. Travel cost models for close-to-home visits

	Truncated negative binomial models for close-to-home visits			
Independent variables	Southern Finland Coefficient (t-ratio)	Western Finland Coefficient (t-ratio)	Eastern Finland Coefficient (t-ratio)	Northern Finland Coefficient (t-ratio)
Travel cost	-0.1576 (-8.37)[a]	-0.2311 (7.83)[a]	-0.1302 (-4.1)[a]	-0.2001 (4.53)[a]
Income	0.0000 (0.51)	0.0000 (0.11)	-0.0001 (-1.95)[c]	0.0001 (1.81)[c]
Gender	-0.2388 (-2.8)[a]	-0.2346 (2.05)[b]	-0.2596(-1.65)[c]	-0.1664 (-0.96)
Age	0.0454 (1.52)	-0.0168 (-0.42)	0.0563 (0.87)	-0.0302 (-0.48)
Not employed	0.2981 (3.15)[a]	-0.0609 (0.48)	-0.1454 (0.83)	0.1999 (1.05)
Lives in an urban area	-0.1139 (-1.25)	-0.0782 (-0.67)	0.0254 (0.16)	-0.4402 (-2.5)[b]
Household size	-0.0719 (-1.75)[c]	-0.0686 (-1.61)	0.1046 (1.33)	-0.0841 (-1.22)
TC*leisure home	0.1184 (2.69)[a]	0.1763 (2.81)[a]	0.1202 (2.15)[b]	0.0381 (0.31)
TC*state land	-0.1850 (-3.81)[a]	-0.2301 (-2.7)[a]	-0.0267 (-0.41)	-0.2953 (-2.59)[b]
Constant	3.8922	4.3507 (17.34)[a]	4.0292 (10.4)[a]	4.1594
Alpha	3.359546	2.8518	2.4379	2.9409
N	1667	818	412	382
Log-likelihood	-7942.5325	-3916.7426	-2025.0297	-1788.6585
Restricted log-likelihood (constant only)	-7993.3753	-3947.3466	-2037.1682	-1805.7758
Log-likelihood ratio	101.6856[a]	61.2080[a]	24.2770[a]	34.2346[a]

[a], [b] and [c] indicate significance at the 1%, 5%, and 10% levels, respectively

According to the results (Table 3), income affected close-to-home recreation activity statistically significantly in Eastern and Northern Finland only, although the effect was also very small in these regions. Women appeared to be more active in close-to-home outdoor recreation than men in all regions except for Northern Finland. Age did not affect number close-to-home visits. Being currently not employed was positively associated with the number of close-to-home visits in Southern Finland, but did not have a statistically significant effect in other parts of the country. Living in an urban area negatively and statistically significantly affected close-to-home visits in Northern Finland, but had no statistically significant effect elsewhere. Household size associated negatively and statistically significantly with the number of visits in Southern Finland.

In the close-to-home model, the interaction variables for travel costs and destination type suggest that people are willing to pay the most for recreation in the surroundings of a leisure home. Only in Northern Finland was the sign of the interaction not statistically significant. Respectively, people

appeared to be willing to pay the least for close-to-home recreation on state-owned lands. The TC–state land interaction variable was negative in all regions, and statistically significant in all regions apart from Eastern Finland.

