Estimating the Non-Market Value of a Single Site: The Case of the Dalsnuten Recreation Area

By

Greta Refsdal

&

Marthe Lohaugen

Thesis submitted to UiS Business School in fulfillment of the requirements for the degrees of Master of Business Administration.

June 2016

Universitetet
i Stavanger

FACULTY OF SOCIAL SCIENCES,
UIS BUSINESS SCHOOL

MASTER'S THESIS

STUDY PROGRAM:	THESIS IS WRITTEN IN THE FOLLOWING SPECIALIZATION/SUBJECT:
Master of Business Administration	Economic Analysis IS THE ASSIGNMENT CONFIDENTIAL? (**NB**! Use the red form for confidential theses)

TITLE:

Estimating the Non-Market Value of a Single Site:
The Case of the Dalsnuten Recreation Area

AUTHOR(S)		SUPERVISOR:
Student number:	Name:	Yuko Onozaka
216547 …………………	Marthe Lohaugen …………………………………….	
227812 …………………	Greta Refsdal …………………………………….	

ACKNOWLEDGE RECEIPT OF 2 BOUND COPIES OF THESIS

Stavanger, ……/…… 2016 Signature administration:……………………………

Acknowledgements

We would like to express our gratitude towards Yuko Onozaka and Gorm Kipperberg for their excellent guidance and support during the term of our candidature. Their engagement, comments and ideas has been of great value to us throughout the challenging task of writing this thesis.

Stavanger Trekking Association, represented by Per Henriksen, has provided us with valuable information and beautiful pictures of the Dalsnuten recreation area. For that, we are grateful.

Finally, we want to thank John Loomis for unconditionally sharing questionnaires from his previous research and thereby providing us with guidance and ideas for our thesis.

Abstract

Outdoor recreation is open access and generally without any direct monetary costs to hikers. The benefits gained by visiting recreational areas are not directly observed in a traditional market of demand and supply. Therefore, the value of recreation can not be calculated as straightforward as market commodities can.

In this master thesis, we examine the non-market value of the Dalsnuten recreation area in Sandnes, Norway. We conduct a combined revealed and stated preference estimation in an individual travel cost model to measure recreation benefits under status quo conditions and with policy relevant quality changes.

In order to do this, we utilize an on-site survey to obtain revealed and contingent behavior data. Panel recreation demand models are estimated and used to derive total consumer welfare with and without quality changes.

Individual consumer surplus per trip is found to be in the range from NOK 58.51 to 98.97 in twelve estimated models. From our preferred model, the estimated non-market value of the Dalsnuten recreation area is approximately NOK 17.350 million.

Changes in welfare stemming from hypothetical changes in site quality was estimated for trail quality improvements and presence of windmills in the viewscape. The aggregated increase in welfare due to the hypothetical scenario of trail quality improvements is estimated to be NOK 5.964 million, while the estimated reduction in welfare due to the scenario of windmills is NOK 3.316 million.

List of Tables & Figures

Table of contents

1. Introduction

Demand for recreational activity and use of recreational areas have gained much attention by the scientific community in the last decades. Several studies reveal that the demand for outdoor recreation is rising and projected to continue to increase (Bell, Tyrväinen, Sievänen, Pröbstl & Simpson, 2007; Carpio, Wohlgenant & Boonsaeng, 2008). Norwegians are known for their hiking and appreciation of nature, and Norway is known for having outdoor recreation areas accessible to the general public. Due to the Outdoor Recreation Act § 2, outdoor recreation is open access to any person:

> "Any person is entitled to access to and passage through uncultivated land at all times of year, provided that consideration and due care is shown,"
>
> (Ministry of Climate and Environment, 1957).

Outdoor recreation is open access and is generally without entrance fees or any other obvious direct monetary costs to visitors. The benefits gained by visiting recreational areas are not directly observed in a traditional market of demand and supply observed. Hence, the value of recreation cannot be valued as straightforward as market goods can. Therefore, it would be of interest to map out this non-market value.

In a world of scarcity, public policy-makers must make smart decisions regarding resource allocations and management of the human impact on the natural environment. Every decision comes with a trade-off, that is, an opportunity cost. For example, choosing to protect natural systems will induce opportunity costs in terms of limiting industrial activities. On the other hand, permitting economic development diminishes the value of natural areas for recreation and other non-market activities. In order to allocate scarce resources in the best possible way, estimates of environmental gains and losses could improve social decision-making.

This master thesis presents the results from a study of the Dalsnuten recreational area in Sandnes, Norway. A single site travel cost model with revealed and stated preferences data is employed in order to estimate the recreation demand and consumer surplus of the Dalsnuten recreation area. To supplement the revealed preference data on actual visits, contingent behavior data is collected to infer values for hypothetical quality changes at the site.

The result from this study could be employed in a benefit-cost analysis to inform social decision making and facilitate efficient allocation of resources. Information about the non-market value of the Dalsnuten recreation area could be useful for the local authority when deciding whether to permit commercial and industrial activities around the site or not. Industrial activity could either lower the quality of the area with respect to the view or making the site less accessible to visitors. Also, monetary information about the recreational values of this area might be helpful in a benefit-cost analysis of trail maintenance or new trail constructions in the area.

Based on the proposed research design, the main research question that forms this thesis is:

What is the recreational value of the Dalsnuten area?

Extending on the main research question, some additional questions is explored:

1. *Does the law of demand hold for the Dalsnuten recreational area?*
2. *Is the Dalsnuten recreation area a normal good?*
3. *Is the trail variation at the site be a positive demand shifter?*
4. *Will the hypothetical quality changes to the area significantly affect demand?*

This thesis is structured as follows: Chapter 2 provides an overview of the Dalsnuten recreation area as the site in question. Chapter 3 describes the modelling of recreation demand, while chapter 4 provides a description of environmental valuation methods. Chapter 5 presents the survey design and implementation. Chapter 6, 7 and 8 encompasses the descriptive statistics, econometric methods and model specification, respectively. Chapter 9 comprises the results and analysis, followed by discussion and implications in chapter 10. Lastly, a conclusion is presented in chapter 11.

2. The Dalsnuten Recreation Area

The Dalsnuten recreation area in Sandnes, Norway, is a popular and frequently visited site in the region. The area consists of several peaks with multiple variations of trails. The trails vary in both length and difficulty, enabling variation in both trip purposes and sights. Recently, some of the trails have been improved with stepping stone sections, which makes previous slightly muddy parts now much more attractive. In addition to trails consisting of stepping stones, parts are gravel and the rest is untouched. Although the peaks range from modest 294 to 363 meters above the sea level, there is scenic views of almost the whole region from some of the peaks. The most visited peak in the Dalsnuten recreation area is Dalsnuten (323 masl).

Figure 1: View of Dalsnuten from Fjogstadnuten. Photo: Kjell-Helle Olsen.

We have chosen to value this particular site because it is easy accessible, and because of the great variability in walking distances and trails. Due to easy access and varying distances, this recreation area is a great destination for both every day and weekend hikes for all ages, and also for solely exercising purposes. The area have visitors every season at almost all hours. Although the visitation rate is highest in weekends, the parking lot is rarely empty in weekdays.

There are three main starting points hiking to the Dalsnuten recreation area: Gramstad, Dale, and Holmavika. These are all located in Sandnes and easily accessible by car. The trails from the starting points are all marked by Stavanger Trekking Association with signs and colored rocks and trees indicating different paths, as illustrated in the picture below. The vast majority of visitors start their trip from Gramstad, which is located at the center of the recreation area. At Gramstad, there is a parking lot and a cabin hosted by Stavanger Trekking Association with seasonally open cafe. This cabin can be rented for accommodation and events. Stavanger Trekking Association have set up a digital counter alongside the start of, according to them, the most frequently used trail from Gramstad, providing them with live feed of visitors. In 2015, the digital counter registered approximately 200,000 hikers.

Figure 2: Marked trail to the Dalsnuten peak. Photo: Kjell Helle-Olsen.

3. Modelling Recreation Demand

The utilitarian theory is applied through use of market information in valuing costs and benefits for goods and services available in a market. For the case of valuing a non-market good such as the Dalsnuten recreational area, information about what is paid for accessing the good and benefits gained is not as readily available due to lack of such a traditional market. In an attempt to capture this, a theoretical framework for incorporation of environmental goods is formed.

3.1 Theoretical Background

The primary intention of this study is to estimate the individual Consumer Surplus (CS) and aggregate this over the population in order to value the recreation area in question. Quality changes are imposed in order to measure changes in CS associated with these scenarios.

With the choice variable being numbers of trips taken per year, CS can be calculated taking account for the travel costs associated with visiting the site. The law of demand in microeconomic theory states that there is an inverse relationship between the travel cost and the number of trips the individual makes, where number of trips is the individual's demand function. Hence, the CS associated with visiting the site is the area below the demand curve and above the implicit price.

In order to trace the recreational demand curve, utility theory is applied, exploring the link between the unobservable utility function of individuals and what is observed in prices and quantities. By using utility theory, a model can be constructed showing what could theoretically influence and motivate the consumers in maximizing their utility, and thereby retrieve demand estimates of an individual's preferences observed through their consumer behavior. Though there is no directly observable price that a consumer pays in order to use and enjoy the environmental good, the theoretical foundation of utility theory can still be applied.

The cost of traveling to the recreational site and the frequency at which the individual chooses to make that particular trip within a certain period, can be applied as a proxy for the price of visiting the site (Clawson, 1959; Clawson & Knetsch, 1966). Utilizing this price, the demand curve can be derived, and the gap between maximum willingness to pay and the price paid, travel cost, can be found. This can be shown by utility theory.

Modelling the demand for recreation at the Dalsnuten area, the individual's utility function is presented in the fashion of Freeman, Herriges and Kling (2014):

$$u(X,\ r,\ q). \tag{1}$$

Where X is the market goods consumed, r denotes the rate of visitation to the site and q is the quality of the site. An individual's utility is subject to a constraint of time *(t^*)* and money *(M)*. Time worked is t_w and the pay for time worked is p_w. The available monetary resources are allocated between goods purchased and total travel cost, decided by travel rates and cost of each trip (c). Money constraint is therefore

$$M + p_w t_w = X + cr. \tag{2}$$

The time constraint the individual's utility would be subject to is time spent working, plus time spent on the recreational site (t_1) and round-trip travel time (t_2) multiplied by trip counts:

$$t^* = t_w + (t_1 +\ t_2)r. \tag{3}$$

From this, a utility maximization problem can be performed where

$$Max\ u(X, r, q) \tag{4}$$

is subject to

$$M + p_w t_w = X + cr \tag{5}$$

and

$$t^* = t_w + (t_1 + \ t_2)r. \tag{6}$$

Substituting the time constraint into the monetary budget constraint, the utility constraint yields

$$M + p_w t^* = X + p_r\, r. \tag{7}$$

The equation $c + p_w(t_1 + \ t_2)$ has been compressed to p_r since it reflects the price of recreation by monetary costs of taking the trip, and the opportunity cost of time by the wage rate multiplied by time spent traveling and on site.

From this utility maximization problem, relevant factors influencing recreation consumption can be derived. As evident in the utility maximization problem above, the household utility is maximized by allocating the consumption of market goods, recreation and environmental quality of the recreation site. Therefore, to derive an individual demand function for visits, the utility equation is maximized subject to the compressed constraint equation, yielding

$$r = (p_r, M, q). \tag{8}$$

Equation (8) can be extended and revised to (Parsons, 2003):

$$r = (p_r,\ p_S, M, q, \boldsymbol{H}), \tag{9}$$

where rate of visitation is decided by, respectively, the price of visiting the site, price of substitute sites, annual income, quality of the site and a vector for socioeconomic factors. On the grounds of this theory, a welfare measure can be calculated for the recreational activity "consumed" over what is actually paid.

3.2 Welfare Measure

The Hicksian Compensating Variation (CV) and Equivalent Variation (EV) is welfare measures that incorporates both substitution and income effects. The Marshallian Consumer Surplus does not incorporate the income effect, but is often used in recreation demand analysis and is an approximation to the CV (Hellerstein & Mendelsohn, 1993). According to Bockstael, Strand and Hanemann (1984), CS can be applied when the income effect is assumed be minimal, which is the position of this study. Also, CV is usually applied in more capital intensive activities such as mountain climbing (Anderson, 2010).

The CS of trips to site *j* can be calculated as the area beneath the demand curve and above the implicit price,

$$CS_j = \int_{p^0}^{p^c} x_j\,(r) dp_j, \tag{10}$$

where p^0 is the individual price, or travel cost, to visit the site and p^c is the choke price that forces trips, *x*, to zero.

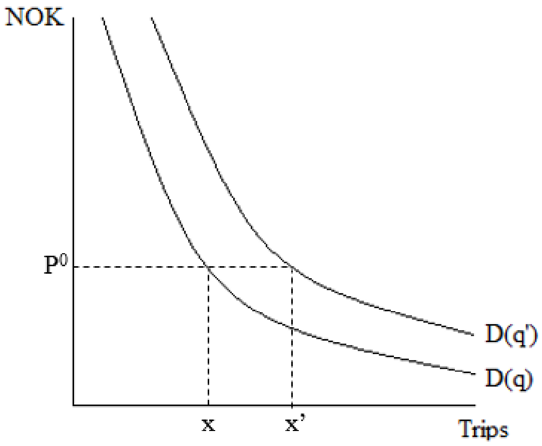

Figure 3: Trip demand at current and improved quality.

For a change in quality, such as an improvement from *q* to *q'*, the demand for trips will, according to theory, shift to the right. According to Whitehead, Haab and Huang (2000), the change in CS from a quality improvement can be calculated as the area between the two demand curves above p^0:

$$\Delta CS = \int_{p^0}^{p^{c\prime}} x'(r', q')dp - \int_{p^0}^{p^c} x\ (r,\ q)dp, \tag{11}$$

where $p^{c\prime}$ and p^c are the choke prices under demand for quality q' and q, respectively.

4. Environmental Valuation

Environmental valuation can be seen as the "commodification" of the services that the nature provides (Perman, Ma, Common, Maddison & McGilray, 2011). Valuing the environment can therefore be described as placing a monetary value on environmental goods and services which, typically, are not traded in the market. Classic examples of environmental goods and services that are not traded in the market are public goods, such as air and water quality, the ozone layer, landscape, and biodiversity.

