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# Surfonomics: The Value of a Wave

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# Abstract

Surfing as an ocean recreational activity is open access and generally without entrance fees. Valuing the recreational activity can, therefore, not be determent as straightforward as market commodities. Through “surfonomics” one can determine the economic value of waves and benefits gained by surfing to local communities.

In this master thesis, the author examines the non-market value of surfing at the coast of Jæren, Norway. A reveal preference estimation in a random utility model of site choice is implemented to measure the recreation surfing benefits under status quo conditions and possible effects in site value for three hypothetical scenarios.

This study uses data from an on-site survey conducted at the coast of Jæren in April 2018. Discrete choice models with fixed effects are estimated and used to derive total willingness to pay for two commonly known local surf sites, respectively Bore and Sele. Willingness to pay per trip per person is found to be in the range from NOK 11.81 to 15.83 in five estimated models. The annual non-market value of surfing, therefore, ranges from NOK 265 135 to 355 384. Results were calculated using a conservative estimate of 22 450 annual surfing trips.

Results stemming from the three hypothetical scenarios suggest that wave quality, wave frequency and water quality at Jæren is expected to increase a site`s value. Hence, as the quality characteristics increase so will local visitations and surfers well-being.

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# 1. Introduction

> "Jæren is probably what we can call the "epicentre" for surfing in Norway. This area is known for being windswept, but as soon at the wind turns, this place is amazing"
> (Kolltveit, surf photographer cited in Vangerud, n.d.)

The economics of surfing, informally known as "surfonomics", have recently gained much attention from the scientific community (Nelsen, 2012). Studies reveal that surfing as an ocean recreational activity is rising in both popularity and participation around the world (Buckley as quoted in Lazarow, Miller & Blackwell, 2009; Nelsen, Pendleton & Vaughn, 2007).

The full economic value of surfing is not adequately captured in the market because outdoor recreation is usually open access. Hence, the value of surfing is not determent as straightforward as market commodities. As a result, monetary information of surfer value is not as readily available to policy-makers. In a world of increasing coastal pressures, public-policy makers must make smart decisions regarding their coastal resources. Failure to capture environmental values leads to policy formulations that are biased towards market values. Consequently, this will undervalue the impact and benefits derived from coastal recreation and result in ill-defined policy formulations. Providing policy-makers with such knowledge could, therefore, improve social decision-making (Nelsen, 2012). Through "surfonomics" one can determine the economic value of a wave and surfing to local communities with the aim to help policy-makers make better decisions to protect their coastal resources and waves (Save The Waves Coalition, n.d.).

Norway has in recent years earned its place as an international surf destination, and Jæren at the southwest coast is the most commercialised surf spot. In October 2017 Jæren hosted the European championship of surfing for the first time, reflecting the activity`s growing popularity and significance along the coast (Vangerud, n.d.). Conceptually, this means a growing value in surf breaks. Therefore, it would be of interest to estimate this non-market value.

This master thesis presents the results from a study of the coast of Jæren, Norway. A Random Utility model of Site Choice (RUSC) with revealed preference data is employed to estimate the willingness to pay (WTP) to access the waves at two commonly known local surf sites, respectively Bore and Sele. To know how local surfers use the coast and how coastal management decisions impact surf recreation simulated visitation patterns are examined. A general characterisation of local surfers is also provided to fully understand the waves` value and significance at the coast. To the author`s knowledge, this is the first formal attempt to estimate the economic value of surfing in Norway. The results from this study could be employed in a benefit-cost analysis to inform social decision making. General information about local surfers and how changes in beach characteristics affect site-choice could be useful for the local authority when deciding whether to permit indirect-or direct regulations. In general, by placing a monetary value on surfing, managers and policy-makers in the Stavanger Region are better informed about the coastal environment and its users.

The main research question that forms this thesis is "*What is the recreational value of surfing as an ocean recreational activity at Jæren?".* Based on the proposed research question the author aims to answer the following questions.

1. What is the most popular surf site at Jæren?
2. Are surfers price sensitive?
3. How do changes in quality characteristics affect the value of a surf site at Jæren?
4. Do surfers have varying preferences according to their skill level and experience?

The main research question, questions 2 and 3 are addressed explicitly using the results from the RUSC model. Research question 1 is addressed by descriptive statistics, while research question 4 is determent by both descriptive analyses and the econometric estimation.

This thesis is structured as follows: the first two chapters collectively establish the background for this thesis. Chapter 4 describes the theoretical framework for environmental valuation. A compressed classification of the environmental valuation methods is outlined in Chapter 5. Chapters 6 and 7, describe the design of the study and the methodological approach, respectively. Chapter 8 presents the survey design and implementation, followed by descriptive analyses in chapter 9. Chapter 10 comprise model specification, while Chapter 11 reports the empirical findings. Estimation results are further discussed in Chapter 12, while conclusions are offered in Chapter 13.

# 2. Background

The chapter provides an overview of the coast of Jæren as the site in question, before proceeding to explore a definition of surfing and related attributes. Lastly, the chapter provides an overview of "Jærstrendene" as a surf region and further lists the threats to the surfing experience. Overall, the chapter provides the contextual background necessary for the reader to understand the focus that forms this thesis.

## 2.1 Case study area: The coast of Jæren, Norway


*Figure 1: Map over the coast of Jæren. ("Kart over Jæren" [Image], 2018)*

The coast of Jæren is a 100 km coastline in south-western Norway (Picture 2.1). Since 1977, approximately 70 km of its length has been classified as a protected area of national importance. The protection aims to safeguard the area's unique natural and cultural landscape, which entails a vibrant bird and plant life, beaches and spectacular dunes (Fylkesmannen i Rogaland, 2010; Humberset, 2013).

The beaches of this coastal region, formally classified as "Jærstrendene" stretch out seven miles from Tungenes in the North to Ogna in the South, corresponding to an area of about 190 $km^2$. Roughly 25 km of the coastline consists of sandy beaches and dunes, while the remainder comprises pebble beaches and rocky coastline (Humberset, 2013). The beaches are known for their natural beauty and are popular for daily recreational activities such as hiking, water sports and bird watching. On average, the coast hosts between 500 000 to 600 000 visitors every year (Jæren Friluftsråd, Strandrydding, n.d.). This estimate, however, may be undervalued due to the recent increase in beach activity, primarily driven by greater affluence. Features such as public restrooms, parking lots and trails have been developed and are monitored by local authorities and beach park managers. Annual clean-ups along the beaches are also organised, and through the efforts of volunteers the beach areas are spotless and close to pristine conditions (Jæren Friluftsråd, personal communication, February 2018). In addition to visitors, about 450 landowners, respectively farmers and cabin owners, are in the area (Fylkesmannen i Rogaland, 1995).

In recent years, there have been changes in the attitude among both landowners and recreational groups. Visitors are experiencing an increasing feeling of "ownership" towards the coastline, and landowners now have a different view on their property at the coast than before. Previously they used the beach-end of their farms as dumping grounds; now they view it as the part of the property they want to front. This attitude change is an increased threat to cultivation and privatisation of coastal zones at Jæren (Jæren Friluftsråd, personal communication, February 2018). Increased human interaction combined with a growing ownership feeling means that the importance of the economic impact and the recreational value at Jæren cannot be understated. There is little-documented evidence of the economic value at the coast. However, a study conducted on "Solastranden" and "Orrestranden" in 2017 estimated the economic value to be NOK 12.6 million and NOK 10.92 million, respectively (Linh & Saeland, 2017).

## 2.2 The study: Surfing & Related Attributes

Surfing in this thesis is the lens through which the recreational value at Jæren is explored. An international definition of surfing is non-existent because it operates within, across and beyond many categories. Though, with an established world tour and its recent success for inclusion in the 2020 Olympic Games, it is tempting to merely describe surfing as a sport. At one level it is, but for many, it is considered more of a lifestyle. Surfing is also variously described as a spiritual communion with nature (Lazarow & Olive, 2017). Anderson (2014) highlight Ford and Brown`s (2006) definition that "…the core of surfing has always simply been the embodiment, raw and immediate glide or slide along the wave of energy passing through the water" (2006:149). The central experience of surfing can, therefore, be explained by the relationship to nature and the direct elemental contact with the ocean. Surfing thus depends upon direct contact with elements such as waves, wind, tides, currents and weather and according to Lazarow (2010), the local surf-quality is fundamental to all of this. A study conducted by Towner (2015) suggest that good quality surfing was the primary factor for surfers` site-choice when travelling to the Mentawai Islands. Hence, surf-quality can be viewed as a vital beach attribute.

Good-quality surf is further disaggregated into wave quality, wave frequency and "surfer safety". The former refers to the dominant local view of how the wave breaks in the form of height, wedge and peel angle, while wave frequency refers to the number of "surfable" waves. Water quality and crowding are two common terms used to describe "surfer safety". Crowding refers to the conditions surrounding the surfing experience such as surf rage[1], aggressiveness and sharing. It relates to surfer safety because overcrowding may lead to physical injury, for example, being struck accidentally by a board. Water quality, on the other hand, is the environmental or biophysical conditions often measured as the amount of sewage in the water. Having poor water quality may lead to ear, nose, throat or intestinal illnesses (Lazarow, 2007).

Other relevant surf-related characteristics are parking availability, wind direction and scenic quality. Jæren is said to be windswept (Vangerud, s.a) and the wind could, therefore, determent a surfer`s site-choice along the Jæren coast. Scenic quality or beauty is said to be a motivation for surfing. Hence, the natural beauty of the Jæren beaches could be a significant reason why individuals choose to surf there. Further, surfing requires lifting heavy surfboards, which means one is dependent upon a car. Thus parking availability becomes necessary (Frode Goa, personal communication, February 2018). This statement further suggests that some surfers might value the ability to rent a surfboard. In addition to facilities such as surf rentals, the ability to change clothes privately could also be valued by some surfers. Public restrooms/changing rooms are provided at some of the Jæren beaches (Jæren Friluftsråd, Jærstrendene, n.d.). As such, one may wonder if this has an impact on surfers wellbeing.

## 2.3 "Jærstrendene" as a Surf Region

Surfing at Jæren started in the early 1980s and has since the 1990s escalated in popularity (Follestad, Gjershaug & Stokke, 2016). Regular swell, pristine waters and marvellous scenery have allowed the coast of Jæren to attract more surfers and has become a popular cold-water surf destination in Norway (Magicseaweed, n.d.). In 2017, Jæren hosted for the first time the ISA EFT Eurosurf (Region Stavanger, 2017). On top of being the first Scandinavian host of the European Championship in surfing, Jæren also hosted Norgescup in April 2018. Both events are an indication of the increased popularity of surfing along the coast. The exact number of surfers, however, is subject to uncertainty due to the lack of research done on the subject. The

[1] The term "surf rage" is often used to describe the violence that occurs when surfers attempt to protect "their" wave from unwanted outsiders (Lazarow et al., 2009).

estimates we do have are the number of club and group memberships. Stavanger Surf club has about 40 members, while "JÆREN BOARDRIDERS", a closed Facebook group that connects individuals to the surf network, currently has 1 743 members (Follestad et al., 2016).

The surfing conditions found in the area is not the most stable in Norway due to strong wind along the coastline. The wind creates "messy" waves often considered unfit for surfing. Nonetheless, the presence of boulder reefs and sandy beaches along the coast generate numerous spots compared to other popular surf destinations in Norway. The following fourteen surf spots are commonly known: Sola, Ølberg, Hellestø, Byberg, "Suppå", Sele, Bore, "Toveis", Reve Havn, Svinestien, Orre, Refnes, Kvassheim, and Brusand (Magicseaweed, n.d.; Tina Eliassen, personal communication, February 2018). Other spots are secret and only known to some surfers (Frode Goa, personal communication, February 2018).

Conditions are generally better for inexperienced surfers in the summer and early autumn due to hot water and relatively small waves. Hellestø, Sele, Bore, and Brusand are particularly suitable for the occasional surfers with less experience. Kvassheim and Svinestien, on the other hand, provide more powerful and challenging waves and are more suitable for experienced surfers. The conditions are generally best during the winter period (Visitnorway, 2017).

### 2.3.1 Threats to the Surfing Experience at Jæren

Increased coastal urbanisation, beach development, privatisation of coastal zones, sea level rise, shoreline armouring, pollution, marine litter and paraffin wax pose threats to the beaches along the Jæren coast (Lundberg, 2010; Jæren Friluftsråd, personal communication, February 2018). Threats that routinely impact surfing resources include water quality, sea level rise and regulations (Lazarow, 2007).

In general, natural or human modification to the resource base has the potential to create, modify or destroy waves. There have been many examples of waves being either destroyed or improved (Murphy and Bernal, 2008; Lazarow, 2007). Table 1 explains how the surf-quality, hence surf-related attributes, are impacted by the environment or by human interaction at "Jærstrendene". The table is adapted and inspired by the work of Lazarow et al. (2009).

*Table 1: Human impacts to the surfing experience at "Jærstrendene"*

| Item | Natural or Human impact on "Jærstrendene" |
|---|---|
| Wave quality | **Construction of coastal protection/amenity structures (**No reported construction at Jæren that could potentially affect waves) |
| Wave frequency | **Sand management** (e.g., Jæren Friluftsråd (JF) have developed paths to direct the visitors in the preferred direction and area, which prevents unwanted activity in those areas of the coastline that are more exposed to damage. This type of sand management helps maintain the good-quality waves). |
| Environmental | **Biological impacts** (e.g. by pollution, marine litter, agriculture, sewage and paraffin wax pose threats to the water quality at Jæren (Jæren Frilufrsråd, personal communication, February 2018)).<br>**Climate change/variability** (e.g. temperature change, less or more storms, sea level rise will lead to beach loss by 2100 (Simpson, Nilsen, Ravndal, Breili, Sande, Kierulf, Steffen, Jansen, Carson & Vestøl,, 2015))<br>**The amenity of the surrounding built and natural environment** ("Jærstrendene" are known for their natural beauty. Could be a positive attribute). |
| Experiential | **Legislation/regulation that might grant, restrict, or control access** (e.g. the ban on surfing during the winter season due to protecting the bird life. This regulation generates internal conflicts between recreational surfers and the Norwegian Environment Agency (Follestad et al., 2016))<br>**Increasing interest in surfing** threatens the low average level of crowding in the water. (e.g., might lead to a phenomenon known as surf rage)<br>**Availability of parking, changing rooms and surf rentals.** (e.g., JF have increased available parking and public restrooms in locations where the sand-dunes are less exposed to human interaction. The increased availability might have a positive effect on the surfing experience[2]) |

# 3. Previous Research

The most frequently valued recreational activity is general beach recreation (Nelsen, 2012). However, failure to distinguish niche groups, such as surfers, may cause limit research. General beach recreation surveys do not account for nuances in behaviour or preferences that drive choices about coastal recreation, which is vital if one is to understand how specific groups use the coast and how they are affected by environmental changes. Acknowledging that surfers are substantially different from the general beachgoers, has resulted in growing work related to the economics of surfing (*ibid.*). Below follows a literature review.

[2] Whether facilities and public restrooms are affecting the surfing experience is analysed in chapter 10.

## 3.1 Surfers` Documented Visitation Patterns

Nelsen et al. (2007) documented a socioeconomic study of surfers at Trestles Beach and found surfers` beach visitation patterns. The results suggested that surfers travelling to Trestles beach travelled on average, 46 miles, which according to the study is 36 miles less than the average beach user. Surfers were also proven to be more avid than beachgoers. Approximately 38 per cent of surfers who visit Trestles makes over one hundred visits per year, which is 31 per cent higher than the general beachgoers annual visitation rate. Lastly, surfers tend to visit the beach at a different time of day. They generally leave in the morning or evening, while general beachgoers tend to visit the beach in the middle of the day. All three scenarios imply that surfers have distinct visitation patterns and values associated with their recreational choices.