Table 4 Travel cost models for nature trips

	Truncated negative binomial models for nature trips			
Independent variables	Southern Finland Coefficient (t-ratio)	Western Finland Coefficient (t-ratio)	Eastern Finland Coefficient (t-ratio)	Northern Finland Coefficient (t-ratio)
Travel cost, €	-0.0337 (-6,37)[a]	-0.0093375(2.16)[b]	-0.0264 (7.47)[a]	-0.0109 (-6.9)[a]
Gender (1 = male)	0.0414 (0,14)	0.249982(0.63)	-0.5170 (1.37)	-0.0346 (-0.12)
Age	0.1479(1,57)	0.1768031 (1.37)	0.0497 (0.40)	0.3392 (3.05)[a]
Household gross income, €	0.0001 (2.24)[b]	0.00022 (2.92)[a]	0.0001 (1.49)[b]	0.0000 (0.02)
Not employed	0.9602 (2.94)[a]	0.3751042(1.02)	1.0497 (2.38)[b]	0.6546 (1.71)[c]
Duration of the trips, days	-0.3565 (-2.43)[b]	-0.4872 (-2.26)[b]	-0.4097 (1.99)[b]	0.0337 (0.2)
Lives in an urban area	-0.0491 (-0.17)	0.7206 (1.95)[c]	0.7792 (2.2)[b]	0.3966 (1.4)
TC *state land	-0.0212 (-1.52)	-0.0208 (-1.97)[b]	0.0154 (3.70)[a]	0.0022 (1.55)
TC*leisure home	0.0245 (3.26)[a]	-0.0017 (-0.24)	0.0191 (4.72)[a]	0.0070 (3.07)[a]
Constant	3.4994 (4.36)[a]	2.2929 (2.46)[b]	3.7229 (3.63)[a]	0.6200 (0.66)
Number of observations	157	85	146	200
Alpha	2.5672	2.505892	5.680299	5.800266
Log-Likelihood	-725.7053	-378.7559	-551.5813	-550.1315
Restricted log-likelihood (constant only)	-753.39175	-393.29031	-581.80965	-595.5367
Log-likelihood ratio	55.3729[a]	29.0688[a]	60.4567[a]	90.8104[a]

[a], [b] and [c] indicate significance at the 1%, 5%, and 10% levels, respectively

The travel cost models for nature trips are presented in Table 4. Income had a positive effect on the number of nature trips to all regions except Northern Finland. Gender appeared not to affect the trip frequency. Age positively affected the number of nature trips to Northern Finland. Being not employed had a positive and statistically significant effect on the number of trips to all regions except Western Finland. Living in an urban area associated positively with number of trips to Western and Eastern Finland. The duration of the last trip negatively and statistically significantly affected the frequency of trips to all regions except for Northern Finland.

Coefficients for interaction variables in the nature trip model suggest that people were prepared to travel longer distances and thus pay more in order to get to leisure homes than other destination types in the whole country, apart from Western Finland. With respect to trips directed to Western Finland, people were willing to pay most for destinations situated in areas used based on

everyman's right. The TC–state land interaction had a statistically significant effect on trips to Western Finland and Eastern Finland: the sign was negative in Western Finland and positive in Eastern Finland. From a regional perspective, people were willing to pay more to get to Northern Finland than other parts of the country. This was expected, as people are ready to travel long distances to Lapland in order to enjoy the unique nature of the region. Furthermore, the many resorts providing a wide range of services to tourists increase the attraction of Northern Finland, especially of Lapland.

Consumer surplus (CS) estimates for close-to-home visits and nature trips are presented in Tables 5 and 6. The tables provide separate per-visit values for both close-to-home visits and overnight nature trips for each combination of destination type and region. A trip to a specific destination type in a particular region obtained a unique value if the corresponding interaction variable was statistically significant in the model for the region in question (Tables 3 and 4).

In each of the models there were two interaction variables: TC–leisure home and TC–state land. Everyman's right areas were the base case. Thus, the CS estimates of trips to areas used based on everyman's right were simply calculated using formula 2. CS estimates for visits and trips to leisure homes and state-owned lands were then calculated with the corresponding interaction variables using formula 3.

Table 5. Consumer surplus per trip (€) estimates for close-to-home recreation visits to different regions and site types

	Everyman's rights	State land	Leisure home
Southern Finland	6.4	2.9	25.5
Western Finland	4.3	2.2	18.3
Eastern Finland	7.7	7.7	100.5
Northern Finland	5.0	2.0	6.2

Close-to-home recreation visits to leisure homes had a clearly greater value than recreation visits to everyman's right areas and state land. Recreation on state land had the lowest per-visit value. In a comparison of regions, close-to-home visits had the highest per-visit value in Southern and Eastern Finland.

