Norwegian University
of Life Sciences

Master's Thesis 2023 30 ECTS
School of Economics and Business
Supervisor: Anders Dugstad

From Pipes to Streams: Assessing Community Preferences for Reopening Underground Water Pipes as a Climate Change Adaptation Measure

Hajar Ben Hammou
MSc Applied Economics and Sustainability

Abstract

As climate change becomes an increasingly pressing global concern, this master's thesis aims to explore the importance of green-blue infrastructure and hydrological ecosystem services. It emphasizes their importance in becoming a crucial part of strategies for climate resilience and area development in Norway. The study specifically focuses on the proposed project in Skjetten, Lillestrøm municipality, involving the reopening of old underground pipes to create a 1km long water stream named *'Melbybekken'*. However, past water stream projects in other parts of Norway have received different reactions from the public and local residents, indicating a need for more knowledge in this field. To shed light on the local community's perception of such environmental goods, this thesis conducts a contingent valuation study to investigate how the residents of Skjetten value the water stream in monetary terms. With this, the study therefore aims to predict their willingness to pay and assess their preferred layout for the water stream by comparing an urban stream to a natural stream with a focus on biodiversity and recreational experiences.

Statistical techniques such as interval regression and multinomial logit models are employed to investigate the impact of predictor variables on outcome variables. The data used for the analysis is derived from a survey that garnered approximately 543 responses. The analysis reveals that, among the three alternatives (A: status quo with no water stream, B: water stream with nature-based elements, C: water stream with semi-natural elements), the residents of Skjetten overwhelmingly prefer alternative B, resembling natural water streams found in wilderness areas. On the other hand, alternative C is the second most popular choice. The interval regression estimates indicate that residents would be willing to pay around 754kr for alternative B and 582kr for alternative C. Respondents attempting to protest against the survey were excluded from the analysis.

Such findings provide valuable insights into citizen preferences for stream reopening. They can be used for cost-benefit analyses of specific projects or integrated into socioeconomic assessments to further explore how local Norwegian communities place value to smaller water bodies and other environmental assets. By understanding the preferences and wishes of the local residents, decision-makers and planners can make informed choices regarding the construction and design of the water stream.

Acknowledgements

I would like to give my sincere thanks to my supervisor Anders Dugstad. I am incredibly grateful for all the support and knowledge he has given me for every step of this thesis. His insight and feedback have been invaluable in guiding my research and shaping the direction of my work. Thus, I cannot thank him enough for all the time and energy he has devoted to me and this project. Furthermore, I would like to thank my co-supervisor Ståle Navrud and TOWARDS at NMBU for giving us master's students an opportunity to dive into such an exciting project with Lillestrøm municipality. This project has been quite challenging, but also incredibly inspiring to see how the students have approached their thesis differently. In addition, I extend my sincere appreciation to NIVA for their insight and feedback for this research as they provided us with illustrations and feedback for the survey. Their contributions have been crucial in shaping this study, and I am grateful for their support.

Above all, I would like to express my deep appreciation to the research project LANDWELL: Climate-induced welfare impacts of ecosystem goods and services from agricultural and seminatural landscapes in Norway (Project number 315990) for funding the data gathering needed for this study. Without their generous support, this research would not have been possible, and for that I am incredibly grateful for their investment in this thesis.

Finally, I would like to take this opportunity to express my heartfelt gratitude for my family and their unwavering love and support throughout my academic career, including this thesis. I am deeply moved by how they all have taken such interest in my work and genuinely cheered me on. I am especially thankful for my mother, who has devoted her life to me and who I love so dearly. Her wise words, patience, and unconditional love have given me the strength and motivation to come this far. She has been with me every step of the way, and it is because of her that I am able to submit this master's thesis after six wonderful years as a student at NMBU, Norwegian University of Life Sciences.

Table of Contents

List of Tables

List of Figures

Abbreviations

BAU: Business as usual

CE: Choice Experiments

CS: Compensating Surplus

CV: Contingent valuation

DCE: Discrete Choice Experiments

ES: Equivalent Surplus

GBI: Green Blue Infrastructure

G&S: Goods and services

HES: Hydrological ecosystem services

Hij: Hypothesis number j of RQ number i

Intreg: Interval regression

MEA: Millennium Ecosystem Assessment

Mlogit: Multinomial logit

MRT: Marginal rate of transformation

NPV: Net Present Value

NSD: Centre for Research Data

OLS: Ordinary least squares

PPF: Production possibility frontier

PV: Present Value

RQi: Research question number i

SWF: Social welfare function

TC: Travel Cost

TEV: Total Economic Value

WTP: Willingness To Pay

1. Introduction

Climate change is leading to an increase in global challenges with severe consequences such as drought, wildfires, extreme storms, rising sea water levels, and floods, to mention a few. These are effects that have significant impacts on society, with great damage costs and may put human lives at risk. In the European Union alone, from the year of 2002 to 2013, such hazardous effects resulted over hundreds of billions of euros in damages. In which around 40% of these damages could be traced back to floods, affecting over 50% of the total population of EU (Bauduceau et al., 2015). Therefore, it is crucial to implement appropriate measures to mitigate these negative impacts. Not only by reducing greenhouse gas emissions, but also by adapting to climate change through sustainable land use management and changing the way we currently live in our cities and settlements. Blue-green infrastructure (GBI) has therefore become increasingly relevant for planning practitioners and policy makers to restore ecosystem services and develop livable neighborhoods with flood risk reduction (Bauduceau et al., 2015; Macháč et al., 2022).

With GBI becoming a widespread practice in urban development, there has been a greater focus on hydrological ecosystem services (HES). One way to promote HES is by reintroducing smaller water bodies into urban environments. Restoration of HES and GBI embraces many technical and innovative solutions for better stormwater management. However, it also holds many social, ecological, and financial benefits. For instance, through attractive landscapes that may provide new business investment opportunities to generate revenue while simultaneously improving public health (Bauduceau et al., 2015; Khan & Zhao, 2019). Thus, many of the water streams that were initially put into underground water pipes for urbanization are now being reopened as a sustainable measure for local area development in various countries. Including Norway, where the state and the municipalities are legally required to contribute for climate change adaptation and mitigation through governance and planning. Such as preserving or restoring nature-based solutions, like reintroducing water streams into public spaces as natural or constructed elements (Plan- og bygningsloven, 2018).

Despite this increasing interest in HES and GBI, most of the focus from the research field has been dedicated to larger water bodies such as rivers (Doherty et al., 2014). Overall, there has been little research on public preferences for reopening piped streams as smaller water bodies for area development. Especially in terms of the public opinion on infrastructural elements

and whether residents may prefer nature-based or semi-natural water streams. Gaining knowledge of such preferences is essential in order to implement the optimal policies and measures which both the environment and human welfare may benefit of from a socio-economic perspective. To do so, we can utilize stated preference methods which is common for valuation of environmental goods and services (G&S). Either through choice experiments (CE) or contingent valuation (CV) to obtain the individual's willingness to pay (WTP) for a change in quantity or quality of the environmental good or service. These values are rather convenient and provide meaningful insight on whether the suggested measure is economically beneficial to follow through with (Mariel et al., 2021).

This master's thesis therefore intends to study the possibilities of reopening a 1km long underground water pipe into a water stream running through the small Norwegian town Skjetten, in the municipality of Lillestrøm. Through CV methods we aim to explore whether there are preferences for reopening the water stream, and if it should be built on nature-based or semi-natural elements. That way, such findings can be effectively utilized in a cost-benefit analysis for the specific project, or even be further transferred to socioeconomic analyses where other local governing bodies in Norway may consider reopening streams as well.

2. Background

2.1 Background for This Thesis

Many of the open streams in Skjetten were previously closed and piped in the late 1960s during the development of new roads, housing, and schools in the area. However, due to increased rainfall and climate change, the municipality has faced new challenges with flooding, resulting in large damage costs. Neither the water pipes nor the drainage networks were designed to handle such an increased amount of rainfall (Ødegård, 2022). Since the pipes are considered to be in poor condition with relatively little capacity, it is reasonable to consider the reopening of the water streams as measures to meet these challenges and further contribute to the development of BGI in Lillestrøm municipality. That is why the municipality is considering reopening the water stream by the name Melbybekken which currently runs through underground pipes starting north of the Glostrupdumpa area, passing under Nordens vei and ending at the area in the north called Nordbyveien, as shown in Figure 2.1 (Sweco, 2021). The proposed project involves opening up the water stream and creating a valley with

greenery and housing on both sides (Sweco, 2021). This valley is relatively new, with a grassy bottom, trimmed sides, and new vegetation which has grown beside the cliff zones. Since the vegetation appears to be rather young, the valley's ecological value is limited. Thus, the lack of biodiversity and relatively poor ecological environment generally makes it unsuitable for use (Sweco, 2021).

Figure 2.1 Outlined route from Bråtenveien to Nordbyveien where the pipes may potentially be reopened. Left shows the path visualized on a map, while right shows the same map with outline from the satellite's perspective.
Retrieved from: (Multiconsult, 2019), figure 1 and 2 of outlined route with maps from 1881.no, 10.10.2019

Figure 2.2 Photo of Bråtenveien towards Glostrupdumpa and onwards to the north, taken with a drone by Multiconsult (2019) Retrieved from: (Multiconsult, 2019), figure 4 drone photo of Glostrupdumpa, photo: Multiconsult

Figure 2.3 Photo of the current state of the area with a frisbee golf course
Retrieved from: (Sweco, 2021), cover photo of the report.

Through reopening of the stream, such landscape transformation will be able to create new social meeting places with increased use values and recreational opportunities. In addition to reaching set goals of improving public health with having easier access to these recreational opportunities (Oslo Kommune, 2015). Viewing the municipality's suggested measures in light of the local infrastructure and the citizens preferences, we may develop better grounding for future projects and policies that are able to address both social and environmental issues. Thus, integrating equitable and climate responsive solutions for future area development by utilizing nature-based solutions against the risk of overflood.

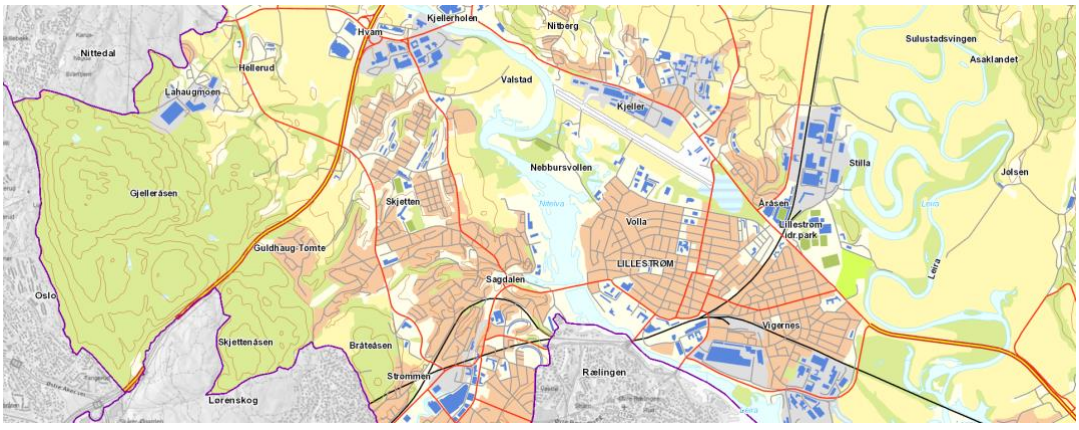


Figure 2.4 Location of Lillestrøm municipality as shown on a regional map of the area.
Retrieved from: (Lillestrøm Kommune Grunnkart, veikart og plankart, s.a.)

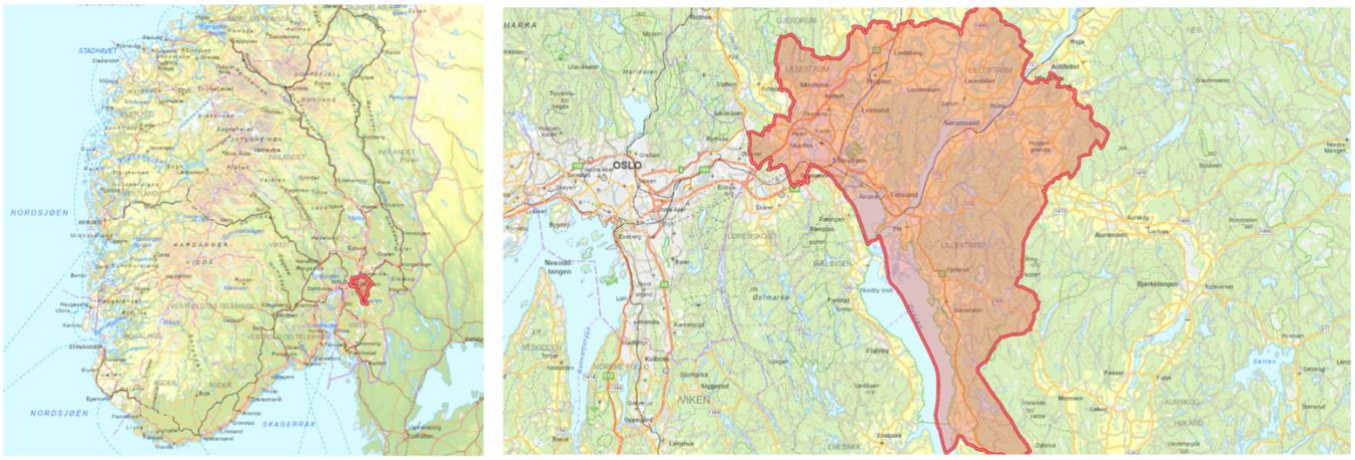


Figure 2.5 Location of Lillestrøm municipality as shown on a regional map of Norway
Retrieved from:(Naturbase Kart, s.a.)

2.2 Contextual Background

The reintroduction of water spaces into the urban development does not only have aesthetical values, but it is also considered as a strategic measure to improve the local stormwater management systems (Oslo Kommune, 2022). Reopening streams has therefore become increasingly relevant for Norwegian municipalities to make inhabited areas better equipped to accommodate climate change with increased rainfall. However, there has been little research on citizens' preferences for such stream openings. In Oslo, for instance, there have been several reopening projects over the years, some of which have been successful while others met with strong opposition from local communities. Thus, more research in this field is needed to establish a solid understanding of people's preferences and wishes, to further consider opening more streams for different Norwegian municipalities.

Hovinbekken is one of the larger water stream reopening projects in Oslo that has been rather successful as it has been well designed and adapted to the development of areas such as Hasle, Hovin and Ensjø. Although many of these areas already had defined infrastructure and neighborhoods, Ensjø, which was notorious for its car industry, has been completely transformed into new residential areas with parks and local shops through blue-green infrastructure, where the water stream played an essential role. It provides new social meeting places and recreational values through the adaptable design and variety of water edge vegetation along the stream. Although parts of the stream from its beginning at Lillomarka to the culvert at Akerselva are still in pipes, about 70% of the waterway is now reopened (Oslo Kommune, 2022). A further planned project for this stream is to reopen the pipes in Klosterenga, between Jordal and Grønland (Johnsen et al., 2019). After all, this specific

stream has garnered a lot of public attention, where the municipality has further highlighted the aesthetical features of an open stream as well as the functionality as an integrated part of the surface water management systems.

In 2018 the City Council of Oslo had proposed to reopen the underground pipes throughout Hovseterdalen as parts of the 5km long stream Mærradalsbekken in Oslo (Johnsen et al., 2019; Oslo Kommune, 2022). However, this proposal was not received well by the local population, as more than 450 people signed petitions against the reopening of the streams that would supposedly be 650m long (Berge, 2020; Nesheim et al., 2019). They claimed that the project was costly and would pose a danger to the safety of the people who actively used the grass fields the stream would potentially run through (Berge, 2020). In the end, the municipality had to shelve the plans for this reopening project and decided that the reopening project would not proceed (Oslo Kommune, s.a.). Instead, they continued to rehabilitate the pipes as they were from the 70s and had since become in bad condition with leakage issues (Johnsen et al., 2019; Oslo Kommune, 2019).

Hovinbekken and Mærradalsbekken are two of the 8 main waterways that flow through the city zone of Oslo, yet the public opinion was quite different for each case. This shows that people have varying understanding and interests related to reopening projects of water streams depending on different factors, such as the use value of the local areas, whether people live in houses or apartments, and accessibility of other recreational sites, to mention a few. Even though there is a consensus between the municipality, professionals, and researchers that reopening water streams is quite beneficial on many levels, the public's opinion is still critical to executing the projects. The objectives for this master’s thesis will therefore be to provide with useful insight on the preferences for reopening water pipes into streams and how they may vary between alternative constructions and designs. Additionally, it will be interesting to compare how these preferences from the population of Lillestrøm Municipality may differ from the cases we’ve seen so far in Oslo.

2.3 Literature Review

With the increase of rainfall and risk of flood due to climate change, planning practitioners and policy makers have initiated implementation of flood protection measures through GBI (Macháč et al., 2022; Ryffel et al., 2014). There has been an increasing awareness of the need to integrate sustainable area development with the technical regulations of the hydrological

ecosystem services. Not only to provide flood protection, but for various benefits including better human and ecological health, improved water quality, increased biodiversity, navigation routes, renewable energy, landscape aesthetics and even recreational experiences from the water spaces in urbanized areas (Sarvilinna et al., 2017). As society adapts to climate changes with the development of GBI, we must carefully consider which measures to apply to avoid any regrettable land transformations as some might even be irreversible (Ryffel et al., 2014). It is therefore highly necessary that the planned projects and designs are accurately communicated to the public so that their interests are correctly reflected in the decision-making process (Macháč et al., 2022). Hence, more research and studies have actively utilized visualization tools to enhance their survey respondents' understanding of the scenario descriptions (Ryffel et al., 2014).

There are many different methodologies within various research fields that can be utilized to obtain knowledge of the public opinion. Research within applied economics and sciences has previously used stated preference methods to value environmental goods and services. Either through CE or CV to account for the residents' preferences for various water bodies and GBI elements presented through sets of attributes (Macháč et al., 2022; Ryffel et al., 2014). These studies have not only contributed with essential input to local policy makers, but they have also supplied the global research within the field of increased knowledge on preferences towards different landscapes and water bodies. Such findings are important to improve sustainable land use management to reach the best socio-economic results.

To assess the local preferences for long-term land transformations, Ryffel et al. (2014) conducted a study with stated preference methods in the medium sized mountainous catchments of Switzerland. These alpine areas have limited land resources, thus land use management these areas are highly centered around careful valuation of trade-offs (Ryffel et al., 2014). This study therefore aimed to locate the resident's individual preferences for settlement, reforestation, and water regulation. In addition, they intended to explore the preferences of land use trade-offs, and to assess how individual choices may be influenced by political parties and interest groups own recommendations for the presented scenarios. Hence, applying DEC to obtain the preferences in the form of willingness to pay for a change in quantity or quality of their land use as an environmental good (Ryffel et al., 2014).

Printed questionaries were sent out through postal services to 3,200 randomly selected and spatially segmented adult residents of the case-study area. This gave a sample size of 547 usable responses that correctly filled out and sent back (Ryffel et al., 2014). In which the survey presented four different attributes, settlement development, forest re-growth, riverine zone with flood protection measures, and lastly a cost attribute. Note that for this study, the long-term time perspective was defined as 90 years, from the year of 2010 to 2100, to ensure a reasonable time-period for trees to grow fully in consideration of the forest attribute (Ryffel et al., 2014). The 547 responses were analyzed with multinomial logit model and mixed logit model. These logit models were further expanded as recommendation models to account for the political choice recommendations. Though, noting that the responses they analyzed did have higher levels of heterogeneity (Ryffel et al., 2014).

Though, models estimated parameters which indicated that the residents had clear preferences to achieve increased flood protection measures through trade-offs. Though, the respondents were more willing to trade in remote and barely productive agricultural land than reduced population and settlement areas (Ryffel et al., 2014). With the assessment for influential powers of political recommendations on individual choices, Ryffel et al. (2014) concluded that the data showed the respondents were indeed influenced by the recommendations. However, Ryffel et al. (2014) also advised further investigation of these findings and the topic itself, as their results suggested presence of heterogeneity. Even though the study may still give an indication of how there is potential for development and implementation of policies for increased flood protection based on the local population's preferences presented in the study (Ryffel et al., 2014).

Another European study utilizing surveys with stated preference methods for valuation of environmental goods and services was conducted by Sarvilinna et al. (2017) in Finland. This study narrowed down the scope of land use level down to hydrological ecosystem services in the form of urban water streams in the city of Helsinki. Thus, exploring the local citizen's acceptance of smaller water bodies, through their willingness to pay for a possible policy-level water management action plan of restoring 20 water streams (Sarvilinna et al., 2017).

Utilizing econometric models to assess the data from 265 responses after sending out 700 tested surveys to a random sample derived from the database of Finnish Official Register of Persons and Addresses, in which 25 of the respondents were electronic (Sarvilinna et al.,

2017). By applying CV methods to their studies, the survey was designed to monetarily measure the individual respondents by a set of valuation questions. Presenting two scenarios where the action plan would either be implemented or not. Details on the methods used to reopen streams, potential consequences of the action plan and information on previous restorations were presented in the survey (Sarvilinna et al., 2017). As the policy needed funding, one of the questions involved asking the respondents were if they were interested in voluntarily contributing with a fixed or specified amount of money in advance of the restoration projects (Sarvilinna et al., 2017). With the acquired data from the surveys, Sarvilinna et al. (2017) performed regression analysis with Tobit Model for Grouped Data to estimate the annual mean and median WTP of the respondents (Sarvilinna et al., 2017).

Sarvilinna et al. (2017) discovered that the residents were indeed willing to support such policy implementation. For a 6-year period they were willing to pay from 10.4 to 25.5 EURO as a yearly fee for every household in Helsinki to achieve the restoration of the water streams according to the action plan (Sarvilinna et al., 2017). The study further highlights that non-use values is the primary reasoning for the respondent's WTP, due to the benefits that arise from reopening water streams related to the knowledge of existence, aesthetical appreciation, and potential use of future generations. The study additionally acknowledges how the respondents' WTP can be linked to the individual's distance to the nearest water stream (Sarvilinna et al., 2017). With these results, Sarvilinna et al. (2017) states that the findings derived from the sample of citizens could provide policy makers with useful insight on preferences for smaller water bodies presented in monetary units as well as their usage of public spaces connected to hydrological ecosystem services in Helsinki (Sarvilinna et al., 2017).

The study by Macháč et al. (2022) had a larger focus on green infrastructure elements within the Czech city named Liberec through surveys where water bodies like urban streams were presented as some of the attributes. They aimed to explore whether the local citizens preferred natural looking elements or the semi-natural looking with a stronger architectural impression (Macháč et al., 2022). With the intention of providing policy makers and spatial planners with helpful input and recommendations of which types of elements for every attribute do the citizens prefer and how much they are willing to pay for these environmental goods and services. Hence, Macháč et al. (2022) also applied DCE in their analysis to investigate the local preferences for different land use managements for sustainable area development.

In the city of Liberec with around 103,000 physical face-to-face interviews in the summer of 2018 were conducted in various green-space areas with either nature based or semi-natural elements. The length of the interviews lasted on average of 15 minutes and resulted in a sample size of 217 respondents (Macháč et al., 2022). Each attribute in the survey were presented with 3 different levels which were also visually illustrated through pictures to ensure the resident's fullest understanding of the attribute. In terms of the water stream attribute the first level was presented as a nature-based solution as one can find in the wilderness, the second level presented an architectural and semi-natural design of the water stream, and lastly the third level was presented as a piped water stream under the ground (Macháč et al., 2022). This level would represent a scenario that had no visible streams in the local green spaces (Macháč et al., 2022). In addition to the various GBI attributes, the study included a cost attribute as an annual and contiguous payment to fund the green elements in public spaces of Liberec (Macháč et al., 2022).

The data retrieved from the interviews could then be analyzed with a mixed-latent class (MLC) model which estimated the parameters for normal and lognormal distribution on responses related to each attribute (Macháč et al., 2022). The MLC model also generated the residents WTP from random draws of the estimated distributions. With such approach to the DCE methodology with MLC, this study highlighted two groups of respondents with differing characteristics and preferences towards the attributes (Macháč et al., 2022). The first group identified as older educated women who had clear preferences towards nature-based elements for GBI. In contrast, the second group was identified as men with lower education who showed stronger preferences against attributes like urban gardens and semi-natural streams (Macháč et al., 2022). Thus, the first class had overall higher WTP for the attributes than the second group.

By analyzing the data with MLC in this study, Macháč et al. (2022) was able to enhance the importance of familiarizing oneself with the local preferences when developing measures and policies for public spaces, as the preferences might differ quite a lot from one citizen to another. While accepting that the sample of 217 respondents is relatively small to the actual population of Liberec, the study concludes that their findings have potential to be partly transferred to other cities of the Czech Republic in relation to similar GBI elements (Macháč et al., 2022). Though, it might be rather challenging to do so for certain nature-based elements such as meadows, and especially those with various trees (Macháč et al., 2022).

2.4 Research Problem and Objectives

The objective of this thesis is to assess how people perceive the possibility of reopening this specific stream in Skjetten, which today consists of about 1km long underground pipes with a maximum capacity of 2 000 l/s. If the stream were to be reopened, it must not exceed the current capacity of 2 000 l/s either (Ødegård, 2022). We will therefore present the three different alternatives for the water stream project. Thus, this thesis aims to explore the following researchable problem "*Should the underground water pipes in Skjetten be transformed into water streams? From a socio-economic perspective"*. We will assess this problem based on respondents' preferred alternatives and WTP to implement the proposed measure.