Neil Lazarow (2009) constructed a series of online and face-to-face surveys from 2006 to 2008 with the aim of documenting surf activity at the Gold Coast of Australia. One of the primary focus of the study was the identification of the issues that might affect a surfer`s status quo visitation rate. Out of six scenarios, the most likely reason to keep a surfer out of the water was the risk of contracting gastroenteritis, with 46 per cent indicating that they were unlikely or not going surfing. The second most likely reason to keep a surfer out of the water was the social issue of the likelihood of aggression in the line-up (44%). A biophysical scenario about a skin rash was the third most likely scenario (35%). Comparing the social scenarios with the biophysical, the latter have in aggregate higher probability to keep a surfer from surfing. The findings thus suggest that surfers are sensitive to environmental conditions.

## 3.2 The Direct Market Value of Surfing

Over the past decade the Save the Waves Coalition has commissioned six “surfonomic” reports on internationally recognised surfing destinations (Table 2). These studies estimated the direct market impact of surfing by examining how much money surfers contribute to the local economy. Through spending related to access, equipment, goods and services they were able to estimate the direct market value of recreational surfing at different surf locations.

*Table 2: "Surfonomic" studies commissioned by Save the Waves Coalition.*

| Location | Study | Surfer daily expenditure | Annual economic contribution |
|---|---|---|---|
| Huanchaco, Peru | (Save The Waves Coalition, 2014) | $45/day | $1.7 million dollars |
| Mavericks, USA | (Coffman &Burnett, 2009) | N/A | $24 million dollars |
| Mundaka, Spain | (Murphy & Bernal, 2008) | $120/day | $1-4.5 million dollars |
| Pichilemu, Chile | (Wright et al., 2014). | $168/day | $2-8 million dollars |
| San Miguel, Baja, Mexico | (Save The Waves Coalition, 2014) | $111/day | N/A |
| Uluwatu, Bali, Indonesia | (Margules, 2014) | $150/day | $35 million dollars |

The studies imply that recreational surfing inject millions of dollars into local economies, ranging from $1 to $35 million a year. Daily expenditures in Huanchaco, Peru was estimated to be lower compared to the other studies, which resulted in a somewhat low annual economic contribution. Surfers located in Pichilemu and Mundaka also spend somewhat less per year. This, however, is due to poorer visitation rates compared to Uluwatu and Mavericks. By 2004, Mundaka experienced a three-year drop in surf tourism due to a negative externality of a dredging project, in which changed ocean dynamics and ultimately lead to the destruction of the sandbar that shaped the known Mundaka wave (Murphy & Bernal, 2008).

In addition to documenting surfers` beach visitation patterns, the socioeconomic study on Trestles Beach also estimated the market value of surfing at the site. With the same survey methodology as the Save the Waves Coalition the average surfer expenditure per trip was estimated to be $40.20. The estimated daily expenditure sums up to a total annual economic contribution between $8 and $13 million in direct spending (Nelsen et al., 2007). Lazarow (2009) extended this version to a much larger region. In his study, the estimated value of recreational surfing on the Gold coast of Australia ranged from $89 to $164 million annually.

A detailed analysis carried out under the direction of Lenard Huff at Brigham Young University, Hawaii collected data on daily expenditures of spectators rather than the surfers themselves. Valuing the Vans Triple Crown of Surfing hosted by the North Shore of Oahu, Huff reported an average expenditure of $173.12 per day. An estimation of 23 195 spectators generated a total of $21 million in direct contribution to the local economy during a period of twelve days (2011; as quoted in Scorse & Hodges 2017).

## 3.3 The Non-Market Value of Surfing

The prior studies discussed above focused on the economic impact of the industry on local economies. There is another aspect of economic value which comes from the welfare or benefits that surfing provides. In recent years, more researchers have attempted to estimate this non-market value. To date, the literature covering this aspect of surfing is scarce. Only two environmental valuation models have been employed, namely the travel cost model (TCM) and hedonic pricing in the real estate market (Scorse and Hodges, 2017).

Tilley (2001) was the first to estimate surfers' consumer surplus (CS) by an individual travel cost model (ITCM). The study reported a CS of $84.6 per day trip for surfers at Pleasure Point, California. The individual CS per trip is equivalent to approximately $8.4 million. Using the same approach as Tilley, Coffman and Burnett (2009) reported a CS of $56.7 for surfers per day trip for surfers in Mavericks, USA. Nelsen (2012) adopted the same approach and found a CS estimate of $138 for surfers at Trestles Beach in California.

One of the latest studies on estimating CS for surfers was done in 2014 by Silva and Ferreira. In their study, they documented the economic value of the waves in Costa de Caparica by using the Zonal Travel Cost Method (ZTCM). The study reported a CS of $62.40 for surfers per day trip. Comparing their findings with other travel cost valuation studies (Table 3), we see that Costa de Caparica reported a similar estimate as Mavericks and Pleasure point. Since all three sites are considered popular surf destinations, similar estimates are reasonable. The survey conducted on Trestles Beach, on the other hand, has a substantially higher valuation estimate. Different use in survey instrument may be the cause of this. Compared with the others, the Trestles beach study used online surveys rather than on-site. As Nelsen (2012), sheds light on, implementing online surveys have the potential to collect more data.

Valuing the famous surf break in Santa Cruz, Scorse, Reynolds and Sackett (2015), reported an average home premium to live near the surf break to be $10 000 per year. However, the value of surfing in this study was estimated through the means of hedonic pricing in the real estate market. Thus, the estimated recreational value of surfing is not directly comparable to the other studies.

*Table 3*: Comparison of the additional CS per trip to different surf regions. Adapted by Silva & Ferreira (2014)

| **Surf region** | **Study** | **On-site** | **Method** | **Welfare measure** | **Result** |
|---|---|---|---|---|---|
| Coffman & Burnett, 2009 | Mavericks, USA | Yes | ITCM | CS | $56.7/person/trip[3] |
| Nelsen, 2012 | Trestles Beach, USA | No | ITCM | CS | $138/person/trip |
| Silva & Ferreira, 2014 | Costa de Caparica, Portugal | Yes | ZTCM | CS | $62.40/trip[4] |
| Tilley, 2001 | Pleasure Point, USA | Yes | ITCM | CS | $84.6/person/trip[5] |

# 4. Theoretical Framework for Non- Market Valuation

Basic microeconomic welfare theory is applied when valuing economic goods and services (Flores, 2003). Conceptually, the same theoretical framework applies to estimations of environmental goods and services. In the case of valuing a recreational activity, such as surfing, information about monetary values and benefits gained is not as readily available. Individuals can surf without a charge and thus have no easily observed market price nor quantity data. Due to lack of market counterparts, a theoretical framework for non-market valuation is formed to capture the non-market value of surfing.

## 4.1 The Utilitarian Theory

The conceptual basis of basic microeconomic welfare theory is utility (Pindyck & Rubinfeld, 2015). Barbier and Hanley (2009) define the term "utility" as factors that make people happy or to explain peoples' choices. Briefly explained, the utilitarian theory assumes that individuals have preferences over goods and make rational choices when maximising their utility, subject to a budget and time constraint. To calculate welfare measures one can explore the link between unobserved individual preferences and observed prices and quantities. Although there is no direct observed price that a surfer pays to use the beach and enjoy the waves, the foundations of utility theory can still quantify and value surfing. Using the round-trip cost of transportation to the surf location, travel time and time-on-site as a proxy for the recreational price of surfing one may derive a utility function (Flores, 2003).

[3] Calculated through EURO 2009 currency rates USD 1.39 https://www.statista.com/statistics/412794/euro-to-u-s-dollar-annual-average-exchange-rate/
[4] Calculated through EURO 2014 currency rates USD 1.33 https://www.statista.com/statistics/412794/euro-to-u-s-dollar-annual-average-exchange-rate/
[5] Calculated through EURO 2001 currency rates USD 0.9 https://www.statista.com/statistics/412794/euro-to-u-s-dollar-annual-average-exchange-rate/

Sources tell us that wave quality, wave frequency, water quality and crowding, respectively good quality surf, play a role of surfers' beach visitation decisions (Nelsen et al., 2007; Towner, 2015). For this reason, beach surf-related attributes may be important determinants of the recreational value of such beaches. Indicating that the attributes of a beach might have a significant impact on visit frequency for surfers, thus the indirect utility of discrete choice is a more appropriate theoretical framework.

## 4.2 Indirect Utility of Discrete Choice

The basic idea behind discrete choices is that individuals choose from a set of alternatives and is considered mutually exclusive on every choice occasion (O'Donoghue & Hanley, 2004). Suppose a surfer considers $j$ alternative beaches of where to surf. The decision will be relative to the individual`s discretionary income, the associated travel cost and the quality attributes the beach has. Each site alternative is then assumed to give the surfer $i$ a site utility, $v_j$. With this construction, the unobservable indirect utility function for site $j$ can be written in the fashion of Freeman, Herriges, Kling (2014).

(1) $U_j = v(M_i,\, p_{ij}, Q_j) \quad for\ j = 1, \dots, J.$

In this equation, the surfer`s income is denoted by $M$, $p_{ij}$ is the recreational price of surfing, $Q_j$ is a vector of beach qualities. A specification of the indirect utility is often broken down into a simple linear model:

(2) $V_j = \beta_M (M - p_j) + \tilde{v}_j(Q_j),\ for\ j = 1, \dots, J$

Where β represent the marginal utility of income, and $\tilde{v}_j(Q_j)$ is a function representing the utility associated with the quality attributes of site $j$. The individual surfer will choose to visit the site that yields the highest utility; that is, the chosen site alternative, $j$, will satisfy, $V_{ij} > V_{iJ},\ \forall J$ (Freeman et al., 2014).

## 4.3 Derivatives, Elasticities and Welfare Calculation

From the indirect utility function, one can calculate derivatives and elasticities. The former gives us useful information of to what extent the site utility is affected by a change in some attribute. The derivatives are called marginal effects and calculated for a one-unit change. For example, if the recreational price of surfing were to increase, a natural question is to what extent will this affect a surfer's site utility. The derivative of the indirect utility is calculated to address this question. Equation (3) formally express the marginal effect of a one-unit change in some quality attribute.

(3) $ME_{v,q} = \partial V_{ij}/\partial q_j$

One can also determine how a change in another substitute site change the utility of choosing a beach. Equation (4) formally express the mathematical approach for the calculation of a change in another site`s quality.

(4) $ME_{vj,q-1} = \partial V_j/\partial q_{j-1}$

In addition to derivatives, elasticities can also evaluate the impact of a change (Train, 1998). Elasticity measures the sensitivity of one variable to another and can, therefore, determent whether a surfer is sensitive to changes or not (Pindyck & Rubinfeld, 2015). The elasticity of indirect utility, *V,* to some attribute $q$ of alternative *j*, is:

(5) $E_{v,q} = (\%\Delta V_{ij})/(\%\Delta q_{ij})$

Explicitly, the elasticity tells us the percentage change in one variable in response to a one per cent increase in another. If the elasticity is greater than one in magnitude, we can say that the surfer is sensitive to the change occurring and insensitive otherwise (*ibid.*).

The indirect utility function is often broken down into Compensating Surplus and Equivalent Surplus. These measures refer to the net change in income that is equivalent to or compensates for changes in quality of goods (Barbier & Hanley, 2009) The compensating surplus refers to the maximum willingness to pay (WTP) for a change occurring for non-market goods (Flores, 2003). By letting the cost go to infinity, the indirect utility function can also be used to simulate the WTP for the removal of sites. In other words, the loss in welfare due to site-loss. In the manner of Haab and McConnell (2002) the associated WTP as measured by compensating surplus can be expressed as:

(6) $v_j(p_j, q_j^*, M - CS) = v_j(p_j, q_j)$

In general, marginal WTP for an attribute change is:

(7) $\Delta WTP = (\partial V_{ij}/\partial q_j)/(\partial V_{ij}/\partial p)$

# 5. Environmental Valuation

Environmental valuation is the process of placing a monetary value on environmental goods and services which, typically, are not traded in the market (Dixon, 2008). Valuing the environment can, therefore, be described as understanding how much the environment is worth to particular people or society as a whole. Although "valuation" in this context commonly refers to the measurement of monetary values, it also refers to ordering preferences among goods or attributes (Brown, 2003).

The traditional lack of a market for environmental amenities means that there is no direct evidence of society`s WTP for these goods. In the effort to address this problem, environmental economists have broadened the concept of value to Total Economic Value (TEV) and developed different environmental valuation techniques to capture society`s WTP (Dixon, 2008).

## 5.1 Total Economic Value

TEV is the value derived from environmental goods and services (Brander, Baggethun, Lòpez & Verma, 2010). A hierarchy framework (Figure 2) provides a classification of both current and future (potential) use to ensure that any values and benefits gained are not missed or doubled counted (Nelsen, 2012). The TEV framework also makes it easier to characterise why and how people value the benefits gained from the environment (Ozdemiroglu & Hails, 2016).

Consider how a surfer value the benefits gained from different beach attributes. Both use- and non-use values emerge, each of which is then further disaggregated in several value components. As illustrated in Figure 2, use values are values associated with the current or future use of the surf-related attributes. Current use values refer to values derived from both extractive consumption (direct benefit) and non-extractive consumption (indirect benefit). Whereas, future use values are non-extractive and refer to the value of preserving the attributes for potential future use, formally known as option value. One may interpret the option value a bit like an insurance policy. Either way, all components of use values leave "behavioural footprints". Non-use values, on the other hand, are non-consumptive and only exist in peoples' mind. Capturing these values are therefore controversial. Bequest- and existence values are the two most common components of non-use values. The latter is the value of knowing that the beach exists, even though the beach is not necessarily utilised**.** Whereas, bequest value describes the value of preserving the beach and its attributes for future generations. These non-market values can be captured either through Stated Preference (SP) or Revealed Preference (RP) methods within environmental economics (Lazarow et al., 2009; Dixon, 2008; Scorse & Hodges, 2017; Nelsen, 2012). Below follows a classification of both models.