Table 6. Consumer surplus estimates per trip (€) for nature trips to different regions and destination types

	Everyman's rights	State land	Leisure home
Southern Finland	29.7	29.7	108.9
Western Finland	107.1	33.2	107.1
Eastern Finland	37.9	90.8	137.7
Northern Finland	92.0	115.1	257.5

Nature trips to leisure homes also provided the highest per-trip value. The value of trips to everyman's right areas and to state land was found to be of approximately the same magnitude, but varied quite considerably between regions. From a regional perspective, trips to Northern Finland seemed to provide the highest per-trip values. This was expected, as people are ready to travel long distances to Lapland in order to enjoy the unique nature of the region. Furthermore, the many resorts providing a wide range of services to tourists increase the attraction of Northern Finland, especially of Lapland.

Aggregate values, i.e. the number of visits and trips multiplied by corresponding consumer surpluses, are reported by region in Figures 3 and 4 and also by destination type in Appendix 3. The patterns in the value of close-to-home recreation (Figure 3) and nature trips (Figure 4) per region follow the patterns of actual use. In the value of close-to home recreation, the main driver was again the regional population. The importance of green areas for close-to-home recreation in the most populated parts of the country, such as Uusimaa, is easily observed. The value of the areas used on the basis of everyman's right was considerable throughout the country. The standard deviation of the value over regions (€120 million), however, reveals the considerable differences between various parts of the country.

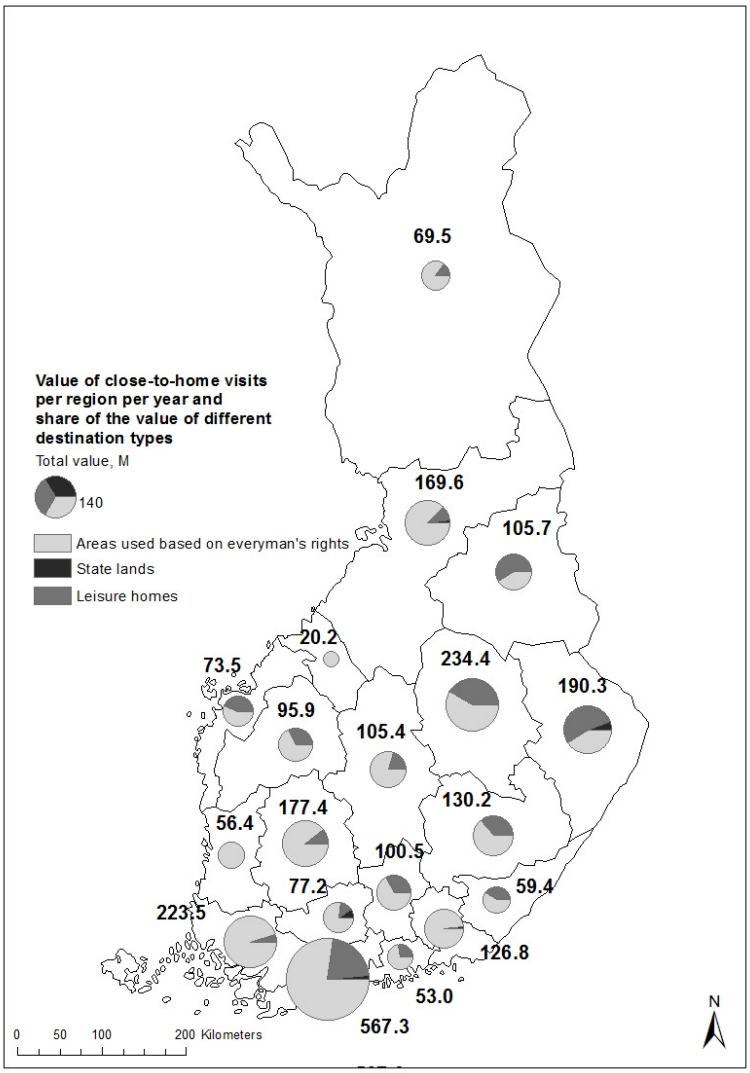

Figure 3. The value of close-to-home recreation visits and the distribution of value according to destination type.