With this problem in mind, our study will include two problem statements with corresponding objectives:

1. Collect necessary findings of the residents' preferences and WTP for physical transformations of their areas and neighborhoods. With the objective of using economic methods to quantify their preferences into monetary units. These findings can then be further utilized in cost benefit analyses for either this specific project in Skjetten, or future projects with stream openings in other parts of the country.

2. Conduct a socio-economic analysis to which may then provide the municipality with meaningful insight for their decision-making process of choosing one of the following alternative measures.

Alternative A: *The municipality will not implement any measures to the existing pipes for the next 5 years.*
This alternative essentially that the stream won't be reopened, and that the area will continue to be used as usual. Consequently, when Skjetten is met with increased rainfall levels in the future, floods may also occur on an average of every 5 to 10 years (Multiconsult, 2019; Sweco, 2021). As this alternative involves keeping the same underground pipes, there will be no improvements in biodiversity, and the area will not be further developed as a recreational or social meeting place.

***Alternative B**: Transforming the underground pipes into a natural water stream that can be typically found in the wilderness.*

By reopening the pipes as a stream with nature-based elements, it will have natural banks with stones, sand, clay, and vegetation. Such elements will allow for natural processes like erosion and sedimentation which continuously renews the water and habitat quality for the organisms living in the stream (Oslo Kommune, 2022). Prioritizing improved water quality, biodiversity, and ecology, this alternative would require less maintenance by the municipality. However, proper safety measures against unwanted erosion must be implemented from the beginning, with a balanced combination of stones and vegetation to ensure that natural processes run smoothly and undisturbed (Oslo Kommune, 2022). In addition to increased biodiversity, alternative B will also create new social meeting spots along the water stream and increase recreational opportunities with proper benches and walkable trails.

***Alternative C:** Transforming the underground pipes into an urban water stream with an evident architectural construction and designed for leisure activities.*

This alternative promotes a water stream with semi-natural elements typically seen in urban parks. The stream will consist of stone-paved banks and walkable paths along the water with new seating and meeting places optimized as social spots. This will make the area even more suitable for leisure and recreational activities compared to alternative B. However, there will be less variety of vegetation along the edges and banks of the stream. Water quality and biodiversity will therefore not be prioritized. Nonetheless, this alternative will also require continuous maintenance by the municipality to preserve the urban landscape.

While alternative A is presented as the project's baseline, alternatives B and C both suggest transformation of the underground pipes into reopened water streams with a capacity of 2 000 l/s. This water stream will flow through Ravinedalen and into the nearby river Nitelva in Lillestrøm municipality. Although alternatives B and C will change the overall landscape with the suggested water stream, it will still be possible to continue current activities in the area, such as playing frisbee golf or going sledding in the winter. The stream will be dimensioned narrow and shallow, therefore posing no danger to neither children or adults. With increased rainfall in the future, by reopening the water stream flooding in the area will occur on average of every 20 to 30 years for both alternative B and alternative A (Multiconsult, 2019; Sweco, 2021).

2.5 Research Questions & Hypotheses

To approach the objective and problem statements of this study, we conducted a survey using CV methods to elicit the WTP of Skjetten's local residents for their preferred alternative among A (no water stream), B (nature-based water stream), and C (semi-natural water stream). The survey was distributed by NORSTAT and generated 543 responses. We have therefore derived five different research questions that will be answered through regression analysis using data from our survey with two different statistical models. During the survey, each respondent represented their household and was presented with the three alternatives through a hypothetical scenario. To encourage truthful answers it is essential to design such CV surveys with realistic questions while still making it clear to the respondent that the case is only hypothetical (Johnston et al., 2017).

As alternative A represents the current situation, alternatives B and C offer two distinct layouts for the potential water stream, it's crucial to understand which alternative is favored by the local community. Investigating which alternative is preferred the most can provide insights into the most significant aspects of the project for the community, such as the ecological elements or the landscape aesthetics of the water stream. Information like this can essentially be used to inform decision makers and to ensure that the final project meets the needs and desires of the community. Additionally, understanding the preferred alternative can positively contribute to resource allocation and project implementation planning. The first research question for this thesis can therefore be formulated as the following:

Research question 1

Which alternative between A (no water stream), B (nature-based water stream) and C (semi-natural water stream) is favored the most by the local community?

However, we are not only interested in determining whether the residents of Skjetten are in favor of the water stream, but also in gaining insight into how they value the alternatives differently based on each their environmental elements, beyond the stream's role as a climate adaptation measure. Which is why the respondents were asked to specify their maximum willingness to pay for their preferred option using a payment card with several payment values (Johnston et al., 2017). This payment would be in the form of a binding annual tax for five years in order to open the water stream. Using the survey results and interval regression,

we will be able to estimate the average and total willingness to pay of households in Skjetten who selected alternative B and alternative C to reopen a water stream with nature-based or semi-natural elements, respectively. As a result, we can formulate research question two and three as we see below. Interval regression is a convenient model to answer these questions as the model allows us to analyze data, like ours, that falls between intervals (StataCorp, s.a-a).

Research question 2

What is the mean household willingness to pay in Skjetten for those who chose alternative B to reopen a water stream with nature-based elements?

Research question 3

What is the mean household willingness to pay in Skjetten for those who chose alternative C to reopen a water stream with semi-natural elements?

To elicit the WTP for a change in an environmental good, the value assigned by respondents may depend on how they perceive it in specific circumstances, their personal values and preferences, and whose interests they are taking into account (Champ et al., 2017). Thus, the respondents were asked additional questions related to sociodemographic characteristics, place identification, political interests, existing recreational opportunities, and more. The information gained from such questions would also contribute to various perspectives of why respondents chose their preferred alternative. Through research question three, four, and five we intend to analyze and investigate whether there are any specific conditions that may explain the respondents' choice of preferred alternative.

As we have observed from previous cases in Oslo, the reopening of water streams has been received with rather different reactions by the local communities and residents. To better understand why people react differently to the idea of reopening streams we can use the multinomial logit model which allows us to analyze the relationship between certain factors as independent variables and a category as the dependent variable with several options. One way to approach this is by considering how the respondents identify with and depend on Skjetten, as well as what it has to offer them specifically. Especially in terms of floods and prevention measures, because even though they greatly affect residents' livelihoods their interests and emotional connection to the place are often not represented enough the in decision-making processes (Verbrugge & Van den Born, 2018).

For instance, a previous study by Verbrugge and Van den Born (2018) found that a planned river intervention in a Dutch town was positively evaluated by the local residents. Especially in terms of improving flood safety, and social bonding, landscape scenery, and recreational values. The study highlights the importance of the local area and accessible spaces in residents' responses to river interventions in order to sustain social processes in river management (Verbrugge & Van den Born, 2018). Residents who have a strong emotional bond to their town, such as Skjetten, may therefore be more inclined to support initiatives that improve the region's ecological health and natural beauty. On the other hand, people who rely heavily on Skjetten for various activities might be concerned about the possible effects of the water stream's reopening to their existing activities and public spaces. To gain a better understanding of the social factors that affect the public's support for environmental initiatives, we can examine the relationship between residents' attachment and dependency levels with their preference for reopening the water stream. Thus, municipalities and policymakers may find it useful to consider such information for new projects while at the same time be able to engage the local communities to promote sustainable area development. Which leads us to the fourth research question:

Research question 4

Will the residents' attachment or activities in Skjetten affect their preferences for whether the water stream should be reopened?

With the third research question we aim to examine the correlation between place attachment and dependency and the respondents preferred alternative. To expand this view, the fourth research question will focus even further on exploring how respondents' choices may differ based on their specific interests and political priorities. Since the water stream is a public good which requires funding, it may also be necessary to determine whether the project indeed aligns with the interests, beliefs, and political priorities of the local community. For instance, some locals might not necessarily have negative opinions towards water streams in general, but perhaps they have other matters of the heart that they would like the municipality to prioritize instead such as healthcare or education. Likewise, some may have a specific interest in the environment and climate which might encourage them even more to support the project. Thus, with the fifth research question below, we can better understand how factors such as environmental concerns, economic development, and community infrastructure affect residents' preferences.

Research question 5

Does the residents' perceptions and priorities around different topics within politics and area development affect their preferences for the project alternatives?

Taking into account residents' life circumstances and housing types can provide valuable insights into their preferences for project alternatives and can help ensure that public projects like reopening a water stream are implemented in a way that meets the needs and expectations of all residents. For example, residents with higher income and education levels may have greater expectations and favor some elements and features over others, whereas residents with lower incomes and education levels might be more concerned about the cost and funding (Stanford et al., 2018). Furthermore, Higher income and education levels may also lead to residents being more vocal about their preferences and having better access to decision making processes (Stanford et al., 2018).

Thus, they might also understand how the potential effects of the project on both their daily lives and the long-term advantages of climate adaptation. On the other hand, residents with lower incomes and education levels may have less access to decision-makers and experience a sense of helplessness during the decision-making process (Stanford et al., 2018). Another aspect we would like to further investigate is the influence types of housing may have on the residents' preferred alternative. For instance, residents living in apartments could perhaps be more supportive of the project due to a greater need for recreational opportunities in smaller living spaces. While people who live in single-family homes might place more importance on features like landscape aesthetic or have other priorities. With these various perspectives in mind, we have formulated the fifth research question as follows:

Research question 6

Are residents' preferences for the project alternatives affected by life circumstances such as education, income, and housing?

Each of the research questions presented above will also have one or more corresponding hypothesis reflecting some possibilities to what the answers might be to the questions.

Table 2.1 List of research questions and corresponding hypotheses

RQ_1:	**Which alternative between A (no water stream), B (nature-based water stream) and C (semi-natural water stream) is favored the most by the local community?**
$H_{1.1}$:	We may answer the question by assessing the data results.
RQ_2:	**What is the mean household willingness to pay in Skjetten for those who chose alternative B to reopen a water stream with nature-based elements?**
$H_{2.1}$:	We may answer the question with average and total WTP using interval regression.
RQ_3:	**What is the mean household willingness to pay in Skjetten for those who chose alternative C to reopen a water stream with semi-natural elements?**
$H_{3.1}$:	We may answer the question with average and total WTP using interval regression.
RQ_4:	**Will the residents' attachment or activities in Skjetten affect their preferences for whether the water stream should be reopened?**
$H_{4.1}$:	Residents with a higher degree of place attachment with Skjetten are more likely to prefer alternatives B and C, which involve reopening the water streams, over alternative A, which represents the status quo.
$H_{4.2}$:	Since the project area is not well-facilitated for use, residents who engage in various activities by the project area are more likely to express a preference for alternative B and C.
RQ_5:	**Does the residents' perceptions and priorities around different topics within politics and area development affect their preferences for the project alternatives?**
$H_{5.1}$:	Residents who would like environmental quality to be politically prioritized are more likely to prefer alternative B and C, compared to those who consider other political topics and infrastructure more important.
$H_{5.2}$:	Residents who consider landscape aesthetics and facilitating the area for use as important are much more likely to prefer alternative C over A, while those who consider biodiversity and water quality to be important will likely prefer alternative B over A.
RQ_6:	**Are residents' preferences for the project alternatives affected by life circumstances such as education, income, and housing?**
$H_{6.1}$:	Higher levels of education are positively associated with alternatives B and C, compared to alternative A.
$H_{6.2}$:	Higher levels of income are positively associated with alternatives B and C, compared to alternative A.
$H_{6.3}$:	Residents living in apartments are more likely to prefer opening the potential water stream compared to those who live in houses.

3. Theory

3.1 Welfare Theory

Welfare economics is a broad framework built on making policy recommendations based on normative statements and value judgments. Thus, it is considered to be a prescriptive branch of economics that focuses on what *should be* rather than *what is* (Perman et al., 2011; Schotter, 2008). Welfare economics aims to identify situations and circumstances that enables the allocation of resources in a way which promotes social welfare, thereby achieving economic efficiency (Perman et al., 2011). Three conditions must therefore be fulfilled for an allocation to be considered efficient: efficiency in consumption, efficiency in production, and product-mix efficiency (Perman et al., 2011). Within welfare economics, such efficiency is often referred to as Pareto optimality. With pareto optimality we are referring to an allocation of resources which is considered efficient if no individual can be made better off without making someone else worse off (Perman et al., 2011; Schotter, 2008).

3.1.1 Pareto Optimality

According to Schotter (2008), welfare economics is built on two fundamental theorems that highlight Pareto optimality as an essential component. The first theorem states that a competitive equilibrium with a combination of inputs and outputs results in a Pareto-optimal outcome of an economy. The second theorem states that a pareto-optimal allocation of goods in an economy can also be achieved as a competitive equilibrium through appropriate redistribution of income (Perman et al., 2011). Thus, to reach perfectly competitive market equilibrium one could argue that government intervention is otherwise considered unnecessary, for as long as income is being distributed, then there is no need to intervene with the prices. Unless the conditions do not hold and we see market failure, that is when government intervention may be deemed necessary to correct for market failure as it could otherwise result in externalities (Perman et al., 2011; Schotter, 2008). However, there are different types of market failures associated with different types of goods.

3.1.2 Public & Private Goods and Services

Although these conditions to reach a pareto optimal allocation are commonly discussed in the context of private or marketed goods, the general concept of an efficient allocation still applies to both private and public goods. However, efficiency is measured differently for environmental goods with public characteristics as it rather challenging to set a price on the

environment (Field & Field, 2013; Perman et al., 2011). As a result, a pure market-based system may not effectively manage public or environmental goods and services. We may therefore categorize goods and services based on some of their characteristics in the economy (Perman et al., 2011).

Rivalry and *Excludability* are the two characteristics that are essential to understand whether goods or services can be considered public, private, or somewhere in-between. Rivalry refers to situations where an agent's consumption of goods or services negatively affects another agent's consumption, while excludability refers to situations where agents are being excluded of consumption (Perman et al., 2011). With these characteristics in mind, we may end up with four different combinations for goods and resources as shown in Table 3.1, which also includes relevant examples for each combination as presented by Perman et al. (2011)

Table 3.1 Characteristics of private and public goods
Source: (Perman et al., 2011)

	Excludable	*Non-excludable*
Rivalrous	**Pure private good**	**Open-access resource**
	Ice cream	Ocean fishery
Non-Rivalrous	**Congestible resource**	**Pure public good**
	Wilderness area	National defense

Ice cream as a pure private good can be both excludable and rivalrous, while pure public goods, such as national defense, are neither of those characteristics (Perman et al., 2011). On the other hand, we also have open-access resources like ocean fisheries outside of territorial waters where the catch of one fish for an agent result in less fish for other agents to catch (Perman et al., 2011). Lastly, there is congestible resources like wilderness areas or even water streams and rivers which also offers recreational experiences. These areas that people can visit up to a point where they may become congested with other visitors, making the experience for every individual less enjoyable as more people visit. These resources are non-rivalrous as long as the capacity of the area is not exceeded (Perman et al., 2011). Even though water streams or wilderness areas are generally not perceived to be excludable, it is still possible to prevent visitors depending on property rights or tools and technology like fences and signs (Perman et al., 2011).

3.1.3 Market Failures and Externalities With Public Goods

An economy may experience externalities or even market failures of both private and public goods for various reasons. Externalities refer to cases where production or consumption of goods and services result in costs or benefits affecting another agent in the economy (Schotter, 2008). Negative externalities that occur on the environment by industrialization of society, such as pollution from factories, has increasingly become recognized over time (Harris & Roach, 2014; Schotter, 2008). With such negative externalities and market failures, society tend to also raise the question on whether the government should interfere and what in ways (Schotter, 2008). This relationship between government intervention and market failures has therefore become a broad discussion rooted in equity and personal beliefs as we previously mentioned. Whether it be to correct market failures for private goods, like incomplete information in the economy, improve the environmental quality which could result in the so called *'free-rider problem'* which becomes a market failure for public goods (Field & Field, 2020; Schotter, 2008).

Since public goods have characteristics like non-excludability or non-rivalry, it is easily subjected to the free-rider problem. Including the environment as it can be considered a public good since one cannot necessarily expect the private market to enhance the environmental quality (Field & Field, 2020). This means that individuals will have incentives to avoid payment for the goods as they are aware that they cannot be excluded of enjoying the same benefits as any other individual who is willing to pay for the costs (Schotter, 2008). On the other hand, for the government to provide public goods with appropriate quality and quantity, it is necessary to have access to accurate information of the individual WTP of every member in the society (Perman et al., 2011).

Schotter (2008) describes this problem through the example of national defense, where the government asks every individual of society to state their maximum WTP between the two options of a large or small defense system. Given the collect data, a coordinator would then choose the alternative that best corresponds with the stated values(Schotter, 2008). Thus, there is a risk that some individual will under-state their values. However, if everyone had this rational thought that understatement is of their best interest, then the collected values would reflect a low demand. In that case, the government would not be able to secure funds to cover the cost(Schotter, 2008). It is therefore essential to keep this problem in mind when developing policies and regulations on the basis of WTP as dishonesty can have consequences

for all participants. However, even if the government did succeed in collecting truthful data on preferences, it can still be a challenge to secure enough supply due to allocation of resources (Perman et al., 2011). Such as we can see the impact negative externalities may have on the environmental quality.

3.1.4 Hicksian Demand and Equivalent Surplus

Since welfare economics uses utility and expenditure functions to quantify the welfare effects of marketed goods and environmental services in monetary terms, we can derive the Hicksian demand from the expenditure function with respect to the price (Mariel et al., 2021). Hicksian demand functions are rather practical because they essentially correct for the income effect of a price change by showing the demand of a quantity for a good given its price while keeping all other prices and utilities constant. Which is why it also can be called 'compensated demand function' (Perman et al., 2011). That way, changes in a Hicksian demand curve can illustrate how an individual will substitute a good for another when prices change (Perman et al., 2011). Thus, keeping a fixed level of utility while minimizing the expenditure to measure the individual's values of willingness to pay (WTP) or willingness to accept (WTA) for the change in the goods or service (Mariel et al., 2021).

Mariel et al. (2021) further presents this concept with the following a series of mathematical expressions to define the Hicksian demand. However, the first step in this process would be to define the indirect utility *u* as a function of marketed goods *z* and environmental goods *q*, so that we get the expression *u(z,q)* as a starting point (Mariel et al., 2021). Since the quantity of marketed goods *z* can be chosen freely while environmental goods *q* are decided exogenously, we may proceed to expand the function so that utility is still maximized according to their income *y* (Mariel et al., 2021). Thus, we get the indirect utility function *v* with prices of marketed goods *p.* Although the goal is to maximize individual utility, it will also be necessary to minimize the expenditure needed to reach that level of utility (Mariel et al., 2021). The expenditure and indirect utility functions presented below can therefore provide the basic theoretical framework for quantifying welfare effects (Mariel et al., 2021).

$$Indirect\ utility\ function\colon v\ (p, q, y) = \max\{\ u\ (z, q) \mid p \cdot z\ \leq y\}$$

$$Expenditure\ function\colon e\ (p, q, u) = min\{p \cdot z \mid u\ (z, q) \geq u\}$$

However, in terms of public goods like environmental quality or quantity, there are two possible ways to measure such responses in utility as monetary units; through compensating surplus (CS) or equivalent surplus (ES) (Mariel et al., 2021; Perman et al., 2011). These methods are rather convenient as environmental resources like water quality cannot easily be divided when it is shared between people, thus each person is unable to fully control the quantity they consume (Perman et al., 2011). With this in mind, it is important to note that CS and ES can differ from each other depending on the income effects and fundamental ideas on which rights an individual has. On one hand we have CS as a measure of welfare losses where the individual is considered to have the right to keep status quo, while on the other hand ES considers the right of improvement, thus measuring welfare gains instead (Mariel et al., 2021).

Mariel et al. (2021) therefore lands on the following expressions below for CS and ES with the indirect utility function in mind. While q alone is denoted as environmental quality or quantity, q^0 would then be the status quo while q^1 would be the improvement. With such an idea of the two different 'rights' CS would result in v^0 to keep utility constant while ES would show the improvements through v^1. For the remaining notations p represents the price while y would be income (Mariel et al., 2021).

$$CS\text{: } v\,(\,p,\,q^1\,,y-CS) = v\,(\,p,\,q^0\,,y\,) = v^0$$

$$ES\text{: } v\,(\,p,\,q^1\,,y\,) = v\,(\,p,\,q^0\,,y\,+\,ES\,)\,=\,v^1$$

In practice, this concept of CS and ES would correspond with willingness to accept (WTA) and willingness to pay (WTP) respectively (Mariel et al., 2021). After all WTA can be defined as the compensation an individual would be willing to accept to give up a good or service (Field & Field, 2020). This approach to evaluating environmental improvements is comparable with CS since the focus is on the keeping utility constant based on a compromised status quo. On the other hand, WTP is more straightforward, as it instead asks much individuals are willing to pay for an improvement (Field & Field, 2020). This would also give an indication of the value the individual places on the good. Thus, WTA and WTP are two equally useful tools to measure the value people place on changes in environmental resources, whether it results in compensation to avoid the change or paying for the change to

happen (Mariel et al., 2021). Additionally, WTA and WTP can each be mathematically formulated based on the Hicksian demand while following the expenditure function instead.

$$WTP\text{: } e\ (\ p, q^0, u^0) - e(p, q^1, u^0)\ when\ u^0 = v\ (p, q^0, y)$$

$$WTA\text{: } e\ (\ p, q^0, u^1) - e\ (p, q^1, u^1\ )\ when\ u^1 = v\ (\ p, q^1, y)$$

However, WTP stands out because it takes into account the individual's ability to pay for the goods and services. This raises the discussion on which approach is appropriate to utilize since WTP is constrained by income while WTA is not (Field & Field, 2020; Mariel et al., 2021). After all, there is a risk that individuals might respond with lower values than their true WTP, while they also might respond with much higher values than their true WTA. As we've previously addressed, this is a problem that has long been present in economic theory (Field & Field, 2020).

3.1.4 The Social Welfare Function and Equity

To determine whether goods and resources are being allocated efficiently, it can be helpful to examine different frameworks within welfare theory, such as the social welfare function (SWF). After all, it is not guaranteed that every policy or effort aimed at efficient allocation will affect the utility of all individuals in the same way. SWF has therefore become a useful tool to evaluate how these policies and implemented measures affect the overall welfare or happiness of society (Pindyck & Rubinfeld, 2012). Thus, allocation strategies can often be linked to utility, and maximizing society's social welfare.

Schotter (2008) illustrates this idea through the analogy of parents with the objective of maximizing the sum of their children's happiness. Further emphasizing that with economic theory, these parents will be able to optimally allocate their income as a resource based on their children's marginal utility (Schotter, 2008). Such analogies can be beneficial in understanding the role of utility in welfare economics to achieve Pareto optimality. Even more so as utility can sometimes be addressed as ´happiness´ for the sake of simplicity. Thus, we can state that the overall objective of resource allocation is to maximize the total utility of every member of society. This concept of social welfare is also referred to as *Utilitarianism* (Perman et al., 2011).

We should note that welfare economics is a broad theoretical framework where the SWF can be approached through several expressions and ideas, such as the *Rawlsian* approach which has a different perception of what equity implies (Pindyck & Rubinfeld, 2012). While the utilitarian SWF weighs the utility of every individual equally to increase welfare, the Rawlsian approach views fairness as improving the utility of the least advantaged member of society (Perman et al., 2011). Ultimately, the understanding of equity and fairness varies depending on the individuals' perspectives. However, some perceptions cannot be fully captured by the SWF due to the limited consideration of utility. For instance, one might even view fairness as a competitive market which rewards the most hardworking and talented individuals (Pindyck & Rubinfeld, 2012).

3.1.6 The Production Possibility Frontier

While the SWF provides a way to measure the overall well-being of society, the production possibility frontier (PPF) can also be useful for policy makers. The PPF is a curve which graphically illustrates the maximum combinations of resources needed for an economy to efficiently produce various goods and services from available inputs (Field & Field, 2020; Perman et al., 2011; Schotter, 2008). For instance, the PPF can show combinations between the two goods food and clothing given constant technology and fixed levels of inputs like labor and capital (Pindyck & Rubinfeld, 2012). However, as we have previously addressed in this chapter, goods and resources may have different characteristics and cannot always be purely classified as either 'public' or 'private' goods. This includes the environment and ecosystem services as well.

While the environment is a valuable asset producing essential goods and resources for all organisms, it is constantly exposed to activities and production of marketed goods that can potentially compromise the ability to provide us with these necessary services (Field & Field, 2020). Figure 3.1 illustrates this very relationship between the environmental quality on the x-axis and marketed goods on the y-axis during a year using the PPF. Any allocation of resources that falls inside the curve is considered to be inefficient (Pindyck & Rubinfeld, 2012). The PPF is typically represented as a concave curve due to the slope defined as the marginal rate of transformation (MRT). The MRT can essentially be described as the amount needed to give up on one good in order to produce an additional unit of some other good (Pindyck & Rubinfeld, 2012). This relationship between goods and resources is also referred

to as a trade-off between two goods. Thus, in this example, the MRT measures the trade-off between marketed goods or services such as cars or insurance policies and the environmental quality such as water quality or urban noise levels (Field & Field, 2020; Pindyck & Rubinfeld, 2012).

For society to be more sustainable we must adapt to climate change, make necessary changes in production, and implement policies for a trade-off which promotes better environmental quality while simultaneously achieving pareto optimality. Thereby the primary goal of society would be to alter the PPF for the economic output to be in line with greater environmental quality (Field & Field, 2020). This can be applicable for both short-term and long-term perspectives as we can see in Figure 3.1 with today's generation (a) and future generation in 60 years at (b). Future generations will have fewer possibilities than what they potentially could have if today's generation continue with activities that may have negative effects on the environment, such as producing marketed goods with negative externalities. Thus, the PPF curve in (b) demonstrates this impact by shifting inwards. Of course, whether the PPF shifts inwards or outwards depends on many complex factors that go beyond our simplified concept of environmental economics. However, with this understanding in place we can better grasp the relationship between the various resources and society's response when reviewing environmental policies. After all, Field and Field (2020, p. 29) describes sustainability itself as *"a matter of making decisions in the short run that do not have serious negative impacts in the long run"*.

