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Exploring challenges of visitor-generated waste in Lofotodden National Park

Hennie Engedal Lindøe
Master's Program in Nature Based Tourism

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This study is my master thesis in Nature-based tourism, written at the Norwegian University of Life Sciences at the Faculty of Environment Sciences and Natural Resource Management.

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Hennie Engedal Lindøe

Abstract

Norway has many scenic and pristine national parks which are desired destinations for foreign and domestic tourists. More visits are encouraged into the parks as they bring local value creation, prompting management to seek enhanced visitor experiences. Recreational activity in vulnerable areas creates pressure and disturbance on ecological values, wildlife, and can detract the experiences in over-visited areas. My thesis explored the challenges of visitor-generated waste in Lofotodden National Park, related to the popular hiking and camping destination of Kvalvika beach. The main objective was to: *Explore the challenges of visitor-generated waste in Lofotodden National park in order to create an understanding of the scope of the problem as seen from the tourists' perspective, investigate visitor-waste relationships and provide initial guidelines for possible management measures*.

To answer the objective, the study applied an exploratory, mixed method approach using quantitative date from a field waste survey to monitor and map out key locations visitors dispose their waste, and "hot spots" where waste accumulates over the main tourist season, combined with observations of waste distribution and visitors' behaviors and 26 qualitative semi structured in-depth interviews with visitors. Ajzen's (1991) "theory of planned behavior" was used as a guiding theory, for identifying some of the prominent attitudes, subjective norms and the perceived behavior control visitors hold towards human waste behavior and management at the specific case area Kvalvika, within Lofotodden National Park.

The findings from the three different methods identify and assess different aspects of the littering problem at Kvalvika. The fieldwork documents that littering is visible, accumulating, and dispersed over a gradually larger area during the main tourist season. Littering takes place near informal campsites, and the most common finding is human feces and toilet paper. Observations show that visitors camp close to surface-disposed human feces and use water sources prone to unwanted bacteria without treatment for a variety of personally hygienic activities, such as filling water bottles and brushing teeth. This raises concerns about visitors' health and degradation/wear of protected nature values. The interviews on the other hand find visitors do not perceive a particular waste problem at Kvalvika and experience it as a clean area. They have clearly negative attitudes towards littering. At the same time, the informants do not perceive toilet waste directly as litter, even though toilet paper was often encountered. Very few mentioned littering as problematic for humans, wildlife, or other ecological values, instead the problem was mainly related to aesthetic conditions, according to visitors. Visitors see it as a social norm not to litter and ask for simple management measures, if any. In particular, they support increased information, encouragement to bring "all" waste out, and guidelines for going to the bathroom in nature and to be more considerate of others. However, they do not want

to be blamed for littering, which is seen as lazy or uneducated behaviors of others. They are negative or hesitant about "hard" management measures. The tourists see themselves as having the primary responsibility for keeping nature clean.

Management can address the waste challenges with various measures, from indirect encouraging and persuasive messaging of wanted behavior from visitors to more direct regulation of access or larger physical measures such as toilets on the beach. Studies on the effect of different waste measures are minimal and adaptive approaches is recommended. Further research is needed to limit man-made waste in national parks and understand the impact of waste on ecological and social values. This study helps to identify areas that are important for further research, that will provide a better basis for effective management measures against littering in the future.

Sammendrag

Norge har mange nasjonalparker som med sin ville og vakre natur utgjør attraktive reisemål for turister fra inn- og utland. Det oppmuntres til flere besøk i parkene ettersom de frembringer lokal verdiskaping og forvaltningsmyndighetene ønsker kunne legge tilrettelegge for å gi gode opplevelser for besøkende som ikke går ut over verneverdiene. Fritidsaktivitet i sårbare områder skaper press og forstyrrelser på økologiske verdier, dyreliv, og kan forringe opplevelsene i overbesøkte områder. Oppgaven min utforsker utfordringene med besøksgenerert avfall i Lofotodden nasjonalpark knyttet til det populære tur- og campingmålet Kvalvika. Hovedmålet er å*: Utforske utfordringene med besøksgenerert avfall i Lofotodden nasjonalpark for å skape empiri om omfanget av problemet/utfordringer sett fra turistens perspektiv. Videre undersøke sammenhenger mellom besøk-avfall-forhold og gi foreløpige anbefalinger om mulig forvaltningsmessige tiltak.*

For å svare på formålet for studien har jeg brukt en utforskende mixed-method tilnærming. Her inngår en kvantitativ feltavfallsundersøkelse som kartla omfang og lokaliteter der besøkende kaster avfallet sitt, og "hot spots" der avfall samler seg gjennom den viktigste turistsesongen, observasjoner av avfallsfordeling og besøkendes atferd, og 26 kvalitative semistrukturerte dybdeintervjuer med besøkende i Kvalvika. Ajzens (1991) “theory of planned behavior” ble brukt som en veiledende teori for å identifisere noen av de fremtredende holdningene, subjektive normene og den opplevde atferdskontrollen besøkende har overfor menneskelig avfallsadferd og mulig håndtering ved det konkrete case-området som er undersøkt i Lofotodden nasjonalpark.

Funnene fra de tre ulike metodene identifiserer og vurderer ulike sider ved forsøplingsproblematikken ved Kvalvika. Feltarbeidet dokumenterer at forsøpling er synlig, samler seg og spres over et gradvis større område i hoved-turistsesongen. Forsøpling foregår i nærheten av uformelle campingplasser og det vanligste funnet er menneskelig avføring og toalettpapir. Observasjoner viser at besøkende slår leir nær overflatedisponert menneskelig avføring, og bruker vannkilder som er utsatt for uønskede bakterier uten behandling for en rekke personlig hygieniske aktiviteter, som å fylle vannflasker og pusse tenner. Dette gir bekymring for besøkendes helse og forringelse/slitasje av verneverdige naturverdier. Intervjuene viser derimot at besøkende ikke oppfatter et spesielt avfallsproblem ved Kvalvika og opplever det i hovedsak som et rent område. De har klart negative holdninger til forsøpling. Samtidig oppfatter ikke informantene toalettavfall direkte som søppel selv om det ofte ble påtruffet toalettpapir. Svært få nevnte forsøpling som problematisk for mennesker, dyreliv eller andre økologiske verdier. I følge besøkende var i stedet problemet hovedsakelig knyttet til estetiske forhold. Besøkende ser det som en sosial norm å ikke forsøple og ber om enkle skjøtselstiltak, hvis noe. Spesielt støtter de økt informasjon, oppmuntring til å bringe «alt» avfall ut, og retningslinjer for å gå på do i naturen og å ta mer hensyn til andre. De ønsker imidlertid ikke å bli klandret for forsøpling,

noe som blir ansett som lat eller uutdannet oppførsel. De er negative eller avventende til «harde» styringstiltak. Turistene mener de selv har hovedansvaret for å holde naturen ren.

Myndighetene kan møte avfallsutfordringene med ulike tiltak, fra indirekte oppmuntrende og overbevisende kommunikasjons tiltak om ønsket atferd fra besøkende, til mer direkte regulering av adkomst eller større fysiske tiltak som toaletter på stranden. Studier av effekten av ulike avfallstiltak er så langt minimale og adaptive tilnærminger anbefales. Ytterligere forskning er nødvendig for å begrense problemer med menneskeskapt avfall i nasjonalparker og forstå effekten av avfall på økologiske og sosiale verdier. Denne studien bidrar til å identifisere områder som er viktige for videre forskning, som vil gi et bedre grunnlag for effektive forvaltningstiltak mot forsøpling i fremtiden.

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1. Introduction

With urbanization comes an urge to interact with nature (Elmahdy et al., 2017). In Norway, the COVID-19 pandemic restrictions made this clear as capitol citizens filled up local forests and sought out scenic nature destinations (Epinion, 2021; Venter et al., 2020). In years before the pandemic struck, increased interest in nature-based tourism (NBT), including visits to protected areas, was noticed (Winter et al., 2020). Estimates suggest that protected areas globally receive around 8 billion visits annually (Balmford et al., 2015). Natural areas provide people with scapes to keep in touch with heritage and enjoy abundant benefits such as improved health and well-being from recreational activities (Winter et al., 2020). However, the increase also comes with increased pressure on resources that the environment and experience quality depend on (Miller et al., 2020), putting the ever so challenging relationship between tourism experiences and nature conservation to the test (Fredman & Margaryan, 2021).

In urban areas, facilities are in place to sort out conflicts and maintain a livable environment. Rubbish bins and cleaners effectively handle litter, and citizens sit down on porcelain thrones without worrying about their waste again. But what happens when such comforts are not in place, and nature calls? U.S. and Australian protected areas find that visitors bring negligent behavior generally associated with urban life into national parks, littering and human waste have become significant challenges in high visited and remote areas (Brown et al, 2010; Miller et al., 2020). This concerns managers in national parks as increasing numbers of visitors with improper littering behavior can potentially degrade ecological values and pose a health risk to recreationists (Brown et al., 2010; Miller et al., 2020).

Lofoten has strengthened its position as a "bucket list" destination for international travelers after Norway now topping rankings in sought-after travel guides such as Lonely Planet (Lonely Planet, 2022). Lofoten's unique and pristine coastal landscapes are highlighted as one of the best places to visit in the world (Lonely Planet, 2022). Yet, Lofotodden National Park is already experiencing a high degree of human impact in some areas (Kvalshaug, 2022). A user survey conducted by the National Park in 2019 shows that visitors have encountered litter, toilet paper, and human feces (Oslo Economics, 2020). Additional pressure adds to the list of management challenges, and the park wants to understand the scope of the problems, to initiate targeted measures to solve problems that destroy conservation values or reduce visitors' experiences (Kvalshaug, 2022). However, knowledge about efficient waste management in protected areas is limited (Miller et al. 2020), especially in Norway. Most of the studies that have been done are associated with littering behavior in American parks with far longer traditions and more facilitation within protected natural areas than in Norway (Ells & Monz, 2011; Lawhon et al, 2013; Mateer et al. 2020; Miller et al., 2020). Therefore, this study will focus on human behavior in natural landscapes, more specifically on identifying waste problems and

understanding more about visitor attitudes concerning waste management in Norwegian national parks.

1.1 Nature-based tourism in national parks

Nature experiences are generally considered time and time again as the most important for tourists visiting and traveling in Norway (Øian et al., 2018). Both domestic and international tourists seek access to Norway's "unspoilt" nature, with attractive environments rich in natural resources and scenery for outdoor recreation activities (Selvaag, et al., 2020). Even the marketing brand slogan for Norway has for a long time been "Powered by nature". Further demand for nature experiences within tourism is also expected to increase (Fredman & Margaryan, 2021), due to different global drivers of change, such as new technology specializing and diversifying equipment, increasing safety, and opening up for easier access and the use of nature in new ways (Elmahdy et al., 2017). Social drivers such as population growth, better health, more leisure time, and higher incomes create a broader and more diverse tourism market (Elmahdy et al., 2017). With diversifying nature-based tourists are new activities starting to flourish such as randonnée skiing, off road cycling, and kayaking (Dervo et al. 2014). However, the characteristics of the Norwegian NBT are still recognized by slow adventures, a traditional outdoor life (friluftsliv), requiring simple equipment and minimal infrastructure (Aasetre & Gundersen 2012). Such as walking or cross-country skiing, where the experience mainly focuses on nature, well-being, or harvesting natural resources (Vistad & Vorkinn, 2012).

The growth in nature-based tourism have opened new opportunities for the declining rural extraction-based economies, historically associated with agriculture or forestry (Haukeland et al., 2011). Haukeland et al. (2011) find that rural communities close to national parks are shifting traditional industries with commercial tourism business that consider the parks as an important asset. These communities are often found in particularly scenic areas, on which the activities and services in NBT depend to a large extent (Aasetre & Gundersen, 2012). Therefore, a substantial part of NBT in Norway operate inside or in the border zones of national parks (Øian et al., 2018). As NBT is a broad market with different interests, it has created potential for economic gain and NBT has become an increasingly important source of income in rural communities (Haukeland et al., 2011). This is also a development that the government's policies approve to support renewed regional value creation (Kaltenborn et al., 2011).

Thus today, the traditional “friluftsliv” simplicity is challenged, one finds that especially scenic mountain areas over the last years have been altered for land development, infrastructure, and tourism (Selvaag et al., 2020.; Øian et al., 2018). New tourists with less hiking experience have proven favorable attitudes toward increased development inside national parks, seeking simple infrastructure

by arranging trails, information signs, picnic areas, and considering offers of NBT commercial activities (Haukeland et al., 2010; Haukeland et al., 2011; Mykletun et al., 2021). However, traditional "friluftsliv" recreationists have shown skepticism toward such changes, and their concern is for instance that this can take away the undisturbed quality of nature (Haukeland et al., 2010; Haukeland et al., 2011; Mykletun et al., 2021). Finding the balance between different park visitors' preferences is a new challenge for national park management, as traditionally management mainly has focused on nature conservation and simple "friluftsliv" (Øian et al., 2018). However, nature conservation is simultaneously an equally important priority as increased activity pressure ecological values, wear on vegetation, and disturb wildlife (Haukeland et al., 2013). Yet, there is little literature that highlights, plans or discusses how to mitigate impacts of increased tourism for local communities and visitor experiences in Norway.

1.2 National Park management in Norway

Today, 40 national parks make up about 10 percent of mainland Norway (Ministry of Climate and Environment, 2019). With other area protection are approximately 17,5 percent of the mainland protected under the Nature Diversity Act (Ministry of Climate and Environment, 2019). The Nature Diversity Act (2009, Section 35) defines a national park as "large areas of natural habitat that contain distinctive or representative ecosystems or landscapes and where there is no major infrastructure development". The main objective is to protect ecosystems, maintain nature qualities, and not allow encroachment that destroys conservation values, such as building roads and cabins, mining, or regulating natural resources (The Nature Diversity Act 2009, Section 35). At the same time, the legislation "ensure that people can enjoy an undisturbed natural environment" (Nature Diversity Act 2009, section 35).

The right to roam ("allemannsretten") is the core element of Norway's "Friluftsliv" culture (Norwegian environmental agency, 2020). It regulates the right of individuals to access nature and land regardless of ownership (Reusch, 2012). Moreover, it gives people a free opportunity to utilize all uncultivated land, including National parks, for recreational purposes (Outdoor Recreation Act, 1957, Section 1). This applies a right to pursue unmotorized activities, camp, and harvest nature's berries (Norwegian environmental agency, 2020). Camping is permitted on uncultivated land such as forests, mountains, beaches, and protected parks at a respectable distance from inhabited housing, no closer than 150 meters for two nights (Outdoor Recreation Act, 1957, Section 9). One should not camp on cultivated land such as agricultural land, and residential and domestic sites (Outdoor Recreation Act, 1957, Section 9). The Outdoor Recreation Act, section 2, also indicates that activities in these areas must be considerate, and people must act with care to not damage or pollute nature. This is also emphasized in

the Nature Diversity Act section 6: "any person shall act with care and take all reasonable steps to avoid causing damage to biological, geological and landscape diversity".

The amount of human activity tolerated within a national park should be documented by park bords in strategic management- and visitation plans (Haukeland et al., 2011). Simultaneously, these should consider interests of protected values, visitor experience, and local businesses (Ministry of Climate and Environment, 2015). The National parks' important role in tourism value creation has sparked initiatives to invite more people into nature by a branding strategy for Norway's national parks (Ministry of Climate and Environment, 2019). This aims to create identity, understanding for protection values, promote visits, and create economic gain for surrounding communities (Øian et al. 2018). Although inviting more recreational visitors into the park is a welcoming gesture, one also runs the risk of exploiting nature with a increasing human impacts. Several Norwegian parks and vulnerable areas are seeing increased wear on nature and disturbance of wildlife (Aas et al. 2022), also conflicts that affect the experience in over-visited areas (Vollan & Lusæter, 2021; Fredriksen, 2020). Here, one of the significant barriers for effective management is the limited opportunities to impose access restrictions in protected areas, especially in national parks, due to common access rights (Vistad & Vorkinn, 2012). Within national parks, the main rule is that recreational use is permitted under the Nature Diversity Act 2009, section 35, it is only possible to prohibit or restrict access in certain areas where human activity is documented to cause severe or irreversible damage to biodiversity or cultural monuments (Reusch, 2012). The common right of access (Allemannsretten) has been discussed as both a blessing and a curse in Norwegian protected areas for decades (Kaltenborn et al., 2009). It provides opportunities for public access to enjoy and experience nature but also limits potential favorable visitor management measures.

Due to these challenges, the Ministry of Climate and Environment created an action plan in 2019 to strengthen the management of protected areas. This plan aims to increase the allocation of funds towards more active national park- and protected area management (Ministry of Climate and Environment, 2019). The Nature Diversity Act (2009) states that adaptive management shall be based on adequate knowledge. However, knowledge obtained regarding the conditions of protected areas, how these develop, and which measures are most effective in improving them is stated as not sufficiently developed as of today (Ministry of Climate and Environment, 2019). Therefore, needed mapping, monitoring, and supervision measures (Ministry of Climate and Environment, 2019). The branding program for national parks attempts to promote collaborative work among stakeholders and guide visitors by channeling traffic away from vulnerable areas (Øian et al. 2018). Some argue that national parks in Norway are shifting towards a more active management phase with commercial tourism as a priority instead of the traditional nature protection and “friluftsliv” (Øian et al. 2018; Haukeland et al., 2011; Kaltenborn et al, 2011).

1.3 Lofotodden National Park

The Lofoten Islands stretch out into Vestfjorden, which again connects to The Norwegian Sea. Lofoten is made up of six municipalities, Vågan, Vestvågøy, Flakstad, Moskenes, Værøy and Røst. The landscape is dominated by narrow alpine mountains with high peaks surrounded by open sea areas and deep blue fjords, making it a breathtaking and unique view. It is a destination desirable for tourists from all over the world and one of Norway's most visited regions by tourists, estimated to around one million nights by guests with international arrivals rising (Kvalshaug, 2022). Despite growing tourism, fishing remains the dominant industry, and about 25,000 people live and work in Lofoten (Thorsnæs, 2021).