The Figure 4 illustrates the total value of nature trips per destination region and Appendix 3 provides the precise distribution according to the destination types. The value of nature trips to a region was on average 18% of the value of close-to-home recreation. The pattern in the regional total value of nature trips parallels the number of trips (Figure 2). In addition to the most populated areas, such as Uusimaa, the most resource-rich areas in northern Finland, particularly Lapland, were also emphasized, as well as the lake area in the central and eastern parts of the country. The areas used based on everyman's right were still the most important in value, but particularly in the central and eastern parts of the country the high total value of the trips to leisure homes was visible. The resource-based destinations in state areas in Lapland, such as national parks, were emphasized in the value of trips.

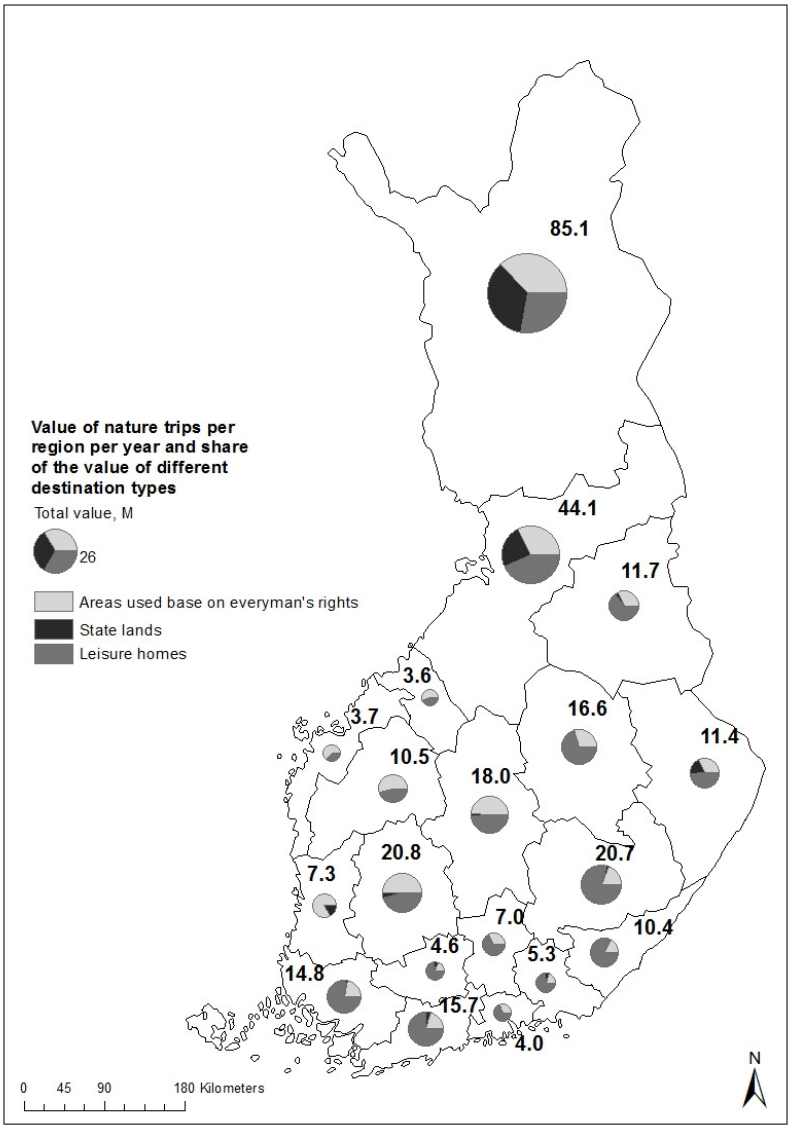

Figure 4. The value of nature trips according to the destination region of trips and the distribution of value between different destination types.