Lack of market information involves no direct evidence of society's willingness to pay for these goods, which further leads to skewed incentives and inefficient allocation of resources. This is referred to as market failure in microeconomic theory. In order to address this problem, the concept of value is broadened to Total Economic Value.

4.1 Total Economic Value

Total Economic Value (TEV) includes both "use values" and "non-use values", as shown in Figure 4 (Perman et al., 2011). Broadening the concept of value addresses the problem of attaching value to the services provided by the natural environment that does not contain market information and further the problem of market failure.

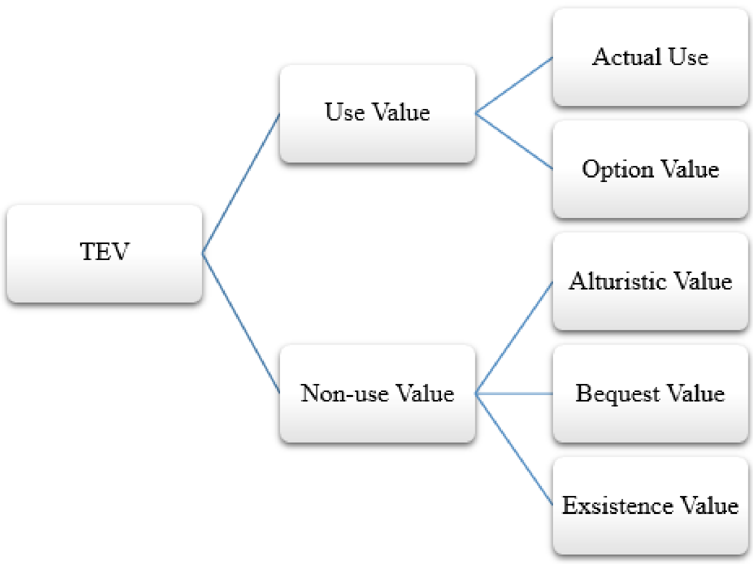

Figure 4: Total economic value.

Use values can be both consumptive and non-consumptive. Actual use value refers to value derived from both extractive and non-extractive consumption. Extractive consumption could be such as exploiting resources from a tropical forest, for instance harvesting timber. Non-extractive consumption could be such as using the forest for recreational purposes and deriving pleasure from watching documentaries or reading articles about the tropical forest. On the other hand, option value refers to the value of preserving an option for available use in the future.

Non-use value divides further into three sub-groups: Altruistic, bequest, and existence value. Altruistic value refers to value derived from concern of human contemporaries. Even though an individual does not value a particular environmental good, knowing that someone else does, provide a certain satisfaction to that individual. Bequest value arise through concern for the interest of future generations. Existence value is the value derived from knowing that a resource exists without necessarily physically interacting with it or even having seen the environmental good.

TEV can be calculated using environmental valuation methods. These methods equip economists with tools and techniques of attaching value to the services that the natural environment provide.

4.2 Classification of Environmental Valuation Methods

There are several approaches of valuing non-market goods and these are often divided in two principal methods; Revealed Preference (RP) and Stated Preference (SP) methods.

4.2.1 Revealed Preference Methods

The Revealed Preference (RP) approaches estimate *ex post* willingness to pay for goods and services using behavioral data, capturing only use values and estimates of Marshallian surplus (Freeman, 1993). The major strength of RP methods is that they are based on actual choices, making individuals consider the internal benefits and costs of their actions (Whitehead, Pattanayak, Van Houtven & Gelso, 2008). The main limitation of RP methods is the inability of measuring non-use values due to their reliance on historical data. Because of this, the methods can not be used to estimate values for changes in environmental quality that have not been experienced. The most commonly used methods within RP is hedonic pricing and the Travel Cost (TC) model.

Hedonic pricing is most frequently used in property value models and is based on microeconomic consumer theory. The model reveal preferences of households for these goods on the basis of where they decide to locate. More specifically, the model can be used to estimate the premium paid by households to purchase a property near or away from, respectively, an environmental amenity or disamenity (Boyle, 2003).

The TC model is demand-based and commonly used in cost-benefit analyses and in natural resource damage assessment where recreational values matters. The model is based on the assumption that individuals would react to changes in travel costs to recreational sites in the same way they would react to changes in admission fees. The fact that individuals have differing travel distances and hence different costs per trip depending on where they reside, means that they in effect “purchase” different number of trips in any given time period. The cost, or price, is according to this theory low for those living near the recreation site in question, while higher the further away the individual resides.

4.2.2 Stated Preference Methods

Stated Preference (SP) approaches estimate *ex ante* willingness to pay for goods and services using hypothetical data. These methods can be used to estimate the total economic value, meaning both use and non-use values. In SP methods, Hicksian surpluses can be derived (Freeman, 1993). Capturing individuals' intended behavior, no actual transaction is made in order to estimate benefits. The main strength, and also weakness, of these methods is the hypothetical nature. Hypothetical scenarios may be the only way to gather policy relevant information, but the analysis can suffer from hypothetical bias because the respondent is placed in unfamiliar situations where complete information is unavailable (Whitehead et al., 2008).

SP methods are based on carefully worded survey questions with constructed scenarios, which enables estimation of individuals' Willingness to Pay (WTP) or Willingness to Accept (WTA) measures of economic value. Given the hypothetical scenarios, SP methods require ordinal or ratio judgements from survey respondents (Brown, 2003). SP approaches to environmental valuation include two main methods: Contingent Valuation and Behavior, and Choice Experiment (Perman et al., 2011).

Contingent valuation is a widespread valuation technique that involves asking a representative sample of the population survey questions about their WTP or WTA for environmental goods, enabling measurement of quality changes. The method is designed to measure monetary value of a single good, although it can also be used to value multiple related goods that differ in key attributes.

The contingent behavior approach also involves hypothetical questions similar to that of contingent valuation, but differ in the sense that the questions involves hypothetical behavior instead of hypothetical WTP. Contingent behavior can for instance ask respondents about hypothetical trip behavior for scenarios with and without water quality improvements.

Choice experiments is another type of contingent behavior where individuals' most preferred alternative among a number of discrete choices in a survey is identified. The different alternatives typically describe different environmental projects or policies and the cost of choosing a given project. Further, the goal is to determine the trade-off between the attributes of an environmental project and its costs.

4.3 The Travel Cost Model

The TC model is a well-established method within RP approaches, first introduced by Harold Hotelling (1947) in his letter to the US National Park Service. His suggestion on how to value the services provided by public parks in the US is considered the birth and keystone of the TC model. The model was further developed and refined by Clawson (1959), Clawson and Knetsch (1966), and many others. Early developers generally believed that the methods to measure economic welfare of outdoor recreation and policies should be based on preferences of visitors and their economic constraints.

The TC model is used to value recreational uses of environmental resources, both recreational losses and gains (Parsons, 2003). Such losses could be caused by oil spill leading to beach closure, while gains could be improved water or air quality. The TC model is an application of weak complementarity, meaning that if the recreation site is too expensive and hence no trips are made, a change in availability and condition will not affect individuals' utility. Since RP methods only capture use values, changes in such factors will not be captured in the TC model.

Within the TC method, there are two principal models that may be undertaken to value single sites; the individual and the zonal TC model. The individual model, suggested first by Brown and Nawas (1973), is based on individual data for trip counts within a set time period, costs and socioeconomic factors as explanatory variables for demand. The dependent variable is trip counts within a period of time for users of the recreation site and this method is appropriate for local, frequently visited sites.

The zonal model is, on the other hand, more appropriately applied on sites visited infrequently by travelers from afar (Fleming & Cook, 2008). With this model, individuals are grouped into zones based on their travel distance to the site and preferences within these zones are assumed to be similar on average. A problem with aggregating zones is that useful information regarding individual tastes that could serve as demand shifters is often lost (Ward & Loomis, 1986). Therefore, estimates of travel cost coefficients from such models are often statistically inefficient and entails reduced precision on this variable (Brown & Nawas, 1973).

Individual models are shown by economic theory to be superior to zonal models (Fletcher, Adamowicz & Graham-Tomasi, 1990), but there may be difficulties estimating individual models in cases where they take few annual trips. Based on the location of and expected trip counts to the site in this study, the individual TC model is deemed most appropriate.

The TC model is well-established as an environmental policy assessment tool, but it is not without controversy. The main challenges encountered by researchers in this area is the valuation of travel time, treatment of on-site time, incorporation of substitutes, and multi-destination trips.

4.3.1 The Valuation of Time

Travel time and on-site time constitute time that could have been devoted to other means - in economic terms; opportunity costs. Time costs is usually a sizeable part of the total trip costs and the treatment of this has received enormous attention in the literature. Most of the researchers agree that time costs are related to individuals' wage rate, and that omission of travel time will bias the travel cost coefficient. A relationship between time costs and wage rate is justified in theory as long as one can substitute work time for leisure time at the margin (Parsons, 2003).

This presupposes a flexible working arrangement, but for individuals with a fixed number of hours and retirees and other who for some reason are not employed, this tradeoff is implausible. Despite this problem, wage-based valuation of time is still the principle method. The common treatment of time costs is to value it as a proportion ranging from one-fourth to the full wage rate of the individual (Blaine, Lichtkoppler, Bader, Harman & Lucente, 2015; Cesario, 1976; Earnhart, 2004; Loomis, González-Cabán & Englin, 2001; McConnell & Strand, 1981; Whitehead, Dumas, Herstine, Hill & Buerger, 2006; Whitehead, Lehman & Weddell, 2016). Earnhart (2004) also proposed using one sixth of hourly income for those who were retired or unemployed, recognizing that their time still had value although less than those who are occupied.

Further, how to incorporate the time costs into the TC model is a popular subject with ambiguous results and discussion. There are two main procedures (Loomis et al., 2001); one where the shadow price of time is calculated and added to the travel cost variable, the other to include travel time as a separate variable. Some argue to include travel time as a separate variable as not doing this can result in omitted variable bias in the travel cost coefficient and further biased consumer surplus estimates (Bockstael, Strand & Hanemann, 1987; Cesario & Knetsch, 1970; Fix & Loomis, 1998; Loomis & Keske, 2009). However, because of the potential of multicollinearity between travel cost and travel time, the usual convention is to add time costs to the travel cost variable in the model (Blaine et al., 2015; Hesseln, Loomis, González-Cabán & Alexander, 2003; Loomis et al., 2001; Navrud & Mungatana, 1994; Sohngen, 2000; Whitehead et al., 2000; Whitehead et al., 2006; Whitehead et al., 2016).

4.3.2 Treatment of On-Site Time

On-site time has a dual role in the TC model: it is a source of utility and hence a determinant of the quality of the trip, and it is also a cost. The opportunity cost of on-site time is often valued at zero and excluded from the model due to the fact that time spent at the site provides the individual benefits that, in absence of evidence to the contrary, are at least equal to the time cost. Also, due to the fact that visitors are willing to incur additional time costs by travelling, the benefits probably exceed the cost (McConnell, 1992; Ward & Beal, 2000). Because of this, the usual convention is to exclude the cost of on-site time from the time costs (Navrud & Mungatana, 1994; Sohngen, 2000; Ward & Beal, 2000; Whitehead et al., 2000), while some choose to include simply the time spent at the site as a variable that may explain trip behavior (Creel & Loomis, 1990; Shrestha, Seidl & Moraes, 2002; Simões, Barata & Cruz, 2013). Creel and Loomis (1990) argue that the more time individuals spend on the site per trip, the less annual trip counts they have.

4.3.3 Incorporation of Substitute Sites

The price and availability of substitutes is an important determinant of demand according to economic theory. Excluding prices of substitute sites may inflate the estimates of consumer surplus (Rosenthal, 1987), and substitute prices should ideally be included in the model. Failure to do so will result in biased estimators, but exclusion might be appropriate in some cases, such as if there are no reasonable substitutes (Albertini & Longo, 2006; Blaine et al., 2015; Common, Bull & Stoekl, 1999).

4.3.4 Multi-Destination Trips

Trips to recreational sites can be an individuals' single destination or one of multiple. For single destination trips, the visitor's only purpose of the trip is to visit the recreation site and the travel costs incurred is a valid proxy for the price of the trip. Trip expenses are easily attributed to the site because they are incurred exclusively to visit this site.

For multi-destination trips, on the other hand, the individual engages in more than solely visiting the recreation site - he or she has another destination on the way to or back from the recreation site. The problem with multi-destination trips is that it complicates the estimation of travel costs to the recreation site, as these are now marginal to the recreation portion of the trip. There is also the case of multi-purpose trips where the individual engages in more than one purpose at the same destination. This poses a similar problem as multi-destination trips.

The literature show that there have been difficulties in finding an applicable way for identifying the marginal cost incurred, and multi-destination trips have therefore often been excluded from the sample (Englin & Shonkweiler, 1995; Loomis & Ng, 2012; Parsons, 2003). By asking the respondents whether the trip is single- or multi-destination in a manner that effectively separates the two, the researcher can drop the multi-destination trips from the sample (Common et al., 1999; Fix & Loomis, 1998). It has been shown that exclusion could lead to an underestimation of total recreation site benefits (Loomis, Yorisane & Larson, 2000; Parsons and Wilson, 1997). However, Loomis et al. (2000) found multi-destination trip value differences to be statistically insignificant.

4.4 Revealed versus Stated Preferences: Gains from Combining Data

Historically, RP and SP methods have been seen as substitutes when researchers have considered the choice of valuation method to apply. Data from the different approaches was simply compared in order to determine the validity of SP methods (Cummings, Brookshire & Schulze, 1986).

Today it is generally acknowledged that each method provide its own strengths and weaknesses - the strengths of RP methods are the weaknesses of SP methods and vice versa. Louviere, Hensher and Swait (2000) therefore described this combined data approach as following a “data-enrichment” paradigm. Combining RP and SP data provides increased amount of information regarding the environmental good in question. Also, because of their contrasting strengths and weaknesses, a data combination can exploit their separate advantages while minimizing their weaknesses (Adamowicz, Louviere & Williams, 1994; Cameron, 1992; Whitehead et al., 2008).