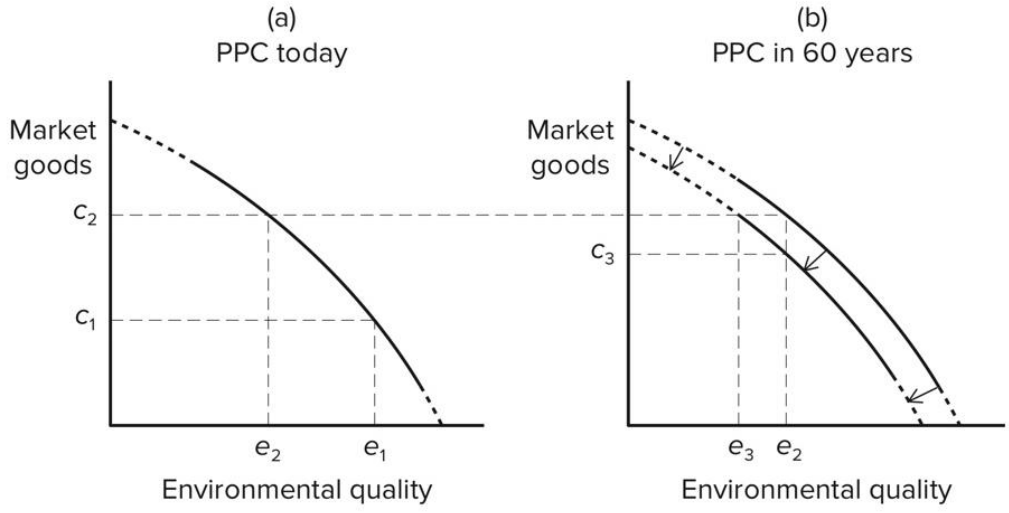


Figure 3.1 Production possibility frontier with today's generation (a) and future generation in 60 years (b)
Retrieved from: (Field & Field, 2020, p. 28), figure 2.2 Production Possibility Curves for Current and Future Generations

3.2 Ecosystem Services

Ecosystem services are known to be defined as the benefits we receive from the diversity of nature and ecosystems which essentially contributes to the well-being of humanity (Everard, 2021). In which the term ´well-being´ can typically be traced to concepts like happiness, utility, security, and human health. Whether it be on a personal level or on a societal level (Everard, 2021). The ecosystem services are essential to enhance life quality through goods and resources that are naturally provided to us. Hence, there has been an increasing interest in ecosystem functions and services to develop frameworks which can support planning and decision-making processes (De Groot et al., 2010). With the intent that the frameworks can provide with a foundation for understanding the value of natural resources and ecosystems beyond their traditional use.

3.2.1 Types of Ecosystem Services

To understand how these services contribute to human well-being, we can categorize them as provisioning, regulating, and cultural services (MEA, 2005). The sustainability of society's use of the services in each category can vary depending on how different goods within the categories are measured in addition to being valued with different methods (De Groot et al., 2010). This four-categorization of ecosystem services was initially identified by the Millennium Ecosystem Assessment, also referred to as the MEA (2005), in *´Ecosystems and Human Well-Being´*, a synthesis which essentially sparked a broad discussion and interest in research of ecosystems and their impacts (De Groot et al., 2010; MEA, 2005). Yet, the actual distinction and classification between the different services can still be challenging to approach in practice (De Groot et al., 2010).

To further explain these categories we firstly have ‘Provisioning services’ that are goods obtained from ecosystems that are necessary for human survival, such as food, fresh water, timber, and fiber (MEA, 2005). These are services that are frequently assigned market prices, like timber and forestry services (De Groot et al., 2010). Food, water, fiber & fuel & other raw materials, genetic materials, biochemical & medicinal resources, and ornamental species and resources are all examples of further categorization of provisioning services (De Groot et al., 2010). ‘Regulating services’, on the other hand, are critical for human well-being due to their impact on climate, flooding, disease, waste management, and water quality (De Groot et al., 2010; MEA, 2005). There are numerous examples of regulating services, such as air quality regulation via the capture of harmful dust particles and natural hazard mitigation, in

which forests play an important role in reducing the impact of extreme events such as floods (De Groot et al., 2010).

Thirdly, there is also ‘cultural and amenity services’ which provides with recreational, aesthetic, and spiritual experiences that can typically activate human senses, emotions, creativity, and be a part of our identities. This is a broad category which often include cultural heritage, spiritual & religious inspiration, recreational opportunities, and of course art of for example landscapes and wildlife (De Groot et al., 2010; MEA, 2005). Finally, ‘supporting services’ is often linked to natural processes like soil formation, photosynthesis and nutrient cycling which are crucial to provide protection of habitats and gene pool where ecosystem services can preserve species and ecological balance of evolutionary development (De Groot et al., 2010; MEA, 2005).

3.2.2 Valuing Ecosystem Services

Measuring and valuing ecosystem services can be convenient in order to make informed decisions about natural resource management. The initial goal of environmental valuation is to include both positive and negative environmental impacts in cost-benefit analyses (Perman et al., 2011). There are several approaches to valuing ecosystem services, which can be classified as either marketed or non-marketed goods, and some of these methods can also be further considered as being either indirect or direct (De Groot et al., 2010; Perman et al., 2011). While there are various methods to value ecosystems, we can also categorize the values as well based on how individuals experience the ecosystem services. Thus, there are essentially two recognizable types; *use* and *non-use* values (De Groot et al., 2010).

Consumptive direct benefits and non-consumptive indirect benefits from ecosystem services are included in use-values, where timber and fish fall under the former and recreational experiences and appreciation for aesthetics fall under the latter (De Groot et al., 2010; Kareiva et al., 2011). However, non-use values refer to the worth we attribute on the mere existence of an aspect of the ecosystem services, regardless of whether we use it. This is commonly known as the value of existence (Kareiva et al., 2011). For simplicity, it can be viewed as an 'insurance value' or a 'glue' value because it helps to hold the ecosystem together (De Groot et al., 2010; Kareiva et al., 2011). According to De Groot et al. (2010) there is also an intermediate value known as 'option value', which is the value we place on the possibility of using ecosystem services in the future, either for ourselves or for future generations.

Thus, with this understanding we can state that the Total Economic Value (TEV) is a broad framework which combines the use and non-use values of ecosystem services and can therefore be effectively used in decision making processes (De Groot et al., 2010; Everard, 2021). By considering the entire ecosystem and all of its different services during such processes then we may avoid unintentionally favoring one service over another which could result in unwanted externalities for those who rely on them (Everard, 2021). Everard (2021) summarizes this framework with the illustration as shown in Figure 3.2 to emphasize the importance of a holistic approach with ecosystem services.

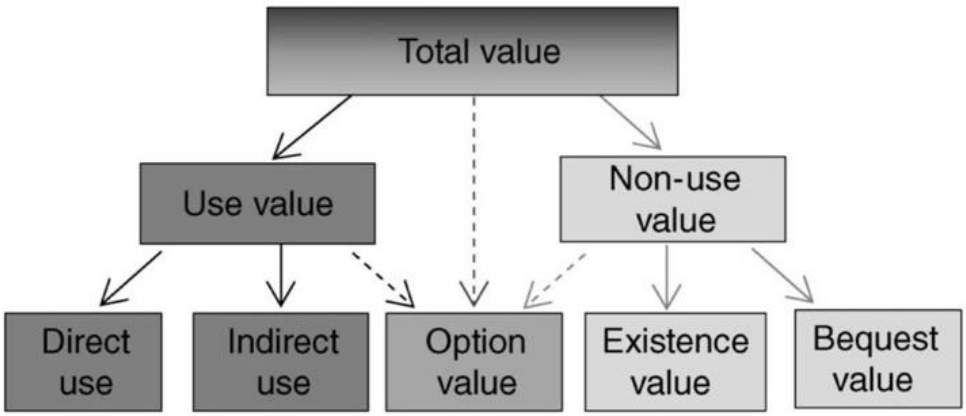


Figure 3.2 Visual map of the Total Economic Value framework.
Retrieved from: (Everard, 2021, p. 129), figure 6.1 Total Economic Value (TEV) model.

4. Method

This chapter will describe the methodology used to conduct the CV study for the potential scenario in which the municipality of Lillestrøm is considering reopening the old underground waterpipes into water streams in Skjetten. The goal of this study was to determine the economic value that people place on this environmental service. This chapter will therefore specifically focus on the stated preference method, survey design, and econometric methods used in our study.

4.1 Non-Market Valuation

4.1.1 Revealed & Stated Preferences

There are various methods and techniques that can be utilized in an attempt to value the environment and different ecosystem services. Harris and Roach (2013) states that there are essentially 5 categorized techniques that embrace different methods; Market Valuation, Cost of Illness Method, Replacement Cost Methods, Revealed Preference Methods, and Stated Preference Methods. The last two are especially of interest for our study and are frequently used for environmental valuation (Harris & Roach, 2013).

The economic concept of revealed preferences is based on people's choices in one market which can reveal their preferences for other goods and services, including the environment (Harris & Roach, 2013). Even if an environmental good or service does not have a direct market, it can still influence people's decisions in other markets (Harris & Roach, 2013). For instance, we can estimate preferences for a cleaner environment by analyzing housing market data to identify the effect of air pollution on house prices and estimate homeowners' willingness to pay for small decreases in particulate exposure (Field & Field, 2020). Two other techniques under revealed preferences are the travel cost method (TC) and hedonic pricing. (Harris & Roach, 2013). In which the TC method estimates the value of visiting a location with specific goods or services, such as a park or water stream, based on the assumption that individuals will keep traveling there as long as the benefit of each visit exceeds the cost (Kareiva et al., 2011). Hedonic pricing estimates the monetary value of non-marketed and non-traded goods, for example by assessing the relationship between property prices and the quality of ambient air in the area (Perman et al., 2011).

While revealed preference methods are based on actual market behavior, stated preference methods ask respondents about the total economic value they place on a resource, providing estimates for both use and non-use values (Harris & Roach, 2013). Thus, it takes a more direct approach in assessing preferences and values for changes in non-market goods and services, such as environmental resources (Field & Field, 2020). This method is especially useful when revealed preference methods cannot be performed due to the nature of the goods and makes stated preferences a useful tool for welfare analyses. It is also typically used to calculate the WTA or WTP for a hypothetical scenario WTP (Champ et al., 2017; Harris & Roach, 2013). However, it is important to note that both revealed and stated preference methods require

consideration of the income levels of the people being studied. Furthermore, while stated preference methods provide direct information on people's stated preferences, it does not always reflect their actual market behavior (Field & Field, 2020; Harris & Roach, 2013).

Validity and reliability are two important concepts to consider when assessing the accuracy of nonmarket valuation like stated or revealed preference studies. On one hand we have reliability which is usually concerned with variance, while on the other hand validity is often concerned with bias of the estimated values (Champ et al., 2017). Mariel et al. (2021) compares the function of reliability and validity with archery as shooting arrows towards a target. Thus, one can think of reliability as whether the arrows end up being grouped or scattered, while validity can be interpreted as the distance from the arrows to the bullseye (Mariel et al., 2021). Thus, reliability is often measured by the standard error, in which values with smaller standard error is considered to be more reliable (Mariel et al., 2021).

It is important to note that validity can also be categorized into three types known as the three C´s, 'content validity', 'construct validity', and 'criterion validity' (Champ et al., 2017). Content validity can be assessed by considering research procedures applied in the study, such as seeing how realistic the questions in a survey are. Construct validity can be tested by comparing results with expectations one might have, for instance based economic theory. Criterion validity can be assessed by comparing results with other valuation methods (Champ et al., 2017; Mariel et al., 2021). Reliability and validity are therefore important for both revealed and stated preference studies so that researchers may apply appropriate valuation methods and analyze the results to provide policymakers with more robust information in order to make informed decisions.

4.1.2 Choice Experiment

Choice Experiments (CE) is considered to be a newer type of stated preference method which has grown in recent decades due to its ability to estimate economic values for multiple characteristics or attributes of an environmental good (Champ et al., 2017). By conducting a survey with CE one can estimate the values of multiple characteristics known as ´attributes´ of a resource such as a forest in terms of ecosystem services (Champ et al., 2017). Respondents are therefore presented with multiple options, each with several attributes, and asked to select their preferred option (Johnston et al., 2017). Thus, even monetary values like price can be perceived as one of the attributes for the subject in question (Champ et al., 2017).

Conducting a survey given this structure of a CE can be convenient because it allows for adjustments to the levels of attributes based on the target group of respondents. Additionally, such structure allows the respondents to freely choose between presented alternatives based on their true values (Champ et al., 2017). Thus, CE provides with a basis for understanding which characteristics of a resource people value differently and how decision makers can go forth in applying policies which may affect quality or quantity of environmental goods and services For instance, the findings of a CE study can be later utilized in a cost-benefit analysis or other similar assessment which may require values of non-marketed goods (Champ et al., 2017). CE studies are therefore convenient for a variety of fields beyond environmental economics with resources that are difficult to value, such as transportation or health sector (Champ et al., 2017).

4.1.3 Contingent Valuation

Another technique which falls under stated preference methods is Contingent Valuation (CV). CV is essentially a method which utilizes surveys to determine how respondents value non-marketed goods in a hypothetical scenario. This is done by either asking the respondents how much they would be willing to pay to achieve or avoid the scenario or have the respondent choose between 'yes' or 'no' given a hypothetical amount of payment which is often addressed as dichotomous choice question (Champ et al., 2017; Kareiva et al., 2011; Perman et al., 2011). In contrast to TC and hedonic pricing which are indirect methods, CV is considered to be more of a direct method. Additionally, while CEs are newer to the field, the CV method has been widely used by economists to valuate non-marketed goods for many decades. Starting with Bob Davis in 1963 who estimated that families were willing to pay between $1 to $2 for recreational outdoor activities in the wilderness areas of Maine (Field & Field, 2020). The values obtained from a CV study can be expressed either as WTP for increased utility or WTA for decreased utility as we have discussed in chapter 2 (Harris & Roach, 2013).

CVs are especially convenient as the methodology is rather adjustable for each field with resources that are otherwise challenging to valuate based on market prices. Including studies of ecosystem services which may have different characteristics like fish as marketed goods or forests as congestible resources (Field & Field, 2020). Then essentially anything can be studied with CV method as long as the survey is structured in a way which follows accepted guidelines and allows the respondents to easily follow along the questions (Champ et al.,

2017; Field & Field, 2020). Field and Field (2020) describe the fundamental procedures of conducting a CV study as firstly identifying the quality of subject of matter such as environmental amenities or health outcome, and then select respondents using sampling procedures. The process continues with design and implementation of a survey, interview or focus group, to then analyze the results as well as aggregate the individual responses with the goal of estimating the values for the affected group (Field & Field, 2020).

Despite the advantages, the CV method has received criticism for several reasons. One of the primary concerns is hypothetical bias, which essentially occurs when respondents fail to respond truthfully to the hypothetical scenarios presented in the survey (Johnston et al., 2017). Hypothetical bias is an issue that has been raised for a long time as it suggests that stated preference methods in general may overestimate values compared to the actual money transactions. Thus, the responses may not accurately reflect the true value of non-marketed goods and services because there's not enough incentives to reveal the true WTP or WTA (Johnston et al., 2017).

The warm-glow effect is another issue related to dishonesty within CV studies, as respondents might answer based on their feelings and experience satisfaction by the act of giving for a good cause rather than responding a WTP which matches their true value of the resource itself (Champ et al., 2017; Gsottbauer & Van den Bergh, 2011; Mariel et al., 2021). Finally, concerns have also been raised in regard to the quality of data collected in CV studies due to insufficient control measures such as using validity tests in econometric regressions (Johnston et al., 2017). These criticisms highlight the importance of additional research and improved methodologies in addressing these issues to improve the validity and reliability of CV studies. However, CV remains a popular method for estimating the value of public goods, especially environmental commodities, when there is no market data available (Johnston et al., 2017).

4.2 Survey Design

The National Oceanic and Atmospheric Administration (NOAA) had previously gathered a panel of respected economists to further investigate the validity of CV studies. They concluded that such studies could deliver valid estimates of nonuse values (Harris & Roach, 2013). However, to improve the accuracy of the results, the panel provided a list of recommendations for developing a CV survey that would be fair and precise (Harris & Roach, 2013; Johnston et al., 2017). Since the panel's formation more than 20 years ago, these

guidelines have prompted further research on the validity of CV (Johnston et al., 2017). Naturally, this has also resulted in an expansion of the use of CV studies, as well as further research on the validity of the CV questions.

This also raised questions about the initial recommendations in the guidelines (Johnston et al., 2017). In fact, the overall survey design is considered to be a crucial aspect of conducting CV studies. That is because the quality of the survey instrument can affect the validity and reliability of the results. To ensure that the survey instrument is well-designed, we have applied the comprehensive list of 23 recommendations provided by Johnston et al. (2017) in the book *"Contemporary Guidance for Stated Preference Studies"* to complete both this CV study as well as the survey to collect necessary data (see Appendix 1). Johnston et al. (2017) suggest that stated preference (SP) survey design should adhere to general survey research best practices to increase the validity and reliability of value estimates. This includes a clear survey design, random sampling, and the selection of an appropriate survey mode (Johnston et al., 2017).

The purpose of our survey was to gather data on the residents' WTP for the suggested project to transform the old underground water pipes to a 1km water stream. A total of 3,500 text messages were sent out to residents over the age of 18 in Skjetten, Lillestrøm. The text messages were sent out by NORSTAT, a professional survey company, using the zip code 2013 to contact the sample population. The message provided the respondent with a link to the online-based survey along with a notice that the survey was based on a topic relevant of those who received the text message. For our study, we developed the survey using the online service SurveyMonkey consisting of a total 24 questions (see Appendix 2), and it was open for responses from February 24th to March 9th. Prior to the distribution of the text messages with link to SurveyMonkey, the survey was pre-registered and accepted by the Norwegian Centre for Research Data (NSD). In total, 543 responses were received, resulting in a response rate of 15.5%. By the end of the period a reminder was sent to half of the sample via text messages using randomization. Out of the 543 respondents, 398 completed the entire survey, resulting in a completion rate of 73%. Respondents spent on average 13 minutes completing the survey.

After accessing the survey through the provided link, the respondents were first informed about the research project with necessary information such as the background and purpose of this master's thesis. They were informed that their responses would be kept completely anonymous. Furthermore, they were also told that there were no correct or incorrect answers, but that their responses would be useful information for the municipality's decision-making process. Lastly, they were asked to consent to participate in the survey. If they didn't agree then their response would not be registered. Once they consented to the survey, the respondents were then asked about their demographics including age, gender, years lived in Skjetten, and preferences for spending on public services. They then had to rate their place attachment to the town and municipality on a given scale. We then proceeded to introduce the project itself along with a visual map of the water stream and background history of when the streams were initially transformed into underground pipes back in the 1970's. That way the respondent could have a clear idea of which water stream was the subject of the project.

Once respondents confirmed whether they knew of this transformation before hypothetical scenarios were presented for the CV study, specifying that the respondent should imagine the scenario where the municipality is considering implementing one of three alternatives and wishes to know more about the local residents' preferences. As we followed (Johnston et al., 2017) first recommendation, a detailed description of each alternative (A, B, and C) was provided by presenting the baseline condition, mechanism of change, and changes to be valued in a credible manner. To increase credibility, photos and illustrations were included to help respondents visualize each scenario, allowing them to ensure they understood the descriptions. Risk and uncertainty are relevant for SP studies and should be communicated in terms that respondents can understand (Johnston et al., 2017). Thus, every alternative essentially included relevant information such as the following:

- Whether the water stream would be reopened or not.
- If the alternative suggested reopening the water stream, we included details on whether the stream would be nature-based or semi-natural and that it would not pose any risk to the safety of neither children nor adults.
- How the alternative would affect the area's flood capacity.
- Whether the alternative would increase biodiversity, recreational opportunities, and/or social activities in the area.

After the survey provided an overview of the project and each alternative, respondents were asked to choose their preferred option from the three available. A simplified table was presented to ensure their understanding of the details, summarizing the main differences between the alternatives and their impact on the area (see Figure 4.1). If alternative A was selected, the respondent was asked a few follow-up questions to gather information on their reasoning for not liking the water stream in their town. For alternative B and C on the other hand, respondents were provided with a payment card that listed various amounts of money. They were then asked to indicate the amount that their household would be willing to pay annually through a municipal tax for a period of 5 years, thus being the payment vehicle of this study, which is also in line with the recommendations of Johnston et al. (2017).

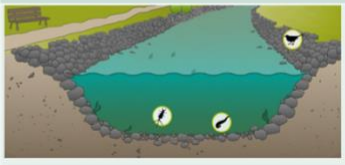
	Alternativ A	Alternativ B	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon			

Figure 4.1 The three alternatives A, B, and C with corresponding illustrations and description of the hypothetical scenario as presented to the respondent in our survey.

Choosing a payment vehicle is crucial in designing stated preference scenarios. It should specify bid amount, payer, mandatory or voluntary payments, payment frequency, and duration (Johnston et al., 2017). The payment system should be credible and significant to respondents and cover enough of the sample population. Payment details should also match the valuation methods used, such as changes in ecosystem services (Johnston et al., 2017). To identify misleading or protest responses, respondents who selected a payment amount of 0kr were asked an additional question about their reasoning for this choice. This allows us to determine if the respondent truly values the environmental change but has concerns about the payment mechanism, or if they are providing a misleading response (Champ et al., 2017). Protest responses may also occur when respondents reject the valuation scenario due to

unrealistic or misaligned payment mechanisms, resulting in unintended consequences such as higher taxes or fees. Thus, it's important to choose a payment vehicle that minimizes such effects while encouraging truthful and reliable responses (Champ et al., 2017).
For those who answered a WTP of 50kr or more, follow-up questions were asked about whether they think the municipality should charge their chosen value equally to all households in Skjetten to finance this water stream project. After answering the questions about preferences and WTP, all respondents were presented with new questions about how they use the area for activities, how often they use it, and other relevant questions to provide an overview of their socioeconomic situation.

It is worth noting that an initial pilot survey was sent out through 200 text messages using the same randomization method which garnered a total of 25 responses. After collecting the data and feedback from the pilot a few changes were done to the final survey. Firstly, we adjusted the survey so that once the respondent completed all questions, we clarified that the municipality was not considering increasing taxes and that the scenario presented earlier was hypothetical. This change was deemed necessary as we received feedback on the pilot that some respondents thought the hypothetical scenario to be real, and thus could not go back in the survey to change their WTP accordingly. The second adjustment made was to specify the average size of the water stream if it were to be reopened, in order to give more understanding to the respondent of what 2 000 l/s actually entails.

4.3 Econometric Methods

After collecting data from the survey, econometric methods were be used to analyze the data and estimate the determinants of WTP. For this study, we therefore utilized mainly interval regression as we were handling censored data. However, multinominal logit regression was also highly relevant to determine the correlation between various factors and the respondents' preferred alternative to test our hypotheses.

4.3.1 Interval Regression

Interval regression can be considered a useful tool for CV surveys such as ours which is aimed at determining the resident's WTP for reopening a water stream in their town. Interval regression is essentially a type of linear model commonly used in econometrics to analyze data where the outcome variable is only partially or not observed at all within a certain range.

This is usually the case when the variable is known to fall below a certain value or above a certain value, and it is often referred to as left-censored data and right-censored data, respectively (StataCorp, s.a-a). Thus, we do not know the exact value the respondent would be willing to pay for their preferred alternative. Instead, the data will consist of an interval with the respondent's lowest choice of WTP on the left end of the interval and the one higher option which the respondent did not choose on the right end. This way, our data will essentially be considered as censored data. According to Wooldridge (2001) a censored normal regression model can mathematically be expressed as the following:

$$y^* = x\beta + u, u|x \sim Normal(0, \sigma^2)$$
$$y = max(0, y^*)$$

In which the dependent variable *y** represents the unobserved latent variable, which in this case can be understood as the respondents' WTP which falls in an interval. The coefficient β will then represent the relevant parameters we wish to estimate to further investigate the relationship between the latent variable *y* and the explanatory variable *x*. The error term u captures the unobserved factors that may affect the dependent variable but are not included in the explanatory variables. The notation $u|x \sim Normal(0, \sigma^2)$ specifies that the error term is normally distributed with mean *0* and variance σ^2, conditional on the explanatory variables. It is worth noting that this expression shows that *y** is normally distributed. Lastly, the additional expression emphasizes that the outcome variable y's actual value is the highest number between *0* and *y**.

4.3.2 Multinomial Logit Model

However, when we handle data with binary responses we would also have to use probit or logit models (Wooldridge, 2020). Multinomial logit regression is another type of statistical model to analyze data where the dependent variable has more than two categorical alternatives along with a set of explanatory variables (Wooldridge, 2001). In cases where we only consider two categories then then even by using the multinomial logit regression, the model will then be reduced to a standard model for logistic regression (StataCorp, s.a-b). The model has been widely used in many fields such as economics, market research, politics, finance, and transportation engineering (Greene, 2018). It essentially assumes that the relationship between the independent variables and the dependent variable is linear on the

logarithmic scale (StataCorp, s.a-b). Following Long and Freese (2014) description of multinomial logit regression, the model can be expressed as such:

$$ln\Omega_{m|b}(x) = ln\frac{Pr(y = m|x)}{Pr(y = b|x)} = x\beta_{m|b}\ for\ m = 1\ to\ J$$

With multinomial regression we'll be able to tell how the probability has changed in relation to the reference category because the model estimates a set of coefficients corresponding to each outcome (Long & Freese, 2014). In this case the notation *b* represents reference category and serves as a benchmark for all other categories. It can also be referred to as the base outcome. The expression $ln\Omega_{m|b}$ therefore represents the log odds of being in category *m* compared to the base or reference category *b*. Thus, we can understand it as the natural logarithm of the ratio between the probability of being in category *m* and the probability of being in the base category b, given the values of the independent variables. For this model $x\beta$ the explanatory variable along with its' coefficient, again for the category *m* and base *b*. The coefficients in the model therefore represent the change in the odds of being in one category versus the reference category for each unit increase in the corresponding independent variable (StataCorp, s.a-b). The multinomial regression model essentially relies on the probability of a particular choice being made (Greene, 2018).