Lofotodden National Park lies in the municipalities of Moskenes and Flakstad in the southwestern part of the Lofoten islands. It takes up most of the uninhabited, rugged and wild part of Moskenes Island. Most of this area refers to as "yttersia" - the outer side for the locals. The park was established on June 22nd, 2018, and officially opened on June 9th, 2019, becoming the so far last and 40th national park in Norway (Lofoten, n.d.). The park covers an area of 99 square kilometers, of which 13 square kilometers is sea area (Norwegian Environment Agency, n.d.). The purpose of the protection emphasizes preservation of a unique coastal alpine landscape without heavier encroachments, hosting distinctive natural diversity and valuable cultural monuments (Forskrift om vern av Lofotodden nasjonalpark i Moskenes og Flakstad, 2018, section 1). Within the protected area, the public shall also be given the opportunity for undisturbed nature experiences with minimal technical facilitation.

In the summer of 2019, Lofotodden national park surveyed the visitors of the national park area (Oslo Economics, 2020). The goal was to gather relevant knowledge about the use of Lofotodden national park. The survey showed that 81 percent visited the area for the first time, and 78 percent had a residential address outside Norway. An almost equal proportion of men and women answered with an average 36.9 years of age. The age average and hiking experience were low compared with other Norwegian national parks. The area's status as a national park was reasonably new during the survey, and more than half of the visitors were not familiar with the protection status. The visitors' motives were not the national park itself but other factors such as the destinations' beautiful scenery (Oslo Economics, 2020). A study by Kaltenborn et al. (2019) documents that it is the dramatic, rugged, and lush landscapes that attract tourists to Lofoten, along with diverse opportunities for recreational activities that suit many different visitors.

The Oslo Economics (2020) survey targeted issues surrounding the conservation status, rules for use, and behavior in the national park. Some of the challenges highlighted in the survey were that large numbers of tourists visit the area. Kaltenborn et al. (2019) found in interviews of tourist to Lofoten that the current popularity could be a threat to the areas long term appeal, tourists' perceptions were found to be that Lofoten is "filled up". Resident respondents in the Oslo Economics (2020) survey reported also concerns that tourist's pressure have become too much, especially on trail networks, increasing litter and waste in and around the national park. From the survey two destinations were highlighted as important attractions; Kvalvika and Ryten. Visitors to these attractions sometimes reported negative experiences with noise from other visitors and rubbish in the area, some informants had also encountered toilet waste (Oslo Economics, 2020). The informants of Kaltenborn et al. (2019) emphasized the need to take care of Lofoten's pristine character and requested increased focus on management of visitor's pressure.

Based on the Lofotodden survey, assessments have emerged of having to alleviate pressure on conservation values at the most popular trailheads through physical facilitation measures and targeted information provision (Kvalshaug, 2022). Because the user survey showed that visitors encountered litter and human waste (Oslo Economics, 2020), Lofotodden National Park together with the Norwegian Institute for Nature Research (NINA) started a project aimed to identify solutions for waste management. With this master thesis, I helped launch the "Sporløs Lofotturisme" project which aimed to gather information (Syverhuset, 2021). The "Sporløs Lofotturisme" project forms a basis for targeted and long-term waste management that can contribute to sustainable tourism (Kvalshaug, 2022). One of the first goals within the project is documentation of the extent and distribution of human waste, with a special focus on the popular Kvalvika trail. Specific aims are to get an overview of how much amount of human waste are left in Lofotodden NP during the main tourist season. The National Park Manager defines this as June 1st to September 1st. Number two is to find where human waste is a problem in the national park.

As part of this project, my master thesis represents one sub-activity with the overall objective of conducting an exploratory mixed method study of visitor-generated waste in Kvalvika in Lofotodden national park.

1.4 Problem Statement

The primary objective of this thesis was to:

Explore the challenges of visitor-generated waste in Lofotodden National Park in order to create an understanding of the scope of the problem as seen from the tourists' perspective, investigate visitor-waste relationships and provide initial guidelines for possible management measures.

1.4.1 Research questions

What are the linkages between visitor numbers and waste?

- Map key locations within the park where visitors dispose of their waste.
- Observe hotspots where waste increase or decrease over the summer season 2021, compared with visitor numbers registered at automatic trail counters.

Investigate attitudes and norms visitors hold towards human waste management within the national park.

- What do people see as the main waste problems and do visitors recognize challenges in Lofotodden national park in particular?
- What attitudes, norms and perceived behavioral control do visitors hold towards human waste in the case area?
- Who do the visitors see as responsible for waste management?
- What attitudes do people hold towards potential management measures to deal with waste problems?

2. Relevant theories and existing research

2.1 Ecological and social impacts of outdoor recreation activities

In Norway, the establishment of national parks has primarily focused on preserving and shielding the same values (Haukeland et al., 2013). However, as nature-based tourism increases and visitors bring economic gain to rural communities, a focus shift has come where national parks now put stronger emphasis on the opportunity for people to visit and enjoy these parks (Ministry of Climate and Environment, 2019). Previously sheltered areas now experience the emergence of diverse users and activities, sometimes infrastructure development and facilitation to meet visitors' interests and make nature areas more accessible (Haukeland et al., 2011). With accessible and inviting gateways to nature comes also more concentrated and voluminous human pressure. Recreational impacts from human activities can potentially change and detriment natural resources such as soil, vegetation, wildlife, and water (Hammitt et al., 2015). Those changes can also degrade the values visitors seek in their nature experience.

Recreation ecology looks at how different activities by tourists and recreationists impact on natural environments (Hammitt et al., 2015). This area of research has emerged since desirable nature often hold conservation values where managers aim to preserve the natural conditions, while at the same time, users hold different opinions of what carrying capacity nature's resources tolerate and what are seen as acceptable management approaches (Vistad & Vorkinn, 2012; Haukeland et al., 2013). Therefore, managers must find a balance between recreational impacts, acceptable changes and management measures. Disturbance differs among activities, and one must look at the management of impacts from several angles and combine social-, ecological- and resource aspects when defining an area’s carrying capacity (Manning et al, 2017).

An area's environment has features that can resist use differently (Hagen et al., 2019). Hammitt et al. (2015) discuss how resistant and resilient aspects of the environment should be assessed. Resistance is defined as the ability a feature has to absorb use without being impacted. For instance, a rock surface that is only disturbed by a hefty force like dynamite, which also would leave a permanent scar (Hammitt & Cole, 1998). On the other hand, resilience shows an ability to return to the same state as before being exposed to a disturbance, this would be vegetation such as grass which has fast recovery but a minimal possibility to resist pressure (Hammitt & Cole, 1998). Wear and tear on vegetation has been highlighted as one of the biggest threats to the natural values in Norwegian national parks (Ministry of Climate and Environment, 2019). Hiking is a common disturbance on vegetation as recreationist compact soil and changes soil structures into solid trail network (Hammitt & Cole, 1998). Recent research in Norway from Femundsmarka National Park indicates that park visitors inflict

negative ecological impacts (Aas et al. 2022). Aas et al. (2022) showed that over a 30-year period, the number of informal campsites, worn away vegetation, and damaged trees had increased considerably. Accumulations of such impacts over time were highlighted as concerning, especially tree damage, which was found with greatest increase, as it may cause further degraded habitats of other organisms (Aas et al. 2022). Furthermore, the study points out that monitoring negative ecological developments inflicted by recreationists is important, this for controlling impacts over time and initiating countermeasures (Aas et al., 2022). Recreationists can also cause noise and stress to wild animals when they enter their habitats (Manning et al., 2017). In Norway, it is primarily wild reindeer that have been researched in this area, where facilitation for recreation has been shown to limit the reindeer's land use and inflict stress as they try to avoid human hikers (Gundersen et al., 2020). Recreationists litter and polluting activities applied to water resources are problematic for aquatic ecosystems, wildlife, as well as for humans (Manning et al., 2017). Disposal of waste can have physical, chemical, and bacterial effects on water (Hammitt et al., 2015). Disturbance to water sources such as lakes and streams in wildland areas is of concern because they strongly relate to human health (Bridle et al., 2007). While few studies have shown recreation as a significant source of water degradation with good water flow, a seasonally heavily used area can bring concentrated pollution to levels of contamination concerns (Hammitt et al., 2015; Monz et al., 2013).

Recreationists in national parks unconsciously and consciously pose these threats to their ecological surroundings (Manning et al., 2017). Inflicted recreational impacts such as crowding, noise, exploited resources, and degraded aesthetics will also affect the social aspects of visitors' nature experiences (Haukeland et al., 2013). Recreationists' reasons for visiting nature are highly diverse, their interests and knowledge vary about ecological conditions, and equally do perceptions about how harmful human activity is (Vistad & Vorkinn, 2012). In other words, social impacts depend to some degree on visitors' preferences. What may be perceived as small disturbances can over time become substantial permanent changes detrimental to the experience and to the place, as visitors' specific expectations have been degraded (Haukeland et al., 2013; Manning et al., 2017). The imposition of disturbances on ecological values may mean that park management, for example, must impose restrictions on recreationalists' access to nature (Selvaag et al. 2020). Studies that look at how open recreationists are to regulations and restrictions show that physical restrictions are less accepted and can diminish the attractiveness of an area (Selvaag et al. 2020; Haukeland et al., 2013; Vistad & Vorkinn, 2012). Therefore Vistad & Vorkinn (2012) find it important to consider the tolerances and preferences of visitors, as visitors to an area will be more or less a purist with different characteristics. In simple terms, a purist prefers the authentic nature with little tolerance for physical infrastructure and high visitor impacts, while someone that is considered a low purist appreciates safety, practicality, and facilitation, they are also less affected by recreational impacts on their nature experience (Vistad & Vorkinn, 2012). Vistad & Vorkinn (2012) find that visitors vary a lot on the purism scale, and

therefore it is not easy to accommodate all wishes and needs in the same area. With a sufficient knowledge base concerning visitors and nature's vulnerability, management can facilitate good experiences and conservation measures, balancing proper communication and physical measures for sustainable visits to national parks.

2.2 Management approaches and opportunities

Manning et al. (2017) assessed management in national parks from four principles, focusing on facilitation from a supply and demand point of view, it is about [1] increasing or [2] reducing number of visitors, supply, or time used. On the other hand, there is a desire to manage and facilitate a fixed visitor pressure, where the matter of [3] strengthening the park's resistance or [4] changing / distributing the pressure of the visitors' activities to reduce impacts.

Visitor management can be classified according to how directly they control visitor behavior, often divided into direct- and indirect management (Manning, 2011). The direct management approach takes away from the visitors the opportunity to choose for themselves (Hammitt & Cole, 1998). In contrast, an indirect approach seeks to influence the visitors' choices, and they voluntarily change their behavior (Hammitt & Cole, 1998). This can also be referred to as hard and soft approaches (Manning, 2011). The hard approach is physical facilitation or enforcement, such as footbridges, marked trails, and regulated campgrounds. These may be necessary where visitors have made or are about to make a substantial impact on the nature resources or the quality of experience, or there are vulnerable species or cultural monuments that must be preserved (Manning, 2011). Hard approaches can be very effective but challenging to enforce in protected areas as they lay remote and deals with visitors with different attitudes and backgrounds (Manson, 2005). It also alters visitors' experience if they seek "authentic" nature (Vistad & Vorkinn, 2012). Moreover, it can be less preferred due to costs (Hammitt, 2015). Communication is a soft approach where one informs true verbal messaging or symbols. Soft management is generally preferred, as it does not enforce or restrict a particular use by visitors (Selvaag et al., 2022). This approach opens for interpretation, education, or persuasion, often guiding visitors toward environmentally sound behavior. It is important to note that communication strategies are context dependent as certain messages may only fit precisely to one area (Selvaag et al., 2022). What kind of attitudes and norms are kept within visitors also has a lot to say (Manning, 2011). Therefore, it is useful to have an overview of who the visitors to the site are and their preferences. These indirect approaches are commonly implemented in Norwegian national parks compared to more direct ones (Vistad & Vorkinn, 2012).

The Norwegian Environment Agency's (2015) guide for visitor management in Norwegian protected areas presents processes to complete before implementing measures. Directed at the management

authority for protected areas, it focuses on creating good experiences for visitors and the greatest possible local value creation, prioritizing implementing measures that increase understanding of protection and how to safeguard protected values. Therefore, in Norway management collaborate with the tourism industry to include their interests and knowledge of visitors. There is also important to note that if facilitating for visitors are conflicting safeguarding conservation values, conservation values must be given greatest consideration (Ministry of Climate and Environment, 2015).

Vulnerability assessments have been presented as a way to directing visits to areas that can tolerate it and shield vulnerable nature from traffic (Hagen et al., 2019). In NINA's handbook for vulnerability assessments (Hagen et al., 2019), they explain that an area's vulnerability gets determent based on assessments of nature's and visitors' impact characteristics. Nature's characteristics are adaptability, resilience, and resistance. These factors refer to nature's sensitivity. Visitors' impacts are external influences from different activities, quantities, spatial distribution, or temporal duration. These factors constitute the probability of exposure and the extent to which this leads to disturbance or wear. Firstly, unacceptable impacts will affect the biological basis, which varies among areas' habitat types and animal species. Secondly, it is about affecting visitors' experiences. An example is soil compaction, which can go so far that fauna and flora do not grow back, but it can also degrade the experience value if an area has worn down to little aesthetic mud and extensive trails (Evju et al. 2020). Management use assessments to determine how these external influences will have adverse effects or be acceptable influences on a protected area and create strategies based on the area's needs (Hagen et al., 2019).

The Ministry of Climate and the Environment (2018) has a guide for standardized visitor surveys in Norwegian national parks. This guide is based on the use of field registrations with automatic counters and self-registration boxes with follow-up surveys. Follow-up surveys are sent by email and let visitors elaborate on their visits, their preferences and norms. Such quantitative data of visitor volume and general demographic characteristics of visitors is essential to make knowledge-based management decisions. For instance, if an area has several first-time visitors and are of different nationalities, more resources have to be put into information compared to a trailhead used by locals (Ministry of Climate and the Environment, 2018). Such surveys are also great for strengthening cooperation between park management and the tourism sector, as they rely on the same knowledge of visitors. The tourism operators connected to the area also benefit from visitors enjoying a well-managed national park.

There are several steps Norwegian management can take to deal with disturbances to nature and the experience. NINA presents this as a pyramid with several layers where measures gradually moves form softer, indirect approaches such as information, to more hard regulatory measures (Hagen et al., 2019). In the foundations, national parks need to have accessibility and essential infrastructure of quality in the marginal zones of protected areas. Then informative measures that enlighten and provide

new learning digitally or through signs, it can also be physical guidance, but guides are little used in Norway today. These indirect preventive measures are mainly applied as management wants to encourage considerate behavior above having to do physical changes to the landscape. The next layer is the physical facilitation in the park environment. A common strategy is improved facilitation used at certain trailheads and degraded at others to channel visitors to certain areas. Further measures are where the right of public access gets questioned if park managers deem it necessary with limited use. Limited use can be achieved by introducing payments, bans, or guide orders for visits. Such strategies need legal provisions and government enforcement. Norway has the Nature inspectorate (Statens naturoppsyn, SNO), which can enforce laws in protected areas, such as orders for leashed dogs during seasons wildlife is extra vulnerable.

2.3 Understanding human waste behavior

Human waste disposal is an issue that impacts both the ecological and social values in national parks (Cilimburg et al., 2000). Remote destinations with little to no infrastructure brings much of the responsibility on the recreationists to behave in an environmentally friendly matter (Settina et al, 2020). And most of the studies on littering and wase in national park environments have therefore focused on effective communication to persuade change in visitors' behaviors (Brown et al., 2010; Miller et al., 2020; Settina et al, 2020). Recreation research about human recreational behavior is dominated by Icek Ajzen (1991)'s *Theory of planned behavior* (TPB), as it addresses the underlying factors that influence and lead to a person's performed action (see for instance Brown et al., 2010, Esfandiar et al., 2020; Miller et al., 2020). Ajzen (1991) indicated that attitudes, norms and perceived behavioral control over the situation at hand can together shape a person's behavioral intention and thus predict actual behavior. Attitudes are based on the person's own beliefs about the results of a given behavior, and the evaluation around these results. Subjective norms are other people's influence on individuals' behavioral intentions, how others will look at and relate to the action performed. This can be a strain on the extent to which the person will be able to meet the expectations of others. A perception of behavior control is about the person's perception of the degree of difficulty in performing the given behavior (Ajzen, 1991). Behavior control is very much about being able to overcome obstacles to perform actions, and it is conceivable that some are in situations where the circumstances make it almost physically impossible to perform desired behaviors. These resources factors are important, but perceived behavioral control is mainly the psychological perception of whether something is easy or difficult to implement, and how suitable the person thinks oneself is. My research was guided by these three main dimensions, attitude, subjective norms and perceived behavior control. Together they form the basis for a behavioral intention that is the closest predictor of the actual behavior (Ajzen, 1991).

USA and Australia have dealt with high visitor numbers and management strategies on a different scale than what one so far see in Norway. Several strategies have been developed based on among others the theory of planned behavior, to make visitors more aware and educated on the impact their behaviors have in wilderness areas. Miller et al. (2020) assessed challenges of increasing visitor numbers in U.S. national parks, especially amounts of generated waste, and how to communicate desirable behavior connected to the Zero Landfill Initiative (ZLI) and researching past communication strategies. Their findings suggested that many visitors already have been exposed to environmentally responsible behavior encouragements, and that visitors' attitudes should reflect proper waste behavior. Although, perceived difficulty and moral norms was shown to have a much larger effect on behavioral intentions. Therefore, Miller et al. (2020, P. 311) suggest messaging from park managers should target moral norms, here they recommend wording such as "the right thing to do". Perceived difficulty was shown to have the biggest impact, and facilitation might be needed to see a change of behavior, giving visitors access to disposal structures and guidance of right ways to recycle. Messaging connected to perceived difficulty is also suggested, giving visitors encouragement to hold on to their waste for a bit further until one reach a facilitated area. Their conclusion highlighted that reported behavior from visitors is not always proven in action, therefore a combination of providing infrastructure and morally grounded messages was advised.