RP data is, as previously described, limited to analyzing behavioral data based on historical numbers. Hence, there are no RP data for behavior in response to future changes such as new products or environmental quality changes. SP data can enhance the RP data allowing estimation of behavior beyond the range of historical experience.

Another problem often encountered with RP data is truncation. Since RP studies often is based on on-site surveys, the dependent variable (trips) is truncated at one and the market size is limited to current consumers, excluding recreation non-participants who might become participants in case of a quality change (Whitehead et al., 2008). This problem can be solved by using general population surveys, which also allows option value to be captured, but data collected by this approach is limited when trying to analyze changes on participation in response to future changes since typically only a small part of the sample have visited the site in question. Thereby, including hypothetical scenarios in the on-site survey allow estimation of such changes. However, on-site surveys with RP-SP combination will not enable estimation of option value.

There is also the issue of inefficiency in data collection using RP approaches, in the sense that a cross-section survey often only allows for one data point to be collected. Collecting data from each respondent over a period of time can solve this, assuming that behavior changes over time. However, time series usually means significantly higher costs related to data collection, both in the form of money and time. Hypothetical scenario questions, such as in SP approaches, can supplement on the single data point and significantly increase the sample size. With SP data, more information from each respondent can be collected, potentially leading to increased efficiency of the model (Whitehead et al., 2008). SP data can be stacked with RP data and treated as additional observations given similar dependent and independent variables

(Bergstrom, Teasley, Cordell, Souter & English, 1996; Eiswerth, Englin, Fadali & Shaw, 2000; Layman, Boyce & Criddle, 1996; Whitehead et al., 2008).

Other method-based issues solved by combining the approaches are hypothetical bias and validity. The problem of hypothetical bias with SP approaches can be solved by a combination with RP data as this grounds hypothetical choices with real choice behavior (Whitehead et al., 2008; Whitehead & Blomquist, 2006). Similarly, combination with RP data can be used to validate SP methods. When two methods yield estimates that are not statistically different, convergent validity exists (Loomis & Ng, 2012; Whitehead et al., 2008; Whitehead & Blomquist, 2006).

With this in mind, several economists working on nonmarket valuation turns increasingly to using a RP-SP combination for estimating environmental values (Adamowicz, Swait, Boxall, Louiere & Williams, 1997; Eom & Larson, 2006; Loomis et al., 2001; Whitehead et al., 2000; Whitehead & Blomquist, 2006; Whitehead, Haab & Huang, 2011; Whitehead et al., 2016).

5. Survey Design & Implementation

In the starting phase of this project, the aim was to value strictly Dalsnuten, which is the most visited peak in the Dalsnuten recreation area according to Stavanger Trekking Association. However, since there are multiple trails and hiking destinations in this area with the same starting point as Dalsnuten, it was hard to separate this peak from the others. In addition, some visitors also choose to go on round-trips where they visit multiple peaks in the same recreation trip.

The research question formed the basis of the survey design, and both RP and SP questions was included in order to capture behavior in case of quality change at the site. Among the different SP methods, contingent behavior was deemed appropriate in this study. In addition to RP and SP questions, the survey also included a section on socioeconomic characteristics in order to capture demand explanatory variables and control for the sample population. The design of the Dalsnuten survey was based on previous questionnaires developed by John Loomis (2009; 2001) and Whitehead et al. (2016; 2006).

5.1 Pilot Study

Before implementing the survey, a pilot study was performed in order to ensure that any unclear formulations, design issues or technicalities were identified and corrected. In total nine individuals helped testing and reviewing the survey, herein our supervisor and co-supervisor, fellow students, colleagues and relatives.

The pilot study respondents had all been at the Dalsnuten recreation area before and were also instructed to imagine that they were given the survey at the exact time they had finished a hike at the site. The surveys were handed out and were self-filled by the respondents. Some helpful comments on the survey were made and a couple of corrections was in order. By the end of March the survey was completed and at the beginning of April the data collection started.

5.2 Survey Design

The survey started off with introductory material, herein an explanation of the purpose of the study, and an assurance that the respondent's answers would be kept confidentially. Then, a revealed preference section was presented, followed by a stated preference section. Lastly, the final section contained questions about socioeconomic factors. The survey contained 36 questions in total and the focus group was individuals resident in Rogaland, Norway.

5.2.1 The Revealed Preference Section

The revealed preference section contained trip count questions, specifically number of trips taken last month, last year (2015), and this year (2016). Expected trip count in 2016 is technically a SP question, but was placed here as this was deemed appropriate and natural with respect to the survey design.

Then, the respondents were asked to rate (from 1 to 9) how important certain characteristics are for choosing to visit recreational areas in general. The characteristics mentioned were short travelling distance from home, available parking, trail quality, trail variability, crowdedness, scenery, café/snackbar, and available restrooms. After stating their general perception of importance of these factors, the respondents were asked to state how the Dalsnuten area scored (from 1 to 9) on the same characteristics.

After being asked about trip behavior in general, the respondents were asked some last trip questions. Because the sampling was on-site, the last trip was the trip taken when the respondents answered the survey. The respondents were asked to state whether today's hike was sole, main, or multi-destination, followed by questions about transportation mode, and travel distance and time. Next, they were asked to state which peaks was visited, how much time they spent on-site, and who their travelling companions were. Lastly, the respondents were asked to give their best estimate of the travel costs for today's trip.

5.2.2 The Stated Preference Section

In the stated preference section, the respondents were asked about substitute sites, and annual trip behavior in case of double and quadruple costs associated with travelling to the Dalsnuten recreation area. In addition, the same scenarios were presented with respect to travel time to the site.

The respondents were also asked whether they would change their behavior in form of annual trips contingent on two different hypothetical scenarios. These scenarios included presence of windmills at the site and improved quality of trails. For the case of windmills, the respondents were presented a photo illustrating how the view could be influenced (Figure 5), along with a short descriptive text. For the case of hypothetical quality improvement of trails, it was specified which trails to be improved and how.

Figure 5: Illustration of windmills. Photomontage: Multiconsult AS, 2013.

5.2.3 The Demographic Section

The demographic section consisted of common questions about gender, age, education, employment status, household size and household income. Postal code was asked enabling calculation of travel time and costs apart from what was stated by the respondents. The respondents were also asked whether they were member of the Norwegian Trekking Association in order to test for a potential relationship with trip counts.

5.3 Survey Implementation

The data collection started in the beginning of April 2016 and was undergone in five days within almost two weeks at six different occasions, gathering data twice in one of the days. It was taken care that the collection was done at different times of the day to gather an as diverse collection of respondents as possible. Due to the fact that the authors of this paper were the only ones who administered the surveys, it was quite easy to control that the respondents were not intercepted more than once to avoid bias.

The recreationists were intercepted at Gramstad as they were returning from their hike. Those intercepted were any group or person above the age of 18 years, ensuring the sample to be sufficiently stratified. If a group was intercepted, one person from the group was chosen to be interviewed.

However, two types of visitors were deliberately not surveyed, as Simões et al. (2013) also decided: Tourists, or those on organized trips such as with schools or treatment centers. The reasoning for excluding tourists (which were expected to be extremely few) was that their postal code would not be Norwegian. Even if they were to provide the postal code of their place of residence while in Norway, their trip to the Dalsnuten recreation area would likely not be the main purpose of their travel. Organized excursions are often too large in group size and therefore avoided (Simões et al., 2013), and the individuals are probably not making individual decisions to take that trip.

The first day the data collection was done by intercepting recreationists at the site, asking them to complete a written survey, letting the respondents fill it out by themselves. However, after reviewing the self-administered surveys, we discovered that there were some partially and fully unanswered questions. Also, cake and fruit was offered in exchange for hikers completing the survey. This lure turned out to be completely unnecessary with respect to response rates - the vast majority of the respondents were entirely indifferent of this gesture and responded to the survey regardless. Therefore, the rest of the data collection was conducted in an interviewing fashion without offering snacks.

5.4 Data Processing

Travel distances, time and whether the visitor passed a toll road was found applying the recommended itinerary in Google Maps from each respondent's postal code to the Dalsnuten area parking lot in Gramstad. This method of gathering accurate distances was also deemed appropriate by Blaine et al. (2015) and Simões et al. (2013). If the respondent resided in the same postal code as the site, the distance from the parking lot in Gramstad to the centre of the postal code was utilized (Blaine et al., 2015).

The transportation costs was calculated using the equation $TC = \gamma d + f$, where γ is the cost per kilometer, d is the round-trip distance and f is the fee for toll roads. The cost per kilometer differentiates between gasoline, diesel and electric or hybrid car. Gas costs were estimated to be NOK 0.97 and 0.64 per kilometer for gasoline and diesel cars, respectively (Statistics Norway, 2016b). Fuel consumption per kilometer for gasoline and diesel cars was calculated as an average over different types of vehicles (Jakobsen, 2012). For electric and hybrid vehicles, the average per kilometer cost is assumed to be NOK 0.2 (NAF, 2016). These two vehicle categories was merged due to the assumed small difference in costs. Toll road fee was set to NOK 16, assuming the vast majority of the population have Autopass.

Vehicle depreciation was not incorporated as a marginal travel cost due to the finding that depreciation, relative to gas costs, has a small effect on the amount that households drive and that depreciation is seen as a fixed rather than a marginal cost (Hang, McFadden, Train & Wise, 2016).

The respondent's opportunity cost of travel time was calculated by use of stated household income divided by number of contributing household members in order to find annual disposable income. Annual disposable income was further divided by the number of hours worked in a year, 1,950 (Statistics Norway, 2016a). One third of this hourly wage rate was used as the opportunity cost of travel time, or also thought of as value of leisure time, for each respondent. As such, the respondent's cost of travel time was calculated by the equation $TT = wt$, where the fraction of wage rate, w, is multiplied with t, round-trip travel time.

The total travel costs, TTC, includes travel cost, TC, and opportunity cost of travel time, TT: $TTC = TC + TT$.

6. Descriptive Statistics

During the data collection a total of 127 individuals or groups were approached and asked to answer the questionnaire. 101 of these responded, providing a response rate of approximately 80 percent. Only two of the respondents were English-speaking visitors.

Among the respondents, 62% were fully employed, 13% were employed part time, while 11% were pensioners. 14% of the respondents were not in paid work, whereas the unemployment rate for Rogaland is 4.1% (Statistics Norway, 2015). The unemployment rate in the area was expected to be high due to the current abruptly lowered activity in the economy in the Stavanger region, but it also might reflect the demand for recreational areas in order to keep oneself active while in-between jobs.

From the age range of 18-29, 30-40, 41-51, 52-62 and 63-74 there were 33, 20, 26, 8 and 12% represented in the data collection, respectively. When it came to educational level, the ones who had completed elementary school as their highest level of education were 4% of the respondents, technical school were 12%, and high school most represented with 34%. Lastly, higher education less than 4 years and over 4 years were 30% and 20%, respectively.

Trip counts among the respondents varied extremely. The frequency of visits to the recreation area was rarely above 150, with one at 180 and two above 270. This is extremely high in relation to other travel cost studies previously done and caused the mean number of trips to be rather high.

Four visitors did not answer all the questions in the survey and was excluded from the sample. Two outliers were excluded from the sample due to extremely high trip counts (270 and 280 annual trips) compared to the mean. Further, additional nine were excluded because they stated that their trip was multi-destination, leaving us with a sample size of 85 observations.

A chart depicting where these 85 respondents resided is provided in Figure 6. The municipality where most respondents resided were, as expected, the same as the Dalsnuten recreational area is present, in Sandnes. The respondents from this municipality represents 48% of the sample, while respondents residing in Stavanger represents 33%. The remaining 19% of respondents resided in close-by municipalities, such as Sola, Hafrsfjord, and Bryne, to mention some.

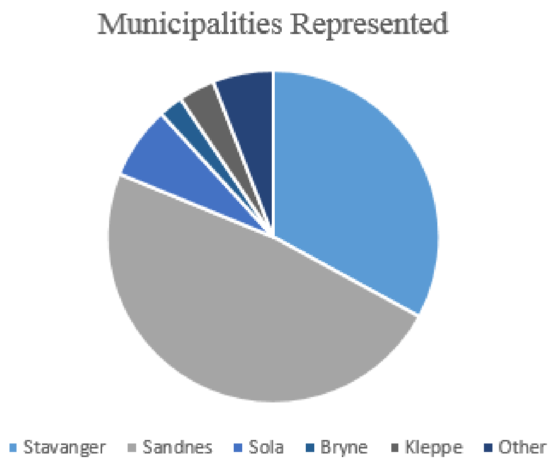

Figure 6: Municipalities represented among respondents.

Stated mode of transportation to the recreation site among the 85 respondents is presented in Figure 7. 45% of the respondents travelled by gasoline car, while 47% used diesel car. 6% reported using electric or hybrid car, and 2% walked or cycled to the site.

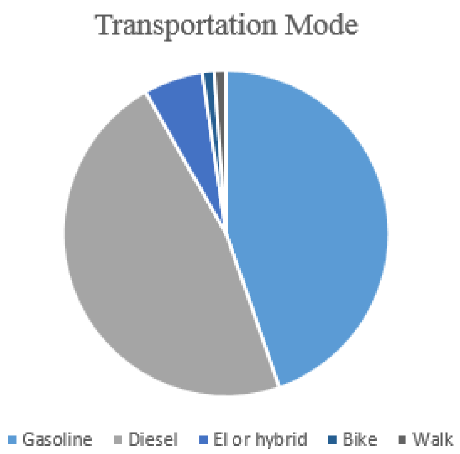

Figure 7: Transportation modes among respondents.

Summary statistics of respondent characteristics and socioeconomic factors is provided in Table 1. A decision was made to divide the model analysis in two in order to add a correction for the higher counts of annual trips. Because of this, the summary statistics table is separated between the full and corrected sample. The full sample include all 85 observations with the highest annual trip count being 180, while for the corrected sample, annual trip counts higher than 50 is excluded. The reasoning for the corrected sample will be further explained in the econometrics section.

Table 1: Respondent characteristics.