5. Data & Results

With this chapter we intend to provide a comprehensive overview of the data collected from our CV survey to explore the initial research questions outlined in chapter *2*. By employing statistical techniques such as interval regression and multinomial logit models, we can highlight how water streams are valued as environmental goods by the local population. With this, we aim to estimate the impact the predictor variables may have on the outcome variables, while at the same time considering our censored data. Thus, we hope to provide new insights for GBI and area development by exploring the various possible correlations between the general preferences for nature-based solutions and semi-natural elements from the community's WTP, perceptions, living conditions, and interests.

5.1 Descriptive Statistics

To properly analyze the data, it is generally required of SP studies to include a set of basic questions to gain an overview of the sociodemographic characteristics of the sample. Thereby, we ensure that the sample is actually representative of the population (Johnston et al., 2017). We can therefore compare the sample of our CV survey with the overall population of Lillestrøm municipality (see Table 5.1). While data of the sample in Skjetten was obtained from our survey, the remaining information on the overall population in Lillestørm was retrieved through various customizable tables of Statistics Norway.

Firstly, we can see that the gender distribution in our sample aligns rather well with the distribution of individuals above 18 years in Lillestrøm. However, Statistics Norway (s.a-a) does not provide statistics of individuals who do not identify as either female or male, resulting in a minor difference in the distribution of men in Skjetten compared to the rest of the municipality based on the observed statistics. Furthermore, to represent the households' income in Skjetten, we used the median of all the income categories that the respondents could choose from, resulting in a range of 800 001 – 1 000 000kr. This median of the sample is consistent with the overall population of the municipality, as the median of household total gross income in 2021 was 799 000kr (Statistics Norway, s.a-c).

While our data consists of a sample with residents of Skjetten above the age of 18, statistics on education provided by Statistics Norway (s.a-b) cover all individuals in the Lillestrøm population above 16 years old. Hence, there is a notable difference in highest achieved education between the sample and the overall population. The majority of the sample in Skjetten has a 3-4 year university degree, whereas the majority of the overall population of Lillestrøm had completed secondary school. Additionally, we can note that these education statistics of the municipality from Statistics Norway (s.a-b) do not include observations of higher education, like doctoral degrees. Lastly, we can observe that our sample from Skjetten has more individuals between the ages of 25 to 49, which is similar to the age distribution of the overall population of Lillestrøm municipality (Statistics Norway, s.a-b; Statistics Norway, s.a-d).

Table 5.1 Descriptive statistics of our survey sample in comparison to the population of Lillestrøm municipality.

		2022	***2021***
		Sample in Skjetten (%)	*Population of Lillestrøm (%)*
Gender			
	Male	44,08 %	49,98 %
	Female	55,01 %	55,02 %
	Other	0,19 %	.
Income			
	Median household's total gross income	800 001 - 1 000 000kr	799 000kr
Educaiton			
		*Above 18 years**	*Above 16 years**
	Primary school 1-10 grade	2,76	26,30
	Secondary school 11-13 grade	21,86	37,20
	Apprenticeship (fagbrev)	15,08	3,00
	3-4 year university degree	37,44	24,10
	5 year university degree	19,85	9,40
	Doctoral degree	2,26	.
	Don't know	0,75	.
Age			
	18-24	6,99	10,30
	25-49	36,86	44,58
	50-64	30,25	25,50
	65-79	23,06	14,65
	Over 80	2,65	4,97
	Mean age	51 years	48 years

5.2 Preferences for the Three Alternatives

To answer the first research question of our study, which is to determine the preferred alternative favored by the local community, we may first review the overall results of the distributions. As we previously mentioned we had initially conducted a pilot survey prior to our main survey to gather preliminary results and feedback for further adjustments. There was a total of 25 respondents in the pilot survey, with 9 identifying as female, 15 as male, and none as any other gender. Of these respondents, 61.90% (13 people) selected alternative B, a nature-based water stream, while 33.33% (7 people) selected alternative C, a semi-natural water stream, and only 4.6% (1 person) selected alternative A, which was to not have a water

stream at all. Thus, a total of 21 respondents chose one of the three alternatives while 4 individuals had exited the survey before answering this question. However, we observed that the majority of respondents in the pilot survey indicated that they wanted the water stream to be opened, and of the two options, alternative B received more favorable responses. Likewise, we can evaluate the applied survey in the same manner.

Thus, for the applied survey we received a total of 543 responses. Out of these responses, 65.55% (293 people) selected alternative B, the nature-based water stream, 24.83% (111 people) selected alternative C, the semi-natural water stream, and 9.62% (43 people) selected alternative A, which was against re-opening the water stream at all. This means that a total of 447 responses were collected while 96 respondents had exited the survey prior to the question asking for their preferred alternative. Thus, alternative B emerged as the most favored option, since it was preferred by a significant margin over the other options, both in the pilot and the applied survey. Figure 5.1 displays the distribution of preferences for the three alternatives. Note that the applied survey had a larger sample size than the pilot, which could potentially have affected the findings. Nevertheless, the overall results clearly indicate that alternative B, the nature-based water stream, is preferred by the local community. Further evaluation of the survey results through research questions two to six will therefore help us to better understand the underlying factors contributing to the preferences of the local community.

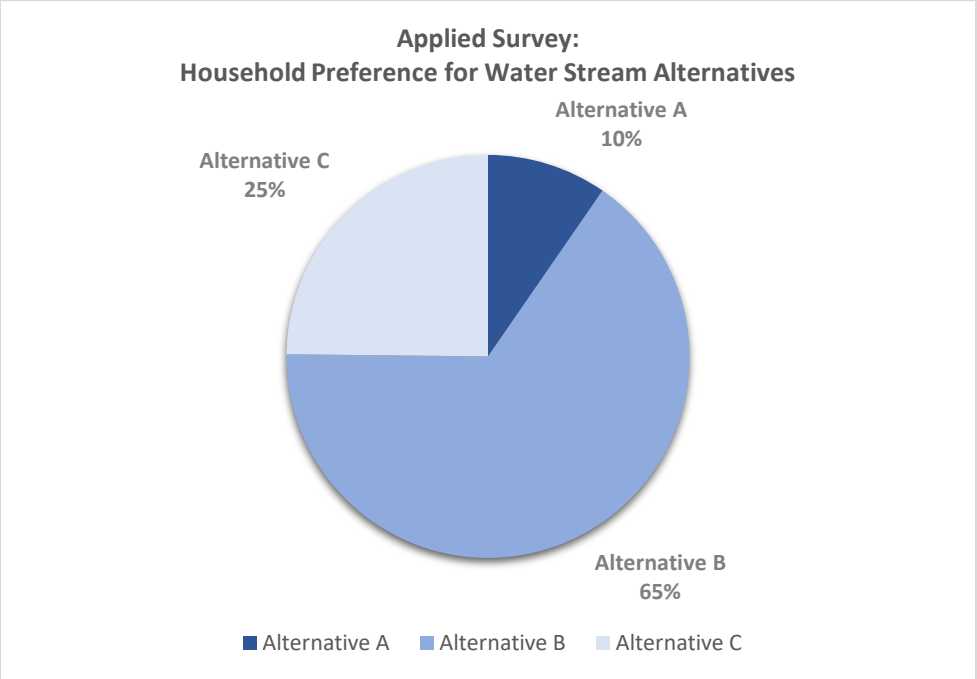


Figure 5.1 Sector diagram illustrating the overall distribution of our survey respondents' preferences for project alternatives A, B, and C.

5.3 Zero WTP – Protest Responses

To continue our analysis, our survey presented the respondents who preferred alternative B or C with a payment card that offered 19 options of values ranging from 0kr to 12,000kr. In addition to these options, respondents were also given the choice to select *'I don't know'* or *'more than 12,000kr'* where they could specify a particular amount as their WTP. However, we observed that only three individuals chose the option to specify their WTP as *'more than 12,000kr'* and used it to explain why they did not want to give any value at all. Therefore, we would have to carefully consider each of these responses to be valid or not since they did not use the option for its intended purpose. One of these respondents had already left the survey after providing their reasoning, while the remaining two had specified the same answer for the follow-up question where respondents who chose 0kr or did not provide a value for their WTP were asked for the most important reason behind their choice. Thus, we will consider those who selected *'over 12,000kr (specify)'* or *'0kr'* as potential protest responses for the survey.

Below in Table 5.2, we can see the distribution of the reasoning that respondents most commonly selected to explain why their WTP for the project is '0kr'. While the respondent may perhaps support one of the alternatives promoting a water stream with either nature-based or semi-natural elements, it's important to also consider that a zero WTP may not accurately reflect the true value they place upon the water stream. Some respondents could have the intention of choosing 0kr as a form of protest against the suggested project or survey itself. To identify such protest responses, a selection of the options from the follow-up question for zero WTP were designed to elicit reasons other than the individual's ability or willingness to pay for the good or service being offered. Such possible reasons presented to the respondents may therefore reflect a broader set of social or political issues or be used as a form of protest against the survey and payment process itself (Mariel et al., 2021).

Based on our presented statements of potential reasons, we can therefore consider option three, five, six and eight as protest responses since the statements represent political beliefs, disagreement of the payment method or lack of information so one may not be able to decide on a specific value for their WTP. Finally, we reviewed each specified response provided by the participants for their choice of zero WTP and determined whether it could be classified as a protest response or not. We identified a total of 55 protest answers, where 35 were related to alternative B and 20 related to alternative C. We may note that more than half of the

respondents who chose zero WTP gave protest responses, with option three being the most frequently selected. Overall, 27 and 6 respondents therefore had 0kr as their true WTP for alternative B and C respectively.

Table 5.2 Respondents' most important reason for selecting zero WTP in the survey

Reasons for choosing zero WTP	Alternative B		Alternative C		Total	
	Perc.	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*
0 = Specified other answers	14,52	9	11,54	3	13,64	12
1 = The household / I can't afford to pay for this.	22,58	14	3,85	1	17,05	15
2 = I don't think this alternative is worth financing.	6,45	4	0,00	0	4,55	4
3 = The municipality should pay for this, not the citizens.	41,94	26	53,85	14	45,45	40
4 = I don't want to pay before I know how much it will cost.	8,06	5	11,54	3	9,09	8
5 = I would be willing to pay if the payment was through voluntary donation and not an increase in municipal taxes.	6,45	4	11,54	3	7,95	7
6 = I don't want more people to use the area.	0,00	0	0,00	0	0,00	0
7 = I don't want to pay, but I am willing to support my preferred alternative through yearly voluntary work (e.g. cut vegetation, clean up litter).	0,00	0	3,85	1	1,14	1
8 = I don't know.	0,00	0	3,85	1	1,14	1
Total	100,00 %	62	100,00 %	26	**100,00 %**	**88**

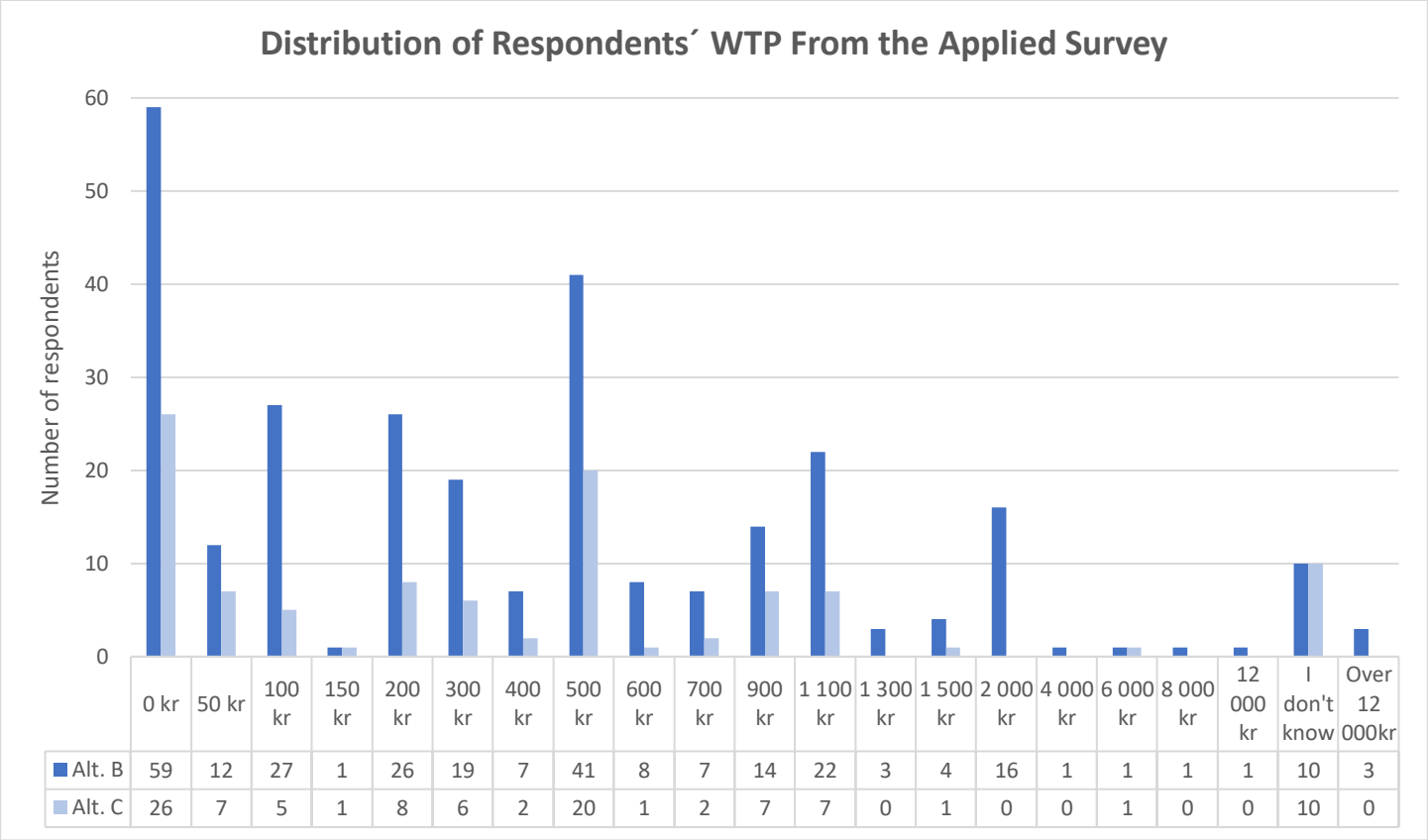
5.4 Mean Willingness to Pay

5.4.1 Distribution of WTP

Based on the overall distribution of WTP from our payment card, it was observed that 85 individuals were willing to pay maximum 0kr of increased municipal taxes to support their preferred alternative. Of these respondents, 59 preferred alternative B, while 26 preferred alternative C. For those willing to pay for reopening the water stream, the majority were willing to pay 500kr annually for five years in additional municipal taxes as we see from

Figure 5.2. Thus, given the descriptive statistics we found that the median of total WTP would be 300kr as the 50% percentile for all respondents who chose to support alternative B or alternative C, in which the median would be 300kr and 250kr respectively.

Figure 5.2 Bar diagram illustrating the overall distribution of our survey respondents' selected WTP from the payment card.



	0 kr	50 kr	100 kr	150 kr	200 kr	300 kr	400 kr	500 kr	600 kr	700 kr	900 kr	1 100 kr	1 300 kr	1 500 kr	2 000 kr	4 000 kr	6 000 kr	8 000 kr	12 000 kr	I don't know	Over 12 000kr
Alt. B	59	12	27	1	26	19	7	41	8	7	14	22	3	4	16	1	1	1	1	10	3
Alt. C	26	7	5	1	8	6	2	20	1	2	7	7	0	1	0	0	1	0	0	10	0

Although we received 543 responses to our survey, only 447 respondents expressed a preference between the alternatives A, B, and C. Of these 404 individuals who expressed support for reopening the water stream via alternatives B or C, just 364 selected a WTP value using our payment card, which ranged from 0kr as the minimum value and more than 12 000 as the maximum value. For our models we firstly excluded approximately 40 responses who selected either of the options *'I don't know'* or *'over 12 000kr (specify)'* and failed to provide an actual value or left the survey after expressing their preference for one of the three alternatives. Furthermore, supporters of alternative A were not asked to provide their WTP as alternative A represents the status quo, so naturally they were also not included in our regression models to estimate WTP values for the water stream project.

5.4.2 Interval Regression for mean WTP

Thus, to address our second and third research questions in order to find the mean and total WTP for alternatives B and C, we conducted three distinct interval regression models. The first two models utilized data from individuals who provided a minimum value of 0kr to a maximum value of 12 000kr, while the third model had a minimum value of 50kr.

The models were as follows:

- *First model: including all zero protest responses, resulting in 364 observations.*
- *Second model: excluding all zero protest responses, resulting in 309 observations.*
- *Third model: including only positive WTP responses, resulting in 279 observations.*

Table 5.3 Variable names and labels for dependent and independent variables used in the first set of interval regressions to estimate mean WTP

Variable names & labels	
wtp_low	Dependent variable, lower limit of given WTP values of all respondents who chose either alt. B or alt. C, where lowest value is 0 and highest value is 12 000
wtp_high	Dependent variable, upper limit of given WTP values of all respondents who chose either alt. B or alt. C, where lowest value is 0 and highest value is 12 000
preferbc	Independent variable, respondents' preferred alternative where 1 = alternative B and 0 = alternative C
_cons	The intercept constant which represents the estimated mean of the outcome variable when all predictor variables are set to zero.

To construct the three interval regression models, we set the dependent variables as the lower and upper limits of the WTP values obtained from our survey data. Additionally, we controlled for the alternatives B and C by using the dummy variable *'preferbc'* as an independent variable. A value of 1 indicates respondents who selected alternative B, and 0 indicates those who selected alternative C. To account for possible heteroskedasticity or clustering, we made sure to also specify robustness measures in our interval regression models. This will ensure that our findings will not be greatly affected by any outliers or clusters of observations with highly similar characteristics.

The independent variable *'preferbc'* provided coefficients and statistical information, serving as the difference in WTP between alternative B and C. The intercept term *'_cons'* gave the estimated value when all independent variables of the model were held at zero, which corresponds to the value of alternative C when *'preferbc'* is equal to zero. Thus, the constant term reflected the mean WTP for alternative C, while the estimations and statistics for alternative B were calculated using the estimated difference from the independent variable. Table 5.3 above therefore presents a small overview of the relevant variables for our three interval regressions.

Table 5.4 Estimated mean Willingness To Pay (WTP)

	Mean WTP	*Std. err.*	*p-value*	*95% conf. Interval*	
1.1 Including all protest responses (364 obs.)					
Difference B & C	193.686	104.210	0.063	-10.562	397.934
Alternative B	656.507	75.973	0.000	507.603	805.411
Alternative C	462.821	73.807	0.000	318.162	607.480
1.2 Excluding protest responses (309 obs.)					
Difference B & C	172.680	122.002	0.157	-66.439	411.799
Alternative B	754.382	86.357	0.000	585.125	923.639
Alternative C	581.701	89.226	0.000	406.821	756.582
1.3 Only positive responses (279 obs.)					
Difference B & C	209.328	131.823	0.112	-49.040	467.697
Alternative B	840.453	94.906	0.000	654.441	1026.465
Alternative C	631.125	95.041	0.000	444.848	817.401

The results of the first model, which includes all zero WTP protest responses, indicate that the predicted mean WTP for those who selected alternative B was 657kr with a standard error of 75.973. For alternative C, the model predicted a mean WTP of 463kr with a standard error of 73.807. Both estimations showed a highly significant p-value of 0.000, with a 95% confidence interval which indicates we can be quite confident that the true mean WTP of the sample ranges from around 507kr to 805kr and 318kr to 607kr respectively. Furthermore, the

difference was initially estimated to be 194kr as the coefficient of the independent *'preferbc'*. We also found the p-value of 0.063 (with an associated z-value of 1.86) was significant at the 10% acceptance level. With *'preferbc'* having a significant coefficient, we see that the WTP for alternative B (coded as 1) is higher than for alternative C (coded as 0).

We used a similar approach to analyze the remaining interval regression models. In the second model, we excluded all the zero WTP responses which could be considered as protests, resulting in an interval regression of 309 observations. This model predicted a mean WTP at around 754kr for alternative B and 582kr for alternative C. Not only are these estimations higher than the first model, the difference between the two is also smaller as the coefficient for *'preferbc'* was almost 173kr. However, this coefficient had a slightly higher p-value at 0.157.

Even though the p-value for the coefficient of *'preferbc'* is slightly higher in the second model, it still indicates a positive willingness to pay for alternative B over C. The insignificant result may be due to the reduced number of observations, resulting in less statistical power. Despite this, these findings still provide an indication of higher WTP for alternative B. We also observed that the standard errors were somewhat higher, with a larger range for the 95% confidence intervals for all the estimated values compared to the first model. Still, future studies with larger sample sizes may be able to provide more conclusive evidence.

We further analyzed the data using a third interval regression model, where we excluded all observations of alternative B and C with zero WTP expressions. This resulted in a total of 279 observations for this interval regression. As the model included only respondents with positive WTP values, the estimated mean WTP was the highest among the models, with 840.4537kr for alternative B and 631.1246kr for alternative C. The difference between the two alternatives was estimated to be 209.3981kr, the largest difference yet, and marginally significant with a p-value of 0.112. Furthermore, the sigma value at 1134.28kr is also the highest so far. Finally, the adjusted prediction from the marginal estimates suggests that the mean WTP for reopening the water stream is 789.433kr, when *'preferbc'* is set to its mean value of 0.7562724 where around 75% respondents with positive WTP values chose alternative B over C.

We can summarize the findings of the three variations of interval regression models used to predict the mean WTP for alternative B (nature-based water stream) and alternative C (semi-natural water stream) in the above Table 5.4. In addition to the uneven distribution of observations among the models, there may also be other variables that are influencing respondents' WTP values, making it difficult to isolate the effect of the variable we utilized as *'preferbc'*. There are likely other factors that related to WTP, the effect of '*preferbc'* may therefore be hidden or overshadowed. Nevertheless, the findings of the regression analysis still provide important estimations of WTP for each alternative B and C and should therefore be considered in decision-making processes in addition to aid us in answering research question 1 and 2.

5.4.3 Present Value of WTP

With these interval regression models we'll be able to account for censored data, where some respondents may not be willing to pay anything for the alternatives. By excluding zero WTP protest responses in the second model, we could obtain more accurate and reliable WTP estimates. Thus, we could use these estimates to further consider the payment vehicle used in our study, which essentially was an increase in yearly municipal taxes over a 5-year period. Even if the payment vehicle is a common method used to finance such public projects, it is still important to account for it in through net present value (NPV) calculations. However, since we lack specific information about the initial investment of the water stream in accordance with each of the alternatives B and C, we would have to make a rough assumption that it is 0kr in our calculations. Thus, we essentially estimate Present Value (PV) rather than NPV specifically. Still, for the interest rate we set it as 4%, which is a standard rate used in public sector CBAs in Norway (DFØ, 2014).

Based on our calculations, we found that the PV for alternative B was 3 358kr with its cash flow of 754.382kr over the 5-year period. When this cash flow is aggregated with 3 500 households in Skjetten, the total mean WTP while accounting for NPV of alternative B would therefore be estimated at 11 754 305kr. On the other hand, the NPV for alternative C based on its cash flow was around 2 590kr, with the NPV of total WTP being 9 063 708kr as the cash flow was also aggregated with the 3 500 households. Note that the number of 3 500 households used to aggregate our estimations for this part of our analysis is a rough assumption out of necessity due to the current unavailability of the precise household count in Skjetten. Instead, we opted to utilize the number of individuals we were able to reach through

text messages during the initial survey distribution, even though the payment vehicle in our study is a household tax. However, our mean WTP and PV estimations may still provide valuable information on expected costs and benefits of each alternative to decision-makers and planners further developing the project and similar cases. It is also important to consider other factors such as the environmental and social impacts, as well as the preferences and values of the stakeholders and the local community.

Table 5.5 Mean and total WTP estimations calculated for present value

Description	Value
Discount rate	0,04
Number of years	5
Number of households	3 500
Mean WTP alternative B	754.382
Total WTP alternative B	2 640 335.6
Mean WTP alternative C	581.701
Total WTP alternative C	2 035 954.55
Mean NPV of alternative B	3 358.375
Total NPV of alternative B	11 754 304.985
M ean NPV of alternative C	2 589.630
total NPV of alternative C	9 063 707.931

5.5 Regression Analyses

5.5.1 Models and Variables

In Table 5.6 we have presented an overview of the informative statistics and values for each of the variables we used in our regression models, such as number of observations, the mean, standard deviation, as well as the minimum and maximum values for every variable. These variables were carefully selected in order to investigate our data and check our hypotheses. Note that the same set of explanatory variables were used in all our model specifications.

In terms of research questions 4 to 6, we primarily examined the relationship between respondents' preferred alternatives for reopening the water stream (A, B, or C) and various independent variables. To do this, we used a multinomial logit model which included control variables such as *'female'*, *'age'*, *'educ_high'*, and *'lnincome'*. This model therefore estimated the log-odds, which would be the logarithmic ratio of the probability for an individual to be in one of two groups. In our case we specified alternative A as the baseline so that the model would generate regression output with two sets of coefficients for each independent variable.