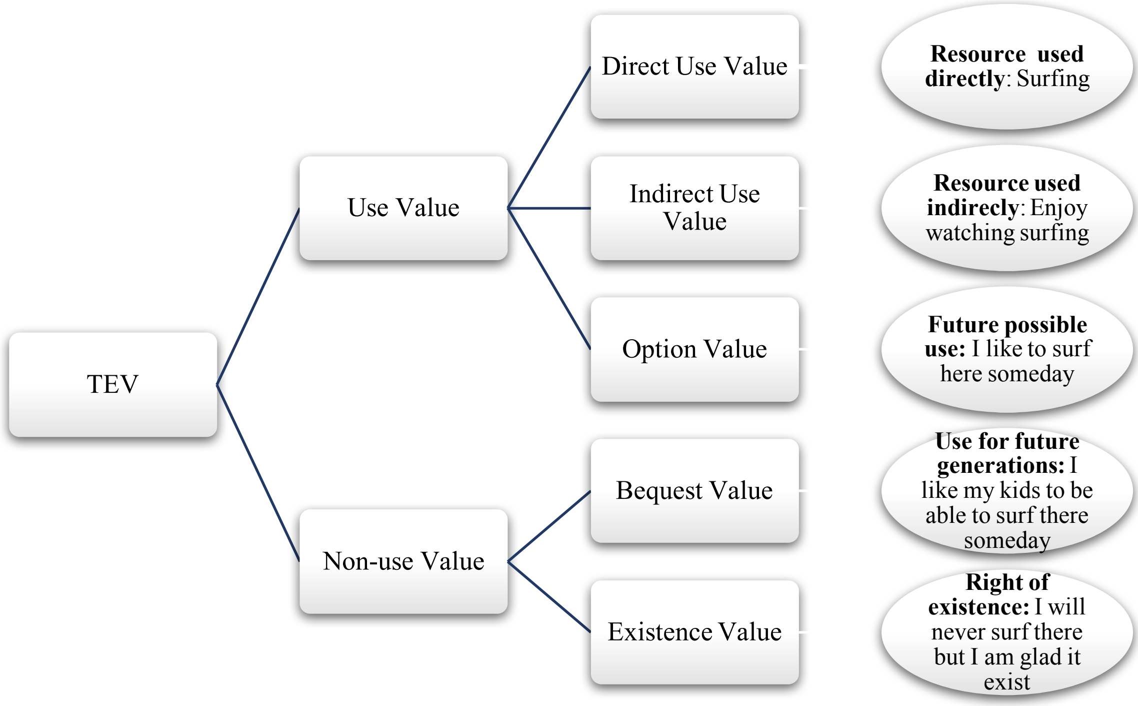


*Figure 2: Non-market values related to surfing. Source: Adapted from Nelson (2012)*

## 5.2 Stated Preference Methods

The SP-methods rely on models of human behaviour and rest on the assumption that hypothetical markets can elicit values (Brander et al., 2010). Because of their hypothetical nature, the models can capture both use and non-use values (Scorse and Hodges, 2017). Hence, using one of these methods can potentially capture the value of a surf wave that we do not observe but which are real (Lazarow et al., 2009). Again, given the hypothetical scenarios, carefully worded survey questions are essential. The two most popular valuation techniques within SP approaches are contingent valuation (CVM) and choice experiments (CE) (Barbier & Hanley, 2009).

The CVM asks direct WTP questions concerning changes in environmental quality. The model was initially designed to measure the monetary value of a single good, but it can also be used to value many related goods that differ in attributes (Brown, 2003). That is, the model can be used to estimate the support that each surf-related attribute would generate. If we were to use this method, a standard approach would be asking surfers for their WTP to preserve wave-quality and frequency. Since this decision involves knowledge about how human modification, beach development and erosion rates affect waves, this hypothetical scenario might leave the respondent in an unfamiliar situation. Further, a reduction in sand-dunes is a long-term process, which is problematic due to lack of realism or immediacy. In effect, this will cause potential bias because the respondent's answers are then less likely to correspond to their behaviour if faced with the same scenario in real life.

The CE method is formally known as choice modelling and was developed initially to order preferences. When using the CE method, one may infer how important each attribute is, how much a person is willing to pay for an increase in any other attribute or a policy that changed several attributes simultaneously. For example, in the case of surfing, one could have designed a nine-attribute survey presented as a choice scenario, where respondents had the unique choice of one of fourteen beaches to visit based on assigned quality levels to each attribute. However, as CE is based on hypothetical scenarios as well, possible bias is still a problem.

## 5.3 Revealed Preference Methods

The RP-methods rely on recalling behaviour that has already taken place (Lazarow et al., 2009). Freeman et al. (2014) argue that the behaviour can be categorised as "revealed" because a person's action in the marketplace reveals information about their preferences for environmental goods and services. For example, what people spend on a trip to a recreational site reveal information about what value they place on that site. Hence, RP methods only capture use values because they draw on values from actual choices people make within markets. The most commonly used methods within RP is HPM and TC-models (Boyle, 2003).

HPM-models, also known as property value models, is based on the theory that through real estate prices researchers can reveal preferences of households for environmental amenities or disamenities (Boyle, 2003). Many avid surfers choose to live close to surf spots and therefore have much lower travel costs, however, pay much higher home prices to live close to surf resources (Frode Goa, personal communication, February 2018). According to HPM-theory some of the consumer surpluses would then be capitalised into real estate values at the coast of Jæren. However, the HPM has its complexity and challenges. The problem is that the Jæren coastal region and its beaches are not only good for surfing. People may pay premiums to live near the Jæren beaches that happens to provide surfing opportunities, but others might pay for swimming and sunbathing in the summer, hiking, nature watching and various other recreational activities. This issue of how to differentiate the reasons why people choose to live near "Jærstrendene" is what makes the model so complicated. One study did employ the HPM-model for the estimation of the non-market value of surfing (Scorse et al., 2015). However, since the surf break in Santa Cruz is used almost exclusively for surfing and little else (due to the small amount of sandy beach adjacent to the cliffs), the HPM could be used.

TC-models are demand-based and typically used to estimate recreational use values of the environment. These models assume that individuals reveal information regarding the value they place in amenities of the chosen site when changes in travel cost incur. Within the TC-methodology, one usually considers the ITCM, ZTCM and the random utility model (RUM) (Freeman et al., 2014). The ITCM and ZTCM are "single-site" models, while the RUM is "multiple-site".

The difference between the ITCM and ZTCM is that the former is estimated on individual data for trip counts, while the latter considers groups of people with similar preferences and travel distance to the site (Freeman et al., 2014). Both models have been employed in "surfonomic" studies. To trace the recreational demand curve, one can use regression analysis based on data of individual's distances travelled to a surf location. With this estimated demand curve one can further calculate a surfer's CS, which represent the aggregate WTP for the good or service. This estimation is done by hypothetically raising the price, to the point at which the surf location is so expensive that no one would choose to surf there, commonly referred to as the "choke price". From basic microeconomic theory, we know that the area under the demand curve is the consumer surplus in dollar terms (Scorse & Hodges, 2017).

Although the frequency of visits to a particular surf location undeniably has a vital role to play, a more suitable approach in this case of surfing at Jæren would be the Random Utility Model of Site Choice (RUSC). As the Jæren coast have a total of fourteen known substitute sites, it would be of vital importance to focus on the substitutability of possibilities between sites. Then the analyst can quantify the trade-offs people are willing to make between the available surf sites and their attributes. Applying this model, we can thus figure out which attributes surfers value the most. If, for example, the result of the estimated RUSC model shows surfers driving further to obtain better wave quality we have substantial evidence that surfers are not price-sensitive and thus quality characteristics may be more critical.

# 6. The Random Utility Model of Site Choice applied to case study area: The coast of Jæren, Norway

McFadden developed the standard statistical Random Utility Model (RUM) in 1974, while Bockstael, Hanemann & Strand introduced the first recreational choice application (1986; as quoted in Haab & McConnell 2002). As of today, the RUSC model is growing in popularity, and most modern applications of the TCM use this approach when valuing non-market goods (Barbier & Hanley, 2009; Phaneuf & Requate, 2016).

In the RUSC model, surfers' site-choice is dependent on site characteristics. An error term is applied because all the features of a person`s utility function and preferences are not observable (Flores, 2003). Since the utility is considered to be random in the RUSC methodology, one uses the expected value of choice occasion utility, instead of a deterministic value. The model thus estimates the probability that a surfer will choose to visit a given surf site at Jæren, depending on the site's attributes and the characteristics of the other alternatives. Better site characteristics translate into a higher probability that the surfer will choose to surf at that site, resulting in a higher value of the site (Parsons, 2003).

## 6.1 Defining the Choice Set

An ongoing issue with RUSC model is to identify the potential set of substitutes for inclusion. Defining the choice-set might cause errors because it could either be too large or too small. As mentioned, there are some hidden surf sites at Jæren that only experienced surfers in the Stavanger region are aware of (Frode Goa, personal communication, February 2018). Excluding these hidden sites from the choice-set can create problems. By excluding such sites, one is consequently understating a surfer`s ability to substitute away from an alternative when conditions are worsened. If so, the welfare impacts of those changes may be overestimated. Another issue caused by exclusion is that the researcher`s ability to identify critical marginal effects are limited. On the other side, including these might also add challenges. The fact that these surf sites are "hidden" means that only a few individuals will have visited these sites, and could, therefore, potentially understate the value of high-quality surfing. Note that a too large choice set would not be beneficial because it becomes unmanageable from an econometric perspective (Barbier & Hanley, 2009). In the effort to avoid underestimating the value of surfing at Jæren, the best approach would be to restrict the choice-set to only well-known sites.

## 6.2 The valuation of Time

Round-trip travel to a site and the recreation activity itself take time, and time is scarce. In economic terms, an opportunity cost of travel occurs (Freeman et al., 2014; Barbier & Hanley, 2009). The methodological issue, however, is how to incorporate this opportunity cost of time into the RUSC model. Previous studies show ambiguous results. Some researchers have tried to estimate the value of time for individuals in a questionnaire and treat the opportunity cost as a separate variable. Arguably, including travel time as a separate variable will result in omitted variable bias in the travel cost coefficient and further bias welfare estimates. Because of the potential multicollinearity, the usual convention is to add time cost to the travel cost variable in the model (Loomis & Keske, 2009).

One may argue that it is possible to use the actual wage rate for a surfer as their time cost. A surfer's decisions depend so much on current conditions, and according to Magicseaweed (n.d.), surf-conditions along the Jæren coast are not stable. Therefore, if the beaches one day experienced great conditions, a surfer might take some hours off work. However, this does not necessarily concern all surfers. Inexperienced surfers, for example, are less likely to take time off work even if the conditions are splendid. Besides, previous studies have shown that most people go surfing before and after work (Nelsen, 2012). Therefore, a fraction of the wage rate would be a more suitable approach in the case of surfing.

Concerning the opportunity cost of time spent on-site, most studies value it at zero and exclude it from the model. It is argued that the time spent on site provide individual benefits that are at least equal to the time cost, in effect, they cancel each other out (McConnell, 1992).

### 6.3 Multi-Destination Trips

An issue for all TC-models is the treatment of multiple purpose trips. If the individual engages in more than visiting the recreational site to surf, the travel cost incurred is no longer a valid proxy for the recreational price. Trip expenses are then no longer exclusively incurred for surfing. Subsequently, the cost is now a marginal measure to the "surfing portion" of the trip (Refsdal & Lohaugen, 2016).

The two standard ways to handle the issue is to either assume that all respondents are there for a single purpose, to surf, or to identify the respondents that are going on multiple-purpose trips (e.g. one might surf after going shopping) and drop them from the analysis. Another treatment would be to define site attributes or characteristics in such a way that they account for the potential of other activities while visiting the beach. By including a dummy variable for the presence of, for example, a shopping mall nearby will allow the researcher to recognise that a surfing experience may be broader than the activity at the beach alone (Parsons, 2003). Several sources indicate that Jæren is most known for its beaches (Visitnorway, 2017; Vangerud, n.d.; Humberset, 2013; Jæren Friluftsråd, Jærstrendene, n.d.), which again implies that the potential of other activities other than beach recreation is less likely. Therefore, the two former approaches would be preferable.

### 6.4 Preference Heterogeneity

Within site choice TC-models, preference heterogeneity implies that people have varying preferences for site attributes. A surfer might, for example, emphasise the importance of a low level of crowding in the water compared to another who more heavily cares about available parking. Mathematically, a person`s preferences are expressed through the βs (Barbier & Hanley, 2009). The "standard" way of dealing with different preferences and how they value each attribute is only to include the β value on travel cost, respectively the marginal utility. Then further assume that attributes` average effect on choices effectively represents preferences. However, if the analysed sample has considerably varying preferences, it will still raise issues of heterogeneity. In the case of valuing recreational groups, Hanley, Hynes & Garvey (2007) argue that varying preferences can be accounted for by segmenting the sample either according to their skill level or experience. Hanley & Barbier (2009) also confirms that segmenting the sample is an appropriate approach. As such, preference heterogeneity in the case of surfing can be accounted for by segmenting the sample.

# 7. Methodology

When analysing data of site choice, the linear probability model (LPM) is a simple way to do so. Still, the model has some drawbacks. For instance, the fitted probabilities can be less than zero and greater than one and the partial effect of an explanatory variable is constant. To avoid limitations of the LPM more sophisticated binary response models can be implemented. More specifically, the multinomial logit (ML) and the conditional logit (CL) model (Wooldridge, 2015). For this study, however, the ML model is not suitable because the model assumes that socio-economic variables determent the recreation choice rather than the attributes. Further discussion will, therefore, only include the CL model.

## 7.1 The Conditional Logit Model

Estimating the parameters of the discrete utility function is done in a probabilistic framework, due to the error term. Thus, the CL model gives us the probability that individual $i$ chooses alternative $j$. In the CL-methodology the error term is assumed to be independently and identically drawn from an extreme value distribution. As shown by Haab and McConnell (2002) the CL model, respectively the probability that an individual visits site $j$, is written as:

$$(8)\ pr_{ij} = \frac{\exp(V_{ij})}{\sum_{k=1}^{J} \exp(V_{iJ})}$$

From equation (8) we see that the probability depends upon the utility received by the chosen site and on the utility received from all sites. Thus, the probability of visiting site $j$ depends on the characteristics of the chosen site and the characteristics of all other sites, $J$.

A weakness of employing the CL model is that it can cause a restriction known as the independence of irrelevant alternatives (IIA). The IIA restriction indicates that the probability of choosing between any two sites is independent of changes that may occur in other alternatives in the choice set. For example, if an improvement in a site attribute causes a 5 per cent increase in the probability of visiting that site, then the probability of visiting each of the remaining sites in the choice set must decrease by 5 per cent. The results might then be unrealistic because one site could be a better substitute for the site experiencing the improvement. One expects good substitutes to have a more significant percentage reduction in probability than poorer substitutes. Hence one would not expect a proportional reduction in all other probabilities (Parsons, 2003). The nested logit (NL) and the Mixed logit are two econometric models said to relax the IIA restriction (Haab & McConnel, 2002).

In the conditional methodological framework, the welfare measure for loss of multiple sites is found by the log-sum formula, whereas a probabilistic framework for the derivatives and elasticities is employed for calculations. Table 4 list the different equations both from a basic utility theoretical framework and within the conditional methodological framework.

*Table 4: Equations derived from the indirect utility function.*

| Equation | Formally | CL-model |
|---|---|---|
| 5 | $\partial V_{ij}/\partial qj$ | $(\partial V_{ij}/\partial q_{ij})\, P_{ij}(1 - P_{ij})$ |
| 6 | $\partial V_j/\partial q_{j-1}$ | $-(\partial V_{ij}/\partial q_{ij-1})\, P_{ij}P_{ij-1}$ |
| 7 | $(\%\Delta V_{ij})/(\%\Delta q_{ij})$ | $(\partial V_{ij}/\partial q_{ij})\, y_{ij}(1 - P_{ij})$ |
| 8 | $v_j(p_j, q_j^*, M - CS) = v_j(p_j, q_j)$ | $\frac{1}{\beta_m} * ln\left[\left(\sum_{j \in J*} \exp(\tilde{v}_j)\right) \Big/ \left(\sum_{j=1} \exp(\tilde{v}_j)\right)\right]$ |

## 8. Survey Design & Implementation

Identification of the sites within the choice set and their relevant attributes were the initial steps in this study. A personal interview with an expert from JF and an in-depth interview with an experienced surfer in the Stavanger region, Frode Goa, was conducted to accomplish this. Previous studies on the subject, forecasting websites and the experience of an acquaintance (Eliassen), also helped in this process. Fourteen surf locations and nine surf-related attributes were identified (see page 5).

Regarding the site attributes, there was a wide variation in the individual evaluations of surf site characteristics. It was deemed crucial to keep this richness of information in the model. Implementation of subjective measures for all attributes other than travel cost was, therefore, the most preferred approach. Only using external data on travel cost was deemed appropriate by Hanley et al. (2007). The nine-related attributes identified were therefore ranked by surfers` judgement.