Respondent characteristics	***Full Sample*** *85 Respondents*	***Corrected Sample*** *69 Respondents*
Female (%)	61.18	57.35
Average age (years)	40.17	37.87
Retired or not in paid work (%)	20.00	16.18
Employed (%)	80.00	83.82
Education (mean, years)	14.54	14.50
Household size (mean, pers.)	2.73	2.76
Household income (mean, NOK)	772,619	796,268
Member of Norwegian Trekking Association (%)	30.59	30.88

Out of the 85 respondents, 61% were female, leaving them somewhat overrepresented. The average age was 40 years, with household size of 2.73 and NOK 772,619 in annual household income. 65% were in a full-time job, 15% worked part time, 11% were retired, and 9% were unemployed.

Summary statistics of visitation is provided in Table 2. The low average travel distance and time to the site was expected as it is more of a local recreation area than a tourist attraction. This is also confirmed by the summary of municipalities of residence among the respondents. The round-trip travel costs has a relatively high variation due to the fact that there are respondents residing in walking or biking distance to the site, enduring only time costs. The most mentioned substitute sites to the Dalsnuten recreation area was Vårlivarden, Lifjell and Melsheia (not reported in table).

Table 2: Statistics of visitation.

	Full Sample *85 Respondents*		***Corrected Sample*** *69 Respondents*	
	Mean	*Std.dev.*	*Mean*	*Std.dev.*
Travel				
Average one-way travel time to site (min)	22.62	8.79	24.40	8.13
Average one-way travel distance to site (km)	15.16	7.72	16.65	7.26
Average total travel cost to site*	116.30	89.41	146.27	102.58
Visitation (mean)				
Minutes spent on site	100.59	40.88	102.52	42.65
Group size (pers.)	2.44	2.42	2.56	1.60
Trips taken, revealed (per person)				
Last month	3.53	4.27	1.81	1.55
Last year, 2015	25.48	41.67	8.26	10.31
This year, 2016	30.66	44.40	11.38	11.85
Trips taken, stated (per person)				
Double cost	27.43	40.38	10.09	11.75
Quadruple cost	16.98	35.21	4.58	6.10
Double time	21.69	38.62	7.87	10.10
Quadruple time	9.65	23.77	2.45	3.91
Windmills	23.01	40.94	6.78	9.92
Trail improvement	25.72	43.22	9.06	11.38

*Total travel cost includes time and travel cost.

The visitation summary show that among the 85 respondents, the time spent at the site is about one and a half hour on average, and the average group size is 2.44 persons, though with a high variation.

The trip counts was expected to be large compared to that of most other travel cost analysis studies previously done due to the characteristics of the site in question, herein the fact that it is local and easily accessible. Simões et al. (2013) states that counts over six trips a year is rare. However, we were surprised to see that the annual mean trips was as high as 25.48, though with a high degree of variation.

The hypothetical price and time scenarios have the expected effect on visitation. Compared to trip counts of 2016, the scenarios of future higher travel or time costs show that visitors are more sensitive to time rather than direct costs. For the quality change scenarios, including windmills at the site and quality improvement of trails, the trip counts is to be compared with that of 2015.

A summary of the characteristics of importance and scores for the Dalsnuten recreation area is provided in Table 3. Among the characteristics of importance to the hikers when choosing outdoor recreational area, scenery caught great attention with a mean of 8.21, recalling 9 being the maximum. When comparing the results of the different scores for the Dalsnuten area characteristics, the parking availability came out strongest with a mean of 8.55. Behind came the scores for short distance, trail quality, scenery and trail variability with means ranging from 7.71 to 7.88. The visitors' attitudes towards crowdedness was quite ambiguous. Both the general importance and how Dalsnuten scored when it came to whether it was not crowded had means of 5.67 and 5.14, respectively. Many said that it was crowded, but due to the high variability of trails they could just steer away from the crowded areas.

Table 3: Characteristics and scores.

	General Importance		Ratings of the Dalsnuten area	
Characteristics	*Mean*	*Std.dev.*	*Mean*	*Std.dev.*
Short travel distance from home	6.69	1.85	7.72	1.73
Available parking space	7.64	1.90	8.55	0.93
Quality of trails	5.64	2.10	7.88	1.39
Possibility of varied trip distances	6.74	1.92	7.71	1.56
Not crowded	5.67	2.43	5.14	2.20
Scenery	8.21	1.07	7.71	1.51
Café/snackbar	2.00	1.65	2.95	2.36
Available toilet	2.98	2.40	3.05	2.73

Out of all the peaks in the recreation area, 62% of the respondents stated that they had visited Dalsnuten the day they were intersected by the interviewer. To compare, Bjørndalsfjellet was the secondly most visited among the peaks with 21%. The high share of respondents visiting the Dalsnuten peak was expected as it is arguably the most popular and well-known in the recreation area.

7. Econometric Methods

When analyzing on-site data of an environmental non-market good, Count Data models are usually applied due to consideration of the non-negative nature and possible low expected mean of the dependent variable. In most previous studies within environmental valuation with similar count data observations, there are two models that sticks out as best performers: The Poisson and the Negative Binomial Model (Creel & Loomis, 1990; Fix & Loomis, 1997; Grogger & Carson, 1991; Hesseln et al., 2003; Loomis & Keske, 2009; Shrestha et al., 2002).

7.1 The Poisson Model

The Poisson model is appropriate in analyzing recreational demand behavior because it takes on a discrete distribution with probabilities for only nonnegative integer values, which makes this distribution excellent for modelling count outcomes (Coxe, West & Aiken, 2009).

As shown by Grogger and Carson (1991) the basic Poisson model can be written as

$$\Pr(Y_i = j) = F_P(j) = \frac{\exp(-\lambda)\lambda^j}{j!}. \tag{12}$$

The model consists of $i = 1, 2, \ldots, n$ individual observations. This probability function for the Poisson distribution shows the probability of observing a given number of trips of an individual, $j(1, 2, 3, \ldots)$, in variable Y. Y_i then being the ith observation on the frequency of annual trips variable. The Poisson distribution parameter λ, in which Y is distributed, is the parameter to be estimated. For the count variable Y, λ is the mean number of visitation within that time period. The Poisson distribution would then consist of the probabilities of 0, 1, 2, 3, … visitations, given the estimated mean (λ) of the distribution. This probability for each visitation rate also depends on the variance of the number of visits, and in Poisson distribution the mean and the variance is defined by the same parameter λ. Due to the necessity of the λ being larger than zero, it is commonly specified as an exponential function (Haab & McConnell, 2002):

$$\lambda_i = \exp(\boldsymbol{z}_i\boldsymbol{\beta}). \tag{13}$$

From this specification, the log-likelihood function can be derived in terms of the parameters

$$\ln\big(L(\boldsymbol{\beta}|\boldsymbol{z},\boldsymbol{x})\big) = \sum_{i=1}^{T}[-e^{\boldsymbol{z}_i\beta} + \boldsymbol{z}_i\boldsymbol{\beta}x_i - \ln(x_i!)]. \tag{14}$$

The Poisson regression model can be derived from Equation (1) and was depicted by Loomis and Keske (2009) as:

$$\ln\lambda = \beta_0 + \beta_1 TC + \beta_2 X_2 + \ldots \beta_n X_n, \tag{15}$$

a semi-log trip demand function where *TC* is travel cost. This log-linear model is to ensure nonnegative probabilities (Parsons, 2003).

The welfare measure is derived using the Marshallian Consumer Surplus (CS), which is the net benefit for an individual of taking the trip. Calculation can be conducted by taking the integral of the demand function:

$$CS_j = \int_{p^0}^{p^c} x_j\,(\ln\lambda)d\,p_j. \tag{16}$$

This would only be appropriate if an OLS or similar econometric model had been applied, but due to the application of count data model for estimation, there is a different calculation method. CS per trip is calculated as the reciprocal of the rate of change in trips to the Dalsnuten recreational area with respect to travel cost (Haab & McConnell, 2002). Since the change in the dependent and independent variables is in exponential form in the count data models, consumer surplus is calculated as follows:

$$CS = \frac{-1}{\beta_1}. \tag{17}$$

Note here that the travel cost relationship with frequency of trips (β_1) should always be negative, and therefore the CS will consequently be positive.

After deriving average CS per trip per individual, it can be used to arrive at an Aggregated Surplus (AS) value for the site by multiplying the average per trip value by the total annual number of trips taken (Parsons, 2003):

$$AS = CS(Trips), \tag{18}$$

where *Trips* is the total number of trips to the site over the relevant season.

A weakness by employing the Poisson model is that it can cause overdispersion, a form of heteroscedasticity, if the assumption of variance being significantly equal to the mean does not hold. The Poisson distribution assume that each count is an independent occurrence (Coxe et al., 2009), meaning that the model assumes the likelihood for an individual to take its first trip of the season has the same likelihood as conducting a second trip within the same season. Overdispersion present in the model is found to be associated with inflated CS estimates (Nakatini & Sato, 2010). Also, it causes a reduction in the standard errors of regression coefficients, increasing the chance of finding a variable significant when it is really not (Blaine et al., 2015; Dean & Lawless, 1989; Palmer, Losilla, Vives & Jiménez, 2007).

For a more efficient estimation, relaxing the assumption that the mean and variance is equal can solve the overdispersion problem. Therefore, the Negative Binomial model has frequently been applied in recreational count data modelling since Englin and Shonkweiler (1995) extended on it.

7.2 The Negative Binomial Model

The Negative Binomial model is a generalization of the Poisson distribution applied in data analysis in order to account for the overdispersion problem. This model does not assume equality of the mean and variance, but that the variance will always be larger than the mean by including an $\alpha > 0$ as a nuisance parameter. The variance (ω_i) in the Negative Binomial is given by (Cameron & Trivedi, 2013):

$$\omega_i = \mu_i + \alpha\mu_i^2. \tag{19}$$

As evident in Equation (19), if alpha is zero the Negative Binomial model turn into a Poisson distribution.

The probability distribution of the Negative Binomial proposed by Grogger and Carson (1991) is:

$$\Pr(Y_i = j) = F_{NB}(j) = \frac{\Gamma\left(j+\frac{1}{\alpha}\right)}{\Gamma(j+1)\Gamma\left(\frac{1}{\alpha}\right)}(\alpha\lambda_i)^j[1+\alpha\lambda_i]^{-\left(j+\frac{1}{\alpha}\right)}, \tag{20}$$

where $\Gamma(\cdot)$ is the gamma function, a discrete probability density function defined for j.

7.3 Issues of On-Site Sampling

On-site sampling is a subject of much discussion on how it affects the data collected and, further, how to correct for it. Shaw (1988) shed light on the importance of recognizing both the problems of truncated counts and endogenous stratification.

7.3.1 Truncated Counts

For the case of strictly positive observations, meaning at least one trip has been made, all information about non-users is truncated from the sample (Shaw, 1988). As Haab and McConnell (2002) phrases it, when the errors in the estimation is truncated at zero, only individuals with sufficiently small errors will be captured in the model. In addition, not accounting for truncation can bias the parameter estimates and inflate the CS values (Bin, Landry, Ellis & Vogelsong, 2005; Creel & Loomis, 1990; Heberling & Templeton, 2009; McKean, Johnson & Taylor, 2012).

Since the dependent variable in this study is number of trips taken for individuals in 2015, while collection was conducted in the beginning of 2016, the sample analyzed actually entails observations of trip counts at zero. This resulted in capturing hikers who were inclined for some demand for recreation at Dalsnuten, but not necessarily yearly. This sampling method provided a sample that automatically corrected for the usual truncation that follows from on-site sampling. In addition, the combined RP and SP method contributes to a correction for truncation.

7.3.2 Endogenous Stratification

With on-site data collection, endogenous stratification, also called avidity bias, can occur because the likelihood of a person being sampled is greater the more frequent the individual usually visits. This could cause an overstated estimation of the CS value (Haab & McConnell, 2002). The usual convention is to use the Englin correction to account for this, which involves subtracting one from the reported number of trips and remove the zeros from the data analysis (Englin & Shonkwiler, 1995). Another correction that can be implemented is to exclude large count data before running the analysis (Englin & Shonkweiler, 1995; González, Loomis & González-Cabán, 2008; Simões et al., 2013). Trip counts exceeding 12 was excluded by both Englin and Shonkweiler, and González et al., while Simões et al. (2013) set the maximum trip count at 15.

As argued earlier, the trip counts for this study were far higher than that of most previous works. Due to the limited time to collect data for this study, the collection was done in April which might be considered off-season by some, due to weather conditions. Because of this, it is suspected that the more avid users who hike in the area all year round is more strongly represented in the sample compared to those with less trip counts. Identifying visitors with trip frequency over 50 annually, it was discovered that they were mostly pensioners and distorted the count of those who do not visit as frequently. Because of this, 50 was deemed an appropriate threshold correcting for avidity bias. This treatment resulted in eliminating 16 observations. A summary of revealed trip counts among the uncorrected sample is provided in Figure 8.

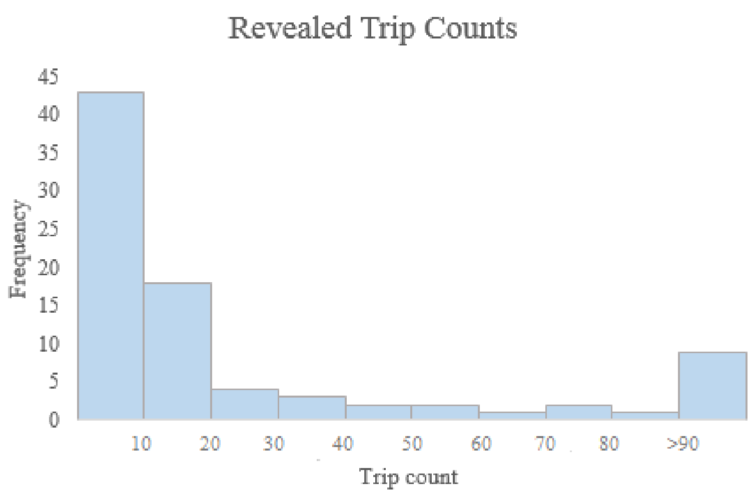

Figure 8: Histogram of trip counts.

To account for the differences in the models by correcting for endogenous stratification, both the Poisson and the Negative Binomial model are analyzed with an uncorrected sample (n =

85) and a corrected sample (n = 69) eliminating respondents with trip counts above 50. The model uncorrected for avidity bias was merely adjusted for outliers, and had a maximum of 180 counts. These two models were then compared in the analysis.