Table 6 reports the average value and value per hectare across regions based on the recreational use of nature. The figures include both close-to-home recreation and nature trips to a region. There is considerable spatial variation in the value per hectare, as indicated by the large standard deviations. The average value of the areas based on everyman's right was either €88 or €179 per hectare per year, the lower value being obtained with the supply weighted average. These values cannot however, be applied equally all over the country. Rather, the majority of the total value is focused around the population centers, as 68% of the visits took place within walking distance. In state areas the relative importance of recreation is considerable if we compare the average hectare-based values of €195 per hectare per year with annual values of timber growth, which vary around €100 per

hectare per year (Metsäntutkimuslaitos 2011). However, as the supply of state-owned areas is spatially skewed, the value per hectare was found to be considerably lower, €30 per hectare per year, if the regional mean was weighted by the supply of state areas. The average value of recreational use of a leisure home, €1808 per year, is of the same order of magnitude as the annual leasing prices of leisure homes (statistics not available).

Table 6. The average recreational value across regions (NUTS 3) and values per unit area.

	Mean across regions	Standard deviation
Values		
Weighted average value of close-to-home visit, € per trip	8	4
Total value of close-to-home visits, mill. € per year	139	120
Weighted average value of nature trip, € per trip	87	25
Total value of nature trips, mill. € per year	17	19
Values per unit, close-to-home visits and nature trips		
Value per hectare for areas based on everyman's right, € per ha per year (unweighted)	179	258
Value per hectare for areas based on everyman's right, € per ha per year (weighted by the supply of areas in the region)	88	157
Value per hectare for state areas, € per ha per year (unweighted)	195	320
Value per hectare for state areas, € per ha per year (weighted by the supply of state areas in the region)	30	95
Value per leisure home, € per leisure home per year (unweighted)	1808	1567
Value per leisure home, € per leisure home per year (weighted by the supply of leisure homes)	1711	1449

To further study the drivers of recreational values of ecosystems, we used correlation analysis to define the importance of the regional population, the number of visits and trips, and finally the supply of ecosystems as the drivers for regional recreation value (Table 7). The value of close-to-home recreation was significantly correlated only with the population and the number of leisure homes. As the median number of visits per individual varied very little between regions, it was not a significant driver of recreation value. The high correlation coefficient between the total value of close-to-home recreation and the population, and the fact that ecosystems did not significantly correlate with the value, implies that the resources for recreation did not limit the recreational activity in any part of the country, and only the population governed the total value. The high number of leisure homes could still slightly add to the total value of close-to-home recreation.

The value of nature trips instead had more significant drivers. Based on the relative proportion of trips to various ecosystems, the presence of other natural land areas (e.g. fjälds) had a significant

effect on the value of nature trips. However, the proportion of the total area covered by forests, water bodies or the sea did not associate significantly with the recreation value derived from nature trips. Comparing the recreation area types, the total number of state areas particularly increased the value of nature trips to a region. The highest correlation was with the number of trips, but also the estimate for individual trip value was significantly correlated with the total value of nature trips.

Table 7. Correlation analysis, with regions as observations, between the value of visits and of trips and the drivers of recreation values.