## 8.1 Pilot Study

A pilot study was performed by a total of five individuals before implementing the survey. The aim was to ensure that any mistakes or unclear formulations were corrected for. Inputs from experts and users were accounted for and major corrections were made concerning design issues and unclear questions. For accuracy, a linguistic expert revised the language in the survey. At the beginning of April, the survey was ready, and the data collection started.

## 8.2 Survey Design

The survey instrument included questions about the visit frequency to the fourteen different surf sites. Specifically, respondents were asked how many times they had gone surfing in the last twelve months to each of the 14 areas[6]. Trip count questions were included for descriptive purposes. Then, respondents were asked to score (from -3 to 3) attributes of the last visited, the second last visited and the most often visited beach. Making the respondents score beach characteristics in three choice settings was an attempt to capture variability in choices and account for the issue of on-site sampling known as endogenous stratification.

After being asked about surf trip behaviour in general and the quality of the surf sites, the respondents were further asked to state whether the last and next last surf session were sole, main, or multi-destination, followed by questions about transportation mode, and travel distance and time[7]. Next, they were asked to provide information about spending related to surfing and their surfing abilities and experience. Respondents were also asked whether they would change their behaviour on one hypothetical scenario. They were presented a photo with a sign stating that any wave activities were forbidden during the time from October to April along with a short descriptive text. The aim was to get respondents to reveal how they are affected by the current ban of surfing along the coast. The hypothetical scenario was inspired by the ongoing conflict between the government and local surfers on the protection of birds.

Other questions that were asked in the survey, that were important for the analysis in this thesis related to standard socio-economic information such as gender, age, education, postal code, employment status, household size and household income before tax. The respondents were

[6] Those sites that were not visited in the previous twelve months were assigned a trip value equal to 0.
[7] Respondents were asked about travel distance and time to account for surfers who travel from beach to beach to find the best surf conditions. Some might drive six hours before deciding on which/what beach to surf on. If this were not accounted for, travel cost could be overvalued (Frode Goa, personal communication, February 18).

also asked whether they were members of any surf clubs due to get a general idea of surfers' characteristics at the Jæren beaches. The socio-economic information on income allowed one to estimate a potential hourly wage rate for each respondent. The estimation procedure for this will be expanded upon in chapter 8.4.

## 8.3 Survey Implementation

The sampling population target were respondents attending "Norgescup" on the 13th and the 14th of April 2018 to ensure that all answers would be comparable. A sample of 32 responses was acquired on-site. To widen surfers were offered to take the questionnaire home and post it in a prepaid envelope. A total of twenty-five envelopes were handed out during the two days. However, the University of Stavanger only received three returned surveys. A sample of 35 responses from surfers was eventually acquired.

## 8.4 Data Processing: The estimation of Total Travel Cost

Google Maps, Statistics Norway and NAF were the external sources used to estimate travel distances and time. Following the approach adopted by Blaine, Lichtkoppler, Bader, Harman & Lucente (2015), the out-of-pocket transportation cost was calculated using the recommended itinerary in Google Maps. With this, information concerning toll road passages, travel distances and time were found.

By multiplying the cost per kilometre, *y*, with the round-trip distance, *d*, and thenceforth adding the fee for toll roads, one was able to obtain the out-of-pocket transportation cost. Formally, the travel transportation cost is:

(9) $TC = \gamma d + f$

Gasoline, diesel and electric or hybrid cars have different average estimates of cost per kilometre. Fuel consumption per kilometre was estimated to be NOK 0.91 and NOK 0.71 for gasoline cars and diesel cars, respectively. Hybrid or electric vehicles have a lower cost per kilometre and is assumed to be NOK 0.2 (NAF, 2017). For those respondents who stated "scooter" as their transportation mode, the cost per kilometre was assumed to be the same average as electric and hybrid vehicles. A round-trip toll road fee, set to NOK 32, was applied to respondents' in use of either a gasoline or diesel car.

To develop an appropriate estimate of the opportunity cost of travel time, also known as the value of leisure, the standard assumption of the human capital literature was assumed. The cost of leisure is, therefore, assumed to be a fraction of an individual`s hourly wage rate, specifically one third. To find the individual's hourly wage rate, one must first divide stated household income by the number of contributing household members and then further divide this by the average number of hours worked in a year. According to Statistics Norway (2016a), this is estimated to be around 1950 hours. To find the opportunity cost of time, *TT,* one must multiply the respondent`s fraction of wage rate, $w$, with $t$, the round-trip travel time. The following equation is:

(10) $TT = w * t$

The total travel costs, *TTC*, was calculated by adding *TT* and *TC* together. Mathematically expressed as:

(11) $TTC = TC + TT$

# 9. Descriptive Analyses

This chapter first provides an overview of the participation profile and skills of surfers. Further, it presents surfing-related spending and descriptive visitation patterns. Finally, the chapter provides an overview of attributes and average scores. The aim is to capture varying preferences in site-choice and give a general characterisation of surfers at the Jæren beaches.

## 9.1 Participation Profile

Among the 35 responses, one respondent stated his residency was in Drammen. However, when surfing in the Rogaland region he travelled from his cabin at Kleppe. Because of this, removing the respondent from the full sample was not needed. Three respondents, on the other hand, could not be used due to incomplete answers or having a too high travel cost compared to the mean. The high travel cost had to be eliminated to account for the high standard deviation in the data set and bias in the calculation of travel cost. A sample of 32 useable responses from surfers was eventually used for the analyses.

Among the respondents, twelve were in the age range of 20-25, which was the largest of the age groups. Eight surfers were in the age bracket 26-31, and only four questioned were aged over 31 years. Most of the respondents were male (n=20), leaving them somewhat overrepresented. Regarding employment status, twelve respondents stated that they worked full-time, while five and fifteen surfers were working part-time or still in school, respectively. Education level varied somewhat, the majority had sixteen years of schooling (n=13), twelve had completed eighteen years, and six respondents had thirteen years of schooling. Only one respondent stated twelve years of schooling. Lastly, six respondents were a member of a surf club. Table 5 presents statistics on respondents' characteristics.

*Table 5*: *Respondents characteristics*

| | **# respondents (N=32)** |
|---|---|
| **Gender** | |
| Female | 12 |
| Male | 20 |
| **Age** | |
| 20-25 | 20 |
| 26-31 | 8 |
| Over 31 | 4 |
| **Employment status** | |
| Full-time | 12 |
| Part-time | 5 |
| Unemployed | 0 |
| Retired | 0 |
| Discouraged worker | 0 |
| Student | 15 |
| **Education** | |
| Primary school | 0 |
| Secondary school | 0 |
| High school | 6 |
| Higher education (1-4 years) | 13 |
| Higher education ( >4 years) | 12 |
| Other | 1 |
| **Member of surf club** | |
| Yes | 6 |
| No | 26 |

Figure 3 is a histogram depicting where the respondents resided. The municipality where most respondents resided were Stavanger (n=16). Respondents resided in Sandnes, Kleppe, Sola, Hafrsjord, Voll and Tanager represented five, three, two, one and two of the respondents, respectively. The respondents from Drammen represent the "other" option and thus represent one of 32 respondents.

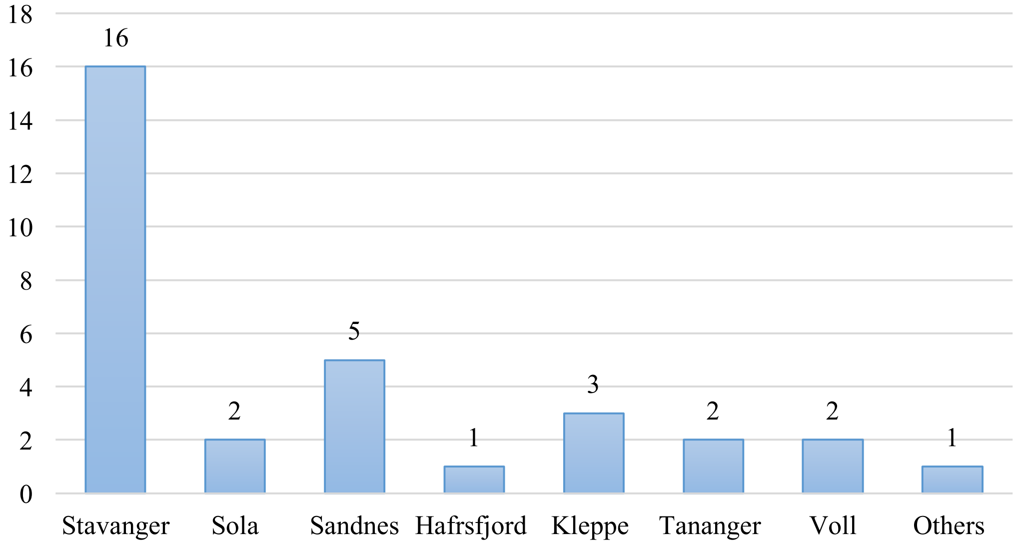


*Figure 3: Municipalities represented among respondents*

A histogram presents the stated mode of transportation to the revealed surf spots among the 32 respondents in Figure 4. Fifteen respondents travelled by diesel car, while ten and four respondents used gasoline car and electric or hybrid car, respectively. Two respondents did state that they usually drove a scooter, whereas one respondent stated that they usually walked or cycled.

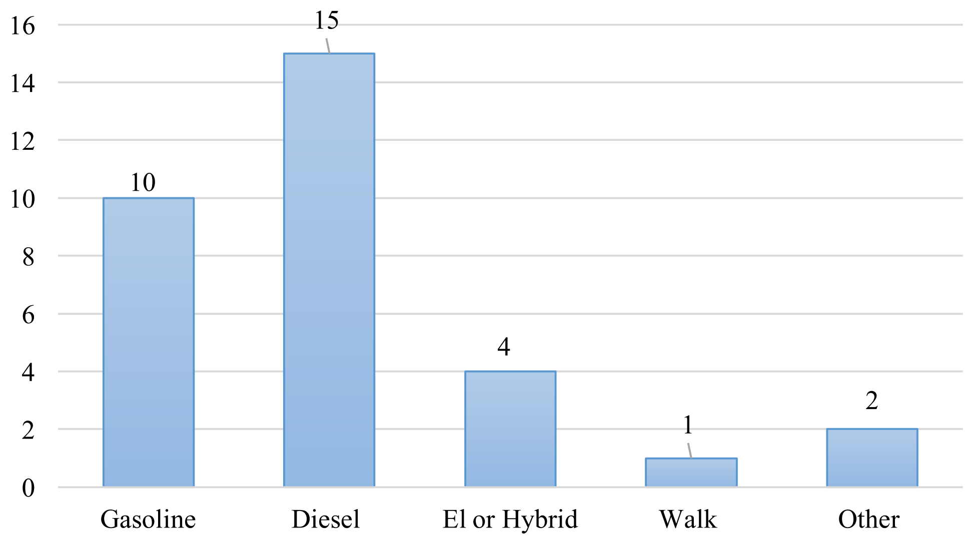


*Figure 4: Transportation modes among respondent*

## 9.2 Participation Skills

Table 6 gives a picture of participation skills and experience for the sample. 21 surfers had been surfing for five years or less, with another eight and two indicating that they had been surfing for between five and ten years and between ten and twenty years respectively. One respondent stated that he or she had been surfing for over twenty years. Overall respondents had been surfing for a minimum of nine months, a maximum of 30 years with the mean at five years.

*Table 6: Statistics of participation skills and experience*

| | **Number of respondents (N=32)** |
|---|---|
| **Activity** | |
| Surfing | 32 |
| Kiting | 4 |
| Windsurfing | 2 |
| Board paddling | 1 |
| Body boarding | 0 |
| **Skill level (Self-defined)** | |
| Beginner (1) | 9 |
| Intermediate (2) | 11 |
| Advanced (3) | 12 |
| Professional (4) | 0 |
| **#years of experience** | |
| less than 5 | 21 |
| 5-10 | 8 |
| 10-20 | 2 |
| Over 20 years | 1 |

From Table 6, we see that the majority define themselves as experienced surfers. However, only thirteen had surfed for over five years. It could, therefore, be interesting to compare respondents own defined skill level to how many months of experience they have (Table 7). As evident in Table 7, surfers with skill level 1 have an average of two months of experience, whereas surfers with skill level 2 and 3 have four and eight years, respectively. Which seems reasonable; however, the high deviations indicate much variation in the dataset. Comparing own defined skill level with stated experience one detects that the number of months' overlap with the different levels of skill. For example, the maximum of six years for skill level 1 is more than the minimum of one year at the intermediate level. The results of this conclude that the respondents might have a different perception of their skill level. There could be some surfers that either overestimate or underestimate their own level of expertise. Of course, one may surf a period and still gain good skills, all depending upon how avid the surfer is.

*Table 7: Participants` defined skill level with  to how many months of experience.*

| Skill level | Mean (#years) | Std.dev. | Min | Max |
|---|---|---|---|---|
| **1** | 0.20 | 1.70 | 4.00 | 72.00 |
| **2** | 4.00 | 3.22 | 12.00 | 120.00 |
| **3** | 8.04 | 7.92 | 24.00 | 360.00 |

### 9.2.2 Surfing-related spending by skill level

During the last twelve months, surfers have spent an average of NOK 4120.69 on surfing-related equipment, with a minimum of NOK 1 500 and a maximum of NOK 12 000. Overall, the 32 respondents purchased a total of NOK 133 500 worth of surfing-related services and goods in the previous year. Hence, surfing as a recreational activity at Jæren contributes to a minimum of NOK 133 500 to the local community, if all equipment was bought in the Rogaland region.

Figure 5 suggests that surfing-related expenditures increase in skill level. On average, surfers with advanced surfing skills spent NOK 8000 during the last twelve months. which is about NOK 4000 more that what surfers with basic skill level indicated they had. Using the surveyed data one was able to obtain the following histogram (Figure 5):

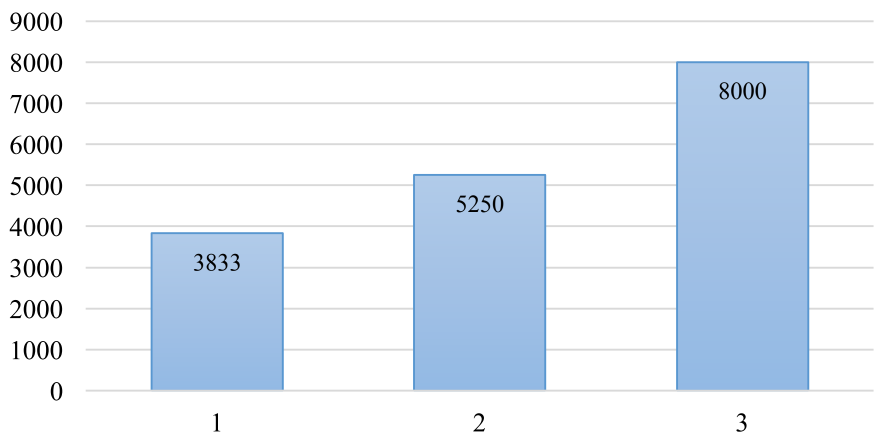


*Figure 5: Average spending by skill level (NOK)*

where the y-axis represents money spent during the last twelve months, and the x-axis is the skill level.

## 9.3 A Descriptive Visitation Patterns

Concerning visitation, eighteen out of all respondents completed 20 surfing trips or less in a year, with the two next largest groups being five respondents, completing from 40 to 60 or over 80 surfing trips in the year. Overall the mean number of surfing trips completed at the coast of Jæren in the previous twelve months was 35 with the median at sixteen.

Table 8 provides summary statistics on visitation to all fourteen surf locations. The visitation summary shows that among the 32 respondents, the time spent during a surf session, hence on site, is about 2.27 hours on average. The average group size is 3.28 persons. Table 8 also reports average TTC to all fourteen surf sites within the choice set.