The study by Mateer et al. (2020) used visitor observations to predict proper waste disposal in three US national parks. Here, they used observers who placed themselves at waste hot spots during the high season for visitors to see how they disposed their waste. They recorded visitors 'descriptions, such as age, gender and group size, but also facial expressions to register if someone was insecure or confused of how to properly dispose waste. Another observational study of Schultz et al. (2013) viewed littering behavior among individuals at 130 outdoor public locations in the United States, trying to find contexts including personal gender and age, but also other potential predictors such as time of day, social contexts, existing litter, and how lack of infrastructure plays into act of behavior. The results of the studies of Mateer et al. (2020) and Schultz et al. (2013) point out that the environment one is in and whom one associates with play a role in whether or not correct waste behavior was conducted. They found that eye-catching signs or rubbish bins created attention, engagement, and are appealing. Knowing where waste disposals are located connects to perceived difficulty. At the same time, if the environment is clean a norm will be presented as keeping the area clean, not much present waste restricted active littering.

Brown et al. (2010) observed change in behavior by putting extra focus on the normative aspects through directed communication. They concluded that "setting a good example for others" was potentially a strong approach after interviews with a selection of visitors to an Australian park. Subsequently, observations were made of hikers' behavior in the face of a littered bottle, here an

administrative experiment was to make signs with directed personal questions such as "what will you do, when you see it?" and "if not you, who? (It's the right thing to do)", signed by the park managers to awaken the norm and attitude elements of TPB (Brown et al., 2010, p. 888). The results showed that the signs had a strong connection with improved behavior towards picking up rubbish. Group dynamics and environmental setting is also interesting to monitor as mirroring of each other's behavior may occur, studies have seen that this happens where families with children more often also litter less (Mateer et al. 2020). Communication measures studies are mainly conducted as park managers seeks to keep infrastructure, regulations and costs minimal, and instead aim to modify the visitors' attitudes and norms consistent with park protected values (Brown et al., 2010; Miller et al., 2020). This is why in the United States issues with littering has sparked initiatives to encourage pro-environmental behavior by recreationists through programs such as "Leave No Trace" and ZLI providing education and guidons on minimum impact and outdoor ethics (Settina et al, 2020). Communication strategies using TPB logistic have proven successful in some cases to reduce litter or increasing acts of picking up other visitor's litter (Brown et al., 2010; Settina et al., 2020).

But there is waste that is less tempting to pick up and bring with oneself, such as human waste in the form of sanitary products, toilet paper and feces. Human waste is especially concerning as feces can carry more than 100 different bacteria, protozoans, and viruses (Ells & Monz, 2011). In many areas without facilitation the common practice is to find a discrete hiding spot and dispose the waste ether right on the surface, covering it with rocks or digging a cathole (Bridle et. al., 2007). And studies have found that shallow-buried and high densities of human feces often lay close to campgrounds or water sources within national parks (Bridle et. al., 2007). In certain climates, these disposal methods keep bacteria in the soil over six months and fecal mass needing six to fourteen weeks to substantial reduce (Ells & Monz, 2011). This is concerning to visitors' health and their perception of the nature experience quality. There are few studies on the impact human waste has on ecological values in a national park, but the studies that exist suggest that vegetation and water is prone to being degraded by high accumulations of human waste (Bridle et. al., 2007). Some of the suggested mechanisms for park management have been to facilitate toilets at heavily used campgrounds, and in less dense areas using carry out measures (such as a WagBag), or applying recommendations for safe distances and the right way of disposal depending on crowd, soil, and climate conditions (Apollo, 2017; Bridle et. al., 2007; Cilimburg et al., 2000; Ells & Monz, 2011). Cilimburg et al. (2000) believe that management must look at the impact of human waste from several criteria such as minimizing direct contact, limiting contamination of water sources, maximizing bacteria destruction, and minimizing the effect on visitors' experience.

3. Methods

The preliminary, overall objective of this thesis was to explore the challenges of visitor-generated waste in Lofotodden National Park by creating an understanding of the scope of the problem as seen from the tourists' perspective, investigate visitor-waste relationships and provide initial guidelines for possible management measures and further research.

3.1 Mixed Methods Approach

For my thesis I have chosen a mixed methods approach. Small (2011, p. 60) defines this approach as studies which "employ more than one analytical technique or cross techniques". The advantages of using a mixed-method approach in an exploratory study like this is that it allows addressing different questions and approach the questions from multiple perspectives (Manning, 2011). I use mixed methods because my research address both quantitative and qualitative questions since I aimed to contextualize numbers and not only rely on simple stats and maps. I also wanted to be able to set my interviews into a larger picture, throughout the whole summer and with different visitor volumes. My study consisted of three phases and applied accordingly three different methods. In Phase 1, I took part in a field waste mapping survey to find key locations within the park where visitors dispose of waste. In Phase 2, I observed waste and visitors' movement over four weeks by an observation protocol looking at hotspots in connection with visitor numbers. In Phase 3, I conducted in-depth interviews with hikers and campers at Kvalvika beach, to identify their attitudes towards waste problems in the area and norms regarding management measures to handle human waste problems.

This approach was chosen to ensure the investigation's originality, possible to complete within the resources and time frame available, and to address the somewhat unpleasant topic, and also reflecting that this so far has been a limited topic for research in Scandinavian settings.

Qualitative and quantitative methods are the two main methodological approaches used in the social sciences. A qualitative approach is used to investigate phenomena with the goal of getting a broader and deeper understanding of them. It may be appropriate if one does not know the phenomenon well or if there has previously been little research on it. Interviews or various observation techniques are most often used to collect data in qualitative research. In a quantitative approach, the purpose is to test different hypotheses from existing theories and findings in previous research. It is often a goal to be able to generalize the findings and relate them to reality in society (Johannessen, Tufte, and Christoffersen, 2016, p. 28).

In contrast to the qualitative methods, quantitative methods are used to analyze large numbers of units, and here data are registered and analyzed in the form of figures and statistics. By far, the most common method of collecting data is a survey, in which large samples of, for example, demographics, countries, or companies are often considered (Johannessen et al., 2016). The main difference between these approaches can be explained as the qualitative approach should seek to find an appropriate selection of the study population, provide more comprehensive answers with depth, and where the researchers themselves take part and must interpret the data (Merriam & Tisdell, 2016). On the other hand, the quantitative method should seek a sample as representative as possible for the population (Johannessen et al., 2016). Manning (2011) recommend that often different complimenting methods of both qualitative and quantitative can be used to find the best answers for amount and type of use in a nature area.

3.2 Case Study Approach

This study is also a case study. According to Johannessen et al. (2016), a case study can be described as an approach where the researcher limits the research to fewer specific subjects, phenomena, or places. It can be about exploring a phenomenon set to a distinct context and/or where distinctions between the phenomenon and context are unclear, such as the dynamics of a particular social environment or a physical location. The characteristic of this research approach is often a limited and specific time frame or place dependency, collecting detailed descriptions and much information from various data sources.

Since individual phenomena are researched in case studies, the studies are often performed using qualitative methods such as observations and interviews (Yin 2014 in Johannesen et al., 2016). In situations such as this study, the case study approach fits well because it is applicable to gain insight into why littering occurs at Kvalvika and how visitors' attitudes are towards littering and management approaches, as opposed to answering a specific hypothesis that needs adapted quantitative data. However, a case study may benefit from combined qualitative and quantitative methods for obtaining detailed amounts of data (Johannessen et al., 2016).

With an exploratory study, a limited case can be useful to complement already existing theories or generate hypotheses (Yin 2014 in Johannesen et al., 2016). The Scandinavian countries have few studies in park management and human waste in relation to countries such as the USA and Australia with different management approaches and longer traditions for facilitation measures. Exploring similar studies on a small scale in Norway can hopefully engage around the topic and lower thresholds for follow-up studies in Scandinavian contexts.

Simple case design with analysis units is a study that focuses on something specific. The *object of study* here is littering and human waste in Lofotodden National Park at Kvalvika beach. The *field* is the complex system of littering and, the attitudes and behaviors of visiting tourists at Kvalvika beach, including the trail to and from and, camp sites on/near the beach. Qualitative data by observation and complimenting one-on-one interviews. Quantitative supporting data with the failed waist survey findings.

3.3 Study area: Kvalvika

Kvalvika beach and the mountain Ryten is well known hikes and desired attractions for tourists and locals within Lofotodden National Park (Oslo Economics, 2020). The destinations are located in the municipality of Flakstad, at the northeast side of Moskenes island (Figure 1). From visitor counters "Lofotodden friluftsråd" have in the aria can one estimate that between 40 and 60 thousand people hike one or both attractions yearly ("Lofotodden friluftsråd", personal communication, 4th February, 2022).

Kvalvika is a popular beach since the medium-difficult walks suit most people, it has opportunities for camping and a fantastic view of the open sea surrounded by cliff walls. One can reach the beach through a mountain pass, leading to the isolated "yttersia". The trip to Kvalvika mainly starts at Torsfjorden trailhead. The hike from Torsfjorden is a bit under 2 km long and the final destination is reached within two hours. The terrain starts with a slight climb true bushes and branches, with a few wooden walkways arranged. Further one meets a surface where there is some boggy and wet terrain, also paved with planks a cupel stretches. Then a climb to the pass at 180 masl., partly rocky with some bigger boulders. Water and foot traffic to the pass has created several paths where vegetation has worn away. On opposite side of the pass the terrain falls quickly with views of the beach, here quite rocky and rugged. Rainy weather can challenge hikers as the trail becomes slippery and muddy. This steep trail leads all the way down to the flat with grassy dunes until one meet golden sand.

One can also reach the beach combined with a trip to the viewpoint at mountain Ryten, which has a trailhead at Innersand. There, the trip starts on a wooden walkway before it is up hill to the peak at 543 masl. There are some flat sections occasionally with some wooden bridges, towards the viewpoint there have become several paths to choose from. Down to Kvalvika one walk past the lake Forsvatnet to a steep descent in rocky terrain. This hike can take around 3 hours.

The hikes are accessible from the E10 but the paved small parking at Torsfjorden has been closed, this due to crowds of visitors' illegal park along the road, blocking traffic and creating problems for locals and necessary transportation such as garbage trucks and ambulances. Other parking options are

available at Fredvang and Innersand, it costs 100 NOK. There is a shuttle bus that runs part of the summer transporting hikers from the parking at Fredvang to the trailheads, it is also possible to walk 3 km along the road. Still several cars chose to park illegal in 2021.

Today there is facilitation at the Torsfjorden trailhead with two toilets costing 10 NOK to access and a small trash can in addition to some information signs about the transport system and a poor map of trails in the area. The trail to Kvalvika beach is not marked with paint which is common among other trails in Norway. At the beach there is no infrastructure other than a sheltered simple self-made cabin and outdoor toilet made by two surfers that spent a winter living at the beach, surfing and collecting marine waste (Kvalshaug, 2022). One also finds a swing made form driftwood and informal camping spots with fire pits. Kvalvika had a small settlement of fishermen and farmers until the late 1930s, and one can find traces of foundations from their buildings in the grass (Flakstad historielag, n. d.). Also, foundations of an even older settlement is being examined by archaeologists, assumedly from late iron age or the middle ages (Lofotodden nasjonalparkstyre, n. d.).

Figure 1. Map of Case study area (overview map of Lofoten, municipalities and Kvalvika trail). 2022. Source: Kartverket GeoNorge..

3.4 Monitoring

Proper monitoring of changes over time can help efficient management and protection of conservation values in national parks (Kajala, et al., 2007). Numerous methods are used to understand recreationists' patterns and behaviors (Manning, 2011). The aim is often getting an overview of questions surrounding what type of area, how many and who visits, and what activities they pursue (Ministry of Climate and the Environment, 2018). One often wants quantitative data from different locations with reliable information and that can be compared, gathered from surveys and counting of visitors (Kajala, et al., 2007, p. 21).

Tracking visitors' movement in a remote nature area with little infrastructure to guide their course can be challenging (Stamberger, et al. 2018). Electronic automatic visitor counters are often preferred for quantities of visitor use data, as it is effective if strategically placed and relatively cheap (Hagen et al., 2019; Manning, 2011). Automatic counters get the total number of passing visitors of the devices, a weakness being it does not cover the exact number of visitors in the aria and does not explain anything further about visitors' actions (Kajala, et al., 2007). Stamberger et al. (2018) used global positioning systems (GPS) to identify the travel patterns of recreationists in Alaska. They found GPS suitable for gathering rich information and mapping human movement, simultaneously was it labor-saving and very detailed. Stamberger et al. (2018) study was proved useful in looking more closely at the impacts visitors impose on ecological and social perspectives, such as areas where visitors camp, and the imprints they leave behind as wear and human waste.

My study has been a part of the pilot project "Sporløs Lofotturisme" lead by NINA and the Lofotodden National Park board. The aim is to map out human waste in the national park area, to get an overview of the amounts of human waste left behind (NINA, 2021). Kvalvika is already a destination with documented human waste problems (Oslo Economics, 2020), but the extent has been unknown and therefore interesting to address.

In my field work with the "Sporløs Lofotturisme" project we trialed monitoring through a field waste survey, where we saw it useful to register waste locations, and categorizing the human waste at Kvalvika. As we aimed to get an overview of the extent and concentrated areas ("hotspots") exposed to litter and human waste (Syverhuset, 2021). This was done during the main tourist season in Lofotodden national park, defined as June 1st to September 1st. The program used was ArcGIS, a geographic information system used for quantitative analyses and creation of maps (Esri, n.d.). ArcGIS is an online cloud base, so we could walk with an iPad and collect geographic coordinate

locations of waste observations. The Sporløs Lofotturisme project will continue in to 2022, and the hope is to eventually become a long-term waste management program that facilitates sustainable tourism in Lofotodden National Park (Kvalshaug, 2022).

Monitoring of the Torsfjorden - Kvalvika track true the field waste survey was conducted four times, 30.06.21, 19.07.21, 30.07.21, and 15.09.21 by fieldworkers from NINA, Lofotodden National Park, and NMBU. I took part in two of the monitoring sessions. The same protocols were presided each time: registering all waste following the main trail, walk 30 meter outside of the trail on each side, and cover the main Kvalvika beach area. Mapping was carried out using the ArcGIS app with map and GPS location. The information noted was the location of waste occur, amount identification, description of waste type, and photo documentation. The categories for waste and the fieldwork protocol were created by the NINA researchers. The categories can be seen in table 1. I also used trail counter numbers from "Lofoten friluftråds" automatic counters to monitor the amounts of visitors per day to Kvalvika, whether it was possible to see proportion changes between days with higher visitor numbers or lower.

Table 1. Categories used for the registration in the waste monitoring survey.

1. Small fecal + toilet paper	5. Pet waste only
2. Large fecal + toilet paper	6. Fecal only
3. Small mixed waste	7. Fecal waste primarily in water
4. Large mixed waste	8. Burned waste/fire pit

3.5 Observations

My observation protocol and interview guide (see attachment) were developed by inspiration from methodologies utilized in previous natural area and protected area studies on littering behavior referencing below in the table (Table 2).

Table 2. Summary of studies inspiring the observation protocol and interview guide in this study.

Author	Main Topic	Method	What is studied	Findings
Brown, T. J., et al. (2010)	Visitor management	Qualitative, Observation Interviews	Communication to influence tourist behavior in protected areas. Using Theory of planned behavior.	Success in influencing visitors' actions comes from understanding what they think about a particular behavior.
Miller, Z. D., et al. (2020)	Visitor waste management	Quantitative, survey	Leave No Trace-concept & TPB questions. Relationship between psychological constructs and behavioral intentions.	Moral norms and perceived difficulty to dispose waste properly significantly predicted behavioral intentions.
Mateer, T. J. et al. (2020)	Waste disposal behavior	Qualitative, Observation	Observing management challenges and disposal techniques, in relation to understand how and why visitors behave the way they do at key locations in NPs.	Results showed individuals meaningfully engaged with signage, did not appear confused, and who had children in their group were more likely to dispose of waste properly.
Schultz, P. W. et al. (2013)	Littering Behavior	Qualitative, Observation	Littering behavior at 130 outdoor public locations in the United States	Results showed age (negatively) predictive of individual littering. At the level of the site, the presence of existing litter (positively) and the availability of trash receptacles (negatively) predicted littering.
Kaltenborn, B. P. et al. (2019)	Tourist's experience	Qualitative, Interviews	The ecological, cultural, and social limits of sustainability from visitors to Lofoten point of view.	Results showed that importance of the landscape was paramount. Further studies must map places with particularly high scenic value.

Observations are suitable for detailed descriptions of people's activities, behaviors, and actions. The data answers questions about when, how, and how often (Johannessen, et al., 2016). This became central in order to understand the visitors' pattern of action - and how, where, and why these negative actions occur. Observational studies in public space can help understand how visitors behave and act with the phenomenon of human littering and waste in a more objective way (Mateer et al. 2020). This is a good method for understanding direct behavior and gives concrete pictures of the situation (Johannessen et al., 2016). What one often loses are thoughts and feelings to gain in-depth knowledge of attitudes and experiences.