Drivers of recreation value	Close-to-home values	Nature trip values
	Correlation coefficients	
Population	0.929***	0.078
Close-to-home recreation		
Participation rate	0.234	
Participation frequency	-0.114	
Visit value	0.130	
Nature trips		
Total number of nature trips		0.967***
Trip value		0.527***
Ecosystems		
Forests, % share of land area	-0.266	-0.244
Other nature land areas (e.g. fjälds), % share of land area	-0.103	0.864***
Inland waters, % total area	0.040	-0.009
Sea, % total area	0.159	-0.256
Recreation area types		
Everyman's right areas, % of total land area	-0.277	0.076
State-owned areas	-0.136	0.891***
Leisure homes	0.422*	0.338

***p < 0.01, **p < 0.05, *p < 0.1

As the study was conducted with a very rough spatial scale to obtain national values, the results do not, however, reveal whether there is in reality a local scarcity of recreational resources in some areas. Even though the quantity of recreation resources does not currently restrict recreation, a small loss of green space may already cause large social costs in some regions (Troy & Wilson 2006). In addition, future demographic changes, such as the still increasing urbanization, may affect the demand for and pressure on ecosystem services (Kreuter et al. 2001).

Conclusions

The results of the mapping of the number and the aggregate values of visits and trips clearly show the importance of close-to-home recreation. The relative importance of close-to-home recreation is

high compared to nature trips with an overnight stay in terms of the total number of visits and their value. The spatial allocation of close-to-home visits and their value reflects the distribution of the population. The results emphasize the importance of everyman's right, as the clear majority of the daily visits and nature trips and their value are concentrated in areas that are used based on this right. The recreational use of nature based on everyman's right is also emphasized, because state-owned areas provided for recreation and nature protection are mostly located in northern Finland, in sparsely populated areas far away from the population centers of southern Finland.

The national recreation inventory data, which included a representative sample of the Finnish 15- to 74-year-old population, allowed us to map the recreational ecosystem services in terms of the recreational use of nature and to apply the travel cost method, pooling sites to estimate their welfare effects in economic terms (Vesterinen et al. 2010). The travel cost models were based on the most recent visit and trip information. This implies that visits by those who rarely participate in outdoor recreation were overrepresented. This may be partly compensated by the fact that the areas that were visited more often than average were emphasized due to the focus on the most recent visit. However, taking into account these two sources of endogeneity is a modeling challenge for future.

Although the sample size was high on the national level, the regional analysis was focused on relatively large regions, and local estimates were unfeasible. Nevertheless, as national recreation inventory datasets exist from a few other European countries, our approach may provide an example of how to utilize these datasets to evaluate the importance of recreational ecosystem services. In addition, a European-wide recreation inventory with location information would provide a versatile database for the analysis of recreation, and nature tourism in particular, as an ecosystem service on a wider scale.

The total values were considerable compared to other land uses, even though they were based on the median number of annual visits by individuals. The mean number of visits would have produced even higher values. Annual area-based values from timber growth are on a lower level. However, it is important to bear in mind that these two ecosystem services, recreation visits and timber production, do not compete in land use. However, for natural resource policy and management, these values provide an important signal, as production services such as food and timber have for the present been the focus of policy.

Including non-market values of forests in green accounting requires the monetary valuation of recreation on its current level. In our approach, as it relies on national data, no transformation of local case study-based benefit estimates is needed for accounting purposes. Furthermore, as

valuation was based on revealed preferences using the travel cost method, there is no need for speculation on the hypothetical nature of values. However, several other issues of discussion related to accounting remain, such as possible double counting of recreation, for example in leisure home prices.

This study was conducted with a very rough spatial scale to obtain national values. However, as over two-thirds of close-to-home recreation takes place within walking distance, the value of urban areas green areas is exceptional. The spatial allocation of values warrants further examination in the future. In addition, the link between ecosystems and values was loose, as the association was analyzed on a regional level using the frequency of the main ecosystems. In the next phase, the connection between the characteristics of ecosystems and the value of recreation services needs to be examined more closely to determine the benefits of various management policies.