*Table 8: Statistics of Visitation*

| | **Travel** | **Visitation(mean)** | | **Trips taken (mean)** |
|---|---|---|---|---|
| | Average TTC | Minutes spent on site | Group size (pers.) | The last twelve months |
| Sola | 64.67 | 136.41 | 3.28 | 1.63 |
| Ølberg | 71.72 | | | 0.21 |
| Hellestø | 74.61 | | | 2.86 |
| Byberg | 80.22 | | | 0.41 |
| "Suppå" | 85.03 | | | 0.28 |
| Sele | 76.65 | | | 4.76 |
| Bore | 87.36 | | | 8.28 |
| "Toveis" | 85.31 | | | 3.66 |
| Reve Havn | 88.08 | | | 4.79 |
| Svinestien | 89.33 | | | 0.41 |
| Orre | 97.23 | | | 0.97 |
| Refnes | 109.85 | | | 0.31 |
| Kvassheim | 149.20 | | | 0.83 |
| Brusand | 163.24 | | | 0.90 |

Surfing trips completed in the previous 12 months are provided in Figure 6 (page 31). As evident in the figure, Bore has been the most frequently visited beach, followed by Sele. Hence, as Bore is the most frequently visited surf site, most of the respondents will spend an average of NOK 87.39 per surf trip.

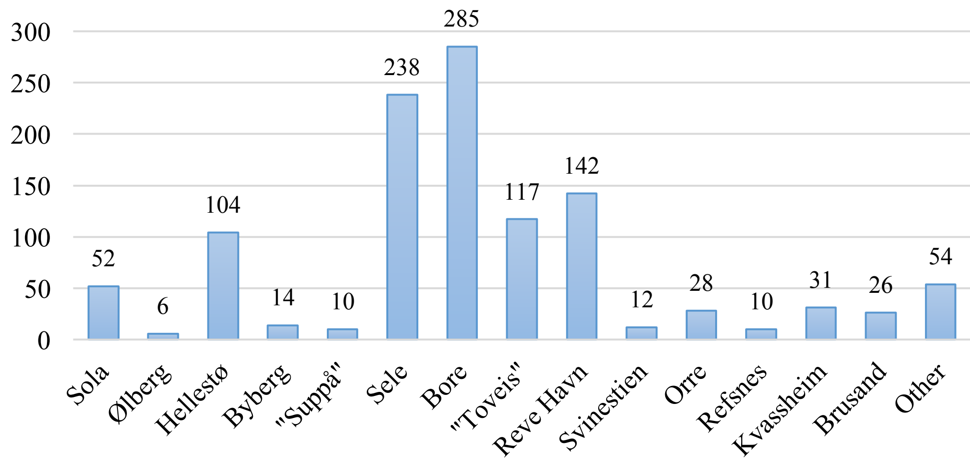


*Figure 6: Revealed trip counts  the last twelve months*

Table 9 gives a picture of surfing activity during the twelve months before the completion of the survey by skill level. Surfers with only basic and intermediate skills (skill level 1 and 2) made 23 per cent less trips, compared to surfers that were more advanced (skill level 3). In fact, advanced surfers made more trips to eleven of the fourteen surf spots in the sample than their basic and intermediate level counterparts. Lastly, as evident from Table 9, surfers who have better surfing skills are more likely to visit a surf spot of difficulty[8].  Indeed, surfers who had only basic skills, hence beginners, made zero trips to Kvassheim and Svinestien, compared to more experienced surfers that visited both sites.

*Table 9: Mean visits to each surf site the last 12 months by skill level*

| | **Skill level 1** | **Skill level 2** | **Skill level 3** |
|---|---|---|---|
| Sola | 0.89 | 1.18 | 2.38 |
| Ølberg | 0.11 | 0.18 | 0.23 |
| Hellestø | 2.00 | 2.45 | 4.54 |
| Byberg | 0.00 | 0.27 | 0.85 |
| "Suppå" | 0.00 | 0.36 | 0.46 |
| Sele | 0.00 | 6.82 | 12.69 |
| Bore | 3.56 | 10.09 | 11.15 |
| “Toveis” | 1.33 | 2.45 | 6.00 |
| Reve Havn | 0.00 | 6.73 | 5.38 |
| Svinestien | 0.00 | 0.64 | 0.38 |
| Orre | 0.00 | 0.64 | 1.62 |
| Refnes | 0.00 | 0.18 | 0.62 |
| Kvassheim | 0.00 | 1.27 | 1.31 |
| Brusand | 0.00 | 0.64 | 1.54 |
| Other | 0.00 | 1.09 | 3.54 |
| Overall | 0.53 | 2.33 | 3.51 |

[8] As mentioned in Chapter 2, Kvassheim and Svinestien are more challenging and more suited for experienced surfers.

## 9.4 Surfer's Stated Behaviour

Among the respondents, most of them stated Bore as their last visited beach (n=15), the second last visited (n=10) and the most frequently visited (n=14). The small variation in revealed site-choice was as expected as Bore is arguably the most well-known surf location in the recreation area (Eliassen, personal communication, February 2018). Table 10 presents the most frequently visited beach by skill level.

*Table 10: Most frequently visited beach by skill level (#)*

| | Skill level 1 (N=9) | Skill level 2 (N=11) | Skill level 3 (N=12) | All surfers (N=32) |
|---|---|---|---|---|
| Sola | 1 | 0 | 0 | 1 |
| Hellestø | 0 | 1 | 1 | 2 |
| Sele | 0 | 1 | 4 | 5 |
| Bore | 7 | 5 | 3 | 15 |
| "Toveis" | 1 | 0 | 0 | 1 |
| Reve Havn | 0 | 2 | 1 | 3 |
| Svinestien | 0 | 0 | 1 | 1 |
| Brusand | 0 | 0 | 0 | 0 |
| Other | 0 | 1 | 1 | 2 |

*Note: Two respondents did not provide an answer*

As evident in Table 10, Bore is most frequently visited surf site by beginners (skill level 1 and 2), while Sele was the most frequently visited surf site by the more advanced surfers. Further, the hypothetical bird scenario had the expected effect on visitation. Most of the respondents did state that they would not change their behaviour (N=32). For those surfers that would change their behaviour, most respondents stated Hellestø as their favourite substitute site (N=14).

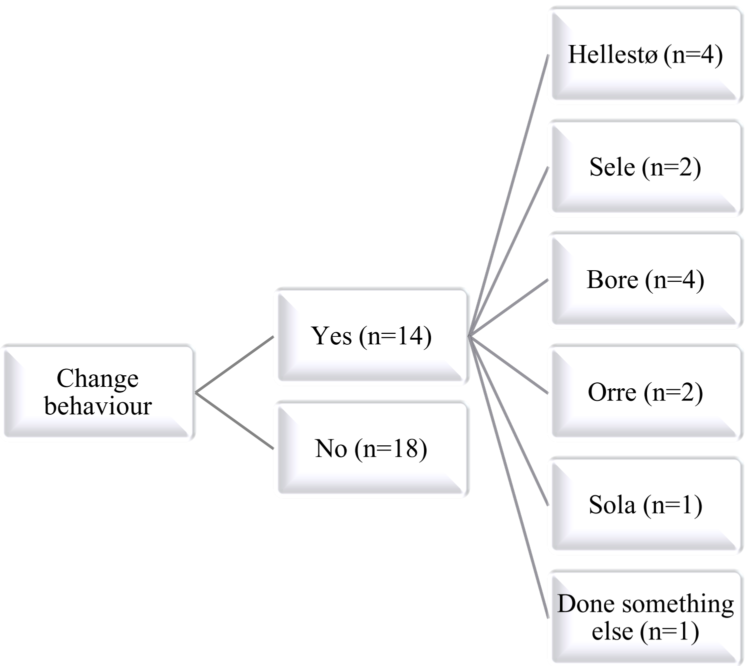


*Figure 7: Hypothetical bird scenario*

## 9.5 Attributes and Scores

Characteristics and scores of attributes were collected on seven beaches along the Jæren coast, respectively Sola, Hellestø, Sele, Bore, "Toveis", Reve Havn, Svinestien and Brusand. Table 11 provides the average quality scores to the seven different surf sites. When comparing the results of the different scores, "Borestranden" came out as the beach with the highest scores on all attributes with an overall average quality score of 0.36. Behind came Sele, Hellestø, Svinestien, Brusand, Sola, Reve Havn and "Toveis" with overall means ranging from -0.02 to 0.36. Comparing the result of the different scores to all beach characteristics, wave and water quality came out strongest with a mean of 0.17 and 0.16, respectively. Facilities were scored the lowest on average by surfers (-0.09).

*Table 11: Characteristics and scores (N=32)*

| | Attributes | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Surf site** | Wave quality | Wave frequency | Wind direction | Changing rooms | Facilities | Water quality | Crowding | Overall |
| Sola | 0.01 | 0.01 | 0,03 | -0.02 | -0.05 | 0.00 | -0.03 | -0.01 |
| Hellestø | 0.15 | 0.10 | 0,09 | 0.01 | -0.24 | 0.31 | 0.27 | 0.01 |
| Sele | 0.29 | 026 | 0.25 | -0.32 | -0.29 | 0.17 | -0.09 | 0.02 |
| Bore | 0.64 | 0.48 | 0.47 | 0.00 | 0.26 | 0.69 | 0.01 | 0.36 |
| "Toveis" | 0.05 | 0.07 | 0.02 | -0.15 | -0.15 | 0.051 | -0.026 | -0.02 |
| Reve Havn | 0.15 | 0.08 | 0.15 | -0.17 | -0.22 | 0.02 | -0.15 | -0.02 |
| Svinestien | 0.04 | 0.03 | 0.03 | 0.01 | -0.04 | 0.01 | 0.02 | 0.01 |
| Brusand | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 |

# 10. Model Application & Specification

The data was set on visited surf site on four different choice occasions per individual. Stacking the data in four panels provided four observations for each respondent. Then, for every choice occasion, the data had a total of fourteen choice alternatives. The first two panels represented revealed site choice the last and the second last time the respondent was surfing at Jæren. Whereas the third panel represented the most frequently visited surf site. Lastly, panel four represented a stated preference response on the hypothetical bird scenario. Because some of the respondents did not provide an answer to all the questions, there was a total of 118 observations.

The recreation site choice models were estimated using the CL, NL and the Mixed logit model. Based on performance, or lack thereof, of the Mixed logit and NL model, they were not reported for discussion. The simulation methods in both models became too complicated for the data and would not run correctly. Besides, panel data with fixed effects is considered to be a more convincing tool when estimating ceteris paribus effects (Wooldridge, 2015), which this study aimed to do.

## 10.1 Model Specification

In this study, site choice of individual $i$ in panel $k$ was modelled as the dependent variable. Thus, the outcome is represented as a dummy variable $Y_{ij}$, defined by:

$$Y_{ij} = \begin{cases} 1, & if\ V_{ij} > V_{iJ} \\ 0, & if\ V_{ij} < V_{iJ} \end{cases}$$

The independent, or explanatory, variables include total travel cost and non-money measured attributes that might have an impact on a surfer`s indirect utility. Attributes, such as wave quality (WAEVQ), wave frequency (WAVEF), water quality (WATERQ), wind direction (WIND) and crowding (CROWD) were included because they are often applied as measures of good-quality surf and thus have documented effect on a surfer`s beach visitation pattern (Towner, 2015). Other attributes included were the quality or the availability of facilities (FACILIT) and changing rooms (CHANGINGR) at each surf site. The purpose of inclusion was to account for a possible effect. Parking availability and scenic quality, two important attributes (Personal Communication, Frode Goa, February 2018), were omitted from the full model due to lack of variation in the data. That is, the subjective measures on the two attributes did not vary across choices. This indicates that all chosen sites in the choice set had similar quality measures on parking availability and scenic quality. The interaction terms, changingrEXPER and facilitEXPER, were included to account for varying expertise among participants. A full specification of the model is formally expressed as:

$$\begin{aligned} V_{ij} = \beta_1 TTC_j + \beta_2 WAVEQ_j + \beta_3 WAVEF_j + \beta_3 WATERQ_j + \beta_4 CROWD_j + \beta_5 FACILIT_j \\ + \beta_6 WIND_j + \beta_7 CHANGINGR_j + \beta_8 facilitEXPER_j \\ + \beta_9 changingrEXPER_j + \varepsilon_{ij} \end{aligned}$$

An additional model was estimated in an attempt to account for varying taste heterogeneity in surf-quality related attributes. Including such terms in the first model caused convergence problems in estimation. Thus, a second model was assessed. The following interaction terms included were: waveqEXPER, wavefEXPER, waterqEXPER and crowdEXPER. Specification of the additional model is:

$$V_{ij} = \beta_1 TTC_j + \beta_2 WAVEQ_j + \beta_3 WAVEF_j + \beta_3 WATERQ_j + \beta_4 CROWD_j + \beta_5 waveqEXPER_j + \beta_6 wavefEXPER_j + \beta_7 waterqEXPER_j + \beta_8 crowdEXPER_j + \varepsilon_{ij}$$

where *i* is the surfer, *j* is the site chosen and $\varepsilon_i$ is the error term for both models. Note, that all interaction terms were multiplied with years of experience rather than own perceived skill level. Then one was able to capture more varying observations within each group. Thus, more significant and reliable estimates emerged. Both models were estimated using the statistical software programme STATA 14.0. The operational definition of the variables used are presented in Table 12, along with its expected signs of estimated coefficients.

*Table 12: Variable definitions for the CL model.*

| Variable name | Operational definition | Expected sign |
|---|---|---|
| **TTC** | Total travel cost, herein round- trip time and travel cost | ( - ) |
| **WAVEQ** | Wave quality is defined as the local view of how the wave breaks. -3 = very bad to 3 = very good | ( + ) |
| **WAVEF** | Wave frequency measured as the number of “surfable” waves. -3= very bad to 3= very good. | ( + ) |
| **WATERQ** | Water quality, herein the amount of pollution in the water. -3 = very polluted to 3 = less polluted | ( + ) |
| **CROWD** | The average level of crowdedness in the water. -3 = very crowded to 3 = less crowded | ( + ) |
| **FACILIT** | Facilities include surf rentals and small shops. -3 = very bad, ..., 3= very good. | ( + ) |
| **WIND** | Wind direction at surf site. -3 = very bad, ..., 3 = very good. | ( + ) |
| **CHANINGR** | Changing rooms include public restrooms and changing rooms. -3 = very bad, …, 3 = very good. | ( + ) |
| **facilitEXPER** | The more experience a surfer has the more or less s/he value facilities. | ( - ) |
| **changingrEXPER** | The more experience a surfer has the more or less s/he value changing rooms. | ( - ) |
| **waveqEXPER** | The more experience a surfer has the more or less s/he value wave quality. | ( - ) |
| **wavefEXPER** | The more experience a surfer has the more or less s/he value wave quality. | ( + ) |
| **waterqEXPER** | The more experience a surfer has the more or less s/he value wave frequency. | ( + ) |
| **crowdEXPER** | The more experience a surfer has the more or less s/he value crowdedness. | ( - ) |

Log-likelihood measures and likelihood ratio tests were conducted with the aim to determine which model to use. To test whether the model should include interaction terms to account for heterogeneity the log-likelihood ratio test was conducted.

## 11.2 Hypothesis Specification

Based on this thesis research questions a total of fourteen hypotheses were tested. Hypotheses 1 through 6 addresses research question 1, 2, 3 and 4. The purpose of this is to assess the possible effects on choice probabilities and thus ultimately the sites` value. Hypotheses 7a and 7b are included to test for potential effects on attributes that were not revealed as important during the in-depth interview. Lastly, Hypotheses 8a through 8f address research question 5 with direct purposes. The hypotheses tested by the two models are presented in Table 13 (page 37).