The coefficients of the first part would therefore predict the log-odds of an individual being in the group of residents preferring alternative B (water stream with nature-based elements) rather than preferring alternative A (no water stream as it is status quo), depending on what perspectives the variable represents. Likewise, the second part will predict the log-odds of an individual preferring alternative C (water stream with semi-natural elements) instead of alternative A. For simplicity, we will interpret the log-odds values by referring to the positive or negative sign as being ‘more likely’ or ‘less likely’ to fall into each group. Additionally, we checked for multicollinearity among the variables in all our models to ensure more reliable statistical inference. Since we also wanted to account for heteroskedasticity, we performed the interval regressions with robust standard errors.

Table 5.6 Descriptive statistics of the variables applied in our regression models.

Variable Name	*Description*	*Mean*	*St. Dev*	*Min*	*Max*	*Obs.*
alternative	Which of the alternatives the households prefer the most, 1 = A no to any water stream, 2 = B yes to nature-based water stream, 3 = C yes to semi-natural water stream	2.152	0.568	1	3	447
lnwtp_low	Log of wtp_low, the lower limit of WTP	4.601	2.704	0	9.393	364
lnwtp_high	Log of wtp_high, the upper limit of WTP	5.759	1.332	3.933	9.393	364
preferbc	dummy showing what respondents chose between the water stream alternatives, 1 = alternative B, 0 = alternative C.	0.742	0.438	0	1	364
female	dummy, 1 = female, 0 = otherwise	0.550	0.498	0	1	529
age	Continuous variable of the respondents' age	51.563	16.653	15	87	529
educ_high	dummy, 1 = has completed higher education from university, 0 = otherwise	0.595	0.491	0	1	398
lnincome	Log transformed variable of the respondents' income levels. Individuals who did not select one of the 12 options for income levels were assumed to have income between 600.001-800.000kr, similar to Lillestrøm's median income of 799 000kr	1.866	0.407	0	2.485	398
pa	Place attachment as average score of agreement scale on statements about place identity and place dependency, 1= strongly disagree, 2= disagree, 3= neutral, 4 = agree, 5 = strongly agree	3.226	0.756	1	5	482
sledding	dummy, 1 = engages the most in the outdoor activity 'sledding' by the project area, 0 = otherwise	0.150	0.357	0	1	408
frisbeegolf	dummy, 1 = engages the most in the outdoor activity 'frisbee golf' by the project area, 0 = otherwise	0.181	0.386	0	1	408
hiking	dummy, 1 = engages the most in the outdoor activity 'hiking' by the project area, 0 = otherwise	0.738	0.440	0	1	408
use_freq	frequency of area usage throughout a year, 1 = never or don't know, 2 = 1 to 5 times a year, 3 = 1 to 5 times every half year, 4 = 1 to 5 times a month, 5 = 1 to 5 times a week, 6 = every day	3.012	1.465	1	6	403
nature_biodiversity	dummy, 1 = thinks the municipality should prioritize political topics like 'public transportation', 0 = otherwise	0.210	0.408	0	1	509
climatemeasures	dummy, 1 = thinks the municipality should prioritize political topics like 'climate measures (emission reduction and adaptation), 0 = otherwise	0.098	0.298	0	1	509
imp_landscape	Scale of how important landscape aesthetics is for the respondent to support preferred alternative, 1 = not important at all, 2= a little important, 3= neutral, 4= important, 5= very important	4.102	0.962	1	5	411
imp_areause	Scale of how important facilitating the area for use is for the respondent to support preferred alternative, 1 = not important at all, 2= a little important, 3= neutral, 4= important, 5= very important.	4.292	0.928	1	5	411
imp_biodiversity	Scale of how important biodiversity is for the respondent to support preferred alternative, 1 = not important at all, 2= a little important, 3= neutral, 4= important, 5= very important	3.774	1.154	1	5	411
imp_waterquality	Scale of how important water quality is for the respondent to support preferred alternative, 1 = not important at all, 2= a little important, 3= neutral, 4= important, 5= very important	3.895	1.087065	1	5	411
apt	Dummy, 1 = residents live in apartment, 0 = otherwise	0.206	0.405	0	1	403
rent	Dummy, 1 = residents rent their home, 0 = otherwise	0.089	0.286	0	1	403
concern	Concerns related to safety as average score of agreement scale on statements «I am concerned about the safety measures of the water stream» and «If the water stream gets reopened then I feel that the area will become more unsafe», 1= strongly disagree, 2= disagree, 3= neutral, 4 = agree, 5 = strongly agree	2.484	1.117	1	5	402

5.5.2 Multinomial Logit Model

Table 5.7 Estimated log-odds values of multinomial logit model for preferences among alternatives B and C relative to alternative A.

	Alternative B		**Alternative C**	
Variables	*Coefficient*	*Std. err.*	*Coefficient*	*Std. err.*
female	1.039**	(0.496)	0.642	(0.511)
age	-0.028	(0.018)	-0.019	(0.018)
educ_high	0.661	(0.471)	0.138	(0.488)
lnincome	1.013**	(0.516)	1.433**	(0.577)
pa	0.378	(0.322)	0.609*	(0.327)
sledding	-1.176*	(0.322)	-0.619	(0.671)
frisbeegolf	-0.836	(0.561)	-0.685	(0.573)
hiking	-0.797	(0.610)	-0.878	(0.625)
use_freq	-0.265	(0.173)	-0.255	(0.180)
nature_biodiversity	0.251	(0.659)	0.018	(0.701)
climatemeasures	-1.327*	(0.724)	-0.994	(0.772)
imp_landscape	0.459*	(0.245)	0.548**	(0.252)
imp_areause	-0.029	(0.276)	0.048	(0.277)
imp_biodiversity	0.874***	(0.255)	0.153	(0.255)
imp_waterquality	0.317	(0.223)	0.362	(0.230)
apt	1.277**	(0.647)	1.062	(0.673)
rent	-0.272	(0.701)	0.001	(0.717)
concern	-0.579**	(0.230)	-0.569**	(0.234)
_cons	-2.738	(1.999)	-3.555*	(2.146)
Number of Obs.		394		
LR chi2(36)		141.43		
Prob > chi2		0.000		
Pseudo R2		0.214		
Log likelihood		-259.765		
Note that * p < 0.10, ** p < 0.05, *** p < 0.01				

As we see above in Table 5.7 we have presented the results of the multinomial logit model with a total of 394 intendent variables to help us answer the three remaining research questions of our analysis. Although we received over 500 responses for our survey, the sample size for this model will be smaller because we included variables for education and income towards the end of the survey. As a result, some respondents had exited the survey by then, and it is not uncommon for individuals to be uncomfortable sharing personal information related to these factors. Additionally, we see that the pseudo R2 value of 0.214

and chi-square of 141.43 with probability 0.000. This suggests that this model is a better fit than the intercept model, where we test the null hypothesis that all coefficients are equal to zero (Long & Freese, 2014).

When we examine the results for our explanatory variables, our analysis reveals that the gender variable *'female'* is a significant predictor with a p-value of 0.036. Since this value is considerably lower than the 5% acceptance level, we can further interpret the coefficient. With its positive sign, we observe that females have a positive relationship with the independent variable *'alternative'* in the first part of the model output, with the estimated log-odds being 1.039. Thus, if we keep all other variables constant then females would be more likely to prefer to reopen the water stream as alternative B rather than having no water stream at all by preferring alternative A. Likewise, this also means that individuals who identify as males or other genders are more likely to prefer alternative A instead. Even though the gender variable isn't significant in the second part showing predictions for preferring alternative C over alternative A, we still see that the coefficient is still positive even if the log-odds value is slightly lower. Such findings highlight that preferences for the proposed water stream in general may vary among genders and between alternatives.

We find that among the other sociodemographic factors, *'lnincome'* as the log-transformed household income variable is quite significant while variables for age and education are not. Thus, household income levels emerge as significant predictors in both parts of the regression, with the log-odds estimated at 1.013 for alternative B and 1.433 for alternative C. In fact, both coefficients remain statistically significant even at the 5% acceptance level. Our model therefore suggests that as the household income levels increases, a local resident in Skjetten would be more likely to prefer alternative B over alternative A. Whereas those with lower income levels would be more likely to prefer alternative A. We can follow the same logic to interpret the positive relationship between the respondents' income levels and preferring alternative C over A.

There are several other explanatory variables with significant coefficients as well. Among them, we found that the variable *'pa'* denoted as place attachment was significant, though only at 10% acceptance level with the log-odds for preferring alternative C was estimated to be 0.609. This means that as the average score of the respondent's attachment to Skjetten increases, they would be more likely to choose alternative C over A. Conversely, if their score

is lower, then the individual would be more likely to prefer alternative A instead. Thus, it becomes evident that place attachment holds significant importance when we specifically consider the water stream with semi-natural elements, where it exhibits a positive impact.

Among the three variables representing popular activities in the local community, only *'sledding'* was found to have a significant coefficient. However, this significance was observed solely for alternative B, while it did not reach statistical significance in the second part concerning alternative C. As a result, we can state that residents who enjoy sledding by the project area are less likely to prefer alternative B over A, relative to those who do not engage in the activity. This is reflected in the negative log-odds value of -1.176 estimated for this group. In contrast, residents who do not engage in sledding are therefore more likely to favor alternative A.

We can apply a similar logic as we also investigate variables representing various factors that could be important for the resident to support their preferred alternative. Each of the four variables, namely *'imp_landscape'*, *'imp_areause'*, *'imp_biodiversity'*, and *'imp_waterquality'*, is represented using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), allowing respondents to express their level of agreement or importance. Through the first variable of these four, we note that the more the resident agrees that landscape aesthetics are important, the more likely they would be to prefer each of the water stream alternatives over alternative A. For alternative C, the coefficient is quite significant at the 5% level. Yet, within our multinomial logit model, *'imp_biodiversity'* stands out as the sole variable achieving a high significance at the 1% level, with an impressively low p-value of 0.001. However, it is only significant for the log-odds of 0.874, indicating that as residents place a higher importance on biodiversity, they are more likely to prefer alternative B over alternative A.

Our multinomial logit model further reveals that housing type may also play a role in shaping the community's preferences for the project. Specifically, residents living in apartments are more likely to prefer the nature-based water stream through alternative B than to prefer alternative A. In contrast, locals living in other housing types such as family homes, townhouses, or even farms, would be more likely to prefer alternative A. However, our model also indicates that home ownership status (whether the resident rents or owns their home) does not impact their preferences. Thus, whether the resident rents their apartment would not affect such preferences.

Moreover, an important aspect of our analysis is to consider how safety concerns may affect their preferences as well since safety concerns are typically raised as the primary argument against reopening water streams in other cases in Norway. We find that residents who are more concerned about safety measures around the stream and believe that the area will feel unsafe are less likely to support either alternative B or A. These findings are rather interesting, as the water stream itself is intended as a safety measure against the negative effects of climate change, such as the risk of flooding.

5.5.3 Interval Regression

Table 5.8 Estimated mean WTP of three different interval regression models with a selection of explanatory variables.

	2.1 Including all protest responses		**2.2 Excluding protest responses**		**2.3 Only positive responses**	
Variables	*Coefficient*	*Std. err.*	*Coefficient*	*Std. err.*	*Coefficient*	*Std. err.*
preferbc	-0.114	(0.204)	-0.161	(0.174)	-0.048	(0.146)
female	0.122	(0.175)	0.096	(0.151)	0.158	(0.133)
age	-0.002	(0.006)	0.000	(0.005)	0.004	(0.005)
educ_high	0.197	(0.178)	0.168	(0.153)	0.107	(0.131)
lnincome	0.368	(0.264)	0.232	(0.240)	0.183	(0.227)
pa	0.047	(0.117)	0.070	(0.105)	0.078	(0.092)
sledding	-0.063	(0.258)	0.023	(0.225)	0.000	(0.204)
frisbeegolf	-0.205	(0.260)	0.074	(0.242)	0.317	(0.212)
hiking	0.327	(0.230)	0.189	(0.200)	0.026	(0.158)
use_freq	0.155**	(0.070)	0.114*	(0.060)	0.053	(0.051)
nature_biodiversity	-0.232	(0.202)	-0.164	(0.181)	-0.027	(0.154)
climatemeasures	0.491*	(0.285)	0.465*	(0.254)	0.363	(0.227)
imp_landscape	0.236**	(0.115)	0.198**	(0.095)	0.101	(0.082)
imp_areause	0.355***	(0.126)	0.248**	(0.107)	0.174**	(0.087)
imp_biodiversity	0.481***	(0.098)	0.363***	(0.095)	0.206***	(0.078)
imp_waterquality	-0.185**	(0.094)	-0.134*	(0.080)	-0.106	(0.069)
apt	0.367*	(0.222)	0.045	(0.209)	-0.001	(0.195)
rent	-0.263	(0.351)	0.067	(0.309)	0.286	(0.262)
concern	0.008	(0.081)	-0.088	(0.070)	-0.135**	(0.062)
_cons	0.183	(0.965)	1.996**	(0.919)	3.628***	(0.810)
/lnsigma	0.339	(0.043)	0.120	(0.046)	-0.082	(0.045)
Sigma	1.403	(0.061)	1.128	0.052)	0.921	(0.041)
Number of Obs.	337		284		257	
Wald chi2 (19)	122.240		82.900		65.170	
Prob > chi2	0.000		0.000		0.000	
Log pseudolikelihood	-853.668		-753.190		-672.929	
Note that * p < 0.10, ** p < 0.05, *** p < 0.01						

Three additional interval regressions were conducted as extensions of our previous analysis by adding the same set of explanatory variables from our multinomial logit model to the interval regressions. This is different from our previously in our analysis, where we ran interval regression models using only the *'preferbc'* variable to predict the WTP for each alternative. The presented findings from our interval regression models are shown in Table 5.8 above.

The model specifications used in this analysis are similar to those applied earlier. In the first model, we therefore used a sample that comprises all observations with WTP values, except for those who were unable to provide an actual value using the payment card method. The second model excluded all protest responses that were presented earlier, and in the third model, we used a sample with only positive WTP values which results in such a small sample size compared the first model with all relevant observations. Thus, this last model excluded all individuals who expressed zero WTP. Additionally, all three models included robust standard errors to account for heteroskedasticity and clustering.

Across all three models, none of the sociodemographic variables appear to be significant at any of our acceptance levels. Nevertheless, the log-transformed income variable *'lnincome'* is still an interesting observation as it has a p-value of 0.164. This may be due to the fact that it has a smaller size compared to the other variables. Despite being insignificant, we can still keep in mind that the income elasticity is estimated to reach up to 0.368 in our models. This suggests that a 1% increase in household income would on average correspond to a 0.368% increase in WTP. Such findings highlight a positive relationship between household income and WTP for the water stream. The education variable is also not significant, but it is worth noting in a similar manner as education and income tend to follow the same pattern.

A similar approach can be applied to interpret the significant estimations in the remainder of our analysis. Firstly, the user frequency variable is significant at the 5% acceptance level for the first model, only significant at the 10% level for the second model, and not significant at all for the third model, which only includes observations exhibiting positive WTP values. This suggests that for the first model, the higher the frequency in which residents use the project area, the higher their WTP values. It is interesting to note that this group of people may be less likely to prefer the alternatives that propose to reopen the water stream. However, if they

do prefer this option, they seem to be more willing to pay to fund the stream the more they use the area.

In addition to these findings, we also observe that factors such as landscape aesthetics, area facilitation, biodiversity, and water quality have significant impact on WTP. Particularly, area facilitation and biodiversity are highly significant factors in all three interval regression models, indicating a positive relationship with the respondents' average WTP. On the other hand, water quality stands out with negative coefficients, implying that those who attach more importance to water quality are willing to pay less to fund it. This essentially aligns with the overall pattern of respondents finding importance in water quality are less likely to be supportive of the water stream compared to maintaining the status quo in the multinomial logit model.

Finally, we also considered the variable *'apt'* to distinguish respondents who live in apartments from those who do not. This variable is only significant at the 10% level in the first model that includes protest responses. Specifically, residents living in apartments in Skjetten have a higher WTP on average than those who do not. Although we find this observation interesting and relevant to our final research question, it has limited statistical significance in our models. It is worth noting, however, that the third interval regression has the lowest number of observations among all our models. Therefore, its results may not accurately reflect the reality compared to our other models. Similarly, we see that the *'concern'* variable for residents who on average are concerned for the safety levels in the area due to the water stream, though this only has an effect on WTP in the last model for only positive values.

5.5.4 Interval Regression with Alternative B

Table 5.9 Estimated mean WTP of three different interval regression models given alternative B only with a selection of explanatory variables.

	3.1 Including all protest responses		**3.2 Excluding protest responses**		**3.3 Only positive responses**	
Variables	*Coefficient*	*Std. err.*	*Coefficient*	*Std. err.*	*Coefficient*	*Std. err.*
female	0.008	(0.206)	0.017	(0.184)	0.124	(0.164)
age	-0.002	(0.007)	-0.001	(0.006)	0.005	(0.006)
educ_high	0.235	(0.220)	0.107	(0.188)	-0.041	(0.155)
lnincome	0.411	(0.290)	0.380	(0.258)	0.376	(0.239)
pa	-0.053	(0.140)	-0.036	(0.128)	0.021	(0.109)
sledding	0.029	(0.330)	-0.037	(0.285)	0.070	(0.246)
frisbeegolf	0.039	(0.308)	0.304	(0.269)	0.461*	(0.237)
hiking	0.343	(0.270)	0.108	(0.232)	0.010	(0.191)
use_freq	0.095	(0.080)	0.080	(0.067)	0.025	(0.058)
nature_biodiversity	0.013	(0.211)	0.097	(0.186)	0.090	(0.169)
climatemeasures	0.428	(0.323)	0.535*	(0.284)	0.359	(0.266)
imp_landscape	0.156	(0.131)	0.141	(0.108)	0.120	(0.095)
imp_areause	0.399***	(0.148)	0.317**	(0.127)	0.183*	(0.095)
imp_biodiversity	0.542***	(0.123)	0.399***	(0.124)	0.193**	(0.092)
imp_waterquality	-0.214*	(0.115)	-0.128	(0.098)	-0.076	(0.082)
apt	0.508**	(0.254)	0.109	(0.234)	0.063	(0.223)
rent	-0.590	(0.430)	-0.021	(0.393)	0.267	(0.369)
concern	0.053	(0.088)	-0.041	(0.081)	-0.096	(0.077)
_cons	0.274	(1.082)	1.715*	(0.983)	3.199 ***	(0.864)
/lnsigma	0.008	(0.050)	0.128	(0.052)	-0.067	(0.051)
Sigma	1.382	(0.069)	1.136	(0.059)	0.935	(0.048)
Number of Obs.	253		218		197	
Wald chi2 (18)	96.990		66.600		54.230	
Prob > chi2	0.000		0.000		0.000	
Log pseudolikelihood	-642.465		-573.942		-514.413	
Note that * p < 0.10, ** p < 0.05, *** p < 0.01						

Our analysis so far has primarily focused on the perspectives and opinions of Skjetten's residents of the proposed reopening project of the old water streams. Our results revealed that alternative B, which involves reopening the pipes as a nature-based stream, is the most popular choice. To further investigate which elements may specifically impact the WTP for alternative B, we have adjusted our interval regressions by only including WTP values given

by respondents who initially selected alternative B as their preference. As shown in Table 5.9 above, these models have a lower sample size than before, as we have excluded all observations who selected alternative A or alternative C. Since we used the variable *'preferbc'* to specify our interest in alternative B in an if-statement, we now have 18 variables in the model compared to the previous 19.

In our previous analysis, we observed some variation in the significance of the variables among the three alternatives. However, in our current analysis, we identified four key variables that are mostly consistently significant at any acceptance level. Facilitating the area for use has remained significant throughout the majority of our analysis, while the significance of water quality has varied, just as we see in this case. Notably, biodiversity emerged as the most important factor for those who prefer alternative B. We consider this to be quite logical as alternative B is distinguished from alternative C by its nature-based elements, which will provide varied vegetation and a generally natural look, similar to streams found in the wilderness.

6. Discussion

The purpose of this chapter is to provide an overview and discuss the validity of the results we have presented so far. As we answer each research question, we may draw conclusions based on the data and insights gathered from our survey, as well as reflect on what we have addressed regarding climate adaptation and GBI. Our primary aim is therefore to make recommendations for further policy development and to determine the best direction for communicating the future of the water stream project to the residents of Skjetten.

6.1 Research Questions and Hypotheses

To address these research questions we employed a multinomial logit model and extended our analysis by utilizing the three types of interval regression models. These additional models served as an expansion of the initial interval regressions used to estimate the residents' WTP. By analyzing survey responses using these models, we wanted to determine two key factors. First, we tried to identify how various factors would influence the respondents to be more likely to choose alternatives B or C, with alternative A serving as the baseline. Second, we aimed to determine how the same factors would affect the their WTP for the water stream.

6.1.1 Research Question 1

RQ_1: Which alternative between A (no water stream), B (nature-based water stream) and C (semi-natural water stream) is favored the most by the local community?

The first research question in our CV study seeks to identify the most preferred alternative among the residents of Skjetten from our set of alternatives including A (no water stream), B (nature-based water stream), and C (semi-natural water stream). To address this question, we conducted a survey that followed the standard guidance for stated preference methods, in which the survey provided the respondent with information about a hypothetical scenario reflecting the project of this study. After they had selected their preferred alternative, we also asked them to express their WTP for the chosen alternative using a payment card with annual municipal taxes over a five-year period as the payment vehicle.

Our findings reveal that alternative B with nature-based elements is the most favored as over 65.55% of the respondents prefers it. This suggests that alternative B is the clear choice among the three options by a significant margin, followed by alternative C with almost 25.83% of the respondents selecting preferring it. Therefore, we see that a significant majority of the survey respondents (90.38%) generally favor the idea of reopening the old underground water pipes as a 1km stream running through the area known by the name 'Glostrupdumpa'. Such findings are evident among both the pilot and the applied survey results. In contrast, only 9.62% of the total respondents preferred alternative A, indicating that a small group of residents oppose to the project and would rather maintain the status quo.

As this study finds strong support for a nature-based water stream, we see that is essentially aligns with the increasing interest in implementing green-blue infrastructure (GBI) as climate adaptation measures in area development. After all, this particular alternative has the potential to yield positive environmental impacts, including improving water quality and increasing biodiversity. Nevertheless, it is crucial to consider the potential costs and challenges associated with implementing such measures, including land use and maintenance expenses. Thus, opting for alternative B has the benefit of requiring less maintenance by the municipality due to its nature-based elements, in contrast to the more urban water stream option, alternative C. Additionally, these results emphasize the importance of taking community preferences into consideration when making decisions regarding environmental goods and area development. Of course, further evaluation of the survey results through

research questions two to six is necessary to better understand the factors and elements which underlie the local community's preferences and how much they are willing to pay to fund it.

6.1.2 Research Question 2 & 3

RQ_2: What is the mean household willingness to pay in Skjetten for those who chose alternative B to reopen a water stream with nature-based elements?

RQ_3: What is the mean household willingness to pay in Skjetten for those who chose alternative C to reopen a water stream with semi-natural elements?

Having determined the most favored alternative, we can further delve into research question 2 and 3 to explore the household WTP to reopen the old water stream in Skjetten. While 543 individuals participated in the survey, only 364 respondents expressed their preferences for either alternative B or C and provided a corresponding WTP value from our payment card. With this sample, we constructed three types of interval regression models. The first model included all 364 observations for the censored data, while the second model excluded a selection of protest responses, resulting in 309 observations in the sample. Lastly, the third model used only positive WTP values, having 279 observations. Additionally, we observed that the overall sample in our analysis had similar sociodemographic statistics to the population of the municipality in general.

After analyzing the censored data, we determined that the second type of interval regression model, which excludes the selected protest responses, is the most reliable for our study and further use of our estimates. After all, it is generally recommended to account for potential protest responses in studies utilizing Stated Preference (SP) methods, like ours. Therefore, the other models that include all WTP values and all positive WTP values can be regarded as a form of sensitivity analysis. Based on this, we can therefore conclude that the estimated mean WTP for alternative B, which involves funding the water stream with nature-based elements, is approximately 754kr. On the other hand, for alternative C, which focuses on reopening the water stream with semi-natural elements, the estimated mean WTP is around 581kr.

However, it is also important to take into account the net present value (NPV) of these estimates, as our payment vehicle involved an increase in annual municipal taxes specifically for a 5-year period. By calculating the NPV, we can assess the long-term financial impact of

implementing alternatives B and C. After conducting such calculations for our analysis, it was revealed that NPV based on mean WTP for alternative B would then be accumulated to approximately 3 358kr, while for alternative C, it would be almost 2 590kr. These values would represent the present-day worth of the estimated WTP over the 5-year period, considering the time value of money. When further aggregating our estimated mean WTP values with the 3 500 households of Skjetten, we can determine the overall NPV which would be generated to fund the project. For alternative B, the total aggregate NPV would amount to over 11.7 million kr, while for alternative C, it would be around 9 million kr.

Of course, it is important to consider both the mean estimates and the NPV analysis when deciding between alternative B and alternative C, in addition to considering the overall preferences of the residents. However, one should set the tax rates mindfully to avoid any potential backlash or complaints by the community. Thus, these WTP values from the second interval regression model seem to be safe choice as it both considers protest responses and are estimated with a decent sample size compared to other models. In addition, it's essential to acknowledge that the uneven distribution of observations could have influenced the estimations for mean WTP of all three models. Even more so as only 270 respondents expressed their WTP for alternative B, whereas only 94 reported their WTP for alternative C. Thus, it is important to consider other potential factors that could influence the WTP values. Nevertheless, these results still suggest that respondents who selected alternative B had a greater WTP than those who opted for alternative C.