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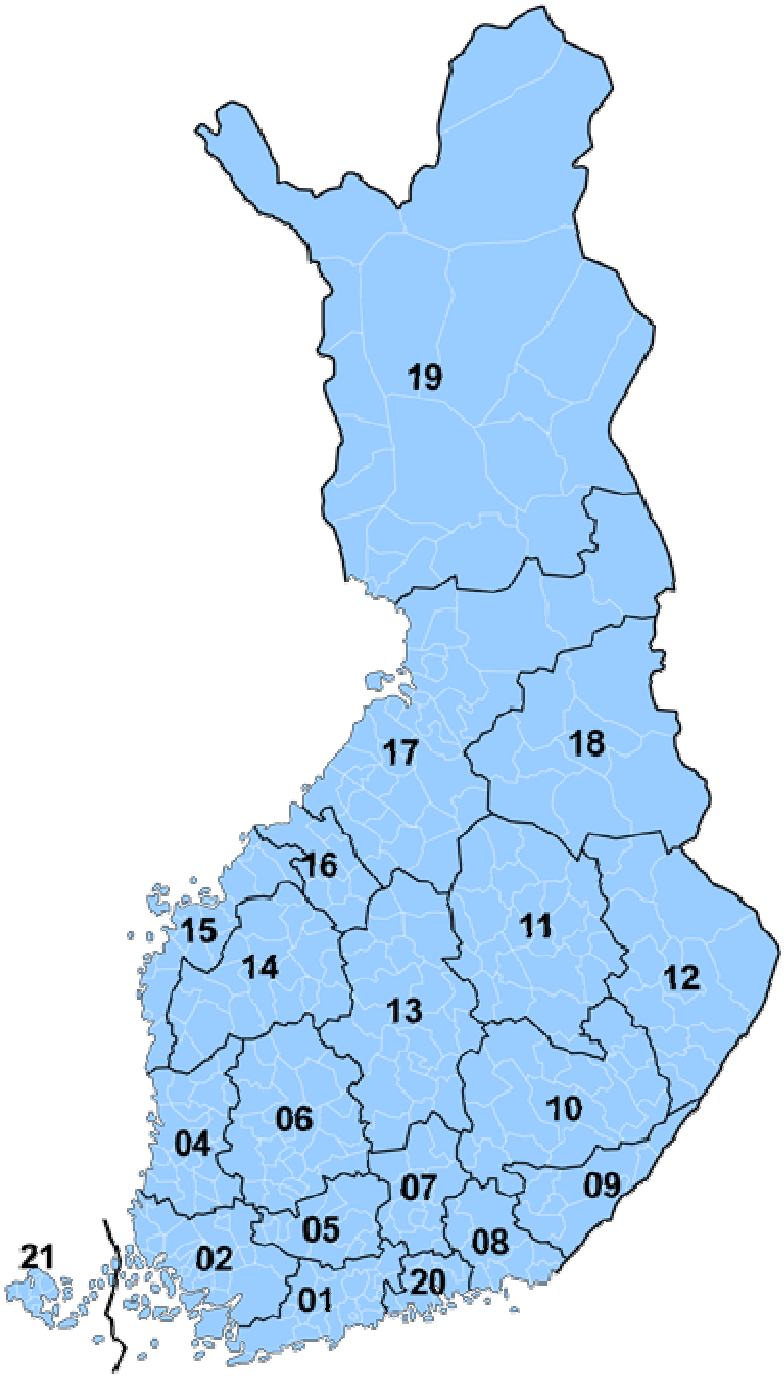
Appendix 1. Regions (NUTS 3).



Appendix 2. Number of recreation visits and nature trips by region.