The single most important hypothesis is the one on travel cost (Hypothesis 1). Performing travel-cost analysis highly rely on a negative and statistical significant travel cost coefficient. The hypothesis is that surf sites that are associated with higher travel cost will have lower levels of local visitation. In other words, the number of surf trips is inversely related to travel cost.

The second hypothesis (Hypothesis 2) is that the demand for surf sites at Jæren is strictly increasing in the quality attribute, wave quality. Thus, the better quality of the waves, the higher associated choice probabilities and value of the site. The same argument is applied to wave frequency (3), water quality (4) and wind direction (6). Hypothesis 5, on the other hand, assumes that increased level of crowding in the water strictly decrease a surfer`s utility. Hence, a negative demand shifter, which consequently means lower choice probabilities. In a sense, this could be an indication that surf sites, hence its waves, are rival. In other words, one surfer`s consumption of a beach`s wave will decrease another surfer`s access to it. For this reason, if the water is heavily congested, another surfer does decrease the utility of those already in the water.

Hypotheses 7a and 7b state that surfers who value and recognize the availability of facilities and changing rooms at the surf site will have higher associated utility. Thus, an improvement in both attributes is expected to increase demand. However, whether these attributes will have a significant effect on utility was not obvious during the in-depth interview. My informant, Goa, did state that both facilities and changing rooms were of no interest when deciding on where to surf. However, considering his high level of expertise, it is not certain that all surfers, herein beginners, feel the same way. Surfers with less experience may for instance not own a surfboard or wetsuit, hence surf rentals at the site may be of importance for some.

The last six hypotheses (Hypotheses 8a-8f) state that different skill levels will have an effect on preferences. In other words, the probability that the surfer will choose that site to surf depends on the individuals' surfing experience; i.e. varying months of experience partly determine both preferences and behaviour.

*Table 13: Hypotheses tested.*

| Hypotheses | Description | Formally |
|---|---|---|
| **1** | A surfer`s utility is strictly decreasing in travel cost. | $H_0: \beta_{TTC} \geq 0$<br>$H_1: \beta_{TTC} < 0$ |
| **2** | A surfer`s utility is strictly increasing in wave quality. | $H_0: \beta_{WAVEQ} \leq 0$<br>$H_1: \beta_{WAVEQ} > 0$ |
| **3** | A surfer`s utility is strictly increasing in wave frequency. | $H_0: \beta_{WAVEF} \leq 0$<br>$H_1: \beta_{WAVEF} > 0$ |
| **4** | A surfer`s utility is strictly increasing in water quality. | $H_0: \beta_{WATERQ} \leq 0$<br>$H_1: \beta_{WATERQ} > 0$ |
| **5** | A surfer`s utility is strictly decreasing in crowding. | $H_0: \beta_{CROWD} \leq 0$<br>$H_1: \beta_{CROWD} > 0$ |
| **6** | A surfer`s utility is strictly increasing in wind direction. | $H_0: \beta_{WIND} \leq 0$<br>$H_1: \beta_{WIND} > 0$ |
| **7a** | Effect of facilities. | $H_0: \beta_{FACILIT} = 0$<br>$H_1: \beta_{FACILIT} \neq 0$ |
| **7b** | Effect of changing rooms. | $H_0: \beta_{CHANGINGR} = 0$<br>$H_1: \beta_{CHANGINGR} \neq 0$ |
| **8a** | Effect on participant experience on the availability of facilities. | $H_0: \beta_{facilitEXPER} = 0$<br>$H_1: \beta_{facilitEXPER} \neq 0$ |
| **8b** | Effect on participant experience on the availability of changing rooms. | $H_0: \beta_{changingrEXPER} = 0$<br>$H_1: \beta_{changingrEXPER} \neq 0$ |
| **8c** | Effect on participant experience on wave quality. | $H_0: \beta_{waveqEXPER} = 0$<br>$H_1: \beta_{waveqEXPER} \neq 0$ |
| **8d** | Effect on participant experience on wave frequency. | $H_0: \beta_{wavefEXPER} = 0$<br>$H_1: \beta_{wavefEXPER} \neq 0$ |
| **8e** | Effect on participant experience on water quality. | $H_0: \beta_{waterEXPER} = 0$<br>$H_1: \beta_{waterEXPER} \neq 0$ |
| **8f** | Effect on participant experience on crowding. | $H_0: \beta_{crowdEXPER} = 0$<br>$H_1: \beta_{crowdEXPER} \neq 0$ |

# 11. Results & Analysis

In total, four CL models have been estimated. Models 1 and 2 present the results ignoring the heterogeneity in preferences across respondents, whereas the remaining models do adequately address this problem. Table 14 shows the regression results (model 1-5). The number of observations, the pseudo-R-square and the log-likelihood value is reported at the bottom of the table for all models.

*Table 14: Restricted sample regression, with expertise interaction dummies.*

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **Coeff.** | **P-value** | **Coeff.** | **P-value** | **Coeff.** | **P-value** | **Coeff.** | **P-value** |
| TTC | -0,018 | 0,015 | -0,024 | 0,039 | -0,022 | 0,064 | -0,019 | 0,025 |
| WAVEQ | 2,241 | 0,000 | 3,831 | 0,001 | 3,634 | 0,003 | 0,802 | 0,152 |
| WAVEF | 1,205 | 0,006 | -0,324 | 0,700 | -0,318 | 0,697 | 2,734 | 0,000 |
| WATERQ | 2,030 | 0,000 | 8,677 | 0,000 | 8,736 | 0,001 | -0,278 | 0,523 |
| CROWD | -0,788 | 0,012 | -1,516 | 0,011 | -1,559 | 0,019 | 1,074 | 0,019 |
| FACILIT | | | -2,028 | 0,018 | -0,571 | 0,624 | - | - |
| WIND | | | 5,566 | 0,000 | 5,778 | 0,001 | - | - |
| CHANGINGR | | | 3,318 | 0,018 | 1,596 | 0,288 | - | - |
| changingrEXPER | | | | | 0,017 | 0,045 | - | - |
| facilitEXPER | | | | | -0,012 | 0,074 | - | - |
| waveqEXPER | | | | | | | 0,092 | 0,001 |
| waterqEXPER | | | | | | | 0,079 | 0,000 |
| crowdEXPER | | | | | | | -0,058 | 0,000 |
| wavefEXPER | | | | | | | -0,040 | 0,051 |
| # observations | 118 | | 118 | | 118 | | 118 | |
| Pseudo R2 | 0,7856 | | 0,879 | | 0,885 | | 0,826 | |
| Log Likelihood | -65,065 | | -36,767 | | -34,778 | | -52,678 | |

For models 3 and 4, a log-likelihood ratio test was performed for the added interaction terms. The variable extensions were jointly significant at P= .001 and the lowest result was still very high ($\chi^2 = 32.50\ [5\ df]$).

## 11.1 Hypothesis Testing

The coefficient on TTC is negative and significant in all models, implying that a surfer's utility is strictly decreasing in travel cost. Thus, the higher the travel cost the less likely a surfer will surf at that beach. Hence, for Hypothesis 1, the null is rejected at the 95% confidence level, confirming that the number of trips is inversely related to travel cost.

WAVEQ is positive and highly statistically significant in models 1 through 3, however insignificant at the 20% level in model 4. Thereby, one may reject the null at the 1% for the first three models. Indicating that the better-perceived measure of wave quality the more likely a surfer will surf at that site.

The coefficient on WAVEF is positive and highly significant with $P < .001$ in models 1 and 4. This implies that the higher the perceived measure in wave frequency, the more likely a surfer is to surf at that site. The null hypothesis of local visitations being strictly increasing in wave frequency in Hypothesis 3 can then be rejected for models 1 and 4. Note that the variable is insignificant and of the intuitive wrong sign for models 2 and 3. Since, however, the variable is highly significant and of the expected sign when accounting for taste heterogeneity in model 4 this can be explained from a taste heterogeneity perspective. Surfers with less experience may be impatient and thus value a higher frequency of "surfable" waves compared to higher and more challenging waves during a surf session. More avid and experienced surfers, on the other hand, may be more patient during a surf session and value higher waves rather than many and smaller. Besides, high-quality waves are perhaps too difficult and challenging for surfers with less experience. For this reason, we would expect this group to be much more concerned with wave quality and less concerned with wave frequency than their less experienced counterparts.

Water quality of the surf sites is of the expected sign and statistically significant at the 1% level for all estimated models. We thereby reject the null at the 99% confidence level, which implies that higher water quality leads to increased choice probabilities and value of sites. In other words, water quality is a positive demand shifter.

The variable CROWD is highly statistically significant in all models. Note that the coefficient is negative in models 1, 2 and 3, and since higher values of this variable represent lower levels of crowding this is intuitively of the wrong sign. Indicating that less people in the water is inversely related to choice probabilities. Which means, that the more crowded the water is during a surf session, the more likely a surfer will surf there. Yet again, this can be explained from a taste heterogeneity perspective. Because in model 4, the coefficient on CROWD is statistically significant with a positive sign ($P= 0.002$). The statistical result indicates that the more experienced surfers care less about the number of surfers in the water. Therefore, in model 4, we can reject the null at the 1% level, which implies that the more crowded the surf site is, the less likely a person will surf there. Hence, the higher perceived value of crowding the higher the value of the surf site, confirming that surf sites can be considered rival goods.

WIND is highly statistically significant in all models were the variable was included. This confirms that associated choice site probabilities are increasing in the perceived quality measure of wind direction. Thus, a positive demand shifter.

The quality attribute, CHANINGR, is positive and significant at the 1% level in Model 2. This indicates that the quality attribute of the sites is valued and hence, a positive demand shifter. We can thereby reject the null at the 99% confidence interval for Model 2 in Hypothesis 8a. The coefficient on FACILIT is highly significant for Model 2, though of the intuitive wrong sign. This may be explained from a taste heterogeneity perspective as well. More experienced surfers are expected to care less about the quality or availability of facilities at surf sites.

The interaction term`s effect on utility displays a degree of significance in all models where taste preference heterogeneity was accounted for. All models are statistically significant at the 1% level and almost all are of the expected sign. We can thereby reject the null hypothesis for Hypothesis 8a through 8b at the 99% confidence interval. This suggests that surfers have different preferences according to different participant experience.

## 11.2 Estimated Average Marginal Effects and Price Sensitivities

The average own-price elasticity and marginal effects were calculated by the statistical software STATA 14.0. The price elasticity of choice probabilities and marginal effects for model 1 is presented in Table 15.

*Table 15: Estimated average marginal effect and own-price elasticity.*

| | Marginal effects (%) | P-value | Elasticity | P-value |
|---|---|---|---|---|
| **TTC** | -0.23 | 0.000 | -1.41 | 0.042 |
| **WAVEQ** | 29.42 | 0.010 | 0.00 | 0.668 |
| **WAVEF** | 15.82 | 0.035 | 0.00 | 0.508 |
| **WATERQ** | 26.65 | 0.008 | 0.00 | 0.927 |
| **CROWD** | -10.34 | 0.044 | 0.00 | 0.708 |

The derivative on travel cost suggests that a one Norwegian krone ceteris paribus increase in price decreases average choice probability by about 0.0023 percentage points. Further explained, if the average travel cost increased by an amount of NOK 10.00, then associated choice probabilities would decrease by 2.3 per cent on average.

Average marginal effects for the quality attributes have the same practical explanation as for the one on travel cost. For example, the change in the probability of choosing alternative *j* given a one-score increase in perceived wave quality, at given levels of the other explanatory variables, is estimated to be 29.2%. The estimated marginal effect on CROWD is statistically significant, however practically insignificant. An explanation of this was given in the hypotheses section but expanded upon in the discussion.

As evident in Table 15, the average price elasticity of surf sites (i.e. the weighted average of price elasticities of all surf sites in the choice set) is strictly over one. This confirms that surfers are price sensitive as a whole. Signifying, that a 1 per cent increase in price to Jæren will decrease the probability of local visitation by more than 1 per cent. As an example, consider a 10 per cent increase in travel cost, this would decrease estimated local visitations by 14.1 per cent.

To calculate beach-specific elasticities, Equation (7) was applied. Table 16 presents the beach-specific elasticities and the average scores on surf-quality to all sites in the choice-set.

*Table 16: Beach-specific elasticities*

| | **Own price elasticity** | **Average surf-quality** |
|---|---|---|
| Sola | -1.131 | -0.002 |
| Ølberg | -1.258 | 0.000 |
| Hellestø | -1.263 | 0.209 |
| Byberg | -1.410 | 0.000 |
| Suppå | -1.469 | 0.000 |
| Sele | -1.271 | 0.158 |
| Bore | -0.409 | 0.455 |
| Toveis | -1.493 | 0.036 |
| Reve Havn | -1.535 | 0.021 |
| Svinestien | -1.571 | 0.026 |
| Orre | -1.715 | 0.000 |
| Refnes | -1.942 | 0.000 |
| Kvassheim | -2.649 | 0.000 |
| Brusand | -2.900 | 0.013 |

*Note: surf-quality is a combination of wave quality, wave frequency, water quality and crowding (Model 1)*

Comparing the beach-specific elasticities with average perceived surf-quality in Table 16, we see that Bore has inelastic demand in addition to having the highest perceived average score on surf-quality. This implies that the beach as a surf site has inelastic demand due to the high perceived surf-quality of the site.

## 11.3 Estimated Effects of Quality Characteristics

To calculate the effect on surfers` visitation patterns if quality characteristics changed, three hypothetical scenarios were created. We hereby consider welfare changes for three scenarios (Table 17):

*Table 17: Scenario characteristics*

| Scenario | Description | Reasoning |
|---|---|---|
| **1** | NOK 25 parking fee per hour at Bore. Since surfers spend on average 2. 27 hours at the site, the cost is expected to increase by NOK 56.75 (2.27*25). | As of today, Bore is experiencing large tear and user damage to sand-dunes. Because Bore is exposed to more damage, a parking fee could be a reasonable attempt to limit users and therefore reduce the beach`s exposure to wear and tear (Jæren Friluftsråd, personal communication, February 2018). |
| **2** | A negative result of a dredging project causes the sandbars that created good-quality waves at Bore to disappear. As a result, the number of "surfable" waves diminishes, and thus the perceived quality measure on wave frequency and wave quality at Bore drops to -3.00. | The threat of damage to sandbars at Bore could also be solved by dredging projects. Where the sand from the ocean is transferred to the beach. This is an example of regular sand nourishment and lessons from the work of Lazarow (2007;2010) have thought us that high-quality waves are vulnerable to coastal development or human modification to the resource base. Since waves at Bore are characterized as beach breaks, the beach and its waves are in fact highly sensitive to such projects. |
| **3** | Improved water quality at all surf sites to a high standard. Perceived quality measure on water quality will thereby increase to 2.00 on average. | Water quality at Jæren is still an issue. Currently, it is threatened by sewage and agriculture. In 2017, a diver found paraffin wax/plastics from legal flushing of cargo ship containers. This is a major threat to the water quality at Jæren. The issue is regulated and monitored by "Fylkesmannen" and can, therefore, be improved. Note, also with the help of volunteers. |

The predicted destination choice probabilities for each surf site in the choice set are based on travel cost, wave quality, wave frequency and water quality estimates (Model 1). To calculate the probabilities Equation (8) was applied. The expected probabilities for the current situation (status quo) and expected changes in all three scenarios are provided in Table 18.