8. Model Application & Specification

RP and SP data were stacked in eight panels, providing eight observations for each individual. The first panel represented actual trips taken in 2015. Panel two through five represented stated preference responses, herein the travel cost and time scenarios. Panel six and seven included the hypothetical quality changes, herein windmill park and trail improvement. Lastly, panel eight represented planned trip counts in 2016 by each respondent. Because some of the respondents did not provide an answer to all of the scenarios, there was a total of 668 and 532 observations, for the full and corrected models, respectively.

The recreation trip demand models were estimated using linear and log-linear OLS and Tobit, Poisson, Negative Binomial and, finally, random effects panel Poisson and Negative Binomial. Based on superior performance of the models, random effects panel Poisson and Negative Binomial is reported for discussion.

When panel data approaches with constrained coefficients are used, the random effects Poisson and Negative Binomial allows trip variation that cannot be explained by prices and income across individuals. Also, it indicates the possible correlation across the RP-SP scenarios for the same individual (Whitehead et al., 2000). On the other hand, fixed effects models assume no correlation and is therefore not suitable because inferences may not be correct.

8.1 Model Specification

Number of trips taken by the individual within the past year and for the hypothetical scenarios (TRIPS) was modeled as the dependent variable. The independent, or explanatory, variables include factors that might influence demand for and value of the recreation site, such as travel costs (TTC), distance to substitute sites (SUBSDIST) and income (INCOME).

A dummy variable, HYPDUM, was created in order to distinguish between RP and SP data and to control for the effect hypothetical scenarios might have on trip counts. Actual trips taken by the respondent in 2015 were coded HYPDUM = 0, while for the seven hypothetical scenarios this variable was coded as HYPDUM = 1. Similarly, two dummy variables was created in order to capture for the separate effect of the two quality change scenarios; HYPWIND and HYPQUAL.

For full specification of the model, socioeconomic factors was included, such as gender, age and education. Furthermore, individual perceptions of trail variability (TRAILVARIA) at the site was included in order to explore whether this factor affect trip counts. Time spent at the site (ONSITETIME) was included as a variable the may explain respondent's annual trip counts. Finally, whether the respondent was member of the Norwegian Trekking Association (MEMBER) was included as a variable that may explain trip behavior.

When the data was satisfactory for running the analysis it was plotted into the statistical software STATA 11.0. The full model is expressed as:

$$\begin{aligned}\ln(r) = {} & \beta_0 + \beta_1 TCC_i + \beta_2 SUBSDIST_i + \beta_3 INCOME_i + \beta_4 ONSITETIME_i + \beta_5 HYPDUM_i \\ & + \beta_6 HYPWIND_i + \beta_7 HYPQUAL_i + \beta_8 TRAILVARIA_i + \beta_9 GENDER_i + \beta_{10} AGE_i \\ & + \beta_{11} EDUCATION_i + \beta_{12} MEMBER_i + \varepsilon_{ui},\end{aligned}$$

for the *i*th individual where ε_u is the error term. A full specification of the variables used in the final model, along with the expected signs of estimated coefficients is provided in Table 4.

Table 4: Variable description.

Variable	***Description***	***Expected sign***
TRIPS	Trips taken by the respondent, herein actual trips taken in 2015 and stated trips taken for each of the seven scenarios.	
TTC	Total travel cost, herein round-trip time and travel cost, including toll and fuel.	(-)
SUBSDIST	Travel distance to stated substitute site.	(+)
INCOME	Annual household income of survey respondent (NOK).	(- / +)
ONSITETIME	Time spent at the site.	(-)
HYPDUM	Dummy for stated preference trips with hypothetical* scenarios.	(-)
HYPWIND	Dummy for stated preference trips with windmills.	(-)
HYPQUAL	Dummy for stated preference trips with trail quality improvement.	(+)
TRAILVARIA	Indicator of respondent's perception of trail variability at the site.	(+)
GENDER	Dummy for gender. 1 = female, 0 = male.	(- / +)
AGE	Respondent's age.	(- / +)
EDUCATION	Respondent's years of formal education. 1 = primary school,…, 5 = higher education over 4 year.	(- / +)
MEMBER	Dummy for member of the Norwegian trekking association. 1 = member, 0 = not member.	(+)

Log-likelihood measures and likelihood ratio tests were used as the primary source of determining which model to be used, in addition to which variables to be included.

8.2 Hypothesis Specification

The hypotheses tested by the model are presented in Table 5. Hypotheses 1, 2 and 3 addresses research questions 1, 2 and 3, respectively, while Hypotheses 4a and 4b addresses research question 4.

Table 5: Hypotheses tested.

Hypothesis	***Description***	***Formally***
1	Downward-sloping demand.	$H_0: \beta_{TTC} \geq 0$ $H_1: \beta_{TTC} < 0$
2	The recreation site is a normal good.	$H_0: \beta_{Income} \leq 0$ $H_1: \beta_{Income} > 0$
3	Recognition of the trail variability opportunities at the site.	$H_0: \beta_{TrailVaria} \leq 0$ $H_1: \beta_{TrailVaria} > 0$
4a	Effect of a hypothetical windmill park.	$H_0: \beta_{HypWind} = 0$ $H_1: \beta_{HypWind} \neq 0$
4b	Effect of a hypothetical trail quality improvement.	$H_0: \beta_{HypQual} = 0$ $H_1: \beta_{HypQual} \neq 0$

Hypothesis 1 is that individuals who have higher travel costs per trip will make less use of the recreation area in question. In other words, that the demand for recreation at the Dalsnuten area is downward sloping. Downward sloping demand would imply that those who reside further away from the site and hence endure higher travel costs, will take less annual trips compared to those who reside closer to the site. This is the most important hypothesis in performing a travel cost analysis - the travel cost variable must have a negative relationship with annual frequency of trips and be significantly negative.

The second hypothesis (Hypothesis 2) is that the Dalsnuten recreation area is a normal good. This hypothesis could result in either of two conclusions. If the income coefficient is positive and significant in relation to trip counts, recreation at the Dalsnuten area is a normal good. This would imply that higher income should lead to increased trip counts. If recreation is an inferior good, income would have the opposite effect on trips.

Hypothesis 3 is that those who value and recognize the trail variation at the site will have higher trip counts. Trail variation is considered a quality attribute of the site and is expected to be a positive demand shifter.

The last two hypotheses (Hypotheses 4a and 4b) is that quality changes will have an effect on annual trip counts. A windmill park (4a) is expected to have a negative effect on trip counts, while trail quality improvements (4b) should have a positive effect. However, whether these hypothetical quality changes will have a significant effect on trip counts did not reveal directly from the interviews. For trail quality improvement, several respondents stated that they wanted to experience nature as it is, and that they would not appreciate this to be tampered with. For the windmill scenario, some stated that they would take more trips by pure curiosity to look at the windmills.

9. Results & Analysis

The regression analysis highlights the factors that affect trip behavior, and provides the independent variables' all-else-equal effects on trip counts. In total, 12 panel regressions were run in order to analyze the dependent variable. Six of the models were analyzed using Poisson (Model 1-3 and 7-9), while Negative Binomial was employed on the remaining six (Model 4-6 and 10-12). All of the regressions allow for random effects between the independent variables among panels.

Table 6 show the regression results from the full, uncorrected sample (Model 1-6), while Table 7 show the results from the corrected sample (Model 7-12). For the Poisson regressions, the overdispersion parameter alpha is also reported. The log likelihood is reported at the bottom of the table for all of the regressions.

Table 6: Full model regression analysis.

	Poisson			***Negative Binomial***		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	4.020 (.3868)	4.3659 (.5421)	1.099 (1.0183)	1.501 (.2537)	1.323 (.3222)	1.122 (.6455)
TTC	-.008*** (.0003)	-.007*** (.0003)	-.007*** (.0003)	-.006*** (.0006)	-.006*** (.0007)	-.006*** (.0007)
SUBSDIST	.002 (.0090)	.005 (.0096)	.015 (.0088)	.015** (.0055)	.011* (.0055)	.011 (.0058)
INCOME	-.038 (.0399)	-.045 (.0402)	-.044 (.0390)	-.002 (.0233)	-.003 (.0239)	.005 (.0250)
ONSITETIME		-.004 (.0040)	-.009* (.0039)		.003 (.0021)	-.001 (.0022)
HYPDUM		.018 (.0283)	.016 (.0283)		-.000 (.0845)	-.003 (.0833)
HYPWIND		-.120*** (.0291)	-.117*** (.0292)		-.222* (.0913)	-.226* (.0912)
HYPQUAL		.083*** (.0234)	.083*** (.0234)		.194** (.0675)	.184** (.0668)
TRAILVARIA			.325*** (.0916)			.042 (.0589)
GENDER			.528* (.2511)			-.196 (.1627)
AGE			.013 (.0097)			.003 (.0064)
EDUCATION			.017 (.1308)			-.033 (.0805)
MEMBER			-.015 (.3041)			.780 (.1875)
Alpha	1.423*** (.1890)	1.412*** (.1877)	1.174*** (.1601)	-	-	-
# Observations	668	668	660	668	668	660
Log likelihood	-3083.66	-3052.63	-3021.82	-2190.85	-2176.31	-2143.61

Note: Significance levels: 1% (***), 5% (**), 10% (*). Standard deviation is reported in parentheses.

Table 7: Corrected model regression analysis.

	Poisson			Negative Binomial		
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Constant	2.617 (.1682)	3.880 (.2197)	1.840 (.4264)	.646 (.2121)	1.2345 (.2743)	.5319 (.4752)
TTC	-.006*** (.0003)	-.006*** (.0004)	-.006*** (.0004)	-.005*** (.0007)	-.005*** (.0008)	-.005*** (.0008)
SUBSDIST	.001 (.0020)	.015*** (.0025)	.016*** (.0030)	.011** (.0036)	.012*** (.0038)	.017*** (.0040)
INCOME	.004 (.0134)	.025 (.0143)	.068*** (.0158)	.032 (.0180)	.034 (.0183)	.059** (.0190)
ONSITETIME		-.017*** (.0013)	-.016*** (.0014)		-.006*** (.0016)	-.007*** (.0016)
HYPDUM		.103 (.0537)	.103 (.0547)		.048 (.1143)	.057 (.1075)
HYPWIND		-.301*** (.0572)	-.298*** (.0582)		-.313* (.1242)	-.331** (.1176)
HYPQUAL		.108* (.0427)	.104* (.0440)		.221* (.0888)	.184* (.0847)
TRAILVARIA			.267*** (.0315)			.134*** (.0384)
GENDER			-.524*** (.1086)			-.349** (.1293)
AGE			-.019*** (.0039)			-.017*** (.0047)
EDUCATION			.086 (.0039)			.090 (.0637)
MEMBER			.638*** (.1004)			.603*** (.1257)
Alpha	.701*** (.1130)	.870*** (.1418)	.783*** (.1272)	-	-	-
# Observations	532	532	524	532	532	524
Log likelihood	-1924.25	-1804.43	-1673.48	-1521.27	-1502.38	-1446.69

Note: Significance levels: 1% (***), 5% (**), 10% (*). Standard deviation is reported in parentheses.

The overdispersion parameter was highly significant in all six Poisson models.

For the Negative Binomial models, a log-likelihood ratio test was performed for the added variables both in the corrected and uncorrected models. The variable extensions were increasingly jointly significant at P < .001 and the lowest result from this test was still very high ($\chi^2 = 29.08$ [$4\ df$]). In addition, the corrected Negative Binomial regressions had a much lower log likelihood compared to that of the full sample and provided more steady and significant variables.

9.1 Hypothesis Testing

The coefficient on TTC is negative and significant in all 12 models, implying that demand for recreation at the Dalsnuten area is downward sloping. Hence, for Hypothesis 1, the null is rejected at a 99% confidence level. This confirms that those who reside further away will take less annual trips compared to those residing closer to the site.

INCOME is positive and significant at the 1% and 5% level for Model 9 and 12, respectively, implying that recreation at the Dalsnuten area is a normal good. The coefficient is negative in Model 1 through 5, though not significant. The null hypothesis of income being smaller or equal to zero in Hypothesis 2 can then be rejected for Models 9 and 12, implying that higher income leads to increased trip counts.

Trail variation at the site, TRAILVARIA, is positive and significant at the 1% level in Models 3, 9 and 12. This implies that this quality attribute of the site is valued and hence, a positive demand shifter. The higher the visitors thinks Dalsnuten scores in offering several trail choices, the more often they visit in a year (Hypothesis 3).

The windmill scenarios' effect on trips (Hypothesis 4a) displays some degree of significance in all eight models that include this variable, indicating a reduction in trip counts and lower consumer surplus if this scenario had occurred. Trail quality improvement (HYPQUAL) is positive and significant in these eight models, though only at the 10% level for the corrected models. Hence, the null in Hypothesis 4b is rejected at a 90% confidence level, indicating that such a quality improvement would increase annual trip counts.

9.2 Additional Observations

None of the sociodemographic variables, with an exception for GENDER in Model 3, were significant in the uncorrected sample.

Time spent at the site, ONSITETIME, was included in order to capture those who had different incentives for the use of the area. Some are perhaps there for a quick exercise and might visit the site more often, while others visit for longer recreational appreciation and might not visit as frequently. This coefficient was negative and significant in the corrected models, implying a negative relationship between annual trip counts and time spent at the site.

EDUCATION was not significant in any of the models, but was left in to avoid omitted variable bias.

The coefficient for gender is positive and significant at the 10% level in Model 3, while negative and significant at the 1 and 5% level in Models 9 and 12. This indicates that among the respondents in the full sample, female hikers might be the most avid users. For the corrected sample, there is a negative relationship between gender and annual trip counts.

AGE is negative and significant at the 1% level in both Model 9 and 12, interpreted as the older the hiker is, the less he or she visits the Dalsnuten area. Before the model was corrected for avid users, this coefficient was positive, though not significant, indicating an increase of use with age.

Being a member of the Norwegian Trekking Association seemed to matter for the frequency of trips in the corrected models. The coefficient (MEMBER) in Models 9 and 12 reveals that membership has a positive and highly significant effect. Whether being a member implies correlation or causation, one could argue that since you are already embarking on many hikes, why not become a member to exploit the advantages. On the other hand, if you wish to motivate yourself further or become a member to enjoy specific trips, the social environment and/or other discovered advantages might cause the hiker to advance on more trips than it otherwise would.