6.1.3 Research Question 4

RQ$_4$: Will the residents' attachment or activities in Skjetten affect their preferences for whether the water stream should be reopened?

As part of our survey, we initially presented the respondents with ten different statements related to place identity and place dependency, using a Likert scale ranging from 'strongly disagree' to 'strongly agree'. To measure place attachment as we calculated the average score of the respondent's answers to these questions. Thus, looking at our findings from the multinomial and interval regression models, the variable 'pa' representing place attachment demonstrates interesting patterns. The analysis revealed that place attachment, plays a significant role in determining the probability of residents preferring alternative C over alternative A. However, it does not seem to have a substantial impact on the preference for

alternative B. Interestingly though, even in the interval regression models, place attachment does not emerge as a significant factor. However, even if the variable was indeed significant, then we would have seen that the coefficients would be found to be close to zero across all models.

These findings imply that the residents' preference for the urban water stream with semi-natural elements (alternative C) as compared to no stream at all (alternative A) may be influenced by place attachment. However, the same variable seems to have little or no impact on alternative B and the estimation of their WTP. As a result, we are unable to fully reject the hypothesis $H_{4.1}$. We should keep in mind that while place attachment may have some influence on residents' choices, it is not sufficient to fully conclude that it matters for both water stream alternatives. Naturally, our sample size may have played a role in this outcome as well. With a larger sample, place attachment could potentially have shown more substantial effects on both alternatives B and C, providing additional support for the hypothesis. Therefore, policymakers should consider other factors with a stronger presence when deciding on which alternative to pursue.

The second hypothesis, $H_{4.2}$, brings a new perspective to our study by suggesting that support for water stream alternatives may depend on the community engaging in activities by the area of interest. Our analysis revealed that sledding was the only variable estimated to have any statistical significance, though only at a 10% level. This indicates that residents who enjoy sledding in the project area are less inclined to prefer alternative B over alternative A. In fact, those who participate in any of the listed activities in our model are less likely to prefer either type of water stream. That also includes the variable we had for user frequency of the area within a year. Thus, we must reject hypothesis $H_{4.2}$ as none of the activities showed a positive impact on residents' preference for the water stream alternatives over the baseline. However, even if the coefficients indeed are negative, it does not necessarily imply that the reopening of the water stream itself will truly have a negative impact on these activities for the residents of Skjetten and reduce the overall quality of the area. After all, the area isn't quite facilitated for proper use to the community to begin with.

Although locals who actively participate in these activities and frequently use the area are less likely to prefer the proposed water stream, we found that those who do express a preference for the project tended to have consistently positive WTP estimates across the interval regressions. Even more so as our analysis revealed that frisbee golf users exhibited significantly positive WTP estimates, particularly in the regression where we considered data with only given positive WTP values. This would mean that even though they would be less likely to prefer the water streams, these residents who engage in such activities like sledding, frisbee golf or even hiking could actually have positive WTP to fund the project compared to those who do not fall in each of those categories. Thus, our results indicate that there is a great potential in this group of residents and that communication is key. These findings would then highlight the potential of the identified target group and emphasize the importance of effective communication strategies to engage them in the project. Seeing how they have positive WTP despite negative likelihood for preferences the policy and decision makers should ensure the group's involvement from the early stages of the project.

For instance, Multiconsult (2019) reports that there are various possibilities to facilitate crossing points over the stream (like small bridges etc.) which could benefit both children and older people while taking the frisbee golf course into consideration. On the other hand, the report also states that the stream could make it somewhat more difficult to go sledding by the are Glostrupdumpa (Multiconsult, 2019). With our findings, it is evident that those who are active in the valley where the stream is intended to run, particularly those who enjoy sledding, will likely be opposed to the project. Of course, it is also possible that these residents may not hold a negative attitude towards all water streams in general, even if the project is proposed through GBI or climate adaptation measures like it was in our case. However, when asked whether they would like a water stream in the area or to not make any changes, the latter appears to be the preferred option. It will therefore be necessary to ensure proper communication with the local community on how the stream will affect the area and their opportunities to continue with such outdoor and recreational activities. All impacts on the activities, whether positive or negative and regardless of their magnitude, will be highly important in the communication process.

6.1.4 Research Question 5

RQ_5: Does the residents' perceptions and priorities around different topics within politics and area development affect their preferences for the project alternatives?

Further on, to answer research question 5, we will begin with assessing hypothesis $H_{5.1}$, which states that residents who prioritize environmental quality are more likely to prefer each of the water stream alternatives B and C over alternative A. As we conducted our regression models, we included the two variables *'nature_biodiversity'* and *'climate_measures'*. These variables collectively determine whether prioritizing environmental quality influences residents' preferences or not. The first variable would thus represent individuals who believe that nature and biodiversity should be prioritized by the municipality as a political topic, in contrast to those who believe that other topics like job opportunities, infrastructure development, healthcare, etc., should take priority. Similarly, the second variable would represent those who believe that climate measures, such as reducing CO2 emissions or implementing climate adaptation strategies, should be given priority instead. Consequently, the results of our analysis would indicate the odds of individuals falling into either group according to which alternative they prefer.

Firstly, we found that nature and biodiversity as a political interest were consistently found to be insignificant in all of our models. Therefore, it does not have an evident impact on residents' preferences or WTP. Secondly, for climate measures as a political topic, we observed significance only in terms of alternative B and not for alternative C. Surprisingly, however, its impact on preferences was negative in both cases. Of course, this does not necessarily imply that the respondents don't find the water stream as a climate measure in our scenario important at all. Instead, it's possible that there are other types of climate measures that the residents would want implemented in the municipality rather than this specific proposal.

For instance, some individuals might consider actively reducing CO2 emissions to be more important than physically transforming public spaces for climate adaptation. However, we suspect that these findings may have occurred due to a rather small sample of respondents who selected this particular political topic from the options provided in our survey. In fact, out of the 447 observations, only 42 individuals prioritized climate measures. As a result, we do not consider these results to be as reliable as we would like because of the limited amount of

data on this matter. The same reasoning can be applied to the lack of significance observed for nature and biodiversity, since only 97 observations selected it as an important and prioritized option. Nevertheless, climate measures still exhibited significantly positive values for WTP, though it was at the 10% acceptance level.

Therefore, this particular group of residents who would want climate measures prioritized, appears to be more inclined to financially support the water stream compared to those who selected other political topics. Therefore, we must reject hypothesis $H_{5.1}$ based on the lack of statistical significance for nature and biodiversity, as well as the negative effects climate measures have on the odds of preferring alternatives B. Despite the outcome of the hypothesis, it's still crucial to acknowledge that building interest in environmental quality would be an important process for further development of GBI in the municipality, whether this specific project becomes realized or not. After all, we do see the potential for significantly positive effects, especially in terms of WTP for finding sustainable solutions to further develop and fund such climate measures.

The second hypothesis for this research question states that certain considerations such as landscape aesthetics and facilitating the area for proper use by the community will positively influence the residents to prefer the urban water stream represented by alternative C. Likewise, preferences for alternative B would be influenced by considerations for biodiversity and water quality. We therefore applied the four explanatory variables *'imp_landscape', 'imp_areause', 'imp_biodiversity',* and *'imp_waterquality'* in our models as they also indicate how much the resident agree that each of them are important in respect of their preferences by also using a Likert scale provided in our survey.

Firstly, our previous findings indicate that the greater importance residents place on landscape aesthetics, the more likely they are to support the idea of reopening the water stream in Skjetten. This is supported by the positively significant coefficients that were predicted for both alternative B and C in our multinomial logit model. In contrast, having the area facilitated for use would not matter at all for the odds of which alternative they would want to see realized, regardless of whether the relationship was positive or negative.

However, as we examine the predictions for WTP levels, we found that landscape aesthetics and area facilitation are both important factors with quite positive values. Thus, the more residents perceive these considerations as important, the more they are willing to pay for the water stream. While area facilitation initially had no impact on preferences, further analysis reveals that it does have a positive influence on WTP as it was found to be highly significant in all our interval regressions. This highlights that facilitating and developing areas, such as the valley in Skjetten, is an important aspect to consider when discussing how local communities value public environmental goods in their neighborhoods. Such considerations could promote a sense of pride and ownership among locals and add to the neighborhood's general well-being. It therefore appears that facilitating the land and area for use by locals is crucial and something they are willing to pay for, especially for a project they support and find appealing.

Thus, landscape aesthetics and area facilitation do play a role in urban water streams, though in different ways. However, we should note that this part of the hypothesis specifically focuses on their positive impact on preferring alternative C, rather than the water stream in general. Considering this, when revisiting the WTP values, it is likely that the results were primarily influenced by the majority who supported alternative B. Moreover, in terms of preferences alone, the significant coefficients for landscape aesthetics showed minimal variation between alternative B and C. Therefore, these two factors hold significant importance for both alternatives, and our conclusion would not necessarily be exclusive to alternative C.

We may also further review our results addressed previously to evaluate the second hypothesis for this research question. $H_{5.2}$ essentially states that residents who perceive landscape aesthetics and facilitating the area for use as some of the important considerations for their preferences are more likely to support alternative C over A. Similarly, if they consider biodiversity and water quality important, then they would be likely to favor alternative B over A. Thus, we observed that landscape aesthetics emerged as quite the significant factor for residents to support alternative B and C, as it positively influenced their probability of preferring each of the water stream alternatives. On the other hand, our findings revealed that area facilitation lacks a statistically significant influence on their preferences.

Additionally, had we assumed significance to area facilitation, our estimated values would have been close zero. This suggests that facilitating the area for use is not as meaningful to the community when selecting among the three alternatives. Nevertheless, we do see that if residents indeed prefer the water stream, both landscape aesthetics and area facilitation are two considerations they greatly value. This is evident as both variables were positively significant in our interval regressions. The positive coefficients associated with these variables suggest that residents who place greater importance on landscape aesthetics and facilitating the area for use are willing to contribute financially to support this project.

Furthermore, biodiversity also proves to be a significant factor positively impacting the odds of preferring for alternative B. These findings are consistent with the characteristics of this alternative, as it emphasizes nature-based elements and strives to provide a diverse habitat with a variety of vegetation. Therefore, residents who place more importance biodiversity would undoubtedly find this option appealing. Additionally, biodiversity had a substantial presence among our WTP estimations, indicating that residents highly value the enhancement of biodiversity in the area through the implementation of a water stream.

Yet, we cannot say the same for water quality, as our predictions were quite insignificant when considering preferences alone. Although our interval regressions did reveal intriguing results regarding water quality. We discovered that residents who prioritize the water stream and place high importance on water quality would have a decreasing WTP compared to those who thought it was less important. This suggests a certain level of skepticism regarding the effectiveness of the water stream's specific elements and natural processes in improving water quality. Further investigation into these perspectives on water quality is recommended, as there may be underlying factors that explain this negative relationship. However, decision makers should carefully consider the importance of these findings, as the significance of the negative coefficients was mostly at the 10% level, and for some models, it was not significant at all. Thus, there could be some inconsistency in these specific findings.

Additionally, residents who value biodiversity are more likely to favor alternative B over alternative A. These significant relationships between the variables and residents' preferences support the initial hypothesis and indicate that these factors play a significant role in shaping residents' choices. However, it is important to note that at the end of our survey, we provided an opportunity for respondents to include any additional comments. Although this open-ended

question was intended to gather questions or comments related to the survey itself, we found that several residents expressed concerns regarding the potential increase in mosquitoes due to the enhancement of biodiversity in the area. These considerations introduce a new perspective as there may be underlying factors influencing the impact of our variables, whether positively or negatively.

Furthermore, the negative coefficients associated with water quality reveal a contrasting pattern, suggesting that residents who emphasize water quality are less willing to financially support the project. While this unexpected result requires further examination, the overall findings support the validity of hypothesis $H_{5.2}$ in understanding residents' preferences for the different water stream alternatives. That way, the project may garner stronger community support and potentially receive financial contributions from residents who value the preservation and enhancement of the natural environment. Based on our analysis, we therefore support for the second hypothesis, $H_{5.2}$. Our results consistently provide evidence that residents who value certain considerations, particularly landscape aesthetics, are more inclined to prefer alternative C. While the facilitation of the area for use may not significantly impact community preferences on its own, it does have a positive influence on WTP, suggesting some support from this factor.

6.1.5 Research Question 6

RQ_6: Are residents' preferences for the project alternatives affected by life circumstances such as education, income, and housing?

The first hypothesis for research question six suggests that higher levels of education may have a positive association with the preference for the water stream in alternatives B and C, compared to alternative A, which represents the status quo. Hence, we made sure to incorporate variables representing various sociodemographic factors in our model specifications. However, it's important to recognize that there are some restrictions when looking into demographics like income and education. Firstly, some respondents were reluctant to disclose such sensitive information. Secondly, there were cases where participants had already exited the survey before the questions regarding education and income were asked. Such decrease in sample size could therefore have affected our analysis' statistical power and potentially create bias.

Nevertheless, education did not yield significant results in any of our regressions, leading us to reject Hypothesis $H_{6.1}$. The lack of significance for this variable in our analysis suggests that education levels are not strong predictors of preference for either of the water stream alternatives compared to the baseline. It is important to note that these results may be attributed to the limitations mentioned earlier. To gain a more comprehensive understanding of the relationship between education levels and preferences for the water stream as an environmental good for the local community, further research would be needed. For a more accurate analysis of this aspect, it would then be necessary with a larger and more representative sample size with targeted approach to collecting education-related data. By implementing these measures, it would be easier to determine the extent to which education levels influence preferences and WTP in relation to the water stream. However, decision makers and planners should prioritize examining sociodemographic factors in general to gain a deeper understanding of the local community in Skjetten. Education, while important, is just one aspect among many that contribute to the bigger picture.

However, we found that the income variable was a significant predictor for both alternative B and C, indicating a positive influence between income levels and preferences for the water stream alternatives compared to the status quo. As a result, we find support for the hypothesis $H_{6.2}$, which suggested that higher income levels would be positively associated with both alternative B and C relative to alternative A. Nevertheless, similar to the education variable, income faced limitations when predicting residents' WTP levels. Despite this, the significance of the income variable emphasizes its role in shaping residents' preferences for supporting the proposed project. It is important to note that while income may not directly impact residents' WTP, it remains a crucial factor to consider when assessing the community's valuation of environmental goods. This is especially relevant in terms of maximizing utility as the theoretical framework suggests which was discussed earlier in this study.

Lastly, we come to the final hypothesis $H_{6.3}$, which proposes that residents living in apartments would be more inclined to prefer the reopening of the water stream compared to those residing in other types of housing, such as family homes, townhouses, or even farms. Our analysis provides some interesting evidence in support of this hypothesis. Firstly, in terms of the preference for alternative B over A, the housing type does indeed play a significant role, though not for alternative C. Secondly, regarding WTP, the impact of living in an apartment only showed significance in the models where we included all WTP

responses from the residents. Conversely, the variable did not demonstrate significance in the model that excluded protest responses or in the model that considered only positive values.

However, there is slight inconsistency in this perspective, which may be attributed to the fact that out of the 403 observations we had for this variable, only 83 participants expressed that they in an apartment. Consequently, we would still support $H_{6.3}$, as we have found some evidence for the hypothesis. However, we should exercise caution due to the small sample size, as it may not accurately reflect the broader population. As we were also interested in exploring the housing situation in general, we included an additional variable to investigate whether paying rent for their homes would influence the residents' support for the project, either in terms of expressing a preference or having a WTP. However, our analysis did not yield any evidence to support this suspicion. Nonetheless, this finding is still noteworthy, and it may be worthwhile for planners to further examine how housing factors can impact local perceptions and support for GBI development in general.

6.2 Validity

As we now have evaluated different aspects related to our research questions and determined that most of our hypotheses can be supported to some extent, it is also important to assess the overall validity of our study. In our previous discussion, we mentioned three types of validity: criterion validity, content validity, and construct validity. However, for the purpose of this study reviewing preferences towards public goods as ecosystem services, we will mainly concentrate on the latter two in order to evaluate our results and study.

6.2.1 Content Validity

Content validity refers to the degree to which the survey utilized in our study is appropriate and effective in measuring the estimated values and drawing conclusions based on the data collected (Mariel et al., 2021). It essentially involves a thorough assessment of various survey components, such as developing relevant questions, scenario information, and the response collection methods, with the aim of determining whether they accurately reflect individuals' genuine preferences (Mariel et al., 2021). Thus, it’s important to follow the recommended steps for such SP studies like ours to improve the overall validity. In which having focus groups or performing pilots prior to the final survey like we did to allow for necessary adjustments to be made so we can avoid respondent misconceptions and ensure they make informed choices. Thus, it's crucial to follow the recommended steps for conducting SP

studies in order to enhance overall validity. In our case, we conducted a pilot prior to the final survey, which allowed us to make necessary adjustments. This approach helped us avoid any potential misconceptions among respondents and ensured that they could make informed choices (Mariel et al., 2021).

However, upon reviewing our methods, there are a few aspects concerning content validity in our survey that could have been approached differently. Firstly, instead of exclusively using a web-based survey, we could have considered employing alternative survey modes. With such consideration, we could perhaps have reached a higher response rate to enhance the overall quality of our research. As our sample was recruited solely through text messages with an online survey, this recruitment method may have potentially excluded individuals who would have otherwise participated if the survey was available in their preferred format. After all, not everyone has the right IT competence to complete an online survey, especially in consideration of the elderly. Furthermore, there was a potential risk of self-selection bias, as some individuals may have been demotivated from participating due to the time commitment required to complete the survey.

With these factors in mind, a telephone survey could therefore have been alternative mode to apply for this study. However, technological development has changed the field of telephone surveys, leading to reduced response rates, notably in the Western regions (Mariel et al., 2021). Additionally, there is also the possibility of using mixed-mode survey as it is commonly believed that this format can attract more respondents. Yet, Mariel et al. (2021) found that there is no substantial evidence supporting this notion. In fact, they emphasize that single-mode surveys, such as web-only or telephone surveys, have demonstrated higher response rates compared to mixed-mode surveys. Hence, opting for either of these two single-mode options would be a reliable choice (Mariel et al., 2021).

Secondly, another aspect we could have addressed in our survey is the manner in which we formulated our questions to elicit the respondents' WTP. In our survey, we first asked which of the three alternatives presented according to the hypothetical scenario they would like to see implemented. Subsequently, we asked for their WTP to fund their preferred alternative among B and C, while respondents who chose alternative A were instead asked to provide reasons for their preference for the status quo.

However, a limitation of this approach is that we observed an uneven distribution of data among respondents who provided WTP values for the two water stream alternatives. Even more so as alternative B was by far the most favored. Thus, while 270 respondents expressed a WTP value for that option, only 94 respondents expressed a WTP for alternative C. As a result, our estimations from the interval regression were mostly driven by WTP for B. Thus, we found that there isn't a notably large difference between our estimated WTP for alternatives B and C. Thus, we would end up with a project where we implement alternative B which requires less maintenance as it will undergo natural processes. This could make it a more cost-effective option in the long run. Simultaneously, we see that the community has expressed that they are willing to pay a slightly higher amount to fund the implementation of alternative B with its nature-based elements. Although this may seem appealing, we are still unsure about the validity of our findings given the difference in sample size between the two water stream layouts.

Alternatively, after the respondent selected an alternative they prefer, we could have proceeded by asking specifically about their WTP to fund the implementation of alternative B in place of alternative A. Further, we would have posed a similar question regarding their willingness to pay for the realization of alternative C over alternative A. With such approach, we could have perhaps achieved a balanced sample size for each alternative as every respondent would be asked for their WTP of both water stream alternatives regardless of their specific preferences. This would further allow our estimations from the interval regression to reveal a more obvious difference in how people genuinely value the two alternatives differently. Nevertheless, a potential disadvantage with this approach is that the order in which questions are presented can influence the respondents' responses (Champ et al., 2017). This consideration becomes particularly crucial in surveys where individuals are asked to evaluate multiple elements objectively and independently from one another. However, it can be challenging to reduce the impact of these effects, so it's generally recommended to randomize the order of questions that could potentially be influenced by the order they are presented in (Champ et al., 2017).

6.2.2 Construct Validity

Construct validity, which we will also assess, can be evaluated by examining how well our methods and results align with the expectations derived from theory, intuition, and previous research (Champ et al., 2017). If the findings consistently meet these expectations prior to the

study, we can consider them to have good construct validity. This will allow us to determine whether the method accurately represents what it intends to measure (Champ et al., 2017). Such evaluations are particularly important for studies whose findings we want to utilize for future projects and policy development. However, if the results happen to be rather inconsistent or deviate greatly from theory and common sense, then that could indicate a lack of construct validity. Thus, the research would need further improvement and consideration of applying an alternative approach (Champ et al., 2017).

Firstly, our expectations were initially derived from our discussions and perspectives that were first introduced at the beginning of this study. Overall, we found that the majority of our results appears to align rather well with the various research questions as we rejected only a few hypotheses. However, we noted that several socioeconomic variables exhibited insignificance in our interval regression models. This is a rather surprising outcome since theory would otherwise have suggested these variables to be influential predictors, such as the income variable should have been. While our coefficients indicated a positive relationship between income and WTP, the lack of statistical significance at any of our accepted levels would typically be concerning.

This could potentially be explained by the methods we applied to elicit the community's WTP. Since the respondents had already voted to support one of the three alternatives, then they would essentially be in a similar group of people when we further ask them to express the WTP for their preferred alternative among B and C. Using these specific values in the regression would make us inevitably exclude parts of the sample (i.e. those who prefer alternative A) who otherwise could have brought more variation into the group. Moreover, the vast majority of the sample gave their WTP with alternative B in mind, which further makes the estimations primarily influenced by one group of people.

For instance, if we could expect higher education levels would result to higher WTP estimates, due to common sense suggesting that better education could make people have a greater understanding of climate measures and enhanced biodiversity. In that case, when we attempt to predict WTP using the sample of individuals who already prefer the water stream to be reopened, then we would be handling data consisting of observations that shares similar characteristics. Thus, the explanatory variables we were interested in assessing may not exhibit a significant impact in the model since they would not stand out within a group of

individuals with limited variation. Therefore, we should bear in mind that this limitation exists in our study when further validating our findings.

On the other hand, this problem does not apply to our findings when using the multinomial logit model. Since the full sample used in that case includes the entire set of respondents before they were grouped into those who prefer each of the alternatives we presented in our hypothetical scenario. Additionally, it's not always problematic to have results deviate from expectations if it happens from time to time. They might occur from unforeseen circumstances, by random, or if there are topics with little existing research to name a few aspects (Champ et al., 2017). After all, it is consistent failure which could cause results to be unreliable, and such failures could provide new insight and perspectives into the field of research as well as the applied methodology (Champ et al., 2017).

Furthermore, if we consider the specific context in which our study was conducted, it’s worth noting that there is an absence of comparable studies and estimates to compare our results with. Thus, it will be difficult to directly assess our findings in terms of construct validity through such means. Despite this absence, however, it's still crucial to reflect on the nuances our findings reveal. We can do so by comparing our results and conclusions with previous projects involving reopening pipes into water streams. Such a comparative analysis will enable us to identify the key aspects that should be prioritized and guide further exploration in the development of GBI and climate resilience.

7. Conclusion

This thesis provides an in-depth analysis of citizen preferences for smaller water bodies, such as water streams. It examines the proposed project of reopening old underground pipes in Skjetten, Lillestrøm, to create a 1km water stream running through the area of Ravinedalen. These water streams were originally piped in the 1960s and 1970s, like many other streams in various parts of Norway. However, the pipes now require rehabilitation due to their aging condition and limited capacity to handle future stormwater management needs in as climate change induces increased rainfall levels. The water stream would therefore be a crucial climate adaptation measure, reducing the risk of floods and mitigating related damage costs.

Consequently, there is a growing interest in green-blue infrastructure, including in Lillestrøm, as they actively pursue new projects and solutions to enhance area and urban development by implementing such measures for sustainability. This approach aims not only to build climate resilience but also to improve neighborhoods and living environments. Ravinedalen in Skjetten, for instance, is currently an area not facilitated for use despite residents spending time there for recreational activities such as sledding, frisbee golf, and hiking. Therefore, our thesis applied stated preference methods to explore how the local community of Skjetten values the potential water stream as an environmental asset. It also investigated their preferences regarding its layout, development, and various benefits for the town, such as creating new social gathering places or promoting biodiversity.

Therefore, we conducted a contingent valuation study using an online survey to gather data. We recruited participants by sending text messages to 3,500 residents of Skjetten who were over the age of 18. As part of the recruitment process, we also sent a reminder text to half of the recipients selected randomly. In total, we received 543 respondents, resulting in a response rate of 15.5%. Furthermore, the survey had a completion rate of 73%. By assessing the respondents' willingness to pay, we could determine the value they placed on the stream in monetary terms. Thus, we presented a hypothetical scenario in the survey with three alternative options. Alternative A represented the status quo, where no changes would be made to the landscape. This meant there would be no water stream, limited biodiversity, and the area would continue being less facilitated for community use. Alternative B suggested reopening the stream using nature-based elements, focusing on enhancing biodiversity and improving the landscape with varied vegetation and a natural stone bank, resembling streams

found in wilderness areas. Lastly, alternative C proposed an urban-stream design, prioritizing landscape aesthetics and social considerations. It would feature semi-natural elements similar to those found in urban areas and parks. Among the three alternatives, alternative B was by far preferred by the majority of our sample, accounting for nearly 65% of the respondents. alternative C ranked second with approximately 25%, while alternative A was the least favored, receiving only around 10% of the preferences. Thus, our survey indicates a strong community support for a nature-based water stream.