		Close-to-home recreation visits							Nature trips			
Region number (Appendix 1)	Region	Population, milj.	Participation, %	Visits per year, median	Total, million	Everyman´s right, million	State areas, million	Leisure homes, million	Total, million	Everyman´s right, million	State areas, million	Leisure homes, million
09	Etelä-Karjala	0.10	97	66	6.51	5.56	0.00	0.94	0.14	0.06	0.00	0.08
14	Etelä-Pohjanmaa	0.14	97	122	16.65	14.93	0.00	1.71	0.10	0.05	0.00	0.05
10	Etelä-Savo	0.12	97	104	11.80	10.84	0.00	0.47	0.23	0.10	0.01	0.12
20	Itä-Uusimaa	0.07	92	104	6.65	6.08	0.00	0.56	0.07	0.04	0.00	0.03
18	Kainuu	0.06	97	104	6.26	5.64	0.00	0.62	0.17	0.10	0.01	0.06
05	Kanta-Häme	0.13	91	104	12.18	9.37	2.39	0.42	0.07	0.03	0.01	0.03
16	Keski-Pohjanmaa	0.05	96	81	4.04	4.04	0.00	0.00	0.03	0.02	0.00	0.01
13	Keski-Suomi	0.20	98	104	20.74	19.22	0.34	1.18	0.18	0.08	0.01	0.08
08	Kymenlaakso	0.14	100	148	20.34	19.68	0.65	0.00	0.08	0.04	0.01	0.04
19	Lappi	0.14	95	104	13.77	11.79	0.41	1.58	0.70	0.34	0.26	0.09
06	Pirkanmaa	0.36	100	104	37.78	36.78	0.00	1.00	0.21	0.10	0.02	0.09
15	Pohjanmaa	0.13	96	91	11.24	9.46	0.00	1.78	0.03	0.02	0.00	0.01
12	Pohjois-Karjala	0.13	97	104	12.61	10.22	1.38	1.01	0.20	0.10	0.06	0.04
17	Pohjois-Pohjanmaa	0.28	100	122	34.49	29.71	2.02	2.76	0.32	0.16	0.09	0.07
11	Pohjois-Savo	0.19	97	104	18.81	17.84	0.00	0.97	0.21	0.13	0.00	0.09
07	Päijät-Häme	0.15	96	81	11.87	10.56	0.00	1.31	0.12	0.08	0.00	0.04
04	Satakunta	0.17	95	81	13.04	13.04	0.00	0.00	0.09	0.06	0.04	0.00
01	Uusimaa	1.09	97	73	77.3	69.01	2.96	4.72	0.24	0.11	0.02	0.11
02	Varsinais-Suomi	0.35	94	104	34.22	33.34	0.47	0.41	0.22	0.11	0.01	0.10

Appendix 3. Total value of close-to-home recreation and nature trips by region.

		Close-to-home recreation visits, value, million € / year				Nature trips, value, million € / year			
Region number (Appendix 1)	Nuts 3	Total	Everyman's right	State areas	Leisure homes	Total	Everyman's right	State areas	Leisure homes
9	Etelä-Karjala	59	35	0	24	10	2	0	9
14	Etelä-Pohjanmaa	96	65	0	31	10	6	0	5
10	Etelä-Savo	130	83	0	47	21	4	0	16
20	Itä-Uusimaa	53	39	0	14	4	1	0	3
18	Kainuu	106	43	0	62	12	4	0	8
05	Kanta-Häme	77	59	7	11	5	1	0	3
16	Keski-Pohjanmaa	20	20	0	0	4	2	0	2
13	Keski-Suomi	105	83	1	22	18	9	0	9
08	Kymenlaakso	127	125	2	0	5	1	0	4
19	Lappi	70	59	1	10	85	32	30	23
06	Pirkanmaa	177	159	0	18	21	10	1	10
15	Pohjanmaa	74	41	0	33	4	2	0	1
12	Pohjois-Karjala	190	79	11	101	11	4	2	6
17	Pohjois-Pohjanmaa	170	148	4	17	44	15	11	19
11	Pohjois-Savo	234	137	0	97	17	5	0	12
07	Päijät-Häme	100	67	0	33	7	2	0	5
04	Satakunta	56	56	0	0	7	6	1	0
01	Uusimaa	567	438	9	121	16	3	1	12
02	Varsinais-Suomi	223	212	1	10	15	3	0	11