The design of my observation protocol has in the first part focus on recording landscape features where waste is present, such as water streams, boulders, and vegetation. These are similar situation specific observation objectives Schultz et al. (2013) focused on in their studies only they aimed at an urban environment, what is the availability of waste bins, how do people relate to them, where is it preferable to dispose of waste, and what environmental features causes litter. The second part of my protocol follows visitors waste behavior patterns and interactions with the landscape. Mateer et al. (2020) and Brown et al. (2010) found it useful to use observations to view how visitors engaged with waste in national park areas. Like them, I have included in my protocol objectives addressing the characteristics of a littering behavior, such as group dynamics, whether a persons conducted active or passive littering, expressions of confusion, or picking up others litter. Observing how these human waste behavior features formats in relation to numbers of visitors and campers has marginal related studies but can provide an interesting supply of context for management. For this I observed changes in waste piles and creations of new waste “hotspots” over the sampling period with connection to registered visitor numbers from the automatic counters. Mateer et al. (2020) and Brown et al. (2010) observation guides was developed in contact with park managers. I have taken this into account and kept in touch with those who are part of the “Sporløs Lofotturisme” project. This exploratory approach to identify special characteristics of littering patterns in Norwegian nature can provide knowledge of where ecological and social recreational conflicts arise. The full observation guide is attached as an appendix.

I also conducted a form of participatory observation, keeping the environment as natural and authentic as possible. I was identifiable as a researcher or manager, using a neon green Lofotodden National Park jacket, but did not inform what I was looking at or for, if not asked. Primarily I wanted to observe visitors’ littering behavior and waste patterns within the case study area, observing the same area used in the *“*Sporløs Lofotturisme” project, but also the trailhead area with the toilet and rubbish bin. Most of the observations were made at the beach where the tourists spent most time, focusing on basic distribution of field waste like toilet paper, waste piles, and litter around tent sites or other locations. In a field diary I noted approximate number of visitors by counting cars, tents, and groups. I wrote down

observations with pen and paper in a personal fieldwork log roughly according to protocol, this normally on a daily basis or if a special situation arose. Waste sites was also recorded in ArcGIS. Documentation from the fieldwork covers just under four weeks during the high season July-August in 2021.

3.6 Interview protocol and process

Semi structured in-depth interviews is a method for obtaining full and detailed descriptions from relevant people involved (Johannessen et al., 2016). I chose this method for my study as it provides information on visitor's opinions, attitudes, and experiences (Kvale & Brinkmann, 2009). The method is good when there are social phenomena that can be perceived as complex, and it is important to bring out different nuances (Johannessen et al., 2016). Detailed descriptions from visitors apply context to the observations and give detailed insight on the tourists' perceptions on waste challenges. One-on-one interview is suitable for this study as I wanted firm understanding of feelings, experiences, perceptions, attitudes and reflection related to waste, and different management measures that can fit in Lofotodden National Park. The topic of waste behavior may seem intimate or private to some informants, therefore it can a be negative to deal with in a group dynamic.

My interview guide was inspired by the relevant prior literature on waste behavior that had implied TPB in their study (Brown et al., 2010; Miller et al., 2020), and the prior qualitative study of Kaltenborn et al. (2019) of tourists' values associated with Lofoten. The interviews were partly structured on the basis of an interview guide, but the questions were relatively open and possible to move differently in the order. This to be able to let informants elaborate further if they mentioned something particularly interesting or relevant. Having open questions and a one-on-one dynamic is to give room for the informants to answer in their own words (Johannessen et al., 2016).
The interviews lasted about 15 minutes. A varied field of responders was selected based on observed different traits such as gender, assumed ethnicity, group size, and age. The topics in the questions focused on TPB, attitudes and perceived difficulty. Trying to get an understanding of how acceptable visitors are to different management strategies. To create a good atmosphere, I started with some more acceptable and easy topics as the introductory questions. Some of the later questions opened for giving examples of strategies, to create some discussion, as the topic of waste and human toilet behavior can be a bit awkward. This was to get an understanding of how acceptable or not acceptable the informant was to a strategy. Management strategy examples could be: watching information videos, permits to camp, having to stop by the visitor center in Reine, the municipality hiring someone to clean, that nothing is done etc. Respondents was at the end informed that many of these examples will need extra resources, this leading to asking how much one might be willing to spend on such measures and who is responsible for these costs. As an interviewer I tried to influence the informants as little as possible

and just let them answer with their own words. In order to retain original expressions are some of the quotations presented in the results chapter from informants in Norwegian.

The informants were informed that they would remain anonymous, no one were asked to provide names. If the visitors approached agreed to answer a member of the group was selected random by who had celebrated their birthday last. I wrote down the informants' answers in pencil on paper. I tried to get as detailed answers as possible by keeping expressions like laughter and pauses for thought. I did not use recording as I had not applied for permission to keep something that could identify the informants due to little time for preparations over the summer. However, I feel that the informants got a comfortable and little pressured atmosphere during the interview when I used paper and pencil. It opened for calm conversations with pauses for thought and confidence that they would not be identifiable. At the same time, I as an interviewer, was focused and sharp on what the informants wanted to convey. This led to honest answers around topics that to some might seem uncomfortable and inappropriate, such as toilet visits behind a rock. When I got back from the field work, I would go true the notes from interviews and record myself adding some thoughts if it were necessary to fill in key words.

3.7 Processing and analysis of the data material

Processing the interviews and observation notes has been demanding and time-consuming in several parts. The process involved reducing the amount of data by description of- and classifying data and seeing how concepts interconnect (Kitchin & Tate, 2000, p. 230). Qualitative research will, for many, be seen as an art form one has to master, and it can mean that one has to try and sometimes fail before mastering it (Merriam & Tisdell, 2016). In contrast to quantitative research, the qualitative analysis process is not a calculator where one plots numbers and gets two equal lines under the answer. Qualitative analysis lacks the formal standardized procedure for quantitative data (Johannessen et al., 2016). Through a manual data analysis process, there are also limitations and the possibility that human errors are committed (Kvale & Brinkmann, 2009). I have a humble understanding of this. However, using formal procedures, one may be wise not to drown in the amount of content to be interpreted (Merriam & Tisdell, 2016).

Initially, I transcribed all the interviews from paper into Microsoft Word. I used the comment feature in the margin of Word to highlight text and then dragged codes and good quotes into Excel, to discover connections between the interviews. Firstly, the process included marking relevant sentences, and giving the names that indicate the content based on theory, my interpretation of the content, or the informant's own words. This is to break up the extensive data material. Secondly, I used this overview

I had made of small codes to place them in clear categories to see the different informants' statements in context. To link statements with each other, glue the pieces of data together. Thirdly, it was to find and interpret relationships between categories. How they fit together and relate to one another, this helped to identify recurring patterns. The latest step provided an opportunity to compare findings from other studies in similar areas (Kitchin & Tate, 2000). This process was carried out several times from start to finish in the project, where I constantly got more and more overview of the content. Although it has been time-consuming, I have learned the content well by breaking up and organizing the data material into smaller parts in a manual data analysis process. I have read and interpreted the data material and been able to put it in a larger context.

3.8 Assessment of method and data material

3.8.1 Reliability and validity

Through my study, I have collected data using three different methods, primarily to strengthen the research's reliability and validity. Reliability considers if collected data measures what it is supposed to (Johannessen et al., 2016). A strength is often whether results are compatible with previous studies. Since my research has very few comparable studies related to Norwegian National Parks phenomenon, I chose to use several methods to explore waste challenges. Validity looks at whether the research has measured what the purpose of the study was, through the choice of methods, literature and sample (Johannessen et al., 2016). What is important in my study is that the research process is sufficiently described so that the research questions and results emerge well enough. This is because what is highlighted in my thesis should emphasize the importance of repeating similar research.

The validity of the data is whether it explains a real representation of the phenomenon being investigated (Johannessen et al., 2016). In my case study the phenomenon is littering and human waste at Kvalvika. Here I would like to point out that the results from the mixed-method approach provide important features securing validity for the case specific area (Kvale & Brinkmann, 2009). However, there will also be limitations in that the phenomenon is particular to Kvalvika and that the study has a limited time frame. There are several factors that come into play, and in a first-time study, there are many parts that must be repeated before one can formulate valid statements about the phenomenon. This makes the results difficult to pass on to something more generalizable. Conditions vary from year to year, in that the number of visitors to the national parks can be affected by factors such as weather, or the impact of the pandemic restrictions. The same study should be repeated in the same case area so that the results can be more reliable. The field waste survey will be conducted again in the summer of 2022 by NINA researchers. In order to strengthen the validity, the selection of a mixed-method

approach was important in order to show the extent of the impact waste has on Kvalvika, and to identify patterns surrounding the phenomenon.

Counting and categorizing waste piles for the field waste survey was challenging. There were sheep grazing in the aria and sometimes not easy to determine what was human or animal feces. Rain and fog also made it difficult to differentiate between new and old piles of waste, as toilet paper get wet and clump together. This potentially altered accuracy of observations and counts. As there is a large area to cover for one every new litter or waste pile, there is also potential that some are left unseen. As I arrived in the middle of July there were already piles made, so to get a thorough understanding of accumulations one would need to arrive in springtime before the main tourist season. My observation guide is also structured with predetermined categories and with scales attached. This became more of a guide for my observations when specific locations and amounts of waste were categorized in the field waste survey of the project.

Observations had several validity and reliability issues that arose due to weather. Several of the days with fog and rain made it difficult to see or even walk down to the beach, only four to six people were present at the beach and would not stay the night. At the same time on days with good weather I would have to camp as visitors arrived late, this also made it dark and people occupying interesting sites, making it difficult to conduct the planned registrations. This potentially altered the accuracy of documentations of behavior and people's reactions, and behaviors when they either created or reacted to waste. Mateer et al. (2020) and Brown et al. (2010) found it useful to use observations to view how visitors engaged with waste in national park areas. Such observations were somewhat downgraded as they are situation dependent and time consuming, the correct form of disposition was also difficult to document, so in my observations the right behavior was to pack the rubbish in the backpack on their way out of the park.

Concerning the qualitative interviews, it is important that selected informants are capable to provide information on the researched questions (Kvale & Brinkmann, 2009). Informants were to a degree randomly selected visitors to Kvalvika beach, I purposefully selected some different ages as visitors have differing agendas for their trip, some tented others did not. I got different perceptions form varied tourists. Other than a few with language barriers, every informant gave their opinions and reflections from their experience. Much of the credibility is based on my human interpretation of the informants' answers. Therefore, my interpretations must be strengthened by related theory from previous studies (Johannessen et al., 2016). The structure of the thesis is therefore important to strengthen each step that leads to a conclusion. There is no guarantee that the sample is representative for the wide range of tourists who visit Kvalvika. I conducted a total of 26 interviews, their opinions and attitudes cannot be generalized beyond that, but they can still give findings that are likely to be similar in repeated studies.

During the interviews, it is also essential that I, as an interviewer, have been aware of my role, not leading the questions to strengthen an outcome, or expressed my own attitudes that can have colored respondents' answers (Kvale & Brinkmann, 2009). By relating the interviews to a theory that has been used in previous studies, I can make meaningful comparisons and add to previous findings, although this study is most relevant for Lofotodden national park. Similar studies can build on the findings of tourists' perceptions of waste at other protected areas in Norway.

3.8.2 Ethical considerations

There are a number of ethical considerations when conducting qualitative research that can affect the credibility of the study's findings (Johannessen et al., 2016). Qualitative research carries with it some responsibilities, according to Kvale and Brinkmann (2009) this issue must be considered throughout the hole research process. In principle, participation should always be voluntary, as a researcher I must absolutely make sure of this. This applies if persons can be identified. Participants who are observed thus have a right to know that they are being researched, and what the research process is about (Kvale & Brinkmann, 2009). These are the challenges of observation, especially since such studies often are exploratory, and wants to uncover special authentic features of a phenomenon or group dynamic (Johannessen et al., 2016). As well as they often are carried out in public space.

In my research, it may be considered unreasonable to obtain informed consent. Seaton (2002) argues that discreet participatory observations related to the subject of tourism research open up less painful and ethical issues, than for example other social studies where people's threshold for hiding their behavior is greater, such as in criminal activities. I was not aiming to identify individuals, instead my focus was on the dynamics and general behavior patterns in a highly visited natural area. When presenting the data material, pictures, or recordings where possibly individuals could be identified, and electronic data storage could trigger a duty to report (Seaton, 2002). Therefore, I have been visible with a branded Lofotodden National Park jacket for people in the area, and for my own safety and comfort. I have informed about the research process if asked, and there were news and park webpages referring to studies being conducted in the area at the time. Data was deleted to ensure anonymity, if there were possible to identify persons who have been considered during the study, there are no use of names or other individuals' information. The setting can be anonymized by referring to situations more generally and changing characteristics, not defining who or where (Johannessen et al., 2016).

The informants in my thesis must have confidence that what is presented in the findings are not abused or to any harm for those involved (Kvale & Brinkmann, 2009). This was clarified with informants when they polity was asked if they voluntarily wanted to take part in the interview. Some chose to say no, but the majority I stopped took part. In order to meet ethical considerations, I clarified the role I as

interviewer and the informants had by informing about the purpose of the interviews. It was clearly communicated that participation would be anonymized, in that no contact information was obtained, and no recordings or physical descriptions would be used in the thesis. They had the opportunity to review notes I took at the spot and the opportunity to withdraw to respond along the way. In cases where informants have not wanted to answer, this has been respected. Introductions emphasized that any response were confidential.

For my own safety I had an in-reach tracker with me at all times due to no mobile signal, and another field worker in close proximity if something were to happen.

4 Results

I present my results organized by research question in two sections. The first section presents registrations of linkages between visitor numbers and waste, based on monitoring of the site with the field waste survey, mapping and observations. In the second section I present interview results focusing on visitor's attitudes, norms and perceived behavioral control towards human waste management within the national park.

4.1 Linkages between visitor numbers and waste

4.1.1 Key locations in the park where visitors dispose of waste.

The field waste surveys allowed me to identify initial waste spots I observed over time. I wanted to find key locations, describe and categorize them and observe features in the landscape around them that may contribute to more knowledge about the challenges of visitor generated waste in Lofortodden National Park.

The map below (Figure 2) shows key locations within the study area where visitors dispose waste. The map is created in QGis by NINA researcher Dr. Rose Keller, it shows the recorded waste locations from the "Sporløs Lofotturisme" field waste survey that illustrates spatial distribution of waste. The map is further marked with recorded accumulations of waste using a heat map, providing an overview of "hot spots" for litter and human waste. The map also provides an outline of the study area boundaries, the topography creates a naturally frame of area where visitor stay at the beach. The landscape of Kvalvika beach is dominated by grass covered dunes of sand surrounded by mountains and cliffs. A flat terrain that gradually goes from tall grass with big boulders from rockslides, to more compacted short gras where the informal campsites are, than to a drop on to the sandy beach that meats the sea. People tend to tent on the flat grass surface closer to the beach. Here one also finds fire pits built up by rocks and some have logs placed around fore sitting. Those are the first areas people put their tents, when it gets more crowded tents are put up closer to the tall grass and occasionally some put tents up at the sandy beach, but not observed often.

The color marked circles on the map indicate individual waste piles that accumulated during the field work period. The impact patten indicates waste at Kvalvika concentrates around camp sites and lay in close proclivity to each other. The average distance between waste sites were found to be 3,9 meters at Kvalvika (Dr. R. Keller, personal communication, 26. October 2021). Another important finding is that 63 fecal sites were located within 2 meters, and 24 within 5 meters of water sources (Dr. R. Keller personal communication, 26. October 2022). The red high-density spots lay a few meters away from

camping spots and usually indicate areas with large boulders. One can see that users of the area utilizes most of the flat surface at Kvalvika in the direction of the mountain walls.

Toilet spots where most frequently recorded in connection with boulders, I found no signs of people digging holes so most human waste where just straight on the ground. Visitors tended to seek out natural crakes between boulders. There are no trees or bushes for visitors to hide behind for privacy at Kvalvika. This leading to the big boulders having high pressure as toilets. There are two streams that flow down from the mountains at Kvalvika, creating another hiding place for visitors who want to go to the toilet. The streams sink slightly into the terrain and are covered with tall grass. Here there were several new observations of toilet waste towards the end of my fieldwork in August. This can be seen in the map where several green single observations and one high-density area has accumulated along the stream.

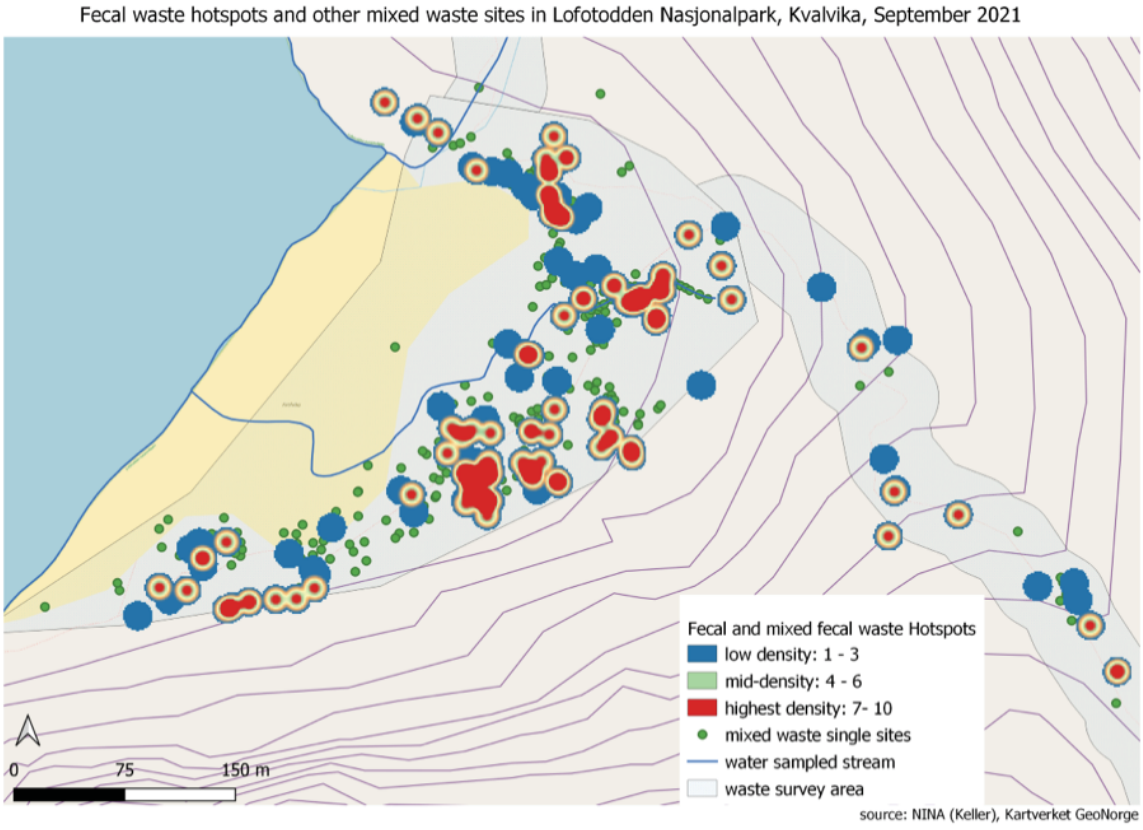

Figure 2. Locations of registered waste in the study area at Kvalvika, Lofotodden national park, 2021. Source: Dr. Rose Keller (NINA).