Finally, the dummy for all the hypothetical scenarios (HYPDUM) was positive, but insignificant in all models. The possible hypothetical bias of overstatements in stated preference trips is therefore not confirmed.

9.3 Estimated Welfare Impacts

In order to calculate the CS, Equation (17) was applied. CS per trip and the individual CS is presented in Table 8. The CS from the estimation was calculated per trip made, regardless of group size. The individual CS is hence adjusted for average group size (2.22[1]).

Table 8: Summary of CS (NOK).

Model	*Treatment*	*CS/trip*	*CS Lower*	*CS Upper*	*CS Width*	*CS/trip/person*
1	Poisson	132.12	123.49	142.05	18.56	59.51
2	Poisson	134.09	122.95	147.46	24.51	60.40
3	Poisson	134.05	122.84	147.52	24.68	60.38
4	Neg. Binom.	158.05	132.63	195.54	62.91	71.19
5	Neg. Binom.	164.59	133.09	215.62	82.53	74.14
6	Neg. Binom.	172.00	137.49	229.65	92.16	77.48
7	Poisson	175.84	157.28	199.37	42.09	79.21
8	Poisson	168.36	147.84	195.48	47.64	75.84
9	Poisson	162.55	142.69	188.82	46.13	73.22
10	Neg. Binom.	214.94	168.06	298.10	130.04	96.82
11	Neg. Binom.	219.72	164.10	328.75	164.65	98.97
12	Neg. Binom.	192.59	149.38	270.99	121.61	86.75

Note: 95% confidence interval is reported.

Overall in these CS estimates, within both the full and corrected models separately, it can be confirmed that they are quite robust since the variation of the estimates are very low.

The uncorrected sample for endogenous stratification causes the CS estimates to be undervalued in Models 1 through 6, which is contradictory to previous findings where not correcting for endogenous stratification tends to overstate the welfare measures (Haab & McConnell, 2002; Martínes-Espiñeira & Amoako-Tuffor, 2008; Martínes-Espiñeira, Amoako-Tuffour & Hilbe, 2006; Ovaskainen, Mikkola & Pouta, 2001). It seems that inclusion of high frequency hikers

[1] There was one major outlier reporting 12 in one group that was corrected for.

drives the cost per trip downwards and consequently the CS estimates due to their short travel distance to the site.

As evident in this table, overdispersion present in the Poisson models causes underestimates of the CS. Because of this and with basis on the log likelihood ratio tests for the Negative Binomial models, Model 12 was deemed the most appropriate for further presentations and discussions.

9.3.1 Changes in Welfare

In order to calculate the effect of changes in welfare from each hypothetical scenario, the dummy coefficients (HYPWIND and HYPQUAL) provide the ceteris paribus effect on annual trips. The change in CS per trip for the windmill scenario can therefore be calculated as

$$\Delta\, Trip\ CS = \frac{\beta_{HypWind}}{-\beta_{TTC}}. \tag{21}$$

The same formula applies for hypothetical quality change, replacing $\beta_{HypWind}$ with $\beta_{HypQual}$.

Similar to that of the previous chapter, the change in CS per trip was divided by average group size in order to derive individual change in CS. Changes in CS in NOK and in percentage change from status quo for both scenarios is presented in Tables 9 and 10.

Table 9: Change in CS (NOK) for the windmill scenario.

Model	***Sample***	***ΔCS/trip***	***ΔCS/person***	***%ΔCS***
5	Full sample	-37.00	-16.67	-22.48
6	Full sample	-37.37	-16.83	-21.73
11	Corrected sample	-62.60	-28.20	-28.49
12	Corrected sample	-66.20	-29.82	-34.37

For Models 5 and 6 the average reduction in individual CS due to this scenario is NOK 16.75 per trip, while NOK 29.01 for Models 11 and 12. Here, the underestimation stemming from analyzing the full sample is quite large, halving the CS estimates compared to the corrected sample.

Table 10: Changes in CS (NOK) for trail quality improvement.

Model	*Sample*	*ΔCS/trip*	*ΔCS/person*	*%ΔCS*
5	Full sample	32.33	14.56	19.64
6	Full sample	30.67	13.82	17.83
11	Corrected sample	44.20	19.91	20.12
12	Corrected sample	36.80	16.58	19.11

For Models 5 and 6 the average increase in individual CS due to trail quality improvement is NOK 14.19 per trip, while NOK 18.25 for Models 11 and 12. The underestimation stemming from the uncorrected models is not as large in this scenario compared to the other, but still present. The variance in between these estimates is larger than in the windmill scenario, likely linked to the significance level of only 10%, making this scenario estimates somewhat less reliable. On the other hand, the lower variance in the windmill scenario imply estimates that are more robust.

9.3.2 Aggregated Welfare

Using the estimated individual CS from Model 12 and aggregating it by utilizing the 200,000 visitors reported by Stavanger Trekking Association, the total non-market value of the site is estimated to be approximately NOK 17.350 million, with an upper and lower bound on a 95% confidence interval ranging from about NOK 13.5 to 24.4 million. Table 11 provide the aggregated change and CS compared to status quo.

Table 11: Aggregated CS (NOK).

Scenario	*CS/person*	*Aggregated Change*	*Aggregated CS*
Status Quo	86.75	-	17.350.000
Windmills	-29.82	-5.964.000	11.386.000
Trail Improvement	+16.58	+3.316.000	20.666.000

The reduction in indicated individual CS of NOK 29.82 from the windmill scenario will result in a corresponding reduction of NOK 5.964 million on aggregated consumer surplus. This corresponds to a total aggregated non-market value of NOK 11.386 million.

For the quality improvement scenario, the indicated individual CS presented by the model of best fit was an increase of NOK 16.58. This aggregated for annual visits implies an increase in recreational value of the area of NOK 3.316 million, resulting in a total aggregated non-market value of NOK 20.666 million.

9.4 Some Previous CS Findings

Valuing a 14,000 meter high peak, Loomis and Keske (2009) reported a CS of $31 for hikers per day trip, equivalent to approximately NOK 173[2]. However, the hikers in this study had to share the peak with automobile and cog railway users, which could obscure a comparison. Hesseln et al. (2003) also had two separate users, bikers in addition to hikers, and they found a CS as high as $130 per trip (NOK 920[3]).

A national forest recreation demand analysis (Simões et al., 2013) reported CS between £47-£51 depending on the chosen model, which corresponds to an interval of NOK 345-375[4]. When valuing The Great Sand Dunes national park, Heberling and Templeton (2009) found day trip CS of $54 (NOK 431[5]). An estimation conducted for recreation value of numerous national forests in the US (Bowker, Starbuck, English, Bergstrom & McCollum, 2009) the range for hiker's CS was between $58 and $216 (NOK 324-1,209), which was "w*ithin the range of values in the literature for forest recreation" (Rosenberger and Loomis, 2001).*

Conducting a benefit-cost analysis of the Middle Fork Greenway Trail located in Boone, North Carolina, Whitehead et al. (2016) found a baseline mean CS per visit of $10.75 (NOK 89.65[6]). The average revealed preference trip count in this study was 70 per year. They also estimated the increase in CS stemming from additional miles of trail to be $5.81 (NOK 48.45[5]).

[2]Calculated through USD 2009 currency rates of NOK 5.5961 http://www.exchangerates.org.uk/historical/USD/03_12_2009
[3] Calculated through USD 2003 currency rates of NOK 7.0803 https://www.measuringworth.com/datasets/exchangeglobal/result.php?year_source=2003&year_result=2003&countryE%5B%5D=Norway
[4] Calculated through EURO 2013 currency rates of NOK 7.3424 http://www.exchange-rates.org/HistoricalRates/E/EUR/1-1-2013
[5] Calculated through USD 2002 currency rates of NOK 7.9839 https://www.measuringworth.com/datasets/exchangeglobal/result.php
[6] Calculated through USD 2016 currency rates of NOK 8.3396 http://www.exchange-rates.org/history/NOK/USD/T

10. Discussion

The hypothesis testing imply that demand is downward sloping, meaning that those who reside further away from the site will take less annual trips compared to those who reside closer to the site, as theory predicts.

The results from hypothesis testing suggests that recreation at the Dalsnuten area is a normal good. This implies that higher income should lead to increased trip counts. Previous research show quite ambiguous results regarding the effect of income on travel demand. Some show zero or negative signs on the income coefficient (Englin & Shonkweiler, 1995; Loomis et al., 2000; Loomis et al., 2001; Loomis & Keske, 2009; McKean et al., 2012), implying that income has little or no impact on travel demand or that the recreation site is an inferior good. Others show positive signs on the coefficient, concluding that the site is a normal good (Hesseln et al., 2003; Huang, Haab & Whitehead, 1997; Whitehead et al., 2000). A positive relationship between demand and income is supported by neoclassical theory stating that higher income provides more opportunities for the individual.

The analysis using socioeconomic factors revealed that this site is frequently visited by pensioners, unemployed and people on sick-leave. It suggests an importance of maintaining this particular recreational area for both the physical and mental health of the locally resided citizens.

Changes in aggregated welfare stemming from hypothetical changes in site quality was estimated for the presence of windmills at the site and trail quality improvements. Arguably, there would likely be net benefits involved in generating renewable energy after taking into account the direct costs of construction. If the true reduction in welfare from the windmill scenario is NOK 5.964 million, the potential benefit from placing a windmill park in the area should at least be greater than the found reduction from placing it.

The estimated increase in welfare due to trail quality improvements was NOK 3.316 million. Similar to the windmill scenario, for it to be worth improving trails in the Dalsnuten recreational area, which in addition would require some maintenance costs, the total change in welfare from this improvement should exceed the potential costs.Taking these estimated changes in total aggregated CS of the Dalsnuten recreation area into consideration, it may have implications for future planned investments in the area.

Our preferred model was the corrected fully extended Negative Binomial model (Model 12), providing a per trip CS of NOK 192.59 and an individual CS of NOK 86.75 per trip. The individual CS estimated in this study is far lower than most CS estimates found in previous research (Loomis & Keske, 2009; Hesseln et al., 2013; Heberling and Templeton, 2009; Bowker et al., 2009). Considering that this study is conducted for a local hiking area and not an as extraordinary hike as a 14,000 high peak or similar, and that the frequency of visits is much higher than most other recreational demand analysis performed, the CS was expected to be somewhat lower. This expectation is consistent with CS estimates found by Whitehead et al. (2016) who also reported high mean trip counts.

10.1 Limitations

Conducting the interviews it was discovered that the household income range in the questionnaire was far too low. The maximum income before taxes was set at NOK 1.1 million or higher, which might have truncated stated income at a lower sum than preferable when aiming to capture the real income pattern. The mean annual household income in this study was approximately NOK 783,000 before taxes, but would likely be higher had the range been at least twice as high.

A relatively high share of the survey respondents were unemployed. This could be the result of lowered oil price and following cut-offs in investments, which has led to a higher percentage of unemployed and temporarily laid off people in the region. If so, this recreational area might be more frequently used in this period due to increased available leisure time.

Also, it should be bared in mind that many of the stated scores of the Dalsnuten area's characteristics might have been biased due to the in-person interviewing fashion (Loureiro & Lotade, 2005). This could have created social pressure causing respondents to not be completely honest when they in reality might be more critical to the Dalsnuten area.

The data collection period was early spring which might be considered off-season by some. This could have caused the hikers who visit all year round, and hence are more avid users, more likely to be encountered. The patterns of socioeconomic variables among the respondents might also vary from a collection conducted in the summertime than a collection done at a season of colder temperatures and fewer on holidays.

Stavanger trekking association have counted approximately 200,000 trips in 2015. A major weakness of using this trip count in assessing the value of the Dalsnuten recreation area is that the counter is placed along only one of the several entrances to the area. The trail the counter is placed by is the most used trail, but still, individuals using the other trails are not captured. As such, using this trip count would lead to an underestimation of the total value of the recreational area.

Correcting for avidity bias, the maximum trip count was set at 50 annually. It can be discussed if this was the appropriate maximum, but whether it had to be corrected for in some degree was unquestionable. This maximum was chosen due to changes in pattern of costs and frequency relations between those over and under 50. Testing models removing increasingly higher trip counts, these changes seemed significant. Also, the TTC coefficient varied wildly until it stabilized around this trip count. The intervals between the stated frequency above 50 trips was 50 in itself and there was relatively small changes in cost per trip between these avid visitors.

With more time for data collection, the transition between intervals could have smoothened out and possibly made a correction for endogenous stratification unnecessary. Unquestioningly, more time spent collecting respondents would have resulted in a higher share of lower frequency visitors since hikers are only interviewed once. Therefore, it can be concluded that the full sample CS estimates might be underestimated and that the corrected sample provide a more reliable estimate.

Though the Negative Binomial model corrects for overdispersion caused by the assumption of the mean and variance being equal in the Poisson, Berk and MacDonald (2008) cautions that this should direct the focus towards specification errors of the model, such as omitted variables or incorrect functional forms, and not necessarily think the Negative Binomial model “fixes” it.

10.2 Implications for Future Work

The CS estimates obtained in this study provide valuable insight for local and regional policy-makers. Hence, in order for them to allocate scarce resources in the best possible way, such knowledge is essential and the estimates and general preferences revealed in this study could provide valuable information. However, due to the limitations of this study, further research is necessary in order to fully understand the general public's preferences regarding recreation demand.

10.2.1 Valuing Local Recreational Destinations

When estimating recreational demand with conventional non-negative integers, the rule of thumb is that if the mean is lower than 10 the OLS regression will cause biased estimates (Coxe et al., 2009). As it turns out, after collection of data for this study, the mean number of trip counts in 2015 was far higher than 10. Therefore, according to Cameron and Trivedi (2013), normal regression methods such as OLS could be satisfactory. Because of this, future works valuing environmental non-market value of local recreational areas with high trip counts could expand on this and compare the significance of utilizing OLS for estimation with the count data models.

10.2.2 Dalsnuten Specific Future Work

The random utility model is often applied to similar sites as the Dalsnuten area, where trip destinations are difficult to separate. This method is generally utilized for comparing quality of different peaks and/or destinations within an area, and could be applied to the Dalsnuten recreation area. Also, singling out the Dalsnuten peak in order to value solely this peak would be an interesting subject of research.