*Table 18: Simulated surf site choice probabilities*

| | **Current situation (%)** | **Scenario 1 (%)** | **Change (%)** | **Scenario 2 (%)** | **Change (%)** | **Scenario 3 (%)** | **Change (%)** |
|---|---|---|---|---|---|---|---|
| Sola | 1.91 | 3.59 | 1.69 | 7.26 | 5.36 | 6.57 | 4.66 |
| Ølberg | 1.62 | 3.05 | 1.43 | 6.17 | 4.55 | 5.58 | 3.96 |
| Hellestø | 5.03 | 9.47 | 4.45 | 19.15 | 14.12 | 6.77 | 1.74 |
| Byberg | 1.39 | 2.63 | 1.23 | 5.31 | 3.91 | 4.80 | 3.40 |
| "Suppå" | 1.28 | 2.41 | 1.13 | 4.87 | 3.59 | 4.40 | 3.12 |
| Sele | 6.99 | 13.17 | 6.18 | 26.62 | 19.63 | 14.38 | 7.39 |
| Bore | 73.73 | 50.52 | -23.22 | 0.00 | -73.73 | 31.38 | -42.36 |
| Toveis | 1.84 | 3.48 | 1.63 | 7.02 | 5.18 | 5.44 | 3.60 |
| Reve | 2.23 | 4.21 | 1.97 | 8.50 | 6.27 | 7.23 | 5.00 |
| Svinestien | 1.36 | 2.57 | 1.21 | 5.19 | 3.83 | 4.55 | 3.19 |
| Orre | 1.03 | 1.94 | 0.91 | 3.92 | 2.89 | 3.54 | 2.51 |
| Refnes | 0.82 | 1.55 | 0.73 | 3.13 | 2.31 | 2.83 | 2.01 |
| Kvassheim | 0.41 | 0.77 | 0.36 | 1.55 | 1.14 | 1.40 | 1.00 |
| Brusand | 0.34 | 0.65 | 0.30 | 1.31 | 0.96 | 1.11 | 0.77 |

Based on the results of the simulation undertaken in this application, the 65-percentage increase in cost at Bore is expected to decrease the number of surf trips taken by approximately 23 per cent, holding other factors fixed. This yields an inelastic demand for Bore, which is consistent with the result in Table 16. The simulated choice probabilities to the other beaches did, therefore, not increase by a significant amount.

Further, in scenario 2, we see that local visitation is expected to fall if the perceived quality measure on wave quality and frequency decreases. Specifically, the choice probability for Bore becomes zero per cent. Meaning, if the waves were scored on such a low level, it is expected that none would surf there. As postulated by Lazarow (2007), "without quality, surfing has no capital". Simply put, without "surfable" waves there is no surf value, hence no reason for surfers to visit the site in question. Sele is expected to increase local visitations with approximately 20%, which was the highest percentage increase. The result suggests that Sele is the most preferred substitute site if conditions at Bore were worsened.

As evident in Table 17, better water quality or less polluted water at Jæren is expected to increase local visitations on average. This result is consistent with the average estimated marginal effect in Table 15. However, one can see a decrease in choice probability for Bore as the other beaches become more attractive.

## 11.4 Loss of Access to Bore and Sele

There are both direct and indirect means of using legislation or regulation to alter surf-quality and the surfing experience (Lazarow, 2007). Like in scenario 1 in section 11.3, parking fees is an example of an indirect mean with the purpose of discouraging or limit users. Direct means could be regulations/by-laws or even legislation (*ibid*.). As a very hypothetical scenario, suppose a sewer line break results in the closure of "Borestranden" and "Selestranden" for an entire year. The value of lost access to multiple sites is the WTP for both. To measure the welfare effects of this closure, equation (6) was applied. WTP from the estimation was calculated per trip made, regardless of group size. The WTP per trip per person is adjusted for average group size, which was found to be 3.28 on average.

*Table 19: Summary of WTP (NOK).*

| | WTP/trip | WTP Lower | WTP Upper | WTP Width | WTP/trip/person |
|---|---|---|---|---|---|
| **Model 1** | -51.91 | -93.60 | -10.23 | 83.37 | -15.83 |
| **Model 2** | -38.74 | -75.49 | -2.00 | 73.49 | -11.81 |
| **Model 3** | -41.94 | -86.32 | 2.44 | 88.76 | -12.79 |
| **Model 4** | -47.90 | -89.78 | -6.02 | 83.76 | -14.60 |

The values presented in the above table would represent the loss in welfare if surfers lost access to both Bore and Sele for a year. Overall, these measures can be confirmed quite robust since the variation of the estimates is somewhat low.

Annual estimated surf trips to the two beaches are zero. The "best" estimate we do have is the 500 000 annual trips reported by JF (n.d.). The question is, how much of this estimate is surf related? A survey conducted on general beachgoers at Jæren found that 4.49 % of the sample were surfers (Linh & Saeland, 2016). Thus, a reasonable extrapolation would be to use 4.49 % of the estimated annual visitation rate as a proxy for annual surfing trips. This gives us a rough estimate of 22 450 annual surfing trips. By aggregating this number with the estimated individual WTP, the total non-market value of Bore and Sele is estimated to range from NOK 265 135 to 355 384. Table 20 provide the estimated aggregated loss in welfare.

*Table 20: Aggregated WTP (NOK).*

| Model | WTP/trip/person | Aggregated loss |
|---|---|---|
| 1 | -15.83 | - 355 383.50 |
| 2 | -11.81 | - 265 134.50 |
| 3 | -12.79 | -287 135.50 |
| 4 | -14.60 | -327 770.00 |

# 12. Discussion

In short, the survey yields estimates of preferences that are realistic and intuitively of the expected effect. However, some topics need to be discussed.

Results from the descriptive analysis suggest Bore as the most popular surf site at Jæren. The reason why is revealed by the simulated choice probabilities in Table 18. As evident in the estimated visitation patterns, Bore has the highest (status quo) choice probability, which implies that the surf site has the highest value relative to its substitutes sites. The beach might then be the most popular due to the high surf-quality.

Estimated own-price elasticity obtained was -1.41 on average, which means that the demand for surf sites at Jæren is elastic in terms of price changes. Surfers can, therefore, be classified as price sensitive as a whole. Arguably, the elastic demand for local surf sites is due to the high availability of surf substitute sites along the coast. The demand, or choice probability, is more elastic to price changes if more substitute sites are available (Pindyck & Rubinfeld, 2015). So, as the coast of Jæren has multiple substitute sites, specifically fourteen sites, surfers can easily switch from one surf site to another. A price elasticity of -1.41 can then be considered realistic by terms of basic microeconomic theory. It also seems reasonable, given that almost all respondents travelled to surf sites not far from their residency (see section 9.4). Nevertheless, the result also suggests that levels of price elasticity vary across surf sites. As evident in Table 16, Bore has inelastic demand. Again, this can be attributed to the relatively high standard of surf-quality at the beach compared to its substitute sites.

Model 1 provided average marginal effects for four quality characteristics, namely wave quality, wave frequency, water quality and crowding. The results suggest that quality changes in the three former characteristics will increase surfers` site utility on average, while the latter will on average decrease site utility. However, changes in the level of crowding stemming from the estimated model is intuitively of the wrong sign. It was reasoned from a taste heterogeneity perspective in section 10.3. Arguably, crowding may have a concave (downwards) relationship with utility. As proven by Hindsley, Landry, Bin and Vogelsong (2006), congestion was statistically proven to have a downward sloping relationship with utility for general beachgoers in North Carolina. However, this has not yet, been studied in the case of surfing. Besides, simulated choice probabilities were found to be more sensitive to wave quality and frequency compared to water quality at Jæren. Changes in such characteristics will, therefore, have a more significant effect on a site's value and thus surfers are affected by a greater magnitude.

The expertise interaction terms are all statistically significant at the 1% level, which implies that surfers do have different preferences. Further, results from the descriptive analyses suggest that surfers with different skill levels have different descriptive visitation patterns. As shown in Table 9, the more advanced surfers travel to sites with a higher degree of difficulty compared to their less skilled counterparts. Suggesting that surfers site choice is determent by skill level. By not taking into account the different skills or expertise, non-market valuation models may be producing erroneous estimates of the welfare measures. It could potentially overestimate welfare losses (Hanley et al., 2007).

The models provided a aggregated WTP ranging from NOK 265 135 to 355 384 per year. The individual WTP estimated in this study is far lower than most estimates found in previous "surfonomic" studies (Coffman & Burnett, 2009; Nelsen 2012; Silvia & Ferreira, 2014; Tilley, 2001). Considering that this study is conducted for a local surf region and not on a world-famous location such as Trestles Beach or Pleasure Point, the value of recreational surfing at Jæren was expected to be lower. The much lower estimated WTP per person per trip in this study can also be explained by the exclusion of substitute sites in the other studies. Excluding these may have inflated the CS estimates and could have resulted in biased estimators (Rosenthal, 1987; as quoted in Refsdal & Lohaugen 2016).

## 12.1 Limitations

In addition to being a small recreational group at Jæren, surfers were proven a hard group to survey. Consequently, the sample size is relatively small compared to other "surfonomic" studies (Silvia & Ferreira, 2014; Nelsen et al., 2007). Because of this, the margin of error may be greater than it ideally would have been had the sample been larger. Therefore, it would be wise to take a cautious view as to how representative the sample is of the population of local surfers.

A relatively high share of the survey respondents were surfers with less than 5 years of experience, leaving inexperienced surfers somewhat overrepresented. The results are therefore affected by having a non-representative sample.

Using perceived quality measures limited scores to a total of seven surf sites within the choice-set. Beaches that were not revealed as a chosen-site on any given occasion were given zero scores on all attributes. Since most respondents stated Bore as chosen-site in every choice setting the estimated average surf-quality at Bore might be overvalued. Overestimated quality scores for Bore may have inflated estimated marginal effects, elasticities and simulated choice probabilities.

The CL model does not control for the issue of endogeneity (Williams, 2017). However, correction this was thought unnecessary because it was assumed that surfers, through personal experience, have good knowledge of major surf locations along the coast. This reasoning was deemed appropriate by Hanley et al. (2007).

Moreover, the study is subject to an issue known as truncated counts, caused by on-site sampling. Since the survey design did not include the option of no trip on any given choice occasion, information about non-surfers is truncated from the sample. As Haab and McConnell (2002) phrase it, not accounting for truncation can bias the parameter estimated and inflate WTP values.

Lastly, the estimated annual surf trips have a significant weakness. It is subjected to high uncertainty because of recall bias. As such, using this trip count would lead to an underestimation of aggregated value.

## 12.2 Implications for Future Work

Estimates and preferences revealed in this study could provide valuable information and insights for local and regional policy-makers. However, due to limitations, further research is necessary to fully understand surfers' preferences regarding recreation site choice and the value of waves.

First of, to enlarge the sample size future research could be to include all recreational activities that involve direct contact with the ocean (e.g. surfing, body boarding, kiting, diving and swimming). As suggested by Nelsen (2012), one could also have retrieved more respondents by implementing an Internet-based methodological approach.

Another fascinating subject of research would be to use objective measures. By the use of objective measure, one could potentially estimate exact WTP measures for improved site quality characteristics.

The traditional TC-model is often applied to value recreational activities. As previously stated, this method is the most widely used valuation technique in "surfonomics". Thus, it could be interesting to apply this method to the coast of Jæren as well. More specifically, Bore and Sele, to compare results.

The Mixed logit model, also known as the random parameters logit, could be applied to future studies on the subject. This method is often used for relaxation of the IIA assumption because it allows the parameters to be random. Allowing variations in surf-quality attributes will lead to correlation among them, and a more general pattern of substitution emerges (Parsons, 2003). One area for future research could be to compare this study, where the CL model was specifically designed to capture heterogeneity, with models that investigate random effects. It would also be interesting to investigate if surfers' preferences differ somehow, by comparing a skill-based approach with an experience-based approach. One cannot test for this in the current data set due to lack of observations.

Finally, results from Figure 5 suggest that advanced surfers spend more money on surfing-related equipment, indicating that they may have higher WTP for surfing. Thus, there could be different preferences related to travel cost as well. However, the data limits one's ability to investigate preference heterogeneity for travel cost. I leave this investigation to future studies.

# 13. Conclusion

By administering an on-site survey at the coast of Jæren*,* this thesis has examined local surfers' characteristics and the non-market value of surfing. Panel data with fixed effects, where observations are stacked, was implemented to incorporate effects of changes in beach attributes and provide four times more observations than initially sampled.

From a representative sample of 32 local surfers Bore was revealed as the most frequently visited surf site. Confirming "Borestranden" as the most popular surf site at Jæren.

The estimated CL model (model 1), suggest that surfers are price sensitive as a whole. As evident from the estimated average marginal effects and the simulated visitation patterns, wave quality, wave frequency and water quality are positive demand shifters. Hence, the value of a surf site increase with the surf-quality characteristics. Interaction terms derived from the estimated CL model confirm that surfers have varying preferences according to their surfing experience. Descriptive analyses of visitation patterns further suggest that preferences also vary across skill level.

Trip WTP obtained for Bore and Sele ranged from NOK 38.74 to 51.91, providing a corresponding individual WTP per trip in the range of NOK 11.81 to 15.83. From this, the estimated non-market value of surfing as a beach recreational activity at Jæren ranged from NOK 265 135 to 355 384.

An estimation of the recreational value of an environmental good or service is said to supplement decision-making on several issues (Ward & Loomis, 1986 as quoted in Refsdal & Lohaugen 2016). The estimated status quo value of surfing could be reviewed and potentially weighed in a cost/benefit analysis. Also, as the coastal environment at Jæren is exposed to increased human interaction, it is essential to understand how surfers would behave if indirect or direct means of regulation would become necessary. Overall, the valuation of waves and the classification of surfers' preferences at the south-western coast of Norway is a crucial tool to understand the full value of the region`s coastal resources. This thesis contributes to estimated behaviour and preferences for the current generation and can further provide findings to compare and expand on for future studies.

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# Appendix: Survey (Norwegian version)

# JÆRSTRENDENE

**SPØRREUNDERSØKELSE**

SURFER DU?

Bilde: Visitnorway, 2017.

**DINE MENINGER ER VIKTIGE!**

Takk for at du hjelper oss med denne spørreundersøkelsen, som er en del av et forskningsprosjekt om kystsoneforvaltning finansiert av Norges Forskningsråd og utført av Universitetet i Stavanger. **Temaet for spørreundersøkelsen er nærmere bestemt hvilket forhold folk her i området har til strendene på Jæren, spesielt surfernes bruk av strendene og deres reaksjonsverdi.**

Svarene du gir oss kan gi lokale og nasjonale myndigheter en bedre forståelse av surfernes meninger og preferanser for Jærstrendene.

**Vi er kun interessert i dine erfaringer og meninger.** Det finnes ingen riktige eller uriktige svar. Som deltaker i undersøkelsen er du helt anonym. Vi er hovedsakelig interessert i sammenfatninger av svarene over alle respondentene.

Det vil ta deg rundt 15 minutter å svare på alle spørsmålene i undersøkelsen. *Det er viktig at alle som blir invitert til å delta i spørreundersøkelsen svarer så* ***fullstendig*** *på undersøkelsen som mulig.*

Ta gjerne kontakt hvis du skulle ha spørsmål angående dette spørreskjemaet eller forskningen vår generelt. **På forhånd, takk for din deltakelse!**

Med vennlig hilsen

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## OM DIN BRUK AV JÆRSTRENDENE FOR SURFING

**Før Norgescupen i dag, har du noen gang surfet på Jæren?**

- O JA → Vennligst forsett med undersøkelsen (spørsmål 1).
- O NEI → Vennligst lever spørreskjemaet tilbake.