The diagram underneath (Figure 3) shows the distribution of most frequently categorized waste occurs out of 448 registrations. One finds that human fecal and toilet paper together with small mixed waste piles and burnt waste is most registered. Of waste that was recorded and observed, human faces and toilet paper are the largest category, referred to further as toilets. Of the litter, it was mainly plastic

food containers, wet wipes, snus and various food scraps such as banana peels. These tend to be left at fire pits. Several of the noted litter left at fire pits had been there prior to me arriving, usually covered with wood, assumed to keep it from blowing away.

Along the trail from Torsfjorden there were a few registrations of waste. Toilet stops were found around 300 m walking from trailhead, there it is some coverage of small trees and bushes to hide in. At the mountain pass a bit over 1 km into the hike there is also some boulders used as toilets. Along the trail there were some litter a few places here and there, mostly paper, "snus", and pieces of wrappers from candy bars. It tends to be more litter at the trailhead or towards the descent down to the beach from the pass than along other stretches of the trail.

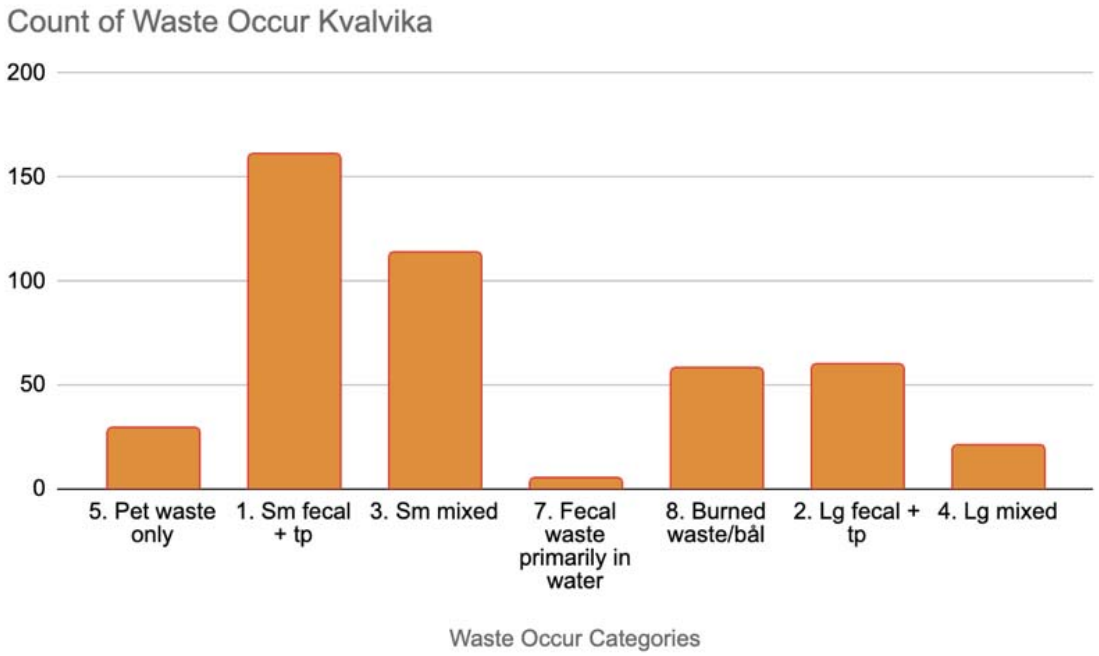

Figure 3. Frequency of different types of waste at Kvalvika, Lofotodden national park, 2021.

4.1.2 How visitor numbers and aggregated visitation over time affect waste volumes and hotspots

My observation protocol allowed me to observe hotspots and visitors' movement around in the study area. The existing waste spots from the survey were used as a base for my observation, to monitor changes over the four weeks. Any visible changes around streams, fireplaces/campgrounds and piles of visible human waste were noted. The visitor counts from "Lofoten friluftsråd" helped indicate level of use during the study period (see figure 4). I had no interaction with the waste piles other than observing, nothing got removed or dissembled by others than the visitors themselves. I normally arrived at the beach around 11:00 AM. Day visitors often started hiking a bit later in the day, and before noon I was often able to meet some of the campers that stayed overnight at the beach or on their way out. In this time frame I was able to observe changes at the lowest amount of use, as there was a change among campers. In this way it was possible to register waste while minimizing disturbance of the visitors. I noted down and took pictures of changes. I also camped at the beach with other visitors on two occasions, both at nights with many campers (27th July and 7th August).

Figure 4. shows visitor numbers of my observation days from the "Lofoten friluftsråd" automatic counter ("Lofotodden friluftsråd", personal communication, 4th February, 2022).

Figure 4. Daily visitor numbers at Kvalvika based on automatic counters, July and August 2021. Data made available from Lofoten friluftsråd.

There were often large variations in weather, and the number of visitors often reflected the weather forecast, so that days with poor weather forecast often saw less visitors, and opposite. When one look at the visitor numbers, bear in mind that the numbers show every passage of the automatic counters in and out of Kvalvika, at the same time there are several who walked from the Ryten mountain.

Behavioral observations happened at random intervals as there where big spans between number of visitors in the area. Most behavioral observations happened late afternoons or before midday as visitors got ready to camp or pack up after camping. Over 15 observation days I counted on average six tents down at the beach per day. The exceptions (not taking into the average count) was the two nights I spent in a tent myself with really good weather, those two nights I counted close to 50 tents.

The picture shows tents set up at Kvalvika on the evening of 27 July.

Figure 5. Kvalvika with many pitched tents, 27th July 2021. Photo: Hennie Engedal Lindøe (HEL).

During my last week of observations, I noted several frequently used toilet boulders had started to gain trails in the tall grass, these also shoved visitors expanded to boulders further away, walking to the next boulder. I assume to access more private or less used toilet areas. I also observed that eight people were hiking far beyond where I observed, they climbed up the rockslide on the south side of the beach. That visitors move further away can also be an indicator that some boulders had become unacceptable for visitors out of aesthetic reasons or fear for health reasons. That users expand further away create

additional impacts. Some of the toilet boulders had gotten tree logs from float wood or from the previous settlement farm, to build up a place to sit for the toilet user's comfort.

Very few of the toilet visitors at Kvalvika show signs that they are trying to hide (e.g. dig down) the waste. Visitors may use natural cracks between rocks to hide paper, but there is not much natural material in the area to cover the waste, making most left visible. As mentioned, there was little indication that anyone used a shovel to dig catholes to reduce negative experiences for others. During my observations I only saw 4 visitors bring a plastic bag with them for a toilet visit, but it is hard to tell if that was for bringing used or unused paper. When little of the human waste is sufficiently buried, it is up to time and weather to eliminate odors, unsightliness, and in turn to degrade the waste. So when I walked around and behind the rocks, I would be greeted by large accumulations of toilet paper, as well as a high probability of stepping into something disgusting (see Figure 6.)

Figure 6. Sample of area near a rock/boulder used as natural toilet by visitors to Kvalvika. July 2021. Photo: HEL.

After a couple of days with good weather and 44 tents counted at the evening of 27th of July I observed on the 28th July some new piles of feces that were located in more open areas. New toilets were made in the tall grass and along the water streams. There are two main streams of water running down to the beach, here I observed lots of activity, from people filling their water bottles and kettles, washing their plates and cutlery, as well as cooling food in plastic bags. I did not observe anyone drinking directly

from the streams with a cup or hand, but it was used to brush teeth by several campers. The streams go down a little into the terrain and with high vegetation cover in some places makes it a possible hiding spot. This area must have been used as toilet during nights with many tents, it can be an indicator that when there are many tents there is pressure on the best hiding spots, if one wants to be discreet, the nearest hiding place can be the streams instead of behind one of the boulders.

This created concern for the health of the visitors, therefore me and another field worker gathered water samples of the two streams at Kvalvika the 2nd of August. Water samples were taken at three different locations: at Kvalvika beach, A) Forsen a stream between Forsvatnet and Kvalvika, and B) Rørholmen a stream at Kvalvika. In addition, samples were taken in a stream that flows down a bit further away from the Torsfjorden trailhead, C) Bergland, this in an area where visitors don't usually walk and camp. Then the tests were sent for analyses, this were interesting in terms of looking at the stream's quality as drinking water. The two streams at Kvalvika had relatively high values of *E.coli*, indicating fecal contamination from humans or animals (Syverhuset, 2021). *E. coli* bacteria does not naturally occur in the environment and therefore it is a clear indication of fecal contamination of the streams, but from the analyzes one cannot indicate if the source is humans, domestic animals or wild animals (Dr. Rose Keller, personal communication, 16. May, 2022). The streams do not meet the quality requirements for drinking water. However, surface water from streams rarely meets drinking water requirements, and the samples were within what is considered good values for water to bathe in.

At the surf cabin on the south side of the beach (see Figure 7), the area is crowded with boulders and there is a small stream running beneath the cabin on to the beach. This area is also widely used as a toilet as there are several cracks between the stones and the cottage has an attached a simple-made outdoor toilet. On hot days over the summer, this area could smell of urine and feces. On more rainy or cold days this would dissipate. This can be worrying during summer seasons with warmer weather over longer periods, how it can affect the experience of visitors.

Figure 7. The simple cabin with associated outhouse toilet at Kvalvika. Photo HEL.

There are about 20 clearly visible informal fire pits at the beach. Observations of the fire pits showed these as locations visitors dump litter, there were few occasions when left behind litter actually was burned properly. This can cause piles getting bigger over time. As the area has no trees many only use a backpacking stove to cook. I observed only seven times someone actually creating a fire in the fire pits, this might have happened more often than observed as I was not down at the beach on several nights. What was mostly left at fire pits where toilet paper, plastic food containers and food scraps. But also less burnable material was left such as tin cans, glass and a pair of hiking boots (see Figure 8). From my observation I find that visitors have a greater tendency to leaving litter in the firepits, as I saw some move food scraps and other small litter from the surroundings into the fire pits. There were also others who collected some beer cans from the beach and placed them close to a fire pit. I also observed one woman standing with a skeptical face expression and crossed arms watching as a family put their food wrapping paper under a log at a fire pit. People seem to have a lower threshold to leave burnable material such as paper and coffee grounds compared to for instance glass and metal waste.

Figure 8. Varied waste left at fire pits at Kvalvika. 2021. Photo. HEL.

I did not observe anyone picking up others litter and taking it with them at the beach. However, I mostly observed that visitor pack everything with them, some even take a walk around there camping spot to check if something is left. I observed two times someone run after a plastic bag and a candy wrapper taken by wind and putting it in their backpack, showing pro-environmentally behavior.

One interesting finding from the observations is that people clearly mimic each other's behaviors. Visitors looked at what the others around them are doing, especially in the mornings. When some started making breakfast and getting water others followed. One example was that toilet paper were left in a firepit the 28th of July, as some had started to do this action several others followed, this is illustrated in picture 9. below. This firepit was connected to one of the campsites in the middle of Kvalvika, one of the most desired camp spots. People must have perceived this action as uninviting when several chose to avoid this camp spot afterwards. A couple of days later a fire was made to burn the unpleasant litter by a family seeking a camping spot, they arrived late, and the beach was crowded. Several who discovered the toilet paper clearly showed that they thought it was disgusting, by wrinkling their noses and some also stated that it was disgusting to their friends.

Figure 9. Firepits with waste at Kvalvika (illustrates how littering increases rapidly at fire pits). 2021. Photo HEL.

My observations of walking along the trail were that there were not much observable litter. I mostly found small pieces of candy wrapping, apple or other fruit scrap, and most common was “snus” and toilet paper/wet wipes. But this was less frequent than littering at fire pits or toilet waste. Several of the objects found along the trail or by the trailhead disappear after a few days, it is difficult to say if this is due to visitors picking it up, or it has been taken by wind. I observed nine people picking up rubbish they either lost or found along the trail, of which there was nothing to indicate differences in age or gender. Most commonly people would walk by the litter on the trail.

Some more litter were observed at the trailhead such as plastic or disposable grills. At the trailhead I also observed that several were confused about the toilet facilities, several were not able to use the payment machine. At the same time, I was informed that it was out of order part of the time. There were also many who expressed confusion over the rubbish bin, some did not find it, and others did not dare to open it as it was sealed with a rubber band.

Marine waste is not part of my study, but I want to point out that six big plastic bags were picked with marine waste by a man with six adult sons. I observed the bags at the trailhead and was told by the man that his son went several rounds over the pass one night with the bags, and they spent the night sheltered from hail in the surf cabin. I also observed four teenagers collecting marine waste and piling

it at one end of the beach. This may indicate that younger people more often show pro-environmentally behavior.

By the time it had become August there where very clear that fresh toilet paper was beginning to appear many places in the terrain. Especially along streams, in tall gras and in between boulders (Figure 10). It was also not a clear area, but rather more scattered throughout, at new places and older already marked toilets. There is also clear that fire pits are used as trash cans by some visitors. However, the majority of visitors pack their rubbish with them, but they can be influenced by the behavior of others in the area to do similar actions. My observations indicate that a lot of human waste cause visitors to move away and find new "clean" places. On days when the weather is nice with many visitors, it becomes difficult to find ways outside close proximity to toilets and litter. This can be worrying as more and more people are pressured to stay close to feces, being a health concern, but also potentially affect the experience by smell or unsightly aesthetics.

Figure 10. "Toilet boulders" in the foreground and tents close by. Kvalvika beach, July, 2021. Photo HEL

4.2 Attitudes, norms and perceived behavior control regarding human waste among visitors at Kvalvika

Table 3. provides an overview of the informants from the semi-structured interviews, that will form the basis for chapter 4.2. As can be seen from the table, the informants covered significant variation in terms of age, country of origin, if they stayed overnight in a tent or not and what type of group they belonged to.

Table 3. Overview of informants and semi-structured interviews at Kvalvika.

Date	Visitor count	Informant	Gender	Age	Ethnicity	Group members	Tented
18.07.21	254	1	Male	35	Netherland	0	No
-	-	2	Female	50	Norway	Spouse	No
-	-	3	Male	22	Germany	Girlfriend	No
20.07.21	165	4	Female	32	France	Boyfriend	No
-	-	5	Male	27	Norway	Friend	No
22.07.21	182	6	Female	34	Canada	Boyfriend	Yes
-	-	7	Male	30	Norway	4 friends	No
-	-	8	Female	64	Norway	Grandchild	No
23.07.21	355	9	Female	23	Norway	Boyfriend	Yes
28.07.21	607	10	Male	26	Norway	5 friends	Yes
-	-	11	Female	68	Finland	Spouse	No
-	-	12	Male	30	Norway	Girlfriend and child	No
-	-	13	Female	32	France	Boyfriend	Yes
30.07.21	291	14	Female	23	Denmark	Boyfriend	Yes
31.07.21	357	15	Female	40	Poland	10 family members	No
01.08.21	358	16	Male	24	Norway	Girlfriend	Yes
-	-	17	Female	66	Sweden	Spouse	No
-	-	18	Male	30	Finland	Girlfriend	Yes
03.08.21	328	19	Male	36	France	4 friends	No
-	-	20	Male	25	Norway	4 friends	Yes
-	-	21	Male	24	Norway	Girlfriend	Yes
07.08.21	685	22	Female	30	France	Boyfriend	Yes
-	-	23	Female	22	Italy	Boyfriend	Yes
-	-	24	Female	40	Norway	Boyfriend	Yes
09.08.21	491	25	Male	46	Sweden	0	No
-	-	26	Female	52	Germany	14 family members	No

4.2.1 What do visitors see as the main problems and do visitors recognize challenges in Lofotodden national park in particular?

Attitudes towards Lofotodden and its nature

".Expectations is this [points to the sea] nature, and being at the end of the world! Like there's nothing else out here then Greenland. We came for that, it's quite unique, you know some might have a hotel her, but not Norway. You know, just endless nature." (Informant 4)

Everyone visiting Kvalvika seem to have an overwhelming expectation of adventurous, beautiful, pristine, and wild nature. Words also mentioned is quietness, clean nature, free for everyone, and easy access. For most of the informants these expectations also seemed to be met when elaborating on and expressing their attitudes towards the destination, here referring to travels in Lofoten and hiking to Kvalvika.

Based on the informants' answers, I could interpret that the number of visitors to Kvalvika did not fit with expectations. About half believed that the area was crowded, and some experienced that their behavior led to mass tourism. The attitudes of the tourists were somewhat divided in this area, where some perceived that at such a spectacular destination they had expected more visitors, and that the number would probably increase. This raised concerns that the beach could potentially become a commercial camping ground, that water sources were not tempting to drink from and that locals no longer used the hiking area. Others were less taken back by the high visitor numbers and expressed joy experiencing many happy people in activity out in nature.