To estimate the value of these water stream alternatives, we proceeded to ask respondents about their willingness to pay (WTP) using a payment card that presented various monetary values for them to choose from. We clarified that the payment vehicle would take the form of an increase in annual municipal taxes that households would contribute over a 5-year period to fund the project. It is important to note that this scenario was purely hypothetical and aimed to elicit the respondents' true valuation of the environmental good. This does not necessarily imply that the municipality should collect funding through this specific method. However, it is worth mentioning that we did receive some protest responses from individuals who strongly believed that the municipality should bear the cost, resulting in suggestions to pay 0kr. Although these responses do not accurately reflect their actual willingness to pay, we considered them when estimating the values based on the data collected by conducting several interval regressions where they were both included and excluded in the sample.

However, we first conducted a multinomial logit model to analyze the residents' preferences among the three alternatives. With this analysis, we aimed to answer our research questions and test our hypotheses. Our analysis revealed that residents' preferences were influenced by several factors. Specifically, we found that residents who placed greater importance on landscape aesthetics and biodiversity were more likely to prefer the water stream, particularly alternative B. Additionally, residents living in apartments were more inclined to prefer both the alternatives B and C. Income levels also played a role, as higher income was associated with a higher probability of preferring the water stream alternatives over maintaining the status quo. However, we also identified some negative impacts. For instance, the popularity of sledding in the valley where the stream would run through had a negative influence on preferences. Additionally, locals expressed concerns regarding the overall safety of the area if the stream were to be reopened.

Furthermore, we conducted several interval regressions to estimate the willingness to pay for the water stream alternatives and examined how these values were influenced by the same set of variables as in the multinomial logit model. While accounting for the protest responses, which is generally recommended in stated preference studies, we found that the mean WTP for alternative B was predicted to be approximately 754kr. When aggregated with the rough assumption of 3 500 households in the area, the total WTP would amount to 2.64 million kr. Considering the present value, this would accumulate to over 11.7 million kr over the 5-year period. For alternative C, residents were willing to pay an average of 583kr, resulting in a total of slightly over 2 million kr. Hence, the annual increase in taxes for alternative C would generate 9 million kr after the 5-year period.

Our analysis also revealed that willingness to pay for the stream, regardless of its layout, was influenced by several variables. These variables include user frequency of the area, the political prioritization of climate measures by the municipality, the importance of biodiversity and landscape aesthetics, and the facilitation of the area for use. All of these factors had a positive impact on willingness to pay. Surprisingly, water quality had a significantly negative influence on willingness to pay, which was an unexpected finding. However, this may be attributed to the limited variety and size of our sample as we found several variables to be overall insignificant. It's therefore important to note that the majority of observations in interval our regression models were primarily from individuals who initially expressed a preference for alternative B, so these results are largely driven by their preferences.

Thus, we conclude that the local residents of Skjetten are generally positive about the proposed project of reopening the pipes into streams. In fact, they prefer a natural stream layout over an urban stream, valuing it even more. This is particularly interesting because, based on previous cases in other parts of Norway, such as Oslo, we have observed different reactions from local communities. The municipality of Oslo and other stakeholders have imitated a significant increase in the development of green-blue infrastructure over the years, with many water streams being continuously reopened. These efforts by the various municipalities serve as climate measures aim to improve neighborhoods, creating better social living environments and increased recreational opportunities.

Some streams in Oslo, like Hovinbekken running through central areas such as Ensjø, have been well-received by residents and communities. However, others, like Mærradalsbekken in

Hovseterdalen, faced strong opposition and had to be withdrawn. Despite similarities between Skjetten and Hovseter in terms of housing types, valley areas, and popular activities, our results align more closely with Hovinbekken. It's worth noting that Hovinbekken is on a larger scale, and areas like Hovin and Ensjø have a greater diversity of housing, making them relatively more urban. Additionally, Hovinbekken incorporates a mix of semi-natural and nature-based elements along its length. On the other hand, the smaller scale of Melbybekken in Skjetten could potentially have influenced preferences as it would be less intimidating and perhaps reduce concerns against safety. This aspect is worth further investigation in future studies to examine how the size of smaller water bodies may also impact preferences.

Even though we can draw some comparisons between our findings and existing streams and previous projects, it is still necessary to compare our estimates and analysis with other studies to validate this research. However, research in this field, particularly in Norway, is limited. Therefore, we strongly recommend conducting additional studies using similar methods in other parts of Norway with different water stream projects. This would allow us to determine whether our estimates can be appropriately applied for benefit transfer and utilized in further cost-benefit analyses. Such considerations would be crucial with regards to the objective of this thesis, as we intended to contribute to the development of water stream projects and similar climate adaptation measures.

Finally, in terms of further policy recommendations, we would like to emphasize the importance of continuously involving the local residents and communities in every necessary step of the project. It is crucial to communicate effectively with them about how this project will impact their lives and existing activities. This includes discussing the municipality's suggestions and solutions regarding the route of the stream through specific areas of the town, the effects on current activities, as well as highlighting the positive aspects such as recreational benefits, new social gathering spots, and safety measures. It is essential for residents of all ages to feel that this addition to their town will be safe and beneficial. By engaging the community in this manner, we can not only mitigate potential criticism and opposition that has been observed in other places, but also uncover hidden perspectives, as we experienced with concerns about mosquitoes. Residents' preferences and desires should be taken into consideration, as they are the ones living there and spending time in their neighborhoods.

Literature List

Bauduceau, N., Berry, P., Cecchi, C., Elmqvist, T., Fernandez, M., Hartig, T., Krull, W., Mayerhofer, E., Sandra, N. & Noring, L. (2015). Towards an EU research and innovation policy agenda for nature-based solutions & re-naturing cities: Final report of the horizon 2020 expert group on'Nature-based solutions and re-naturing Cities'.

Berge, J. (2020, 7th June 2020). Gigantsprekk i Oslo:

Raser mot bekkeåpning: - Ingen fornuftige mennesker kan være med på dette. *Nettavisen*. Available at: https://www.nettavisen.no/nyheter/raser-mot-bekkeapning-ingen-fornuftige-mennesker-kan-vare-med-pa-dette/s/12-95-3423991644 (accessed: 12.11.2022).

Champ, P. A., Boyle, K. J. & Brown, T. C. (2017). *A Primer on Nonmarket Valuation*. 2nd 2017. ed., vol. 13. Dordrecht: Springer Netherlands : Imprint: Springer. Available at: https://link.springer.com/book/10.1007/978-94-007-7104-8.

De Groot, R. S., Alkemade, R., Braat, L., Hein, L. & Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological complexity*, 7 (3): 260-272. doi: 10.1016/j.ecocom.2009.10.006.

DFØ. (2014). *Veileder i samfunnsøkonomiske analyser*. 1st ed. Bergen: Fagbokforl.

Doherty, E., Murphy, G., Hynes, S. & Buckley, C. (2014). Valuing ecosystem services across water bodies: Results from a discrete choice experiment. *Ecosystem services*, 7: 89-97. doi: 10.1016/j.ecoser.2013.09.003.

Everard, M. (2021). *Ecosystem services: key issues*. 2nd ed. New York: Routledge.

Field, B. & Field, M. K. (2013). *Environmental Economics*. 6th ed. New York: McGraw-Hill Education.

Field, B. & Field, M. K. (2020). *Environmental Economics* 7th ed. New York: McGraw-Hill Education.

Greene, W. H. (2018). *Econometric analysis*. 7th ed. New York: Pearson.

Gsottbauer, E. & Van den Bergh, J. C. (2011). Environmental policy theory given bounded rationality and other-regarding preferences. *Environmental and Resource Economics*, 49: 263-304. doi: 10.1007/s10640-010-9433-y.

Harris, J. M. & Roach, B. (2013). *Environmental and natural resource economics: A contemporary approach*. 3rd ed. New York: Routledge Taylor & Francis Group.

Harris, J. M. & Roach, B. (2014). *Environmental and Natural Resource Economics*. 3rd ed. New York: Routledge Taylor & Francis Group.

Johnsen, T., Løddesøl, J. M. & Tibballs, J. E. (2019). *TURGUIDE Hvordan finne Oslos bekker og elver med bane, buss, trikk og tog*. Oslo.

Johnston, R. J., Boyle, K. J., Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T. A., Hanemann, W. M., Hanley, N., Ryan, M. & Scarpa, R. (2017). Contemporary guidance for stated preference studies. *Journal of the Association of Environmental and Resource Economists*, 4 (2): 319-405.

Kareiva, P., Tallis, H., Ricketts, T. H., Daily, G. C. & Polasky, S. (eds). (2011). *Natural capital: theory and practice of mapping ecosystem services*. New York: Oxford University Press.

Khan, I. & Zhao, M. (2019). Water resource management and public preferences for water ecosystem services: A choice experiment approach for inland river basin management. *Sci Total Environ*, 646: 821-831. doi: 10.1016/j.scitotenv.2018.07.339.

Lillestrøm Kommune Grunnkart, veikart og plankart. (s.a.). Hønefoss: Kartverket, Geovekst, kommuner og OSM - Geodata AS. Available at:

https://kartutside.lillestrom.kommune.no/Html5Viewer/index.html?viewer=Lillestromkart.Lillestromkart&locale=nb-NO (accessed: 04.12.22).
Long, J. S. & Freese, J. (2014). *Regression models for categorical dependent variables using Stata*. 3rd ed. Texas: Stata Press.
Macháč, J., Brabec, J. & Arnberger, A. (2022). Exploring public preferences and preference heterogeneity for green and blue infrastructure in urban green spaces. *Urban forestry & urban greening*, 75. doi: 10.1016/j.ufug.2022.127695.
Mariel, P., Hoyos, D., Meyerhoff, J., Czajkowski, M., Dekker, T., Glenk, K., Jacobsen, J. B., Liebe, U., Olsen, S. B. & Sagebiel, J. (2021). *Environmental Valuation with Discrete Choice Experiments : Guidance on Design, Implementation and Data Analysis*. 1st 2021. ed. Cham: Springer International Publishing : Imprint: Springer. Available at: https://link.springer.com/book/10.1007/978-3-030-62669-3.
MEA. (2005). *Ecosystems and human well-being-Synthesis: A report of the Millennium Ecosystem Assessment*. USA: Island Press.
Multiconsult. (2019). *FORPROSJEKTRAPPORT Bekkeåpning på Skjetten*. Oslo: Multiconsult.
Naturbase Kart. (s.a.). Oslo: Kartverket, Geovekst, kommuner og OSM - Geodata AS | Statens kartverk | NONE | Miljødirektoratet. Available at: https://geocortex02.miljodirektoratet.no/Html5Viewer/?viewer=naturbase (accessed: 04.12.2022).
Nesheim, B., Andreassen, D. & Mykleby, H. (2019). *MÆRRADALSBEKKEN GJENNOM HOVSETERDALEN Til medvirkningsmøter i november 2019*. Available at: https://www.oslo.kommune.no/getfile.php/13353316-1576064985/Tjenester%20og%20tilbud/Politikk%20og%20administrasjon/Slik%20bygger%20vi%20Oslo/Vann-%20og%20avl%C3%B8psetaten/Hovseterdalen%20%E2%80%93%20vann-%20og%20avl%C3%B8psledninger%20og%20bekk/18-09155-21%20Presentasjon%20om%20gjen%C3%A5pning%20av%20bekk%20ved%20Grindaker%20landskapsarkitekter%203089840_1_1.PDF (accessed: 12.11.2022).
Oslo Kommune. (2015). *Styringsdokument Prinsipper for gjenåpning av elver og bekker i Oslo*. Available at: https://www.oslo.kommune.no/getfile.php/13166758-1480941996/Tjenester%20og%20tilbud/Politikk%20og%20administrasjon/Slik%20bygger%20vi%20Oslo/Bymilj%C3%B8etaten/Vannomr%C3%A5de%20Oslo/Rapporter%20og%20planer/2015%20Prinsipper%20for%20gjen%C3%A5pning%20av%20elver%20og%20bekker%20i%20Oslo.pdf (accessed: 29.10.2022).
Oslo Kommune. (2019). *ÅPENT INFORMASJONSMØTE om rehabilitering av vann og avløpsledninger og gjenåpning av Mærradalsbekken*. Available at: https://www.oslo.kommune.no/getfile.php/13353313-1576064979/Tjenester%20og%20tilbud/Politikk%20og%20administrasjon/Slik%20bygger%20vi%20Oslo/Vann-%20og%20avl%C3%B8psetaten/Hovseterdalen%20%E2%80%93%20vann-%20og%20avl%C3%B8psledninger%20og%20bekk/18-09155-21%20Presentasjon%20ved%20Vann-%20og%20avl%C3%B8psetaten%203089833_1_1.PDF (accessed: 12.11.2022).
Oslo Kommune. (2022). *Styringsdokument Gjenåpning av elver og bekker i Oslo*. Available at: https://www.oslo.kommune.no/getfile.php/13461306-1661931566/Tjenester%20og%20tilbud/Politikk%20og%20administrasjon/Milj%C3%B8%20og%20klima/Vannmilj%C3%B8%20og%20overvann/Vann-

%20og%20avl%C3%B8p_Gjen%C3%A5pning%20av%20bekker%20og%20elver_innmat_nettversjon.pdf.
Oslo Kommune. (s.a.). *Nye vann- og avløpsledninger i Hovseterdalen*. Available at: https://www.oslo.kommune.no/slik-bygger-vi-oslo/hovseterdalen-vann-og-avlopsledninger-og-bekk/#toc-2 (accessed: 13.11.2022).
Perman, R., Ma, Y., Common, M., Maddison, D. & McGilvray, J. (2011). *Natural resource and environmental economics*. 4th ed. Harlow: Pearson.
Pindyck, R. S. & Rubinfeld, D. L. (2012). *Microeconomics*. 8th ed. U.S.A: Pearson.
Plan- og bygningsloven. (2018). *Statlige planretningslinjer for klima- og energiplanlegging og klimatilpasning*. Available at: https://lovdata.no/dokument/SF/forskrift/2018-09-28-1469 (accessed: 02.12.2022).
Ryffel, A. N., Rid, W. & Grêt-Regamey, A. (2014). Land use trade-offs for flood protection: A choice experiment with visualizations. *Ecosystem services*, 10: 111-123. doi: 10.1016/j.ecoser.2014.09.008.
Sarvilinna, A., Lehtoranta, V. & Hjerppe, T. (2017). Are Urban Stream Restoration Plans Worth Implementing? *Environ Manage*, 59 (1): 10-20. doi: 10.1007/s00267-016-0778-z.
Schotter, A. (2008). *Micro-Economics: A Modern Approach*. Mason: South-Western Cenage Learning.
Stanford, B., Zavaleta, E. & Millard-Ball, A. (2018). Where and why does restoration happen? Ecological and sociopolitical influences on stream restoration in coastal California. *Biological Conservation*, 221: 219-227. doi: https://doi.org/10.1016/j.biocon.2018.03.016.
StataCorp. (s.a-a). *intreg — Interval regression*: Stata Press: StataCorp LLC. Available at: https://www.stata.com/manuals13/rintreg.pdf (accessed: 25.03.2023).
StataCorp. (s.a-b). *mlogit — Multinomial (polytomous) logistic regression*: Stata Press: StataCorp LLC. Available at: https://www.stata.com/manuals13/rmlogit.pdf (accessed: 26.02.2023).
Statistics Norway. (s.a-a). *07459: Alders- og kjønnsfordeling i kommuner, fylker og hele landets befolkning (K) 1986 - 2023*. Available at: https://www.ssb.no/statbank/table/07459/ (accessed: 03.04.2023).
Statistics Norway. (s.a-b). *09429: Utdanningsnivå, etter kommune og kjønn (K) 1970 - 2021*. Available at: https://www.ssb.no/statbank/table/09429/ (accessed: 03.04.2023).
Statistics Norway. (s.a-c). *12852: Kommunefordelt månedslønn, etter bosted, arbeidssted, alder og kjønn (K) 2015 - 2022*. Available at: https://www.ssb.no/statbank/table/12852/ (accessed: 03.04.2023).
Statistics Norway. (s.a-d). *Kommunefakta Lillestrøm (Viken)*. Available at: https://www.ssb.no/kommunefakta/lillestrom (accessed: 03.04.2023).
Sweco. (2021). *LILLESTRØM KOMMUNE Bekkeåpning Skjetten Prosjektnummer 10223639 SUPPLERING AV EKSISTERENDE FORPROSJEKT*. Oslo: Sweco.
Verbrugge, L. & Van den Born, R. (2018). The role of place attachment in public perceptions of a re-landscaping intervention in the river Waal (The Netherlands). *Landscape and urban planning*, 177: 241-250. doi: https://doi.org/10.1016/j.landurbplan.2018.05.011.
Wooldridge, J. M. (2001). *Econometric analysis of cross section and panel data*. 1st ed. Cambridge: MIT press.
Wooldridge, J. M. (2020). *Introductory econometrics : a modern approach*. 7th ed. Boston, Massachusetts: Cengage Learning.
Ødegård, I. (2022). *Introduksjonsmøte med TOWARDS Tverrfaglig masterprosjekt Lillestrøm 2023* Ås (22.06.2022).

Appendices

Appendix 1

The 23 recommendations for Stated Preference Studies

The following comprehensive list summarizes the 23 recommendations by Johnston et al. (2017) in the book *"Contemporary Guidance for Stated Preference Studies"*:

1. **Clear and concise questions:** Questions should be easy to understand.
2. **Appropriate payment vehicle:** The payment vehicle should be relevant to the context of the study.
3. **Payment vehicle follow-up questions:** Follow-up questions should be asked to ensure that respondents understand the payment vehicle.
4. **Realistic bid amounts:** Bid amounts should be realistic and reflect the value of the good or service being studied.
5. **Realistic scenarios:** Scenarios that are presented should be realistic and relevant to the respondents.
6. **Pilot testing:** A pilot survey should be conducted to test the survey mode and ensure that questions are clear and understandable.
7. **Incentives:** Incentives can be used to improve response rates and reduce non-response bias.
8. **Sample size determination:** Sample size should be determined based on statistical power calculations.
9. **Survey administration:** Surveys should be administered in a standardized way to reduce measurement error.
10. **Clear instructions:** Clear instructions should be provided to respondents to ensure that they understand the survey.
11. **Response rate monitoring:** Response rates should be monitored to ensure that they are sufficient for statistical power.
12. **Survey distribution:** The survey should be distributed in a way that ensures representativeness of the sample.
13. **Data quality control:** Data should be checked for accuracy and completeness.
14. **Outlier detection:** Outliers should be detected and dealt with appropriately.
15. **Data management:** Data should be managed in a way that ensures confidentiality and privacy.

16. **Stated preference data analysis:** Appropriate statistical techniques should be used to analyze the data.
17. **Non-response bias:** Non-response bias should be assessed and dealt with appropriately.
18. **Hypothetical bias:** Hypothetical bias should be assessed and dealt with appropriately.
19. **Scenario and attribute testing:** Scenarios and attributes should be tested to ensure that they are relevant and understandable to respondents.
20. **Data visualization:** Data should be presented in a way that is easy to understand and highlights key findings.
21. **External validity testing:** External validity should be tested to ensure that the study results are generalizable.
22. **Quality assurance and control:** Quality assurance and control measures should be implemented to ensure that the study is conducted to a high standard.
23. **Transparency:** All aspects of the study, including data collection, analysis, and reporting, should be transparent and well-documented.

Researchers can improve the precision and dependability of their findings by heeding these suggestions, thereby giving decision-makers more reliable data with which to work.

Appendix 2

The Survey

Skjetten Bekkeåpning

Denne undersøkelsen gjennomføres av forskere ved Norges miljø- og biovitenskapelige universitet (NMBU) i regi av «NMBU bærekraftsarena: TOWARDS - Mot bærekraftige byer og lokalsamfunn». Undersøkelsen handler om en potensiell bekkeåpning ved Skjetten for å redusere overvann og flomfare. Vi ønsker å kartlegge innbyggere i Skjetten sine preferanser om dette og informasjonen vi får fra spørreundersøkelsen vil bli brukt til å skrive en masteroppgave i regi av NMBU. Det finnes ingen riktige eller gale svar, men resultatene kan bli en del av kommunens informasjonsgrunnlag for videre beslutninger. Din mening er derfor viktig for disse beslutningene.

Hvis du velger å delta i denne undersøkelsen innebærer dette at du fyller ut et spørreskjema. Undersøkelsen tar 10-15 minutter å gjennomføre. Svarene dine blir automatisk anonymisert. Det innebærer at det ikke er mulig for oss å identifisere deg gjennom svarene du oppgir i undersøkelsen. Det er frivillig å delta i undersøkelsen. Hvis du velger å delta, kan du når som helst trekke deg.

Har du noen spørsmål vedrørende undersøkelsen kan du kontakte Anders Dugstad (e-mail: anders.dugstad@nmbu.no) ved NMBU som er ansvarlig for undersøkelsen. På neste side vil du bli bedt om samtykke til å delta i undersøkelsen.

Med vennlig hilsen

Anders Dugstad (postdoktor/veilder) og Hajar Ben Hammou (masterstudent)

* 1. Vennligst gi uttrykk for ditt samtykke til å delta i undersøkelsen ved å krysse av nedenfor. Hvis du ikke samtykker kan du gå ut av undersøkelsen. Husk, alle svar du oppgir i denne undersøkelsen er anonyme. Vi kan ikke linke dine svar til deg og dine personopplysninger.

☐ Jeg samtykker til å delta i undersøkelsen

Neste

Skjetten Bekkeåpning

* 2. Hva er din alder?

* 3. Hva er ditt kjønn?

- ◯ Kvinne
- ◯ Mann
- ◯ Annet

4. Hvor mange år har du bodd på Skjetten?

Forr. Neste

Skjetten Bekkeåpning

5. Hvilke politiske saker mener du er viktigst å prioritere i din kommune? *Velg opptil 2 saker som er viktig for deg og din husholdning?*

- [ ] Idrett og kultur
- [ ] Landbruk
- [ ] Arbeidsplasser og økonomisk omstilling
- [ ] Kollektivtransport
- [ ] Helse og eldreomsorg
- [ ] Politi og forsvar
- [ ] Vern av natur og biologisk mangfold
- [ ] Asyl og integrering
- [ ] Klimatiltak (utslippsreduksjoner og tilpasning)
- [ ] Samferdsel og annen infrastruktur
- [ ] Utdanning og forskning
- [ ] Annet (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

* 6. Hvor enig eller uenig er du i følgende påstander?

	Svært uenig	Uenig	Nøytral	Enig	Svært enig
Ingen andre steder i Lillestrøm kommune kan måle seg med Skjetten	○	○	○	○	○
Det å bo på Skjetten er bedre enn å bo noen andre steder i Lillestrøm kommune	○	○	○	○	○
Skjetten er det beste området i Lillestrøm kommune for fritidsaktiviteter jeg liker å gjøre	○	○	○	○	○
Jeg identifiserer meg sterkt med Skjetten	○	○	○	○	○
Jeg er veldig tilknyttet til Skjetten	○	○	○	○	○
Det å gjøre fritidsaktiviteter på Skjetten er viktigere for meg enn å gjøre de samme aktivitetene andre steder i Lillestrøm kommune	○	○	○	○	○
Skjetten betyr mye for meg	○	○	○	○	○
Det er ingen andre steder jeg ville bodd i Lillestrøm	○	○	○	○	○

	Svært uenig	Uenig	Nøytral	Enig	Svært enig
kommune enn Skjetten					
Jeg har mange gode minner fra Skjetten	◯	◯	◯	◯	◯
Jeg ville ikke byttet ut Skjetten med noen andre områder i Lillestrøm kommune for fritidsaktivitetene jeg gjør her	◯	◯	◯	◯	◯

Forr. Neste

Skjetten Bekkeåpning

På 1970-tallet ble bekker på Skjetten lagt i rør for utbygging av nye boliger og veier. Dette inkluderer deler av Melbybekken. Som vist i figuren nedenfor med grønn linje så er Melbybekken lagt i rør fra Bråteveien, gjennom Glostrupdumpa, under Nordens vei og videre nordover til Nordbyveien. I dag er dette et tilgjengelig grønt område i en dalbunn med boligområder på hver side, kjent som Ravinedalen. Området blir blant annet brukt til frisbeegolf, og aking om vinteren. Det går også gangveier på tvers av dalen. Økologisk sett er det lite artsmangfold i dalen i dag og dalen er ellers lite tilrettelagt for bruk.

Bildet nedenfor viser hvordan Ravinedalen ser ut i dag.

Figur 3: Dronebilde tatt skrått opp fra Bråteveien mot Glostrupdumpa og nordover. Foto: Multiconsult

Figur 4: Dronebilde tatt fra Glostrupdumpa og nordover, med Nordensvei på bru over dalen. Her kommer grøntdraget fram i dalen mellom bebyggelsen. Foto: Multiconsult

Bildet er lånt av Multiconsult

7. Dagens underjordiske rør gjennom Ravinedalen er ikke tilstrekkelige for å håndtere overvann. Dette kan medføre flomfare i perioder med ekstrem nedbør som er forventet å øke som følge av klimaendringer. Derfor må kommunen gjøre et tiltak.

Var du klar over at enkelte bekker på Skjetten er lagt i rør?

- ◯ Ja
- ◯ Nei

Forr. Neste

Skjetten Bekkeåpning

Informasjon

Kommunen skal iverksette tiltak i 2023 for å forbedre situasjonen. Se for deg at kommunen har tre alternativer, og ønsker å vite hva lokalbefolkningen foretrekker. De tre ulike alternativene vil nå bli beskrevet.