**1. Hvilket postnummer og poststed pleier du normal å komme fra når du surfer på Jærstrendene?**

POSTNUMMER: ☐ POSTSTED: ☐

**2. Hvilke av strendene på Jæren har du surfet på i løpet av de siste 12 månedene?** *[Vennligst spesifiser antall "surfe - besøk" på hver av strendene nevnt nedenfor i løpet av de siste 12 månedene.]*

| **Strand:** | **Surfet her?** *[Kryss av de det gjelder.]* | **Antall besøk de siste 12 mnd.** *[Oppgi svar i tall og gi oss ditt beste anslag.]* |
|---|---|---|
| Sola | ☐ | ☐ |
| Ølberg | ☐ | ☐ |
| Hellestø | ☐ | ☐ |
| Byberg | ☐ | ☐ |
| «Suppå» | ☐ | ☐ |
| Sele | ☐ | ☐ |
| Bore | ☐ | ☐ |
| «Toveis» | ☐ | ☐ |
| Reve Havn | ☐ | ☐ |
| Svinestien | ☐ | ☐ |
| Orre | ☐ | ☐ |
| Refsnes | ☐ | ☐ |
| Kvassheim | ☐ | ☐ |
| Brusand | ☐ | ☐ |
| Andre strender | ☐ | ☐ |

HVIS «ANDRE STRENDER» VENNLIGST OPPGI NAVN PÅ STRAND/STED:

______________________________

OM DINE SISTE SURFETURER PÅ JÆREN OG DIN MEST BESØKTE STRAND

3. **Hvilken strand på Jæren var den SISTE du surfet på <u>før Norgescupen</u> (13. – 15. april)?** *[Vennligst oppgi navn på strand besøkt før Norgescupen. Bruk listen i spørsmål 2 som referanse.]*

   NAVN PÅ STRAND: ________________________________________

4. **Omtrent hvor mange kilometer må du reise hjemmefra for å komme deg til denne stranden?** *[Vennligst gi oss ditt beste anslag på reisedistanse til strand oppgitt i spørsmål 3.]*

   [ ] KILOMETER (EN VEI)

5. **Omtrent hvor lang reisetid har du hjemmefra til stranden?** *[Vennligst gi oss ditt beste anslag på reisetid til strand oppgitt i spørsmål 3.]*

   [ ] TIMER [ ] MINUTTER (EN VEI)

6. **Hvilket transportmiddel brukte du i hovedsak på din siste surfetur**? *[Kryss av ett alternativ.]*

   - O DIESELBIL
   - O BENSINBIL
   - O ELBIL/HYBRIDBIL
   - O TOG
   - O BUSS
   - O SYKKEL
   - O GIKK TIL FOTS
   - O ANNET, vennligst oppgi:__________________________

7. **Husker du når du surfet sist?** *[Vennligst spesifiser hvilken dag og måned.]*

   [ ] (DAG) [ ] (MÅNED)

8. **Å besøke stranden for å surfe sist var**: *[Kryss av ett alternativ.]*

   - O DET ENESTE FORMÅLET da jeg reiste hjemmefra denne dagen
   - O HOVEDFORMÅLET da jeg reiste hjemmefra denne dagen
   - O ETT AV HOVEDFORMÅLENE da jeg reiste hjemmefra denne dagen

9. **Hvor bra synes du <u>stranden du surfet på sist</u> er <u>sammenlignet med andre mulige surfeområder</u> langs Jæren?** *[Vennligst sett ett kryss for hver av faktorene nedenfor, fra -3 = veldig dårlig til 3 = veldig bra.]*

| | **-3 = Veldig dårlig** | **-2** | **-1** | **0** | **1** | **2** | **3 = Veldig bra** |
|---|---|---|---|---|---|---|---|
| Kort vei hjemmefra | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Parkeringsmuligheter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bølgekvalitet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bølgefrekvens | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Vindforhold | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Tilgjengelige toaletter/ skifterom | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fasiliteter (åpen kiosk og utleie av surfeutstyr) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lite forurensning/avfall i vannet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lite folk & trengsel | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Naturomgivelser | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

10. **Hvilken strand surfet du på <u>NEST SIST</u>, altså <u>før siste tur før Norgescupen</u>?** *[Vennligst oppgi navn på strand. Bruk listen i spørsmål 2 som referanse.]*

NAVN PÅ STRAND: ______________________________________________

*HVIS SVARET I SPØRSMÅL 10 ER DET SAMME SOM I SPØRSMÅL 3 KAN DU HOPPE TIL SPØRSMÅL 14 (NEDERST PÅ SIDE 6). OM DET <u>IKKE</u> ER DET SAMME, VENNLIGST SVAR PÅ SPØRSMÅL 11-13.*

11. **Omtrent hvor mange kilometer må du reise hjemmefra for å komme deg til stranden du besøkte <u>nest sist</u>, og hvor lang tid tar det**? *[Vennligst gi oss ditt beste anslag på reisedistanse og reisetid til stranden oppgitt i spørsmål 10.]*

☐ KILOMETER (EN VEI)

☐ TIMER & ☐ MINUTTER (EN VEI)

12. **Hvilket transportmiddel brukte du i hovedsak på din <u>nest siste</u> surfetur?** [*Kryss av ett alternativ.]*

- O DIESELBIL
- O BENSINBIL
- O ELBIL/HYBRIDBIL
- O TOG
- O BUSS
- O SYKKEL
- O GIKK TIL FOTS
- O ANNET, vennligst oppgi: ________________________

13. **Hvor bra synes du stranden du surfet på <u>nest sist</u> er sammenlignet med andre mulige surfeområder langs Jæren?** *[Vennligst sett ett kryss for hver av faktorene nedenfor, fra -3 = veldig dårlig til 3 = veldig bra.]*

| | **- 3 = Veldig dårlig** | **-2** | **-1** | **0** | **1** | **2** | **3 = Veldig bra** |
|---|---|---|---|---|---|---|---|
| Kort vei hjemmefra | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Parkeringsmuligheter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bølgekvalitet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bølgefrekvens | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Vindforhold | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Tilgjengelige toaletter/ skifterom | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fasiliteter (åpen kiosk og utleie av surfeutstyr) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lite forurensning/avfall i vannet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lite folk & trengsel | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Naturomgivelser | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

14. **Hvilken strand surfer du på <u>OFTEST</u>?** *[Vennligst oppgi navn på strand. Bruk listen i spørsmål 2 som referanse.]*

NAVN PÅ STRAND: ______________________________________________

*HVIS SVARET I SPØRSMÅL 14 ER DET SAMME SOM I SPØRSMÅL 3 ELLER 10 KAN DU HOPPE TIL SPØRSMÅL 18 PÅ SIDE 8. OM DET <u>IKKE</u> ER DET SAMME, VENNLIGST SVAR PÅ SPØRSMÅL 15-17.*

15. **Omtrent hvor mange kilometer må du reise hjemmefra for å komme deg til <u>stranden du besøker oftest</u>, og hvor lang tid tar det**? *[Vennligst gi oss ditt beste anslag på reisedistanse og reisetid til stranden oppgitt i spørsmål 14.]*

☐ KILOMETER (EN VEI)

☐ TIMER & ☐ MINUTTER (EN VEI)

16. **Hvilket transportmiddel bruker du normalt for å komme deg til den <u>stranden du besøker oftest</u>?** [*Kryss av ett alternativ.]*

- O DIESELBIL
- O BENSINBIL
- O ELBIL/HYBRIDBIL
- O TOG
- O BUSS
- O SYKKEL
- O GIKK TIL FOTS
- O ANNET, vennligst oppgi: ____________________

17. **Hvor bra synes du <u>stranden du surfer på oftest</u> er sammenlignet med andre mulige surfeområder langs Jæren?** *[Vennligst sett ett kryss for hver av faktorene nedenfor, fra -3 = veldig dårlig til 3 = veldig bra.]*

| | **- 3 = Veldig dårlig** | **-2** | **-1** | **0** | **1** | **2** | **3 = Veldig bra** |
|---|---|---|---|---|---|---|---|
| Kort vei hjemmefra | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Parkeringsmuligheter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bølgekvalitet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bølgefrekvens | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Vindforhold | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Tilgjengelige toaletter/ skifterom | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fasiliteter (åpen kiosk og utleie av surfeutstyr) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lite forurensning/avfall i vannet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lite folk & trengsel | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Naturomgivelser | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

OM HVOR ERFAREN DU ER PÅ BØLGENE

**18. Hvilke brettaktiviteter driver du med når du besøker Jærstrendene?** *[Velg opptil* *<u>to</u>* *aktiviteter.]*

- ☐ SURFING
- ☐ KITING
- ☐ BRETTSEILING
- ☐ BRETTPADLING
- ☐ "BODYBOARDING"
- ☐ ANDRE, vennligst oppgi:__________

**19. Hvordan vil du beskrive ditt nivå som surfer?** *[Kryss av ett alternativ.]*

- O NYBEGYNNER
- O MODERAT
- O ERFAREN
- O PROFESJONELL (eks: driver med konkurranser, etc.)

**20. Hvor lenge har du drevet med surfing?** *[Vennligst oppi år/måneder.]*

☐ ÅR OG/ELLER ☐ MÅNEDER

**21. I gjennomsnitt, hvor ofte surfer du på Jæren i løpet av de fire årstidene?** [*Kryss av relevante alternativer.*]

| | | | | | |
|---|---|---|---|---|---|
| Sommeren: | ☐ Hver dag | ☐ Ukentlig | ☐ 2-3 ganger/måned | ☐ Månedlig | ☐ Noen ganger/år |
| Høsten: | ☐ Hver dag | ☐ Ukentlig | ☐ 2-3 ganger/måned | ☐ Månedlig | ☐ Noen ganger/år |
| Vinteren: | ☐ Hver dag | ☐ Ukentlig | ☐ 2-3 ganger/måned | ☐ Månedlig | ☐ Noen ganger/år |
| Våren: | ☐ Hver dag | ☐ Ukentlig | ☐ 2-3 ganger/måned | ☐ Månedlig | ☐ Noen ganger/år |

**22. I gjennomsnitt, hvor lang tid bruker du i vannet i løpet av en "surf session"?** *[Kryss av ett alternativ.]*

- O MINDRE ENN 30 MIN.
- O 30 TIL 60 MIN.
- O 1 TIL 2 TIMER
- O 2 TIL 4 TIMER
- O 4 TIL 5 TIMER
- O MER ENN 5 TIMER

**23. Hvem surfer du normalt med?** *[Kryss av ett alternativ.]*

- O ALENE
- O FAMILIE
- O VENN(ER)
- O MED EN SURFESKOLE
- O EKTEFELLE/SAMBOER/ KJÆRESTE
- O KOLLEGA(ER)
- O ANDRE, vennligst oppgi:________________________

**24. Hvis du drar med en gruppe, hvor mange drar du normalt sammen med?** *[Vennligst oppgi antall personer i boksen nedenfor.]*

[______] PERSONER

**25. Hvis du surfer med en surfeskole, hvor stor er klassen din av?** *[Kryss av ett alternativ.]*

- O 1 TIL 5 PERSONER
- O 6 TIL 10 PERSONER
- O MER ENN 10 PERSONER

**26. Har du kjøpt nytt surferelatert utstyr i løpet 2017 eller 2018?**

- O JA → Gå til spørsmål 27
- O NEI → Gå til side side 10

**27. Hvis ja, omtrent hvor mye penger har du brukt du på surferelatert utstyr i 2017/2018?** *[Kryss av ett alternativ.]*

- O MINDRE ENN 1000 kr.
- O 1000-3000 kr.
- O 3000-5000 kr.
- O 5000-7000 kr.
- O 7000-9000 kr.
- O 9000-11 000 kr.
- O Mer enn 11 000 kr

I DET NESTE SPØRSMÅLET BER VI DEG BESKRIVE HVA DU VILLE GJORT UNDER ET TENKT SCENARIO

**FORBUD MOT BØLGESURFING:** Et svært omtalt problem for surfere på Jærstrendene er forbudet om å surfe i vinterhalvåret på grunn av det rike fuglelivet i området. Strendene er stengt for brettaktiviteter for å unngå forstyrrelser av fugl i sårbare perioder, hvor blant annet havelle, sjøorre og kvinand er påvist sensitive for bølgesurfing (NINA rapport 1243, 2016).


*Foto: Frode Goa / gründer av KANT*

Se for deg at den **stranden du surfet på sist** ble underlagt et forbud mot brettaktiviteter. Anta at ingen av de andre Jærstrendene fikk det samme forbudet.

**28. Hva ville du ha gjort?** *[Kryss av ett alternativ.]*

○ Jeg ville ha fortsatt med å surfe på samme strand, til tross for forbudet

○ Jeg ville ha dratt på en annen strand som ikke var forbudt
Hvilken strand ville du da ha dratt til? Vennligst spesifiser: ___________________

○ Jeg ville ha besøkt noe annet. F.eks. et annet friluftsområde
Vennligst spesifiser:_________________________________________________

○ Jeg ville gjort noe annet eller blitt hjemme denne dagen

TIL SLUTT LITT DEMOGRAFISK INFORMASJON. *Svarene du gir oss på disse spørsmålene er bare for statistisk klassifisering, slik at vi kan forsikre oss om at utvalget av respondenter er representativt for den generelle befolkningen.*

**29. Hva er ditt kjønn?** *[Kryss av ett alternativ.]*

- O KVINNE
- O MANN

**30. Hvilket årstall er du født?**

[ ]

**31. Hva er ditt høyeste utdanningsnivå?** *[Kryss av ett alternativ.]*

- O BARNESKOLE
- O UNGDOMSKOLE
- O VIDEREGÅENDE
- O HØYERE UTDANNING (1- 4 år)
- O HØYERE UTDANNING (>4 år)
- O ANNET, vennligst oppi:_____

**32. Hva beskriver best din nåværende arbeidssituasjon?** *[Kryss av ett alternativ.]*

- O JOBBER FULLTID
- O JOBBER DELTID
- O JOBBSØKER
- O PENSJONIST
- O HJEMMEVÆRENDE
- O STUDENT
- O ANNET, vennligst oppgi: ____________________

*Hvis du ikke er i jobb full-/ deltid på nåværende tidspunkt kan du hoppe til spørsmål 35 på siste side.*

**33. Tar du deg noen gang fri fra jobb for å surfe?** [*Kryss av ett alternativ.*]

- O JA
- O NEI

**34. Hvor mange uker ferie pleier du vanligvis å ta ut i løpet av et år?** *[Vennligst oppgi antall uker i boksen nedenfor.]*

[ ] UKER

**35. Vennligst oppgi <u>postnummeret</u> ditt:**

[ ] POSTNUMMER

**36. Hvor mange medlemmer er det i din husstand (inkludert deg selv)?** *[Bokollektiv regnes ikke som husstand.]*

[ ] MEDLEMMER

**37. Hvor mange medlemmer av din husstand er under 18 år?**

[ ] BARN

**38. Omtrent hva var totalinntekten for din husstand før skatt (brutto årsinntekt) i 2017?** *[Vennligst kryss av det alternativet som passer best.]*

- O MINDRE ENN KR 100 000
- O 100 000 – 300 000
- O 300 000 – 500 000
- O 500 000 – 700 000
- O 700 000 – 900 000
- O 900 000 – 1 100 000
- O 1 100 000 – 1 300 000
- O 1 300 000 – 1 500 000
- O 1 500 000 – 2 000 000
- O MER ENN KR 2000 000

**39. Er du medlem av en organisert surfeklubb, f.eks. Stavanger Surf klubb?** *[Kryss av ett alternativ.]*

- O JA
- O NEI

TUSEN TAKK FOR AT DU TOK DEG TID TIL Å SVARE PÅ DENNE SPØRREUNDERSØKELSEN!