«Vi så mye på YouTube før vi kom hit, der sto det at man kunne ikke forvente å være alene på noen steder [...] Man tenker kanskje ikke over at dette er et masseturisme sted.» (Informant 10).

"Can you drink the water here? I'm not sure if I would do it. Here with this many people." (Informant 11)

Another difference in attitudes to the destination was the experience of the extent to which the terrain was challenging. Some greatly appreciated the challenge and the minimal facilitation, that this was something they had preferred and valued. Others were surprised, perceived the trip as risky and that they missed simple facilitation measures at Kvalvika increasing access and safety.

Attitudes towards trash and human waste

The overall response from the informants is that they find Kvalvika very clean, and that litter is not seen as a big problem. Many expressed it was even cleaner than expected, and one compared it with the year before (2020) where it was apparently worse.

"Oh it's very clean. That's our overall experience, we haven't seen anything" (Informant 2)

The attitude of some of the informants is that people who seek out nature do not purposefully litter since they appreciate the value of nature, this applies especially to Norwegian culture. Active littering behavior was seen to be only something lazy and uneducated people pursue. Some felt that the younger generation in particular has a more pro-environmentally friendly behavior as they learn more about it at school. A couple of informants thought that the rubbish present was out of there and the parks control as marine waste for instance is a world problem.

"I think it's the type of tourist, here in the mountains people respect nature" (Informant 22)
"I think some people are just lazy" (Informant 25)

Although most informants expressed littering not as a problem at Kvalvika, those who had encounters with waste expressed emotions such as anger, frustration, disgust and that it was "un-charming". The most encountered waste was toilet paper, this was consistently experienced when hikers were close to boulders or fire pits. Many informants mentioning toilet paper did this with a shoulder shrug or a laugh, sort of insinuating that it is not much to do with that. I interpreted this as they felt little perceived behavior control over the act of having to go to the toilet. On the other hand, there were informants who thought most people perceive toilet waste as biodegradable, and therefore leave it. A couple of the informants had a plastic bag for toilet paper with them, expressing visitors should take their toilet paper out of the park or dig it down. One also had bought a shovel but did not bring it to Kvalvika hike since it was so short. Informants generally had an attitude that to dig down or cover up human waste is acceptable, but often did not do behave in accordance with this. Some also felt that since the trip is short and crowded, visitors could wait until they were back at the trailhead before going to the bathroom.

«I just went over there [points to boulder] on the toilet, and I almost stepped in a poop, because it was so much toilet paper. Like people might think that's biodegradable and they just leave it there, […] it's a lot of campers so it's so much toilet paper and poop everywhere which is quite disgusting. And people also leave stuff after the fire pits, which is not very nice" (Informant 14)

The second most mentioned litter encounters were marine waste and “snus”. There was also a general concern among informants that waste can become a bigger problem over time, with more and more people visiting Kvalvika and Norwegian nature in general. They seem to agree that crowding will mean that many lose or leave small bits and pieces of trash that can accumulate. Some saw the bad weather as one of the reasons why there was little litter to be seen, as there had not been so many overnight visitors. On the one hand, based on the informants' answers, I can interpret attitudes that toilet waste is not litter, at the same time after some reflection further into the interview’s toilet paper were perceived as the main challenge. The main attitude is that Kvalvika is very clean, and waste is not seen as a big problem.

4.2.2. Perceived Behavioral Control/Barriers

It may seem that the informants do not fully understand what make it challenging to perform the correct behavior when it comes to littering. Most informants say that they do not know what the barriers may be. Many mention that when hiking in Norwegian nature one knows there is no system for handling waste. Therefore, informants believed it is evident that visitors take everything they bring into the park out again. Again, informants perceived lack of knowledge as a behavioral barrier. Many informants expressed that they themselves have adequate knowledge for performing correct behavior, as they read and prepared themselves for the hike. Most said they always bring their waste out. Other informants thought that the lack of knowledge about how long it takes before waste disappears was a problem. Since some types of waste such as paper, food leftovers, and feces is perceived as biodegradable, it seems some have a lower threshold for leaving such waste in nature. A couple of informants were worried that many visitors do not know what it means, including themselves, to hike into a national park and what kind of considerations and preparations one should make. They thought most people just think national parks is worth experiencing as an attraction.

> “I think a lot about how I walk in nature, and we are scouts, we have a love for nature […] i have learned a lot, you know, that you take with you everything, you don’t just throw banana peel. People don’t know that it takes time for stuff to disappear. They should just take everything with.”
> (Informant 23)

A possible barrier that several mentioned were that visitors may forget an extra bag to carry their waste and instead leave it, because people do not want to put dirty and disgusting rubbish in their backpack. Therefore, some suggested having extra bags at the trailhead for people to bring on the hike as a measure. The informants reflected a lot on whether rubbish bins in the park would be helpful. Some believed that this was maybe a barrier for correct behavior, but when they had thought about it, most changed and said that putting out a rubbish bin would cause more waste in the park. Because

bins would tempt visitors to bring more and become lazier at taking their trash out with them. I also interpreted that some informants had not discovered the rubbish bin at the trailhead, as several mentioned there should be a recycling station by the toilets. A couple of informants believed facilitation near areas where people camp is essential to maintain the area free of litter and waste, they said preferably along connected roads, but that this was difficult to implement at Kvalvika since it is so remote. The informants thought that most visitors' behaviors could improve from a reminder to bring "all" waste before hiking. Some also thought the available information signs at the trailhead were washed out and unclear and should be replaced.

"For folk forsøpler sikkert hovedsakelig fordi de ikke har med seg pose, det handler jo ikke om vekt for de klarer jo å ta med seg tingene inn, det handler om bekvemmelighet. Jeg prøver jo å ta med ting jeg ser ut, så tar jeg alltid en ekstra plastpose med til søppel» (Informant 9)

Some informants mention there is a distance to walk to the nearest rubbish bin, and if someone has something urgent to throw away, that might be a barrier, but they did not see it as a big problem. Others believed that visitors might be unprepared since this is known as a short hike. There were some informants that believed the rugged terrain without facilitation was beneficial to the waste problem, as the hike does not suit everyone, it helps reduce crowding and waste left behind. One of the informants had experienced that abundantly facilitated beaches in England were more crowded and filled with rubbish than less facilitated beaches.

"There is nothing needed here, we were kidding that it would be nice with a cold beer, but if you have like a trash can here, everything would just overflow." (Informant 11).

Some thought that everyone could lose some rubbish and that this is something one cannot control. Most informants believed everyone could become better at bringing some more of other people's rubbish one come across to keep nature clean. The unintentional loss of small rubbish was considered a significant problem since this is a highly visited area where it can accumulate or be blown off into nature. Picking up other people's rubbish was something that the informants thought young people were better at than older people.

4.2.3 Norms

Based on the informants' attitude that visitors to Kvalvika are very good at taking all their rubbish with them, and that the informants thought the vast majority do not litter on purpose. I interpret that people have a highly developed anti-litter moral norm. The informants have a general belief that to be reflected on the consequences of waste, is what stops negative littering behavior. Most of the informants didn't even feel that there were any barriers to the right way of behaving, many expressed that not to litter is common sense. I interpret this as visitors to Kvalvika generally have a strong sense of environmental values. This then led to emotions around not wanting to feel blamed for others' actions, here referring to the attitude that only uneducated and lazy people litter. The informants expressed they have hiking experience, and that if measures were implemented it should be a reminder and not enforced or too educational, as they already hold adequate knowledge. Some had experienced measures in other situations where they thought it was intrusive or unpleasant, because they felt they were perceived as lacking appropriate knowledge.

"I believe people are not really acceptable to restrictions and such [information], one feel a bit attacked, not like that but you know dumb. Or that I am the one to blame, but we are used to hiking you know." (Informant 3)

Informants clearly had a general acceptance to people going to the toilet in nature, that I interpret as a developed subjective norm.

"We think is very clean, but only thing is I saw waste some toilet paper, but people have to go! Haha." (Informant 15)

"I haven't really thought about that going to the toilets are a problem, that is natural too, people walk off to find a rock, and here they are quite far of the track" (Informant 2)

One of the mainly prominent subjective norms is that there should not be built infrastructure in Norwegian nature. I can interpret from the informants there are internal conflict of management measures against keeping nature pristine. As informants have attitudes that the number of visitors at Kvalvika pressures nature, they recognize for instance vegetation harm along trails, they reflect that it potentially will be necessary with visitor management measures. However, it seems complicated to say that one wants physical measures, and informants pushed the problem away by saying that facilitation could be considered later. Informants expressed that Norway is known for its easily accessible and untouched nature. And most sad that they have limitations on how adapted Norwegian nature should be, and they prefer that measures are minimal. And one should instead try to inform

visitors about the correct behavior. It may seem that there is a general normative influence from a cultural tradition about keeping Norwegian nature pristine.

«Jeg synes egentlig at det skal være så lite som mulig i Norsk natur, det skal på en måte være en sånn frihet man går dit uten noen form for restriksjoner eller noe sånn. Men jeg ser jo at det kan bli problematisk med mye toalett besøk og sånt da" (informant 7)

4.2.4 Ascription of responsibility

First and foremost, the informants expressed very clearly that they themselves as tourists have a responsibility. They have a responsibility to gain the right information, pick up rubbish they see and take their things out of the park area. Many mention that nature must be treated with respect and that visitors must manage this in order to maintain free access to nature.

"I think it is the tourist's responsibility and common sense to not leave trash in nature. […] The same with like it being free for everyone one can't say its anybody else than the ones using it" (Informant 3).

In the second part, informants think that the national park has a responsibility, here providing the tools and information needed for tourists to have adequate knowledge to improve and change their behavior. The park should provide good information and encourage proper behavior. Some informants thought that the current situation in Norway's parks indicates that it is only the tourists' responsibility, only if new measures were implemented would these be the park's responsibility. Most informants believe that there will be necessary to implement some measures and understand that these must be funded one way or another.

"I think if there was a trash can the park managers should empty the trash […] I feel the park has responsibilities. And I guess who pays them has the responsibility to pay for measures" (Informant 4).

The informants see that human waste, wear and tear can become a growing problem and hope that visitors will be able to comply with the recommend behavior before further measures. And that the park can receive more funding from the government, municipality and organizations to supervise and maintaining the trails, and have some annual clean-ups. Not many, but some informants were willing to fund small donations or join voluntary clean-ups.

"I think the visitors have the responsibility, like to behave right or we have to start paying. But like to inform just to remind people of proper behavior would be good." (Informant 14)

4.2.5 Visitors' Assessment of Perceived Management Solutions

When it comes to waste problems hikers seems to agree more information is needed, reminders on proper waste behavior and guides of how to properly do toilet visits in nature. This then coming before what they expressed as more drastic changes to the landscape. Some believe it's enough with just a nice reminder to bring wase with oneself. The fact that the park had to make the right information available was generally the first thing the informant's thought would be a solution. Signs had the most united acceptance and was the firsthand wanted management measure. Informants hopes signs can encourage and make people more aware before entering the park and starting on their hike. Some mentioned it is almost no information today and the signs now are old and washed out. The best placement was perceived to be at the beginning of trail as informants believe visitors source here for last preparations before entering the park. There are also wishes for information signs of trail conditions such as what to be aware of and directions to prepare for a safe trip.

"More Information signs would be good to remind people to bring everything out again. That should be enough" (Informant 25).

Information online is also perceived as needed, several mentioned that this is where visitors first start preparing for the hike. Informants believe that visitors have a responsibility to stay up to date on information and what proper behavior in respect to nature is. The most mention channels to reach the tourists are Instagram, visitor pages and YouTube. And a lot of the informants said not to use QR-codes as those drowns among the others, and do not get any attention. Informants also mention they use apps to look up difficulty, amplitude, length, and comments about hike. A couple informants say they rather follow and trust the apps recommendations and trails descriptions over trail markings. The visitor center is preserved as a place to stop by to experience something cool rather than looking up hiking and behavioral information. A lot of the informants say they don't use it and probably would not stop by. Some say the only way to draw visitors to the information center is by having interesting things to look at, with then a benefit being learning or gaining information. Here informants believe there should not be exhibitions where tourists are portrayed as stupid, or everyone is stereotyped under the same roof. Videos are seen as an ok measure among the informants, if precented true the right channels, considers the tourists, and do not blame them. But many said they wouldn't just stop to look at it. A lot of the informants gave a clear "no" having to watch a video at the visitor center, as this would be a lecture. They say it would be better to come over an inspirational video searching online or on the ferry rides, this way it would be more comfortable and likely to get viewed.

"Altså jeg kan fort komme over en sånn video på Insta liksom, men det må være noe som griper interessen, som eksempel den bæsj and carrry greia [WagBag], det er for eksempel kult å lære litt om" (Informant 20)

There were also informants that would want proper behavior in nature to be part of education systems. Many saying that the youth is better informed about environmental changed due to humans' actions. Many refers to themselves as being reflected about owns actions consequences, and that this is what helps with proper behavior. Therefore, tools to obtain adequate knowledge seemed to be a perceived solution, given as reminders that make visitors reflect even more about certain topics, are enlightening and interesting. And communicated true the right channels. At the same time informants say that management must not exaggerate information and guidelines, as this can be unattractive or unsightly. Information should not be forced. Many compared their experiences with American parks where some of their strategies had been better received than others. It is clearly important for visitors that what is being communicated not makes them feel incomprehensible, stupid, or guilty.

«Jeg var på tur i California i fjor og der er det jo helt håpløst mye informasjon, usjarmerende egentlig. Der måtte vi se videoer hele tiden i hver park med tvang [...]. Den følelsen man får som dum eller uforstående er jo håpløst» (Informant 5).

When it comes to perceived management solutions for human waste informants shoves a bit more uncertainty. In general informants describe going to the toilet in nature as an acceptable behavior, but they believe visitors can be reminded what is considerate behavior on behalf of others. This including going out of sight from people, find a big rock, dig a cathole, or cover the waste. Many did not see human waste as a problem other than it effects the senary, because they perceived toilet paper and feces to be natural materials. Some informants believed right toilet behavior is not something people think about without having a reminder. They say hikers have enough to prepare for and to concentrate on while being in nature, I interoperate this as safety, gear and clothing concerning the hike. As mentioned earlier someone had brought bags for their toilet paper, they perceived bags for toilet paper as something more people should be informed to bring. Here some thought that information about how to not live any trace and that paper is also litter should be implemented. There were also informants that thought the infrastructure today with toilets at the trailhead was adequate, as visitors could hold off going to the toilet one night. Most of the informants believed there should not be needed infrastructure in the park for people to go to the toilet.

"if you don't see a sign or anything people do not think about these things as toilet stops […] We need signs to be reminded of that" (Informant 3).

A toilet put up at Kvalvika was seen as a drastic measure for most of the informants. Firs the informants preferred to be informed about right ways to go to the toilet in nature. Only seven out of the 26 informants (five being Norwegians) considered toilets as a solution, concerning that the human waste problem have potential for escalating further. As problematic is not the situation informants describe the amount of human waste at this stage, they prefer toilets as a possible future measure. One couple from Norway found the toilet at the surf cabin, they were surprised how comfortable it was with a toilet at a crowded tourist destination as Kvalvika. It seems to be important that in a scenario where management see the need to put up a toilet it must be designed to blend in with the landscape by good designers. One informant from Canada said they would not think twice if it was a toilet at the beach because they are used to it, but that this was not something they found suitable or normal to accept in Norway. For the ones not approving with a toilet solution it was clear that this would interfere with the nature experience and the view, the common answer was to keep nature as natural as possible, and that there is enough infrastructure today at the trailhead. A toilet could then be appreciated by some, but most informants are fine with visitors going to the toilet in nature, with more information, use of catholes and learning to bring toilet paper out of the park.

«…hadde det vært satt ut en festival-do så hadde ikke det vært akseptabelt, men et fint toalett som går i ett med naturen kunne jo vert greit.» (Informant 16)

A carry out measure such as Wag Bags have divided opinions among informants, with fifty percent thinking it is a very good and a cool measure, the others being more hesitant and not thinking the majority would carry out their own feces, that it is not discreet enough and outside the comfort zone. The positive informants say there need to be more information, maybe a free trial period, and a station to empty it by the trailhead for visitors to be onboard. Many that were hesitant would rather learn more about proper ways of going to toilet in nature. Two informants also wanted a toilet rather than having to carry their feces with them. And others prefer to try Wag Bags rather than having facilitated a toilet in nature. There were also discussions if such measure would work comparing to dog owners' behaviors, arguing that it is the same as one dos with dogs and others saying some don't even pic up after their dogs. Many expressed it as a measure they had never heard of and would like to learn more about.

"I think we would also be very open to try out this shit and carry bag, like you do this with your dog's so it wouldn't be any problem, for us at least. But we can't really speak on behalf of everyone, but for us this would be really quite cool" (Informant 6).

Trash cans was a lot reflected on in the interviews. Informants saw the lack of a trash cans as a potential barrier but that having one would also make visitors leave more. This making informant more negative to trash cans than toilets. Informants perceived having a bigger emptying station at the trailhead as a good management solution, with extra bags, together with a reminder of good behavior. There were also concerns that trash cans would need park managers to empty them, this maybe leading to costs for entering the park. Informants were sure that most visitors will be willing to improve their behavior to keep its nature free form what they say is invasive facilitating measures.

“don’t put lots of stuff that don’t work like trash cans. People are here to enjoy nature.” (Informant 11)

Payment and fines are not preferred if it leads to restrictions getting access to nature. There were a few informants willing to pay small amounts (50 NOK) for clean ups and maintenance, but mainly, informants think that nature should be free. Some suggest a better solution would be having voluntary payment options for clean ups and voluntary seasonal clean ups to join as volunteers. Several reflected on that payment is not the normal in Norwegian nature and that it can threaten the right to roam. Others think the park should get more money from the government or municipality to deal with challenges within the park. Some informants found payments could act as a threat, for example saying that if people is not becoming better at picking up litter, they would have to pay. Informants also linked payment or fee systems with implementing infrastructure such as toilets and trashcans in the park. A couple from Sweden experienced that “their” (Swedish) parks had started with fines for littering in parks but said that it didn’t have a great effect, this because there was no way to catch people in the act of littering. A family was happy about a system they were met with in the USA, where one paid a small amount for an entrance card to several national parks and thought this was possible to implement in Norway as well.