Alternativ A

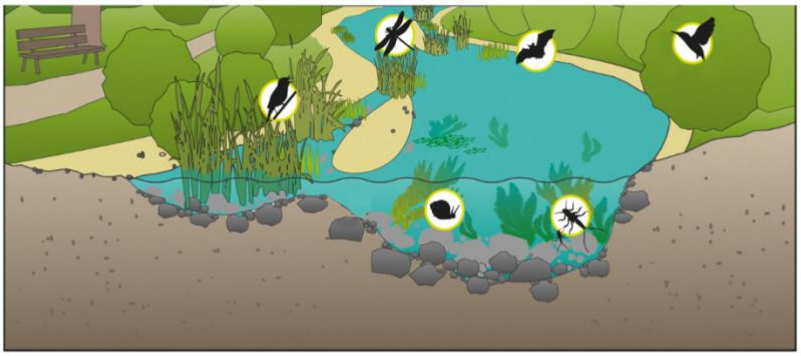
Alternativ A innebærer at kommunen ikke gjør noe tiltak. Dette alternativet innebærer da at gjenåpning av bekken ikke gjennomføres og at området blir som i dag. Gitt antakelser om fremtidig klima og nedbørsmengder vil flomvannføring i området i gjennomsnitt overskrides hvert 5 til 10 år. Det blir ingen forbedringer i biologisk mangfold eller tilretteleggelse for bruk av området med dette alternativet. Dagens tilstand er illustrert i bildet under.

Bildet er lånt av Sweco

Alternativ B

Alternativ B innebærer en gjenåpning av bekkeløpet som en åpen og naturlig bekk gjennom Ravinedalen på 2000 liter per sekund. Alternativet inkluderer ny turvei i grus med nye sitte- og møteplasser som gjør området mer tilrettelagt for rekreasjon enn dagens situasjon. Bekken vil ha helt naturlige kantsoner med stein og varierende vegetasjon, hvor dybden og bredden er noe ujevn. Som illustrert i bildet nedenfor, vil dette gi svært god vannkvalitet og forbedret biologisk mangfold. Området rundt og i bekken vil bli et bedre leveområde for fugler, vanndyr, og insekter. Det vil fortsatt være mulig å spille frisbeegolf og ake om vinteren. Bekken vil være smal, grunn og ikke utgjøre noe fare for verken barn eller voksne. Gitt antakelser om fremtidig klima og

nedbørsmengder vil flomvannføring i området i gjennomsnitt overskrides hvert 20 til 30 år med dette alternativet.



Bekken vil i gjennomsnitt ha høyde på 0.5 meter og toppbredde på 3.5 meter.

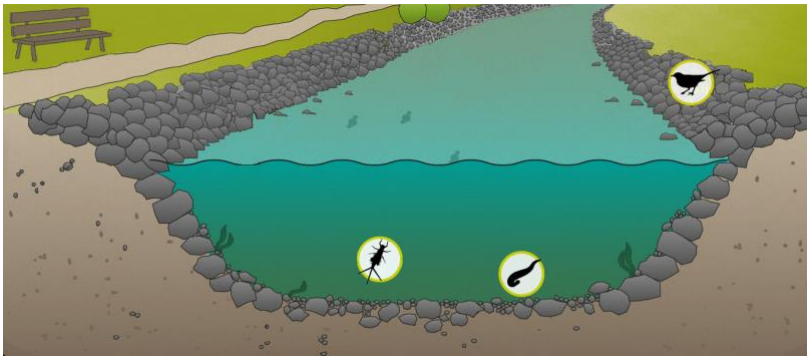
Alternativ B

Bildet nedenfor illustrerer hvordan bekken kan se ut med Alternativ B.

Bildet er lånt av Multiconsult

Alternativ C

Alternativ C innebærer at gjenåpning av bekkeløpet blir utformet som en typisk urban by-bekk med steinlagt bekkekant på 2000 liter per sekund. Området får en ny turvei i grus langs bekken med nye sitte- og møteplasser som gjør området like tilrettelagt for rekreasjon som Alternativ B, og med det mer tilrettelagt enn dagens situasjon. Det vil være lite vegetasjon og variasjon langs kanten av bekken. Som illustrert i figuren nedenfor, så vil vannkvalitet og biologisk mangfold derfor være dårligere med dette alternativet enn Alternativ B. Løsningen krever også mer vedlikehold av kommunen enn Alternativ B for å bevare det urbane landskapsbildet. Det vil fortsatt være mulig å spille frisbeegolf og ake om vinteren. Bekken vil være smal, grunn og ikke utgjøre noen fare for verken barn eller voksne. I likhet med Alternativ B så vil, gitt antakelser om fremtidig klima og nedbørsmengder, flomvannføring i området i gjennomsnitt overskrides hvert 20 til 30 år.



Bekken vil i gjennomsnitt ha høyde på 0.5 meter og toppbredde på 3.5 meter.

Alternativ C

Bildet nedenfor illustrerer hvordan bekken kan se ut med Alternativ C.

Bildet er lånt av Multiconsult

* 8. Hvilket alternativ foretrekker du og din husholdning? Se nøye på de ulike egenskapene og velg det alternativet du foretrekker.

	Alternativ A	Alternativ B	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon			

- ◯ Alternativ A
- ◯ Alternativ B
- ◯ Alternativ C

* 8. Hvilket alternativ foretrekker du og din husholdning? Se nøye på de ulike egenskapene og velg det alternativet du foretrekker.

	Alternativ A	Alternativ B	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon			

- ◯ **Alternativ A**
- ◯ Alternativ B
- ◯ Alternativ C

Forr. Neste

Skjetten Bekkeåpning

* 9. Det er viktig for oss å vite hva befolkningen i Skjettenbyen mener om bekkeåpningen. Hva er den viktigste grunnen til at du ikke vil ha noe form for bekkeåpning? Vennligst velg et alterantiv nedenfor eller skriv egen begrunnelse.

- ◯ Jeg er engstelig for sikkerheten til barn med en åpen bekk
- ◯ Jeg liker landskapet slik det er nå
- ◯ Jeg tror ikke bekken vil redusere risikoen for flom
- ◯ Det er ikke verdt å bruke offentlige midler på å åpne en bekk
- ◯ Annet (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

* 10. Hvor viktig var de ulike effektene nedenfor for å støtte ditt foretrekkende alternativ?

	Ikke viktig i det hele tatt	Lite viktig	Nøytral	Noe viktig	Svært viktig
Biologisk mangfold	◯	◯	◯	◯	◯
Vannkvalitet	◯	◯	◯	◯	◯
Tilretteleggelse for bruk av området	◯	◯	◯	◯	◯
Landskapsestetikk	◯	◯	◯	◯	◯

11. Hvis bekken åpnes kan kommunen utvide bekken til små vanndammer enkelte steder for å bedre **vannkvaliteten** og **overvannshåndteringen** ytterligere. Hvor positiv eller negativ er du til dette?

- ◯ Svært positiv
- ◯ Noe positiv
- ◯ Nøytral
- ◯ Noe negativ
- ◯ Svært negativ
- ◯ Vet ikke

12. Føler du bekken blir mer eller mindre trygg hvis kommunen utvider enkelte deler av bekken til små vanndammer?

- ◯ Mindre trygg
- ◯ Like trygg
- ◯ Mer trygg
- ◯ Vet ikke

Forr. Neste

* 8. Hvilket alternativ foretrekker du og din husholdning? Se nøye på de ulike egenskapene og velg det alternativet du foretrekker.

	Alternativ A	Alternativ B	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon			

- ◯ Alternativ A
- ◯ **Alternativ B**
- ◯ Alternativ C

Forr. Neste

Skjetten Bekkeåpning

* 9. Det er viktig for oss å vite hva befolkningen i Skjettenbyen mener om bekkeåpningen. Alternativ A (ingen bekkeåpning) betyr ingen økte kostnader for kommunen. Alternativ B, som du foretrekker, medfører utbyggings- og vedlikeholdskostnader som ikke Alternativ A har. Se for deg at det er usikkert hvor store disse ekstra kostnadene blir, og at de ikke kan dekkes over kommunebudsjettet. Videre se for deg at kommunen kan med det vurdere å øke de årlige kommunale avgiftene likt for alle husholdninger i Skjettenbyen de neste fem årene for å dekke ekstrakostnadene ved Alternativ B. Siden størrelsen på ekstrakostnadene er usikker, kommer vi til å be deg oppgi det høyeste beløpet du og din husholdning er villige til å betale for å få Alternativ B. Når utbyggings- og vedlikeholdskostnadene er kjent og de nødvendige ekstrakostnadene i kommunale avgifter er beregnet, så kan vi med det vite prosentvis hvor mange som er for og imot denne kostnadsøkningen. Beløpet du velger er ikke bindene, men blir i stedet brukt til å informere beslutningstakere.

Vennligst tenk på hva det er verdt for deg og din husholdning å få Alternativ B i stedet for å få Alternativ A. **Hva er den høyeste økningen i de kommunale avgiftene, øremerket til dette formålet, som skal til for at du nesten helt sikkert fortsatt støtter Alternativ B?** Husk, grunnen til at vi spør er fordi finansieringen og de ekstra kostnadene er usikre.

	Alternativ A	Alternativ B
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon		

Kroner per husholdning per år i 5 år

◯ **0 kr**	◯ 500 kr	◯ 2000 kr
◯ 50 kr	◯ 600 kr	◯ 4000 kr
◯ 100 kr	◯ 700 kr	◯ 6000 kr
◯ 150 kr	◯ 900 kr	◯ 8000 kr

- ◯ 200 kr
- ◯ 1100 kr
- ◯ 12000 kr
- ◯ 300 kr
- ◯ 1300 kr
- ◯ Vet ikke
- ◯ 400 kr
- ◯ 1500 kr
- ◯ Mer enn 12000 kr (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

10. Hva er den viktigste årsaken til at du svarte 0 kr som betalingsvillighet for ditt foretrukkende alternativ? (Kun ett svar mulig)

- ◯ Jeg vil ikke at flere skal begynne å bruke området.
- ◯ Jeg ville betalt hvis betalingen var i form av frivillig donasjon og ikke økt kostnad i kommunale avgifter
- ◯ Vet ikke
- ◯ Kommunen skal betale, ikke innbyggerne
- ◯ Husholdningen/jeg har ikke råd til å betale for dette
- ◯ Jeg vil ikke betale før jeg vet hva det koster
- ◯ Synes ikke alternativet er verdt å finansiere
- ◯ Jeg vil ikke betale, men jeg er villig til å støtte mitt foretrukket alternativ med en årlig dugnadsinnsats (f.eks. klippe vegetasjon, rydde søppel)
- ◯ Annet (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

* 9. Det er viktig for oss å vite hva befolkningen i Skjettenbyen mener om bekkeåpningen. Alternativ A (ingen bekkeåpning) betyr ingen økte kostnader for kommunen. Alternativ B, som du foretrekker, medfører utbyggings- og vedlikeholdskostnader som ikke Alternativ A har. Se for deg at det er usikkert hvor store disse ekstra kostnadene blir, og at de ikke kan dekkes over kommunebudsjettet. Videre se for deg at kommunen kan med det vurdere å øke de årlige kommunale avgiftene likt for alle husholdninger i Skjettenbyen de neste fem årene for å dekke ekstrakostnadene ved Alternativ B. Siden størrelsen på ekstrakostnadene er usikker, kommer vi til å be deg oppgi det høyeste beløpet du og din husholdning er villige til å betale for å få Alternativ B. Når utbyggings- og vedlikeholdskostnadene er kjent og de nødvendige ekstrakostnadene i kommunale avgifter er beregnet, så kan vi med det vite prosentvis hvor mange som er for og imot denne kostnadsøkningen. Beløpet du velger er ikke bindene, men blir i stedet brukt til å informere beslutningstakere.

Vennligst tenk på hva det er verdt for deg og din husholdning å få Alternativ B i stedet for å få Alternativ A. **Hva er den høyeste økningen i de kommunale avgiftene, øremerket til dette formålet, som skal til for at du nesten helt sikkert fortsatt støtter Alternativ B?** Husk, grunnen til at vi spør er fordi finansieringen og de ekstra kostnadene er usikre.

	Alternativ A	Alternativ B
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon		

Kroner per husholdning per år i 5 år

◯ 0 kr	◯ **500 kr**	◯ 2000 kr
◯ 50 kr	◯ 600 kr	◯ 4000 kr
◯ 100 kr	◯ 700 kr	◯ 6000 kr
◯ 150 kr	◯ 900 kr	◯ 8000 kr

- ◯ 200 kr
- ◯ 300 kr
- ◯ 400 kr
- ◯ 1100 kr
- ◯ 1300 kr
- ◯ 1500 kr
- ◯ 12000 kr
- ◯ Vet ikke
- ◯ Mer enn 12000 kr (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

10. Husk, den ekstra kostnaden av alternativet er usikker på nåværende tidspunkt, og det er derfor vi spør deg om å oppgi det høyeste beløpet i økte kommunale avgifter du kan betale for fortsatt å støtte alternativet du foretrekker. Når utbyggings- og vedlikeholdskostnadene er kjent og den nødvendige ekstra kostnaden i kommunale avgifter er beregnet, så kan vi med det vite prosentvis hvor mange som er for og imot denne kostnadsøkningen.

Burde kommunen øke kommunale avgifter med verdien du valgte ovenfor likt for alle husholdninger i Skjettenbyen for å finansiere alternativet du foretrekker?

- ◯ Ja
- ◯ Nei

Forr. Neste

* 8. Hvilket alternativ foretrekker du og din husholdning? Se nøye på de ulike egenskapene og velg det alternativet du foretrekker.

	Alternativ A	Alternativ B	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Naturlig bekk med kantsoner av stein og vegetasjon med noe ujevn dybde og bredde. Kapasitet på bekken blir 2000 l/s.	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Svært god forbedring fra dagens situasjon	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Svært god vannkvalitet	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon			

- ◯ Alternativ A
- ◯ Alternativ B
- ◯ **Alternativ C**

Forr. Neste

Skjetten Bekkeåpning

* 9. Det er viktig for oss å vite hva befolkningen i Skjettenbyen mener om bekkeåpningen. Alternativ A (ingen bekkeåpning) betyr ingen økte kostnader for kommunen. Alternativ C, som du foretrekker, medfører utbyggings- og vedlikeholdskostnader som ikke Alternativ A har. Se for deg at det er usikkert hvor store disse ekstra kostnadene blir, og at de ikke kan dekkes over kommunebudsjettet. Videre se for deg at kommunen kan med det vurdere å øke de årlige kommunale avgiftene likt for alle husholdninger i Skjettenbyen de neste fem årene for å dekke ekstrakostnadene ved Alternativ C. Siden størrelsen på ekstrakostnadene er usikker, kommer vi til å be deg oppgi det høyeste beløpet du og din husholdning er villige til å betale for å få Alternativ C. Når utbyggings- og vedlikeholdskostnadene er kjent og de nødvendige ekstrakostnadene i kommunale avgifter er beregnet, så kan vi med det vite prosentvis hvor mange som er for og imot denne kostnadsøkningen. Beløpet du velger er ikke bindene, men blir i stedet brukt til å informere beslutningstakere.

Vennligst tenk på hva det er verdt for deg og din husholdning å få Alternativ C i stedet for å få Alternativ A. **Hva er den høyeste økningen i de kommunale avgiftene, øremerket til dette formålet, som skal til for at du nesten helt sikkert fortsatt støtter Alternativ C?** Husk, grunnen til at vi spør er fordi finansieringen og de ekstra kostnadene er usikre.

	Alternativ A	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon		

Kroner per husholdning per år i 5 år

◯ **0 kr**	◯ 500 kr	◯ 2000 kr
◯ 50 kr	◯ 600 kr	◯ 4000 kr
◯ 100 kr	◯ 700 kr	◯ 6000 kr
◯ 150 kr	◯ 900 kr	◯ 8000 kr
◯ 200 kr	◯ 1100 kr	◯ 12000 kr

- ◯ 300 kr
- ◯ 1300 kr
- ◯ Vet ikke
- ◯ 400 kr
- ◯ 1500 kr
- ◯ Mer enn 12000 kr (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

10. Hva er den viktigste årsaken til at du svarte 0 kr som betalingsvillighet for ditt foretrukkende alternativ? (Kun ett svar mulig)

- ◯ Jeg vil ikke at flere skal begynne å bruke området.
- ◯ Jeg ville betalt hvis betalingen var i form av frivillig donasjon og ikke økt kostnad i kommunale avgifter
- ◯ Vet ikke
- ◯ Kommunen skal betale, ikke innbyggerne
- ◯ Husholdningen/jeg har ikke råd til å betale for dette
- ◯ Jeg vil ikke betale før jeg vet hva det koster
- ◯ Synes ikke alternativet er verdt å finansiere
- ◯ Jeg vil ikke betale, men jeg er villig til å støtte mitt foretrukket alternativ med en årlig dugnadsinnsats (f.eks. klippe vegetasjon, rydde søppel)
- ◯ Annet (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

* 9. Det er viktig for oss å vite hva befolkningen i Skjettenbyen mener om bekkeåpningen. Alternativ A (ingen bekkeåpning) betyr ingen økte kostnader for kommunen. Alternativ C, som du foretrekker, medfører utbyggings- og vedlikeholdskostnader som ikke Alternativ A har. Se for deg at det er usikkert hvor store disse ekstra kostnadene blir, og at de ikke kan dekkes over kommunebudsjettet. Videre se for deg at kommunen kan med det vurdere å øke de årlige kommunale avgiftene likt for alle husholdninger i Skjettenbyen de neste fem årene for å dekke ekstrakostnadene ved Alternativ C. Siden størrelsen på ekstrakostnadene er usikker, kommer vi til å be deg oppgi det høyeste beløpet du og din husholdning er villige til å betale for å få Alternativ C. Når utbyggings- og vedlikeholdskostnadene er kjent og de nødvendige ekstrakostnadene i kommunale avgifter er beregnet, så kan vi med det vite prosentvis hvor mange som er for og imot denne kostnadsøkningen. Beløpet du velger er ikke bindene, men blir i stedet brukt til å informere beslutningstakere.

Vennligst tenk på hva det er verdt for deg og din husholdning å få Alternativ C i stedet for å få Alternativ A. **Hva er den høyeste økningen i de kommunale avgiftene, øremerket til dette formålet, som skal til for at du nesten helt sikkert fortsatt støtter Alternativ C?** Husk, grunnen til at vi spør er fordi finansieringen og de ekstra kostnadene er usikre.

	Alternativ A	Alternativ C
Type bekk	Ingen bekk. Området forblir likt som i dag	Urban bekk med steinlagte kantsoner og jevn dybde. Kapasitet på bekken blir 2000 l/s.
Biologisk mangfold	Området forblir likt som i dag	Liten forbedring fra dagens situasjon
Vannkvalitet	Området forblir likt som i dag	Middels vannkvalitet
Bruk	Området forblir likt som i dag. Ingen endring i tilretteleggelse for bruk.	Mer tilrettelagt for bruk av området med ny tursti med sitte- og møteplasser
Overvann og flom	Flom gjennomsnittlig hvert 5-10 år	Flom gjennomsnittlig hvert 20-30 år
Illustrasjon		

Kroner per husholdning per år i 5 år

◯ 0 kr	◯ **500 kr**	◯ 2000 kr
◯ 50 kr	◯ 600 kr	◯ 4000 kr
◯ 100 kr	◯ 700 kr	◯ 6000 kr
◯ 150 kr	◯ 900 kr	◯ 8000 kr
◯ 200 kr	◯ 1100 kr	◯ 12000 kr

- ◯ 300 kr
- ◯ 1300 kr
- ◯ Vet ikke
- ◯ 400 kr
- ◯ 1500 kr
- ◯ Mer enn 12000 kr (vennligst spesifiser)

Forr. Neste

Skjetten Bekkeåpning

10. Husk, den ekstra kostnaden av alternativet er usikker på nåværende tidspunkt, og det er derfor vi spør deg om å oppgi det høyeste beløpet i økte kommunale avgifter du kan betale for fortsatt å støtte alternativet du foretrekker. Når utbyggings- og vedlikeholdskostnadene er kjent og den nødvendige ekstra kostnaden i kommunale avgifter er beregnet, så kan vi med det vite prosentvis hvor mange som er for og imot denne kostnadsøkningen.

Burde kommunen øke kommunale avgifter med verdien du valgte ovenfor likt for alle husholdninger i Skjettenbyen for å finansiere alternativet du foretrekker?

- ◯ Ja
- ◯ Nei

Forr. Neste

Skjetten Bekkeåpning

* 11. Hvor viktig var de ulike effektene nedenfor for å støtte ditt foretrekkende alternativ?

	Ikke viktig i det hele tatt	Lite viktig	Nøytral	Noe viktig	Svært viktig
Biologisk mangfold	◯	◯	◯	◯	◯
Vannkvalitet	◯	◯	◯	◯	◯
Tilretteleggelse for bruk av området	◯	◯	◯	◯	◯
Landskapsestetikk	◯	◯	◯	◯	◯

12. Hvis bekken åpnes kan kommunen utvide bekken til små vanndammer enkelte steder for å bedre **vannkvaliteten** og **overvannshåndteringen** ytterligere. Hvor positiv eller negativ er du til dette?

- ◯ Svært positiv
- ◯ Noe positiv
- ◯ Nøytral
- ◯ Noe negativ
- ◯ Svært negativ
- ◯ Vet ikke

13. Føler du bekken blir mer eller mindre trygg hvis kommunen utvider enkelte deler av bekken til små vanndammer?

- ◯ Mindre trygg
- ◯ Like trygg
- ◯ Mer trygg
- ◯ Vet ikke

Forr. Neste

Skjetten Bekkeåpning

Til slutt vil vi spørre deg om noen oppfølgingsspørsmål.

14. Omtrent hvor ofte bruker du området hvor bekken vurderes å åpnes?

- ◯ Aldri
- ◯ Hver dag
- ◯ 1-5 ganger i uken
- ◯ 1-5 ganger i måneden
- ◯ 1-5 ganger i halvåret
- ◯ 1-5 ganger i året
- ◯ Vet ikke

15. Velg alle aktivitetene du gjør i området hvor bekken vurderes å åpnes

- ☐ Frisbeegolf
- ☐ Aking
- ☐ Turgåing
- ☐ Annet (vennligst spesifiser)
- ☐ Trening (feks løping, sykling)
- ☐ Jeg gjør ingen aktiviteter i området hvor bekken vurderes å åpnes

16. Er du medlem i en friluftslivs- og/eller miljøorganisasjon?

- ◯ Ja
- ◯ Nei
- ◯ Vet ikke

17. Hvordan er din bosituasjon?

- ◯ Jeg bor i en leilighet som jeg leier
- ◯ Jeg bor i et hus/rekkehus som jeg eier

- ◯ Jeg bor i et hus/rekkehus som jeg leier
- ◯ Jeg bor hjemme hos foreldrene mine
- ◯ Jeg bor i en leilighet som jeg eier
- ◯ Annet (vennligst spesifiser)

18. Har du egen hage der du bor?

- ◯ Ja
- ◯ Nei, men jeg har tilgang til et grønt fellesområde der jeg bor
- ◯ Nei, og jeg har ikke tilgang til noe grønt fellesområde der jeg bor
- ◯ Vet ikke

19. Hvor mange barn har du fra følgende aldersgrupper? (Skriv "0" om ingen eller hopp over hvis du ikke ønsker å oppgi informasjonen)

0-6 år	
7-12 år	
Over 12 år	

20. Hvor enig eller uenig er du i følgende påstander?

	Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig
Jeg er bekymret for sikringen av en åpnet bekk	◯	◯	◯	◯	◯
Hvis bekken åpnes, føler jeg stedet blir mer utrygt	◯	◯	◯	◯	◯

21. Hvor sikker eller usikker er du på at du og din husholdning må betale mer i kommunale avgifter de neste fem årene for å finansiere en åpning av bekken?

- ◯ Svært sikker
- ◯ Ganske sikker
- ◯ Ganske usikker
- ◯ Veldig usikker
- ◯ Vet ikke

22. Hvor sikker eller usikker er du på at resultatene fra denne undersøkelsen vil bli brukt av kommunen til planlegging av bekken?

- ◯ Veldig sikker
- ◯ Ganske sikker
- ◯ Ganske usikker
- ◯ Veldig usikker
- ◯ Vet ikke

Forr. Neste

Skjetten Bekkeåpning

* 23. Hva er din høyeste fullførte utdanning?

- ◯ Grunnskole (7-10 år)
- ◯ Videregående skole/gymnas
- ◯ Fagbrev
- ◯ 3-4 årig universitetsutdanning (bachelor/cand.mag)
- ◯ 5-årig universitetsutdanning (mastergrad/profesjonsutdanning)
- ◯ Doktorgrad
- ◯ Vet ikke

* 24. Hva vil du anslå at din husholdnings samlede brutto inntekt (inkludert stønader) før skatt var i 2022? *Din husholdnings samlede inntekt før skatten er trukket fra.*

- ◯ Intill 200.000 kr
- ◯ 200.001 – 300.000 kr
- ◯ 300.001 – 400.000 kr
- ◯ 400.001 – 500.000 kr
- ◯ 500.001 – 600.000 kr
- ◯ 600.001 – 800.000
- ◯ 800.001 – 1.000.000 kr
- ◯ 1.000.001 – 1.200.000 kr
- ◯ 1.200.001 – 1.600.000 kr
- ◯ 1.600.001 – 2.000.000 kr
- ◯ 2.000.001 - 3.000.000 kr
- ◯ 3.000.001 - 4.000.000 kr
- ◯ Ønsker ikke å oppgi
- ◯ Vet ikke
- ◯ Mer enn 4.000.000 kr (vennligst spesifiser)

25. Takk for at du svarte på undersøkelsen. Vi ønsker å pressisere at økningen vi beskrev tidligere i undersøkelsen i kommunale avgifter er hypotetisk og vurderes ikke av kommunen. Alternativene vi presenterte samsvarer nødvendigvis ikke med kommunen sine planer for bekken, men er basert på rapporter fra selskapene Sweco og Multiconsult. Har du en kommentar til undersøkelsen kan du legge den igjen her:

Forr. Ferdig

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

Postboks 5003
NO-1432 Ås
Norway