The previously described digital counter is positioned at only one specific entrance to the area and the aggregated welfare will consequently be underestimated. In order to retrieve more reliable visitor estimates, a method of counting user vehicles similar to that of Whitehead et al. (2016) in order to get a more precise number of annual visitors could be applied in future research.

11. Conclusion

This study makes use of data obtained from a carefully designed on-site survey in order to estimate the non-market value of the Dalsnuten recreational area and characterize its users. Poisson and Negative Binomial models were implemented for the analysis, which is the standard procedure for treating count data from the individual travel cost method. The sample was further divided into two in order to control for avidity bias. A panel methodology, where observations are stacked, was implemented in order incorporate effects of hypothetical changes and provide seven times more observations than originally sampled.

By employing this estimation method, the Dalsnuten recreational area follows the law of demand and was identified as a normal good. In addition, trail variation was found to be one of the main site-specific attributes affecting demand.

Trip CS obtained ranged from NOK 132.12 to 219.78, providing a corresponding individual CS in the range of NOK 58.51 to 98.97. Our preferred model (Model 12) provided an individual CS of NOK 86.75. From this, the estimated non-market value of the Dalsnuten recreation area was approximately NOK 17.350 million. Whereas accounting for the estimated welfare changes in the windmill and trail improvement scenarios lead to an aggregated value of NOK 11.386 and 20.666 million, respectively.

As Ward and Loomis (1986) sheds light on, there are several issues in which an estimation of recreational value of an environmental good can supplement decision-making. The estimated status quo value of the Dalsnuten recreational area could be reviewed and potentially weighed in a cost/benefit-analysis for local decision-making. In addition, it is demonstrated that by incorporating hypothetical scenarios it can be estimated an approximation of how a quality change can influence the population's welfare. The potential benefits of such a change can be weighed by the attached costs in order to improve decision-making. This thesis contributes to this area of research and can further provide findings to compare and expand on for future studies.

12. References

Adamowicz, W., Louviere, J. & Williams, M. (1994). Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities. *Journal of Environmental Economics and Management, 26*, 271-292.

Adamowicz, W., Swait, J., Boxall, P., Louiere, J. & Williams, M. (1997). Perceptions versus Objective Measures of Environmental Quality in Combined Revealed and Stated Preference Models of Environmental Valuation. *Journal of Environmental Economics and Management, 32*, 65-84.

Albertini, A. & Longo, A. (2006). Combining the Travel Cost and Contingent Behavior Methods to Value Cultural Heritage Sites: Evidence From Armenia. *Journal of Cultural Economics*, *30*(4), 287-304.

Anderson, D. M. (2010). Estimating the Economic Value of Ice Climbing in Hyalite Canyon: An Application of Travel Cost Count Data Models that Account for Excess Zeros. *Journal of Environmental Management, 91*(4), 1012-1020.

Bell, S., Tyrväinen, L., Sievänen, T., Pröbstl, U. & Simpson, M. (2007). Outdoor Recreation and Nature Tourism: A European Perspective. *Living Reviews in Landscape Research, 1*(2), 1-46.

Bergstrom, J.C., Teasley, R.J., Cordell, H.K., Souter, R. & English, D.B.K. (1996). Effects of Reservoir Aquatic Plant Management on Recreational Expenditures and Regional Economic Activity. *Journal of Agricultural and Applied Economics, 28*, 409-422.

Berk, R. & MacDonald, J.M. (2008). Overdispersion and Poisson Regression. *Journal of Quantitative Criminology*, *24*(3), 269-284.

Bin, O., Landry, C.E., Ellis, C. & Vogelsong, H. (2005). Some Consumer Surplus Estimates for North Carolina Beaches. *Maritime Resource Economics*, *20*(2), 145-161.

Blaine, T.W., Lichtkoppler, F.R., Bader, T.J., Harman T.J. & Lucente, J.E. (2015). An Examination of Sources of Sensitivity of Consumer Surplus Estimates in Travel Cost Models. *Journal of Environmental Management, 151*, 427-436.

Bockstael, N., Strand I. & Hanemann M. (1984). *Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models, Benefit Analysis Using Indirect or Imputed Market Methods.* Volume II, Project Report to Office of Policy Analysis, Office of Policy and Resource Management, US Environmental Protection Agency, Washington D.C.

Bockstael, N., Strand I. & Hanemann M. (1987). Time and the Recreational Demand Model. *American Journal of Agricultural Economics, 69*(2), 293-302.

Bowker, J.M., Starbuck, C.M., English, D.B., Bergstrom, J.C., Rosenburger, R.S. & McCollum, D.C. (2009). Estimating the Net Economic Value of National Forest Recreation: An Application of the National Visitor Use Monitoring Database. *Faculty Series Working Paper, FS 09-02, September 2009; The University of Georgia, Department of Agricultural and Applied Economic.*

Boyle, K.J. (2003). Introduction to Revealed Preference Methods. In Champ, P.A., Boyle, K.J. & Brown, T.C. (eds.). *A Primer on Nonmarket Valuation* (259-267). Dordrecht: Kluwer Academic Publishers.

Brown, T.C. (2003). Introduction to Stated Preference Methods. In Champ, P.A., Boyle, K.J. & Brown, T.C. (eds.). *A Primer on Nonmarket Valuation* (99-110). Dordrecht: Kluwer Academic Publishers.

Brown, W.G. & Nawas, F. (1973). Impact of Aggregation on the Estimation of Outdoor Recreation Demand Functions. *American Journal of Agricultural Economics, 65*, 154-157.

Cameron, A.C. & Trivedi, P.K. (2013). *Regression Analysis of Count Data* (Vol. 53): Cambridge university press.

Cameron, T.A. (1992). Combining Contingent Valuation and Travel Cost Data for the Valuation of Nonmarket Goods. *Land Economics, 68*(3), 302-317.

Carpio, C. E., Wohlgenant, M. K. & Boonsaeng, T. (2008). The Demand for Agritourism in the United States. *Journal of Agricultural and Resource Economics, 33*(2), 254-269.

Cesario, F.J. & Knetsch, J. (1970). Time Bias in Recreation Benefit Estimates. *Water Resources Research, 6*(3), 700-704.

Cesario, F.J. (1976). Value of Time in Recreation Benefit Studies. *Land Economics, 52*(1), 32-41.

Clawson, M. & Knetsch, J. (1966). *The Economics of Outdoor Recreation.* Baltimore MD: John Hopkins University Press.

Clawson, M. (1959). Methods of Measuring the Demand for and Value of Outdoor Recreation. *Washington DC: Resources of the Future Reprint, 10*.

Common, M., Bull, T. & Stoeckl, N. (1999). The Travel Cost Method: An Empirical Investigation of Randall's Difficulty. *Australian Journal of Agricultural and Resource Economics, 43*(4), 457-477.

Coxe, S., West, S.G. & Aiken, L.S. (2009). The Analysis of Count Data: A Gentle Introduction to Poisson Regression and its Alternatives. *Journal of Personality Assessment, 91*(2), 121-136.

Creel, M.D. & Loomis, J. (1990). Theoretical and Empirical Advantages of Truncated Count Data Estimators for Analysis of Deer Hunting in California. *American Agricultural Economics Association, 72*, 434-441.

Cummings, R.G., Brookshire, D.S. & Schulze, W.D. (eds.) (1986). *Valuing environmental Goods: An Assessment of the Contingent Valuation Method.* Totowa, NJ: Rowan and Allanheld.

Dean, C. & Lawless, J.F. (1989). Tests for Detecting Overdispersion in Poisson Regression Models. *Journal of the American Statistical Association, 84*(406), 467-472.

Earnhart, D. (2004). Time is money: Improved Valuation of Time and Transportation Costs. *Environmental and Resource Economics, 29*(2), 159-190.

Eiswerth, M.E., Englin, J., Fadali, E. & Shaw, W.D. (2000). The Value of Water Levels in Water-Based Recreation: A Pooled Revealed Preference/Contingent Behavior Model. *Water Resources Research, 36*, 1079-1086.

Englin, J. & Shonkweiler, J.S. (1995). Estimating Social Welfare Using Count Data Models: An Application to Long-Run Recreation Demand under Conditions of Endogenous Stratification and Truncation. *The Review of Economics and statistics, 77*(1), 104-112.

Eom, Y.S. & Larson, D.M. (2006). Improving Environmental Valuation Estimates through Consistent Use of Revealed and Stated Preference Information. *Journal of Environmental Economics and Management, 52*, 501-516.

Fix, P. & Loomis, J. (1997). The Economic Benefits of Mountain Biking at one of its Meccas: An Application of the Travel Cost Method to Mountain Biking in Moab, Utah. *Journal of Leisure Research, 29*(3), 342-352.

Fix, P. & Loomis, J. (1998). Comparing the Economic Value of Mountain Biking Estimated Using Revealed and Stated Preference. *Journal of Environmental Planning and Management, 41*(2), 227-236.

Fleming, C.M. & Cook, A. (2008). The Recreational Value of Lake McKenzie, Fraser Island: An Application of the Travel Cost Method. *Tourism Management, 26*(6), 1197-1205.

Fletcher, J., Adamowicz, W.L. & Graham-Tomasi, T. (1990). The Travel Cost Model of Recreation Demand: Theoretical and Empirical Issues. *Leisure Sciences, 12*, 119-147.

Freeman, A. M. III, Herriges, J. A. & Kling, C. L. (2014). *The Measurement of Environmental and Resource Values: Theory and Methods*. Routledge.

Freeman, A. M. III. (1993). *The Measurement of Environmental and Resource Values: Theory and Methods*. Washington, DC: Resources for the Future.

González, J.M., Loomis, J. & González-Caban, A. (2008). A Joint Estimation Method to Combine Dichotomous Choice CVM Models with Count Data TCM Models Corrected for Truncation and Endogenous Stratification. *Journal of Agricultural and Applied Economics, 40*(2), 681-695.

Grogger, J.T. & Carson, R.T. (1991). Models for Truncated Counts. *Journal of Applied Econometrics, 6*(3), 225-238.

Haab, T. & McConnell, K. (2002). *Valuing Environmental and Natural Resources: The Econometrics of Non-Market Valuation*. Edward Elgar, North Hampton, MA.

Hang, D., McFadden, D., Train, K. & Wise, K. (2016). Is Vehicle Depreciation a Component of Marginal travel Cost? A Literature Review and Empirical Analysis. *Journal of Transport Economics and Policy, 50*(2).

Heberling, M.T. & Templeton, J.J. (2009). Estimating the Economic Value of National Parks With Count Data Models Using On-Site, Secondary Data: The Case of the Great Sand Dunes National Park and Preserve. *Environmental Management, 43,* 619-627.

Hellerstein, D. & Mendelsohn, R. (1993). A Theoretical Foundation for Count Data Models. *American Journal of Agricultural Economics, 75*(3), 604-611.

Hesseln, H., Loomis, J., Gonzáles-Cabán, A. & Alexander, S. (2003). Wildfire Effects on Hiking and Biking Demand in New Mexico: A Travel Cost Study. *Journal of Environmental Management, 69*, 359-368.

Hotelling, H. (1947). Letter to the national park service. *An Economic Study of the Monetary Evaluation of Recreation in the National Parks (US Department of the Interior, National Park Service and Recreational Planning Division, 1949).*

Huang, J.C., Haab, T.C. & Whitehead, J.C. (1997): Willingsness to Pay for Quality Improvements: Should Revealed and Stated Preference Data Be Combined? *Journal of Environmental Economics and Management*, *34*, 240-255.

Jakobsen, Ø. 2012, 14/08. Så mye drivstoff bruker bilen din – egentlig. *Dagbladet. Retrieved from* http://www.dagbladet.no/2012/08/14/tema/bil/forbruker_bil/klikk/22951058/

Layman, R.C., Boyce, J.R. & Criddle, K.R. (1996). Economic Valuation of Chinook Salmon Sport Fishery of the Gulkana River, Alaska, Under Current and Alternate Management Plans. *Land Economics, 72*, 113-128.

Loomis, J. & Keske, C. (2009). The Economic Value of Novel Means of Ascending High Mountain Peaks: A Travel Cost Demand Model of Pikes Peak Cog Railway Riders, Automobile Users and Hikers. *Tourism Economics, 15*(2), 426-436.

Loomis, J. & Ng, K. (2012). Comparing Economic Values of Trout Anglers and Nontrout Anglers in Colorado's Stocked Public Reservoirs. *North American Journal of Fisheries Management*, *32*(2), 202-210.

Loomis, J., González-Cabán, A. & Englin, J. (2001). Testing for Differential Effects of Forest Fires on Hiking and Mountain Biking Demand and Benefits. *Journal of Agricultural and Resource Economics*, *26*(2), 508-522.

Loomis, J., Yorizane, S. & Larson D. (2000). Testing Significance and Multi-Purpose Trip Effects in a Travel Cost Method Demand Model for Whale Watching Trips. *Agricultural and Resource Economics Review, 29*(2), 183-191.

Loureiro, M.L. & Lotade, J. (2005). Interviewer Effects on the Valuation of Goods with Ethical and Environmental Attributes. *Environmental and Resource Economics, 30*(1), 49-72.

Louviere, J.J., Hensher, D.A. & Swait, J.D. (2000). *Stated Choice Methods: Analysis and Application.* Cambridge: Cambridge University Press.

Martínez-Espiñeira, R. & Amoako-Tuffour, J. (2008). Recreation Demand Analysis under Truncation, Overdispersion, and Endogenous Stratification: An Application to Gros Morne National Park. *Journal of Environmental Management, 88*(4), 1320-1332.

Martínez-Espiñeira, R., Amoako-Tuffour, J. & Hilbe, J. M. (2006). Travel Cost Demand Model Based River Recreation Benefit Estimates with On-Site and Household Surveys: Comparative Results and a Correction Procedure - Reevaluation. *Water Resources Research*, *42*(10).

McConnell, K.E (1992). On-Site Time in the Demand for Recreation. *American Journal of Agricultural Economics*, *74*(4), 918-925.

McConnell, K.E. & Strand, I. (1981). Measuring the Cost of Time in Recreation Demand Analysis: An Application to Sportfishing. *American Journal of Agricultural Economics, 63*(1), 153-156.