«You know we are used to this concept of paying for any kind of facilities in parks, […] And I guess that sometimes is good, but maybe not Norwegians wouldn’t think that's true, because it's supposed to be this concept about nature is for everyone. Witch I think is really nice about Norway. It is so open.» (Informant 6)

Any form of restricted access to nature and camping, like having an entrance barrier, not allowing walking off path, and certain amount of camping spots is highly disliked by the informants. They rather have guidelines than restrictions of any sort. Only two informant was open to this way of park management, they thought it was ok for the beach to become more of a commercial campground with toilet, restricted number of tents and good information about capacity. The general response form visitors is that there is a limit for any kinds of management measures and that the goal should be to keep Norwegian nature as pristine as possible. The informants would like to keep physical measures to

a minimum, as little as possible is most common expression and keeping it authentic. The fear is that having larger measures will open for a spiral of gradually more and more facilitation, leading nature to becoming either less accessible or too accessible, and less "natural" overall.

"I wouldn't like the nature to become less natural, that is Norway!" (Informant 26)

5 Discussion

5.1 Summary

This thesis has shed light on several aspects regarding waste challenges in Lofotodden National Park through a mixed-methods approach.

The results provided by the field waste survey and seasonal monitoring showed that visitors at Kvalvika leave noticeable traces of human waste. Monitoring of the area show that key locations had waste accumulating throughout the primary tourist season. Waste "hotspots" are related to boulders and fire pits concentrated around the area's informal camping areas. People tend to accept fire pits with existing waste as places to leave more litter. At the same time, feces and toilet paper are left uncovered in a high number of places and is the dominant waste in the area.

Observations showed that the closest boulders to informal campsites and fire pits become unsightly, leading visitors to move to the next boulder. Waste locations are then growing in numbers and scattered more unevenly throughout a gradually larger area over the summer. As visitors look for hiding places in an open landscape, there are few choices other than the boulders. However, also areas next to the small streams become used as toilets on sunny and crowded days. Visitors frequently gather water and brush teeth in these water sources as well, in waters that are prone to contain unwanted bacteria if not treated before use. Overnight campers stay near toilet boulders, and therefore temporary kitchens and bedrooms are at risk of contact with feces. This indicate that human waste at Kvalvika not only represents an esthetical and practical problem, but also might pose health risks to visitors. Littering along trails is limited and less concerning, and visitors are generally good at packing regular litter out of the park and show considerate behavior. Today's facilities at the trailhead were also met with confusion by visitors, visitors could not read the signs, some could not access the toilet due to payment problems, and many did not see or did not dare to use the rubbish bin.

Interestingly, the 26 visitors interviewed have a general attitude that Kvalvika is very clean, and littering is not seen as a significant problem. Informants perceive people that seek out nature destinations to hold pro-environmental values. This also applies to younger visitors, which seem more educated on responsible behavior. However, there is a concern that Kvalvika is on its way to becoming a mass tourism destination, where more negative consequences may arise. Informants hold negative attitudes toward the impact of litter, and visitors with active littering behavior are blamed for being lazy or uneducated. Informants also believe waste is sometimes left due to people forgetting to bring trash bags.

Toilet paper was for many the only encountered waste. Encounters with toilet paper were not accepted and seen as unpleasant and unsightly. However, visitors seemed to have adopted a behavioral norm accepting going to the toilet in nature, at least if one buries or covers the waste. Some suggested that people tempted to being more accepting towards littering of biodegradable materials such as paper and food.

Overall, informants had strong anti-litter moral norms and considered that tourists themselves were responsible for keeping nature clean. However, they do worry about visitors' potential impacts and support positive reinforcement management measures. Visitors support communication measures such as signs and videos provided by park management. Still, they do not want to be punished or blamed for others' actions. Therefore, visitors held negative attitudes towards forced (obligatory) and strict educational measures. Visitors also appear negative about “hard” management measures such as regulation of access, fees and/or larger physical measures that interfere with the pristine landscape and the right to roam.

There is uncertainty and no clear answers from the informants about what would reduce the human waste problem. Very few considered any other solution than encouraging people to dig catholes. Several were open to a trial period with a carry-out system, and a few were not. A toilet was not preferable among a majority of the informants and was generally seen as a last chance solution. A few were open to a toilet, but hesitant that others would accept it. Therefore, it seems among visitors, Norwegian and foreigners, to be a cultural norm that Norwegian nature should be kept without physical facilitation. Informants also worried that facilitation would either lead to the beach becoming more (easier access) or less accessible (fees or limitations to visitor numbers).

The prominent impact seems to relate to toilet visits and toilet paper that reduces the experience quality of Kvalvika beach. Most substantial is probably the social impact of downgraded aesthetic values; however, some informants were concerned about potential health problems of using water from the streams, independent of possible contamination. Overall, health concerns and possible contamination from waste near water is supported by registrations in the field waste survey.

The findings from the three different methods highlighted different aspects of the littering problem at Kvalvika. The fieldwork shows clear signs that littering is visible, accumulating, and dispersed over the area during the main tourist season. They are affiliated with informal campsites, and the most common finding is human feces and toilet paper. From a nature management perspective, this raises concerns about visitors' health and degradation/wear of protected nature values. The interviews find that visitors do not perceive a particular waste problem. They have negative attitudes towards littering. At the same time, the informants do not perceive toilet waste directly as litter, even though toilet paper

was most encountered. It may seem that the informants see littering as physically brought materials. In contrast, toilet visits are perceived as an uncontrollable behavior and an accepted norm to leave in nature, as long as others do not see it. Very few mentioned littering as problematic for humans, wildlife, or other ecological values. The problem as they saw it was mainly related to aesthetic conditions. They also do not see any significant barriers to behavior for proper handling of own waste, and they see it as a social norm not to litter. The informants see a need for some management measures. They are positive to more information, encouragement to bring "all" waste, and guidelines for going to the bathroom in nature to be more considerate of others. However, they do not want to be blamed for littering, which is seen as lazy or uneducated behavior of others. They are negative or hesitant about "hard" management measures. The tourists see themselves as having the primary responsibility for keeping nature clean.

5.2 Management and research implications

It is important to recognize that the findings in this study does not represent Lofotodden National Park as a whole, and the discussion of potential management approaches apply to the specific case area of Kvalvika. The study focus on a small and highly visited area of the park over a short timeframe, documented distribution and accumulations of waste would be strengthen by monitoring development over longer time. The park management have, however, documented waste challenges at Kvalvika from a prior user survey (Oslo Economic, 2020), and the results in this study help to assess the scope and explain some of the behavioral origins of visitor generated waste. From a nature conservation perspective, human waste has problematic impacts on both the ecological and social values (Cilimburg et al., 2000; Hammitt et al., 2015; Manning et al., 2017; Monz et al., 2013). It is therefore important to address how the extent of waste at Kvalvika pose a potential threat from several perspectives.

It is clear from the results that visitors 'generated waste is perceived differently, here I address the clearly perceived difference between the tourists' relationship to littering of brought objects such as plastic, glass or metal packaging, and the slightly less controllable behavior of having to go to the toilet in nature. These perceptions also provide different starting points for how management can address countermeasures for these two categories of waste. Littering has a general norm in society that indicates that it is not okay, at the same time people are more often met with legislation that one cannot litter in the streets and garbage cans are arranged. The same applies to toilet visits in a city environment, the big difference is that toilet visits have not similarly had the same (it's not okay) norm in nature, not even in protected areas. The protection regulations for Lofotodden National Park (Forskrift om vern av Lofotodden nasjonalpark i Moskenes og Flakstad, 2018, section 10) state that pollution and littering are prohibited, but what is in those words must be interpreted. Could it be that

the two sides of human influence should be seen equally, it should be possible since several of the informants pointed it out themselves, that it is the same as we do with our dogs.

What are the linkages between visitor numbers and waste?

Findings in this study indicate accumulations of waste relate to areas people camp, similar to what is found among other national parks (see for instance Bridle et. al., 2007). Research on ecological impacts of human waste shows that the impacts are often associated with informal campsites, and they accumulate close by, especially in places where it is possible to hide (see for instance Bridle et. al., 2007). What is accepted recreational impact often depend on nature's resistance, resilience, how impacts evolve over time and in volume, those factors determine if management measures are necessary (Hammitt et al., 2015; Hagen et al., 2019). Degradation of some objects such as plastic, metal, and glass that are left by visitors will take several hundred years, and it is therefore fatal that tourists bring out. And the informants also seem to hold an understanding of this. On the other hand, toilet paper and feces, that is the largest category in the counts of waste spots on Kvalvika, can be resisted by nature to a much greater extent. However, research by Ells and Monz (2011) shows that feces take a long time, even up to fourteen weeks, to disappear. Burying down feces may also lead to traces of bacteria persisting over longer time periods and even up to a year later (Ells & Monz, 2011; Bridle et al., 2007). Their concern is that human waste, if accumulated to a large scale, can contaminate soil and add nutrients, potentially carrying the risk of disturbing valuable vegetation species and spread new species that degrade conservation values (Ells & Monz, 2011; Bridle et al., 2007; Bridle & Kirkpatrick, 2003). At the same time, disease causing pathogens form human waste can runoff from soil or be disposed in direct contact with water sources, threatening wildlife, ecosystems, and human health (Ells & Monz, 2011; Bridle et al., 2007).

It is difficult to say how great a threat the amount of waste we find at Kvalvika has on the protected area. The few studies that have tried to look at this in the past show that the nutrient and bacterial additions from human waste have no more than limited effects on vegetation and water (Bridle et al., 2007; Bridle & Kirkpatrick, 2003; Cilimburg et al., 2000; Ells & Monz, 2011). Therefore, unlikely to present major conservation problems, it is, however, pointed out that one sees large variations and there is need for more research (Bridle et al., 2007; Bridle & Kirkpatrick, 2003; Cilimburg et al., 2000; Ells & Monz, 2011). It is important to consider that these are studies from Australia and the U.S., parks with far higher visitor numbers than Lofotodden. What is maybe concerning with the results given in this study are when the time frame for decomposition of toilet waste is so long, and Kvalvika can have up to 60 thousand visitors in a year, high amounts of human waste will be pressuring a very small area, leading to risk of human contact with waste, water pollution and degraded experiences. If one takes into consideration that on sunny days there are up to 50 tents, and then potentially 100 people who may have to go to the bathroom in a small area, at the same time as people tend to not

cover the waste, and feces can remain visible well over six weeks. If one than have within those six weeks 20 sunny days, there can potentially be 2000 clear human traces left at the beach. A scenario no one wants to be a part of, and a volume of waste that can be problematic from a conservation perspective. The study's findings of E. coli in the streams at Kvalvika is perhaps also a warning sign that something needs to be done, however, this is not yet clear if humans are the source (Syverhuset, 2021).

A weakness is often that people lack understanding of human waste as a polluting behavior (Apollo, 2017). In remote areas without facilities management have to rely on that tourist practice considerate behavior and leave as little trace as possible. This is also something highlighted in both the Outdoor Recreation Act (1957, section 2) and Nature diversity Act (2009, section 6). However, having to go to the toilet is not something visitors can control, and wrong disposal behavior from visitors cannot be blamed if correct disposal alternatives are not in place or communicated as such (Apollo, 2017). At the same time, going to the toilet in nature is generally accepted in Norway, it has been a standard practice in outdoor recreation for many years, and become somewhat of a norm. Trying to alter this behavior would need a change in people's mindsets. If one assesses the extent of human waste as unacceptable, management would have to implement rules and measures similar to other littering objects. This would need implementing educational measures to make people aware off the consequences related to such practice. And for example, enforcing use of carry-out solutions.

The social impacts are also important to consider (Manning et al., 2017). Recognizable impacts of waste have substantial negative effects on aesthetic features expected by visitors (Brown et al., 2010.; Cilimburg et al., 2000). Informants thought waste was both disgusting and frustrating. Kaltenborn et al. (2019) emphasized the need to take care of Lofoten's landscapes pristine character as tourists place this most important in their experience. Haukeland et al. (2013) pointed out that tourists often are observant of visual traces they inflict on nature, and degrading effects tend to be previsied as negative. From this study it may seem overnight campers are more effected than day hikers. As waste sites are concentrated around camp sites, however, more distributed throughout the area over the summer, increase the chance of visitors encounter waste. Some beautiful locations are also avoided, indicating that visitors do react to the impacts. And downgraded aesthetics can also increase the potential of littering escalating further. Schultz et al. (2013) found areas already exposed to waste being significant predictors of further/continued littering behavior. Observations in this study support this and find that visitors tend to accept fire pits with present waste as places to leave more litter, or place gathered litter in the area. This led to rapidly accumulations of waste at the fire pits, and some waste such as toilet paper collected in fire pits is not very hygienic. Hygiene is a growing concern, especially on very crowded days that make people camp close to toilet boulders and use polluted fire pits. Crowdedness, unpleasant sites, and accumulations of waste have potential to cause downgraded experiences and

affect health negatively, also increased littering can provide bad smell and cause conflicts among visitors (Haukeland et al., 2013; Manning et al., 2017; Schultz et al., 2013).

Lofotodden has clearly faced a challenge with waste that must be met by management measures if one wishes to maintain the area's qualities of experience and reduce further wear and tear on ecological conservation values.

Do visitors recognize waste as a problem - what attitudes do visitors hold towards Lofotodden and the waste challenges?

The interviews show informants attitudes about waste are negative. These negative attitudes are about other people perceived as lazy or uneducated creating the problem. Visitors then tend to blame the waste problem on other people's actions. As most perceived themselves and most other tourists as responsible and littering is not seen as an action done on purpose. Kvalvika and its environment bring positive experiences to the visitors. In general, visitors do not recognize that the area has waste problems, the overall perspective is that it's clean, pristine and a beautiful landscape. However, visitors do recognize that the crowd of visitors can pose impacts on the environment, mainly visible impacts such as worn trails, but also waste, especially toilet paper were mentioned often. And the main negative attitude is related to downgraded aesthetic qualities, showing they are concerned about how littering can have negative impact on their experience. What the findings might indicate is that visitors do not tend to reflect on the ecological impacts waste can pose, nobody mentions for instance health risks towards wild or domestic animals or other people. A few were skeptical about drinking water from the streams, but this were not necessarily directly related to waste as a source for contamination.

Informants tended to hold strong anti-litter moral norms. I interpret this as visitors to Kvalvika generally express a sense of pro-environmental beliefs, however, this does not necessarily mean they hold knowledge of the many different consequences visitors' waste has on nature. Haukeland et al. (2013) found that tourists with higher levels of education are more concerned about their ecological impacts, at the same time, the level of education and knowledge on visitor impacts varies. Informants may be confused with their strong sense of environmental values (they are moral norms) with what they see as their knowledge. Because the informants are blaming uneducated people as making the problem, this could also be why they thought it was intrusive or unpleasant with corrective educational measures as they are perceived as lacking appropriate knowledge. Miller et al. (2020) found visitors to U.S. national parks tended to report attitudes, norms and behavior control aligned with right waste disposal, however, they are not aware of ZLI guidelines adapted in the parks. Showing visitors often are predisposed to responsible ethics but might not engage in all educational measures by the park. This causing intended behavior not correspond with visitors' actual preformed actions (Miller et al., 2020).

What I interpret is that informants do see themselves as experienced hikers with knowledge and hold a highly developed anti-litter moral norm. However, informants might have a harder time understanding other forms of human impacts to the environment that they may do or could have control over. This may also be a reason why some litter is more often left at Kvalvika than other. As society we might have learned that litter is foremost plastic and other un-degradable material, several informants recognized for instance the problematic marine waste situation, but saw this as out of their control. Toilet waste were, on the other hand, not mentioned by many informants in connection to questions about litter and waste. Toilet waste was described as unpleasant to come by and toilet paper were seen as degrading the scenery. However, having to go to the toilet where also perceived as something one could not control and should be allowed to do. The fact that informants seldom perceive toilet waste as litter can have a lot to do with what is accepted as the social norm. Some informants think for instance that in general people find biodegradable materials easier to leave in nature. It may seem like visitors should be better informed about different kinds of waste and what impact it might have on the many aspects of the environment at Kvalvika.

Informants tend to have an attitude that younger visitors are more environmentally concerned and litter less, this was for instance connected to that they are better educated on environmental impacts. The observations also showed that younger visitors tended to engage in clean ups at the beach related to marine waste. That younger seem to hold stronger pro-environmental intentions and concern for human impact are similar to findings by Kaltenborn et al. (2019). Mateer et al. (2020) also found families with children tend to act more concerned of how to dispose waste properly. This may indicate there are underlying attitudes among informants that education is important to change behavior.

Miller et al. (2020) found that visitors tend to show engagement in considerate behavior beneficial for national parks environment, however moral norms and perceived difficulty had significant impacts on behavioral intentions. Therefore, it is important for Lofotodden National Park to change the social norms of surface-disposed human waste and make people aware of their ability to control their own waste deposits. Changing attitudes alone might not have any effect on changing littering behaviors (Miller et al., 2020). Therefore, it is not enough to rely on informants' negative attitudes to waste. If the park wants to effectively address these problems, focus should be on minimizing perceived behavior control barriers and establish new social norms.

5.3 Implications for visitor management and monitoring in Lofotodden national park

There are a number of management implications that can help reduce the waste challenges at Kvalvika. Different adaptive management strategies should be tested, following NINA's management

measures pyramid (Hagen et al., 2019) supported by systematic monitoring and evaluation of what works and what don't. Here I discuss different approaches from softer, indirect measures to harder, direct measures (Manning et al., 2017; Hammitt & Cole, 1998).

Regarding the waste situation at Kvalvika, these findings suggest that the main focus of the park should be to inform the visitors about the different ways they litter to create awareness, and then how they can control and reduce their own detrimental waste behavior. As a matter of slowing down waste that accumulates and escalates further, Schultz et al. (2013) suggest systematic clean-ups of existing waste, in addition to encourage more people to bring with them waste left by others. It has, however, been found that it is more difficult to encourage people to bring other people's waste than to decrease their own littering behavior (Brown et al., 2010). To address potential health hazard for human waste, one must minimize the possibility of direct contact and limiting bacteria contamination of water sources (Cilimburg et al., 2000). Finally, it is important to minimize the negative impact of waste on visitors' experience. The park management can meet this with different indirect (soft) and direct (hard) approaches (Manning et al, 2017), taking into account the attitudes visitors have about different management approaches ensuring they will be accepted (Vistad & Vorkinn, 2012).

Changing the perceived behavioral control barriers by informants, there are two things in particular should be addressed. Firstly, informants should be offered bags to carry out their litter and rubbish and be informed about the rubbish bin at the trailhead where they could leave it on return. Simple management solutions can be related to updating already established infrastructure in the marginal zones to the national park. The Kvalvika trailhead can upgrade today's trash can to a bigger recycling station, so people recognize it, make it more engaging and accessible for visitors to use. Schultz et al. (2013) find that wrong placement and inconvenience of trash cans were predictors of more littering. Mateer et al. (2020) suggested that having recycling stations that stands out and is highlighted with creative measures can help with minimizing confusion and wrong disposal of litter. This recycling station could also provide extra bags for visitors to bring with them, fast access to a place to lay waste has found to be important to decrease perceived difficulty of correct disposition (Miller et al., 2020; Schultz et al., 2013). One can also supplement with encouraging signs to make visitors more aware of waste impact, such as Miller et al. (2020, p. 311) message "one million years or one minute walk". Having extra bags can also be encouraging for people to pick up litter from others on the hike. Brown et al. (2010, p. 895) find signs directed at moral norms most effective for this, such as "If not you, who?". Informants did not want extra added trash cans in the park, though Schultz et al. (2013) found that distance to trash cans can negatively affect right disposal of waste. They also found that the presence of or adding of more trash cans did not directly decrease littering behavior. However, convenient placement was important. Therefore, having messaging indicating where accessible

recycling bins are located, persuade people to hold on to their waste for a bit further may reduce littering from visitors.

Information measures want to persuade or change the behavior of visitors in meeting management wishes (Hagen et al., 2019). Communication measures are preferable as they can be implemented effectively, the costs are often lower than harder, direct measures and maintain visitors' freedom of choice, they are, however, dependent on visitors following the encouragements (Manning et al., 2017). The informants in Kvalvika were positive about implementing more information such as signs at the trailhead, posts online and to some degree videos. They also suggested that use of different online platforms such as Instagram, YouTube and visitor pages could be effective. This is in accordance with Haukeland et al. (2013) who found that tourists were open to be guided by information measures to protect ecological conditions inside national parks.

Lofotodden National Park has potential to strengthened visitors' awareness and knowledge regarding waste management and the effect waste might have on ecological and social values. However, management should take into consideration how they formulate the message they present since informants were negative to being "instructed" and they preferred enlightening and inspiring messaging instead of commanding language. Previous communication measures tested in relation to waste have been most effective if they target informal norms and perceived behavioral control (Miller et al., 2020). Messaging could focus on what is the right thing to do instead of what visitors are doing wrong. Done right, this could encourage a social norm change of what is the right way of going to the toilet. Informants said that people do not think about having to go to the toilet and that this is something they would need reminders about.

Therefore, park management should establish what they see as appropriate for human waste disposal and provide informative guidelines accordingly. There are different approaches to decrease the impact human waste have, such as the use of catholes and carry-out systems. Implementing concrete guidelines on how to dispose human waste might be necessary if the problem escalates further, those could include recommending digging catholes, move a certain length from campsites and water sources, and bring toilet paper out of the park. Use of catholes is recommended in areas where soil is sufficient to properly bury feces, to minimize feces' direct contact with water and humans, at the same time it is a more accepted and a widespread norm in today's society and therefore easier to achieve (Bridle & Kirkpatrick, 2003; Ells & Monz, 2011). Informants' attitude to catholes generally seem positive, something they might be willing to comply with. Bridle et. al. (2007) found that very few recreationists followed minimal impact guidelines in Tasmania, when they were directed to walk a 100m distance from water and camps and dig a 15cm cathole. At Kvalvika it is highly doubtful anyone would move into the open landscape going to the toilet. And clusters of waste would probably

continue to accumulate around the boulders and only help reduce astatic degradation, as digging holes have proven to keep the bacteria longer in the soil with the health hazards not reduced (Ells & Monz, 2011).

An alternative solution many therefore be to encourage carry out one's own waste. Many of the studies in waste management recommend carry-out disposal options ("Wag Bags") to decrease problems of human waste at popular destinations (Bridle et. al., 2007; Cilimburg et al., 2000; Ells & Monz, 2011). They are especially recommended in areas where drinking water sources are exposed (Bridle et. al., 2007; Cilimburg et al., 2000). It is important to take into account that the success of introducing carry-out solutions has been subject to limited researched and it is uncertain whether the measure will be complied with by visitors. In Kvalvika, informants were curious to the use of Wag Bags as most had never heard of it before. Some saw having to handle their own feces as not very hygienic. Informants suggested that a trial period could be a good idea, where one was given Wag Bags for free to become more familiar and comfortable with the measure.

Direct management measures are about directing and channeling visitors with the use of physical facilitation and formal regulation to preserve the natural values (Hagen et al., 2019). They can often be smart where one sees the need to effectively reduce considerable resource degradation or when there is concern of visitor's safety (Hammitt et al., 2015). Hard approaches often have a character that suggests that they take away an important part of what visitors often come to nature for, namely, the freedom (Hammitt et al., 2015). At the same time, it is not the case that it necessarily needs to be negative, one finds that people often understand and want to take part in helping preserve nature (Hammitt et al., 2015; Haukeland et al., 2013). Facilities can also provide a form of comfort as well as attract visitors (Hagen et al., 2019). It is important to consider different preferences and the type of burden one put on visitors (Hammitt et al., 2015;). The tourists to Lofoten are very diverse in terms of hiking experience and nationalities (Kalteborn et al., 2019; Oslo Economics, 2020). One could argue that visitors to Kvalvika are probably not what Vistad and Vorkinn (2012) would place under a category as "high purists", as the trip is highly visited, easily accessible and marked as an easy hike. Those who come here will therefore probably be open to comfort, safety and simple infrastructure. And although some will be closer to high purists with a desire for less people and natural surroundings, it is very likely that they are already less satisfied due to the crowds Kvalvika has faced. At the same time, Vistad and Vorkinn (2012) suggest that one must take into account that more foreigners are coming to Norway to experience what is documented as wild and untouched nature, some will therefore be more negative to larger facilities. This may be why Norwegians seemed more open to a toilet than foreigners. In a place like Kvalvika, it will be especially difficult to be able to achieve all the visitors' preferences. The park management can make a choice based on which groups they want to facilitate for inside the park and in fringe areas. Vistad and Vorkinn (2012) see that one

can also inform openly about how managed and facilitated an area is, as well as how likely it is to meet other visitors to adjust the expectations of the trip, and that visitors gain an understanding of whether this is something they seek. Kvalvika is primarily a destination for spectacular and beautiful views.

To minimize human health hazards, environmental impacts and experiences among visitors a well-managed toilet could be seen as an effective and necessary measure at Kvalvika, despite the informants are rather negative to this. In Bridle et al. (2007) study from Tasmania, they found toilets to be way more effective than communicated guidelines for reducing human waste. They suggest management should set thresholds for amounts of waste seen acceptable and act with measures such as providing camp areas with toilet, or rationing access. They suggest that adding a toilet, or a carry out method for toilet waste, is necessary in situations where 5 or more deposits of human waste is found within a 20 m radius of campsites or water sources or when soil conditions is not sufficient for proper burying techniques. The field waste survey in Kvalvika found a total of 63 fecal sites located within 2 meters, and 24 within 5 meters of water sources (Keller, 2022). This is much higher and denser than what Bridle et al. (2007) found acceptable for surface disposal, and therefore a toilet solution should also be taken into consideration.

Formal regulations that limit access and total number of visitors is a possibility, however it was not welcomed by informants, only a couple informants were open to restricted number of campers. Restrictions can also be difficult and take time to implement as it might conflict with the public right of access (Øian et al., 2018). Resources would also be needed to monitor and control such regulations if approved by the authorities. It is also impotent to recognize that this would likely affect local inhabitants as well user groups with low acceptance for such regulations (Kaltenborn et al., 2009).

5.4 Limitations

First and foremost, time was a major limitation on this study, I would have liked to have further explored the waste behavior and attitudes that arose during the sunny days, since they made up overall few of my field work period.

Modified behaviors may occur if one is too informative of what the observations is about (Seaton, 2002). As an observer, I was prepared for some changes in behavior patterns that may occur, due to my presence with an iPad and a green jacket with a national park logo on. Making correct and detailed notes during fieldwork was therefore challenging, some were taken at the beach, and others were more discreet noted afterword's, when out of sight or by using binoculars.

In hindsight, the preparation of the interview guide beforehand could have been better. If more time available, I would have liked to have prepared questions more clearly aimed at TPB to bring out a deeper understanding of its dimensions, especially the subjective norms. I received a lot of information that was not so relevant to the thesis, a lot about trail wear, vulnerable vegetation, and discussions of safety in the mountains. This gave interesting findings that are not included in the thesis but refer to potential for other follow-up studies on tourists' perception of Lofotodden National Park.

5.5 Research needs

The pressure from nature-based tourists on ecological and social dimensions of national parks are unlikely to subside. Findings from this exploratory study is particular to Kvalvika, and obviously further research is needed to understand fully and effectively manage waste problems in Lofotodden and other national parks. Different management measure should be subject to systematic testing and evaluation, with caution to generalize findings across areas due to large differences in how relatively similar visitors behave in different settings.

Further research is needed on effective persuasive communication measures. Effective messaging needs to consider several ethical concerns, and such campaigns have yet to be tested in full in Norwegian national parks. Studies that have tested different targeted signs based on the theory of planned behavior have proven to find some more effective than others, however communication measures found effective in other national parks in other countries may not fit the target audience of visitors in Norway.

6 Conclusion

This study has applied an exploratory, mixed method approach to investigate visitors littering behavior in Kvalvika, Lofotodden national park. Research in waste management in National Parks is so far very limited, and the growing popularity of NBT means that the pressure on fragile landscapes is likely to increase in the foreseeable future. This study helps to identify issues that are important for further research and effective management aimed to reduce problems related to waste in natural recreational and protected areas. By using Ajzen (1991) TPB as a guiding theory, I have been able to identify some of the prominent attitudes, subjective norms and perceived behavior control issues that underlie waste behavior in the specific setting of Kvalvika, Lofotodden national park. While the mixed methods of field survey of waste, observations and semi-structured interviews is a strength, it should be underlined that the small strategic sample for the interviews does not represent a basis for generalizing to the total population of visitors at Kvalvika. A quantitative study is needed to strengthen or correct these findings and create a broader and more representative view.

The study asked the following research questions and from my investigations I conclude on these questions as follows:
What are the linkages between visitor numbers and waste?

Map key locations within the park where visitors dispose of their waste:
The field survey supplemented with observations confirm that there are relatively little waste in terms of litter and rubbish in the area, but abundant waste of the category toilet paper and human feces. These are located around boulders located behind and in relative close proximity to typical campsites along the Kvalvika beach. Mainly observed and registered rubbish is associated with fire pits.

Observe hotspots where waste increase or decrease over the summer season 2021, compared with visitor numbers registered at automatic trail counters:
Generally, human waste become more abundant during the summer season of 2021. Especially days with very good weather and a high number of visitors staying overnight documented also on the trail counters lead to more waste distributed over a larger area, also near some smaller streams, with the possibility that water used by tourists for drinking, cooking and personal hygiene was contaminated. Fire pits with existing waste are also more prone to rubbish accumulating over the summer season, as few burn the waste, and some people tend to easier leave rubbish if waste already is present.

Investigate attitudes and norms visitors hold towards human waste management within the national park.

What do people see as the main waste problems and do visitors recognize challenges in Lofotodden national park in particular?
Most of the informants do not perceive Kvalvika to have a waste problem at the time of the interviews. They find the main problem is the potential for waste to increase in connection with Kvalvika's rising popularity. The main challenge is unconsciously littering that can potentially lead to waste escalating, degrading esthetic qualities of the area and degrade hygienic conditions. Most encountered litter were toilet paper. This was for many perceived as negative and inconsiderate towards others to not cover toilet waste.

What attitudes, norms and perceived behavioral control do visitors hold towards human waste in the case area?
Informants hold negative attitudes towards waste and littering, however they varied depending on type of waste. Attitudes regarding littering of rubbish was seen as unacceptable but also something informants perceived to have control over. It was also seen as a social norm in nature not to litter. On the other hand, toilet waste was generally accepted to leave behind in the park if out of sight from the most visited areas. Informants perceived they had little control of their toilet behavior. Informants have an attitude that most visitors that enjoy nature care about not leaving a trace and avoid to litter, therefore I perceive informants to hold pro-environmental values. Littering is perceived as a behavior only conducted by lazy and uneducated people. Yet few of the informants reflect on ecological impacts that human waste can pose.

Who do the visitors see as responsible for waste management?
The informants find tourist to have the main responsibility to keep nature clean. They do however believe that the park management should provide tools and information for visitors to be more aware of their actions and encourage visitors to bring "all" waste out of the park.

What attitudes do people hold towards potential management measures to deal with waste problems?
In general visitors have positive attitudes towards simple and indirect (soft) management measures, as log they are enlightening and encouraging, not blaming visitors' for being lazy and lacking knowledge. Informants are more negative or hesitant towards direct (hard) measures that can take away free access or visible, larger facilities such as toilets within the park since it is seen to degrade Kvalvika's pristine and wild character. Most of the informants saw a potential in upgrading already offered facilities at the trailhead, and some were curious to try out different waste management solutions, such as Wag Bags.

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Attachment 1: Interview guide

Introduction

Information about anonymity, confidentiality, and information about use for master's in nature-based tourism at the Norwegian University of Life Sciences at Ås.

- How difficult do people say it would be to change their own plans when hiking /camping in LNP?

Now I would like to ask you a bit about your perspectives about visitor behavior – by behaving I mean how people plan and go about their trip…

- Visitors should stay on the destinated paths at all times, but sometimes people go off-trail. What might be some of the reasons you have for leaving the path?
- What problems do you think leaving the path might cause?
- What are some of the difficulties faced when trying to stay on on-trail?

Attitudes towards Lofotodden/Norway & trash and human waste

- What are the expectations of Lofoten & Lofotodden NP /Norway you hold?
- What is your general opinion about Norwegian nature and littering?
- Are there any locations or areas that you find particularly problematic?

Perceived Behavioral Control/Barriers

- What is your perceptions of the surrounding landscape wit it's physical features, what measures have you seen/ not seen?
- What measures do you feel are missing?
- What surrounding factors are affecting the perceived difficulty to dispose waste (location, terrain, degree of how tiredness, distance from receptacles/toilets)?
- How do you perceive people's intent with waste: is it without intent, with intent?
- What are your opinions on disposal of objects properly or improperly?
    - Do you find it easy to bin your litter?

Perceived Management Solutions

- What measures would you be acceptable to in Norway?
    - Is there a limit?
    - * Introduce examples of possible strategies - how acceptable it would be? (form 1- 7).

Ascription of responsibility

- Who do you feel is responsible for waste management?
    - And in relation to financial expense?

Closing question/Reflection

- May I ask what may have been going through your mind when I asked these questions?

Attachment 2: Observation guide

- Location: (Park entrance, rural (part way from facilities), mid hike, camp site)
- Time of day: (before noon, afternoon, or after 4:00 p.m.)
- Amount of existing litter in location: (0 = not at all littered to 7 = extremely littered).
- Indicated types of litter: (e.g., paper, food wrappers, cans, bottles, etc) present or absent.
- Rated the amount of human feces: (0 = not at all littered to 7 = extremely littered) -> Counted nr.
- Rated the overall cleanliness of the site from 0 = not at all clean to 7 = extremely clean (operationalized as free from bad smells, litter, objects that do not belong in the location).
- Recording landscape features where waste is present. E.g. are human feces piles always behind boulders? Next to streams?
- Landscape. Example categories: 0=open, sand beach , 1 = boulder field, 2 = boulder, vegetation mix, 3 = boulder streambank, 4 = dense vegetation/trees, 5 = built infrastructure (parking lot), 6= on trail
- Landscape features of campsite (same as in comment a bow)
- Waste co-occurs with campsite? y/n
- Information, littering signage present (1 = yes, 0 = no).
- Crowdedness of the location from 0 = not at all crowded to 10 = extremely crowded.

- Record gender and approximate age in waist behavior situations.
- Number of individuals in group with individual(s) disposing of waste.
- Presence of children in group in acts linked to disposing of waste.

- Disposal options: do not have item to dispose, had item to dispose but left the site carrying the object, or the participant disposed of the object.
- Appeared confused or unsure by where to dispose waste.
- Object was disposed of properly or improperly.
- Surrounding factors affecting perceived difficulty (location, terrain, degree of how tiredness)
- Perceived intentional litter vs. perceived unintentional litter.
- If someone is picking up rubbish, sets a good example for others, increase likelihood of more doing the same?

Norges miljø- og biovitenskapelige universitet
Noregs miljø- og biovitskapelege universitet
Norwegian University of Life Sciences

Postboks 5003
NO-1432 Ås
Norway