McKean, J.R., Johnson, D. & Taylor, R.G. (2012). Three Approaches to Time Valuation in Recreation Demand: A Study of the Snake River Recreation area in Eastern Washington. *Journal of Environmental Management*, *112*, 321-329.

Ministry of Climate and Environment. (1957). Outdoor Recreation Act (1957). Act of 28 June No. 16 Relating to Outdoor Recreation. *Retrieved from https://www.regjeringen.no/en/dokumenter/outdoor-recreation-act/id172932/*

Multiconsult AS. (2013). Konsesjonssøknad Vardafjellet Vindpark I Sandnes Kommune. *Retrieved from http://webfileservice.nve.no/API/PublishedFiles/Download/200803409/742420*

NAF (2016). Hvordan lader jeg elbilen på riktig måte? *Retrieved 18.04.2016 from https://www.naf.no/tips-og-rad/elbil/lade-elbil/oversikt-over-ladeformer-og-ladestasjoner/*

Nakatani, T. & Sato, K. (2010). Truncation and Endogenous Stratification in Various Count Data Models for Recreation Demand Analysis. *Journal of Development and Agricultural Economics, 2*(1), 293-303.

Navrud, S. & Mungatana, E.D. (1994). Environmental Valuation in Developing Countries: The Recreational Value of Wildlife Viewing. *Ecological Economics, 11*(2), 135-151.

Ovaskainen, V., Mikkola, J. & Pouta, E. (2001). Estimating Recreation Demand with On-Site Data: An Application of Truncated and Endogenously Stratified Count Data Models. *Journal of Forest Economics, 7*(2), 125-144.

Palmer, A., Losilla, J.M., Vives, J. & Jiménez, R. (2007). Overdispersion in the Poisson Regression Model. *Methodology, 3*(3), 89-99.

Parsons, G.R. & Wilson, A.J. (1997). Incidental and Joint Consumption in Recreation Demand. *Agricultural and Resource Economics Review, 26*, 1-6.

Parsons, G.R. (2003). The Travel Cost Model. In Champ, P.A., Boyle, K.J. & Brown, T.C. (eds.). *A Primer on Nonmarket Valuation* (269-329). Dordrecht: Kluwer Academic Publishers.

Perman, R., Ma, Y., Common, M., Maddison, D. & McGilvray, J. *Natural Resource and Environmental Economics.* Pearson Education Limited, 2011.

Rosenberger, R.S. & Loomis, J.B. (2001). Benefit Transfer of Outdoor Recreation Use Values: A Technical Document Supporting the Forest Service Strategic Plan (2000 revision). *Gen. Tech. Rep. RMRS-GTR-72. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.*

Rosenthal, D.H. (1987). The Necessity for Substitute Prices in Recreation Demand Analysis. *American Journal of Agricultural Economics, 69*, 828-837.

Shaw, D. (1988). On-site Samples' Regression: Problems of Non-Negative Integers, Truncation, and Endogenous Stratification. *Journal of Econometrics, 37*(2), 211-223.

Shrestha, R.K., Seidl, A.F. & Moraes, A.S. (2002). Value of Recreational Fishing in the Brazilian Pantanal: A Travel Cost Analysis Using Count Data Models. *Ecological Economics, 42*, 289-299.

Simões, P., Barata, E. & Cruz, L. (2013). Using Count Data and Ordered Models in National Forest Recreation Demand Analysis. *Environmental Management, 52*(5), 1249-1261.

Sohngen, B. (2000). The Value of Day Trips to Lake Erie Beaches. *Unpublished report, Department of Agricultural, Environmental, and Development Economics, Ohio State University.*

Statistics Norway. (2015). Registrerte Arbeidsledige, 2015. *Retrieved from https://ssb.no/regledig*

Statistics Norway. (2016a). Yrkesdeltaking. *Retrieved from* *http://www.ssb.no/a/metadata/conceptvariable/vardok/2744/nb*

Statistics Norway. (2016b). Sal av petroleumsprodukt. *Retrieved from* *https://www.ssb.no/energi-og-industri/statistikker/petroleumsalg*

Ward, F. & Beal, D. (2000). *Valuing Nature with Travel Cost Models, a Manual.* Northampton: Edward Elgar Publishing.

Ward, F. & Loomis, J. (1986). The Travel Cost Demand Model as an Environmental Policy Assessment Tool: A Review of Literature. *Western Journal of Agricultural Economics, 11*(2), 164-178.

Whitehead, J., Dumas, C.F., Herstine, J., Hill, J. & Buerger, B. (2006). Valuing Beach Access and Width with Revealed and Stated Preference Data. *Marine Resource Economics, 23*, 119-135.

Whitehead, J., Haab, T. & Huang, J. eds. *Preference Data for Environmental Valuation: Combining Revealed and Stated Approaches.* Routledge, 2011.

Whitehead, J., Haab, T. & Huang, J. (2000). Measuring Recreation Benefits of Quality Improvements with Revealed and Stated Behavior Data. *Resource and Energy Economics, 22*, 339-354.

Whitehead, J., Lehman, J. & Weddell, M. (2016). A Benefit-Cost Analysis of the Middle Fork Greenway Trail. *Department of Economics Working Paper*, *16*, 01.

Whitehead, J., Pattanayak, S.K., Van Houtven, G.L. & Gelso, B.R. (2008). Combining Revealed and Stated Preference Data to Estimate the Nonmarket Value of Ecological Services: An Assessment of the State of the Science. *Journal of Economic Surveys, 22*(5), 872-908.

Whitehead, J.C. & Blomquist, G.C. (2006). The Use of Contingent Valuation in Benefit-Cost Analysis. In Albertini, A. & Kahn, J.R. (eds.) *Handbook of Contingent Valuation.* Edward Elgar Publishing, Northampton, M.A.

Appendix: Questionnaire (English version)

Dalsnuten recreation area

What do you think?

Photo: Odd Inge Worsøe

ABOUT THIS SURVEY

Your opinion matters!

Thank you for assisting us by filling out this survey, which is part of a social science research within recreation and tourism by the University of Stavanger.

The answers you provide in this survey could assist authorities and public management agencies with increased understanding of citizen's attitudes and preferences within this area.

We are only interested in your opinions. *It is crucial that everyone who receives an invitation to participate, both interested and not too interested in the subject, answer as honestly and complete as possible.* <u>There are no right or wrong answers.</u>

The answers you provide will be strictly confidential and you as a participant of this survey is anonymous. We are mainly interested in a compilation of the answers of all participants.

It will take approximately 10 minutes to complete this survey.

Please tell us of your usage and perceptions of the Dalsnuten recreation area.

Q01: How many trips to the Dalsnuten area have you taken in **the last month**?

______ trips.

Q02: Approximately how many trips did you take to the Dalsnuten area in **2015**?

______ trips.

How sure are you about your stated number of trips? *[Circle the number reflecting you level of certainty.]*

Very uncertain								**Completely certain**
1	2	3	4	5	6	7	8	9

Q03: How many trips to the Dalsnuten area do you expect to make in total in **2016**?

______ trips.

Q04: On a scale from 1 (not at all important) to 9 (extremely important), to what degree do you find each of the characteristics of importance when you **in general** choose which recreational area to visit? *[Please tick the box reflecting the degree to which you consider the characteristics important in your decision to visit a recreational area.]*

Characteristic	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Short travel distance from home									
Available parking space									
Quality of trails									
Possibility of varied trip distances									
Not crowded									
Experiencing nature									
Café/snackbar									
Available toilet									

Q05: On a scale from 1 (bad) to 9 (excellent), how do you think **the Dalsnuten area** meet the following characteristics? *[Please tick the box reflecting the degree to which you consider the characteristics important in your decision to visit a recreational area.]*

Characteristics	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Short travel distance from home									
Available parking space									
Quality of trails									
Possibility of varied trip distances									
Not crowded									
Experiencing nature									
Café/snackbar									
Available toilet									

The following questions will be regarding <u>today's</u> trip to the Dalsnuten area.

Q06: Visiting the Dalsnuten area today was... *[Tick the relevant circle.]*

- O Your **sole purpose** when you left your home.
- O Your **main purpose** of when you left your home.
- O One of **several purposes** when you left your home today.

If you tick one of several purposes, *please answer the following questions based on one of the following relevant to you, instead of your home:*
- *the location from which you travelled from to here, or*
- *the location you are travelling to after leaving here*

Q07: Approximately how many kilometers do you have to travel from your home to Dalsnuten area?

_____ kilometers.

Q08: Approximately how much time do you spend travelling (one way) from your home to the Dalsnuten area?

_____ hours _____ minutes.

Q09: What sort of main mode of transportation did you arrive with at the Dalsnuten area? *[Tick the relevant circle.]*

- O Gasoline car
- O Diesel car
- O El/hybrid car
- O Bus
- O Bike
- O Walk
- O Other, please elaborate: ____

Q10: Which of these peaks did you climb today? *[Tick the relevant box(s).]*

- ☐ Dalsnuten
- ☐ Øvre Eikenuten
- ☐ Fjogstadnuten
- ☐ Kallandsnuten
- ☐ Bjørndalsfjellet
- ☐ Mattirudlå
- ☐ Steinfjell
- ☐ Kollirudlå
- ☐ Other, please elaborate: ____

Q11: After arriving at the Dalsnuten area, how much time do you expect to spend before returning home (elsewhere)?

_____ hours _____ minutes.

Q12: Who are your travel companions for the day? *[Tick the relevant circle.]*

- O Family
- O Partner/spouse
- O Friends
- O Colleagues
- O I am traveling alone
- O Other, please elaborate: ___________________________________

Q13: How many people are you travelling with, including yourself?

_____ persons.

Q14: What do you estimate to be this trip's total costs for you and your travel companions? *[Please give us your best estimates.]*

Fuel: NOK ______

Toll road: NOK ______

Other: NOK ______

If "other" is stated, please specify: ___________________________________

Q15: What do you perceive to be <u>your</u> costs of the total costs for this trip? *[Please give us your best estimates.]*

_____ NOK.

In the following questions you will be asked to describe your behavior regarding possible changes in costs related to visiting the Dalsnuten area.

Q16: If the Dalsnuten area, for whatever reason, was suddenly not available, what equivalent/similar destination would you have chosen to travel to?

____

Q17: Approximately how much time (one way) would you have to spend travelling from your home to this destination?

_____ hours _____ minutes.

Q18: Approximately how many kilometers would you have to travel from your home to this destination?

_____ kilometers.

Q19: Now assume that for some reason, let's say increased fuel prices, it costs you **twice as much** as what you normally spend, to travel to the Dalsnuten area. Meaning if it normally costs you NOK 50 to make this trip, it now costs you NOK 100. In this scenario, how many trips would you take annually?

_____ annual trips.

Q20: Now assume that for the same reason as above, it costs you **four times as much** as what you normally spend to travel to the Dalsnuten area. Meaning if it normally costs you NOK 50 to make this trip, it now costs you NOK 200. In this scenario, how many trips would you take annually?

_____ annual trips.

Q21: Now assume that for some reason, for instance due to traffic congestion, it takes you **twice as long** to travel to the Dalsnuten area than it normally does. Meaning, if you used to spend 15 minutes to get here, you now have to spend 30 minutes. In this scenario, how many trips would you take annually?

_____ annual trips.

Q22: Now assume for reasons as above you have to spend **four times as long** travelling than what you have previously spent. Meaning, if you uses to spend 15 minutes, you now spend 60 minutes travelling before you arrive. In this scenario, approximately how many trips would you take annually?

_____ annual trips.

Imagine a windmill park being placed at the Dalsnuten area. The windmill park consists of 25 windmills, each being approximately 75 - 90 meters high. Below we have depicted how this could hypothetically affect the view in the area.

Q23: Should a windmill park as depicted above exist, how many fewer or more trips would you take **annually**? *[Tick the relevant box and state how many fewer or more trips.]*

- O I would take just as many annual trips.
- O I would take _____ **fewer** annual trips.
- O I would take _____ **more** annual trips.

Q24: In 2015 there was conducted a lot of improvements of the trails to Dalsnuten (marking of trails, signing and partial placing of stone paths). If these improvements had been conducted for the trails to Bjørndalsfjellet and Mattirudlå as well, how many more or fewer trips would you take **annually**? *[Tick the relevant box and state how many fewer or more trips.]*

- O I would take just as many annual trips.
- O I would take _____ **fewer** annual trips.
- O I would take _____ **more** annual trips.

Finally: Please tell us a little about yourself.

These questions will help us in our evaluation of whether our population selection is representative. Your answers will be held strictly confidential and will only be used for this analysis in this study. They will not be shared with outsiders or used for other purposes.

Q25: Are you...

O Female   O Male

Q26: What is your age?

_____ years of age.

Q27: Are you currently employed?

O Yes → O Full time employed   O Part time employed

O No → Are you retired?   O Yes   O No

If you are currently not employed you may proceed to question 31.

Q28: Do you take work leave in order to participate in outdoor recreation?

O Yes   O No

Q29: How many weeks of paid vacation do you get each year?

_____ weeks.

Q30: Are you paid hourly or do you receive a fixed (e.g. monthly) payment?

O Fixed   O Hourly

Q31: What is your postal code?

____

Q32: What is your highest completed educational level? *[Tick the relevant circle.]*

- O Elementary school.
- O Practical/technical school.
- O High school.
- O Higher education up till 4 years (college, bachelors).
- O Higher education over 4 years (masters, doctorate).

Q33: Including yourself, how many members are there in your household?

_____ members.

Q34: How many of these members are children under the age of 16?

_____ children.

Q35: What was your household's total annual income from all sources, before taxes, in 2015? *[Tick the relevant box.]*

O Less than NOK 99 999	O NOK 400 000 – 499 999	O NOK 800 000 – 899 999
O NOK 100 000 – 199 999	O NOK 500 000 – 599 999	O NOK 00 000 – 999 999
O NOK 200 000 – 299 999	O NOK 600 000 – 699 999	O NOK 1 000 000 – 1 099 999
O NOK 300 000 – 399 999	O NOK 700 000 – 799 999	O More than NOK 1 100 000

Q36: Are you member of any association that organizes outdoor recreational activity, such as DNT?

O Yes O No

Thank you for your participation!