

Article

# Implementing Sustainable Urban Drainage Systems: Themes of Cultural Conflicts and Public Resistance—A Case Study

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**Abstract:** A six-year study investigates the challenges of balancing stakeholders' interests when implementing climate adaptation regulations and makes a case for analytical tools that can improve the acceptance and adoption of local planning initiatives. In this study, the challenges of adopting European Union and Norwegian national climate adaptation regulations at a local level are examined through the analysis of the 'Fredlybekken Water Management Proposal' case study. This study includes an overview of the proposed climate adaptation project 'Fredlybekken', a site analysis, quantitative surveys, and qualitative interviews with the project's stakeholders. Reflexive thematic analysis is employed to establish themes of the project and categorically describe the feedback and objections of residents. The findings of the study set forth recommendations to improve the implementation processes of stormwater management infrastructure and other urban climatic adaptation initiatives. These findings are aimed at public policy makers and municipal administrations. The general conclusions within this paper are also relevant for egalitarian countries with similar societal challenges attempting to implement climate policy at the local level.

**Keywords:** conflict; brook restoration; SUDS; municipal–public relations; cultural conflict; public resistance

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## 1. Introduction

### 1.1. Stormwater Management

An increasing share of the ground area in urban and suburban areas is being covered by impermeable surfaces like roads, buildings, and parking lots as a result of urban development and densification [1]. This trend negatively impacts stormwater management as precipitation cannot easily infiltrate into the ground, requiring greater volumes of water to be managed by increasingly strained drainage networks [2]. International consensus is working to find long-term solutions for the management of increased precipitation and flooding within urban environments. As stated in the 2014 IPCC report: “global urbanization in its current state, may be the greatest deciding factor of aggravated hydro-spheric and atmospheric perturbations” [3].

The weather of Nordic countries is projected to be disproportionately affected by climate changes like increased precipitation [4]. Norway faces warmer, wetter, and wilder weather. Presently, the average annual precipitation in Norway is 20% higher than it was 100 years ago. By the end of this century, an additional increase of 20% is expected [5]. Climate change scenarios indicate that Norway will also see an increase in the intensity and frequency of extreme weather events [6]. This will further exacerbate heavy loads and strain on surface water systems and drainage, resulting in water damage to infrastructure and buildings, as aging infrastructure within existing urban environments has already been shown to currently be beyond capacity [5,7]. With increases in both the frequency and intensity of current stormwater events, projected increases expected for the future,

and urban development patterns, regulations have been nationally adopted to combat these challenges [8].

Stormwater floods may cause costly damage to buildings and infrastructure in affected areas. Insurance claims related to stormwater damage have increased substantially in recent years in Norway [9]. As refurbishing the entire stormwater drainage network within a short time frame would be prohibitively expensive, adaptation of infrastructure to stormwater management measures that detain or retain water locally has been prioritized [5].

Sustainable Urban Drainage Systems, or SUDS, is a term that encompasses a range of technologies and techniques that manage stormwater through replicating as closely as possible the natural, pre-development drainage from a site [10]. The term “Nature-Based Solutions” (NBS) is a broader term encompassing SUDS and other stormwater management practices that aim to use the features and processes of a complex natural system to achieve desired benefits [11]. However, for the present study, SUDS is preferred as it is a more descriptive term. A typical example of a SUDS is the restoration of creeks or brooks that were previously piped underground. The restored brook may feature stormwater ponds and be surrounded by foliage. Greater emphasis is being placed on the co-evolution of naturally occurring and built green–blue infrastructure into the future planning and construction of human habitats [12]. Kaupang [13] found that climate adaptation and urban densification within cities were the largest technical challenges that would face Scandinavian municipalities in the future. Of special interest within that study are the challenges for regional municipalities that practice egalitarian, decentralized governance at the local level to implement green–blue climate initiatives in an open public process.

### *1.2. SUDS as a Climate Adaptation Measure and Challenges*

Climate adaptation is being integrated into the legal framework of Europe [14]. The Water Directive [15] is a European Union (EU) initiative that pertains to the management of freshwater resources. This environmental policy has also been incorporated into the Norwegian water management standards via water regulation policy as part of the European Economic Area (EEA) Agreement. The Water Directive intends to protect and improve the environmental status of natural bodies of water. This policy requires that bodies of water should, as far as possible, be maintained or returned to their natural state, maximizing their ecological potential.

The implementation of climate adaptation measures in the Nordic countries has, until now, been slow [16]. Norwegian laws and regulations for climate adaptation are broadly written and open to interpretation. Municipalities are left to decide how and to what degree climate adaptation measures are to be carried out. While it is assumed that superior legislation and guidelines should be adequate to safeguard climate adaptation in Norway, some municipal projects have failed when implementation has been tested [17]. Klaussen et al. [18] noted that in urban planning, the introduction and adoption of adaptation measures is often arbitrary and dependent upon whether a climate enthusiast is spearheading the project. Adoption and implementation, therefore, seem to be more dependent on individuals than the organizational structure of the municipality. Moser [19] and Repetto [20] emphasize that knowledge, capacity, and resources do not guarantee that adaptation takes place.

Guidelines and tools are needed to support decision-making processes, including the planning and execution of projects. Effective climate adaptation depends as much on implementation processes as it does on technical solutions [6]. Previous studies have confirmed that municipalities lack the right kind of competence and expertise to succeed in the execution of climate adaptation plans [6,21,22]. Vaughan and Dessai [23] argue for the collaborative production of climate guides and services. Currently, in Norway, there is an overwhelming amount of guidance material, and it is suggested that this may cause confusion and uncertainty for users during the execution process [6]. As it applies to guidance

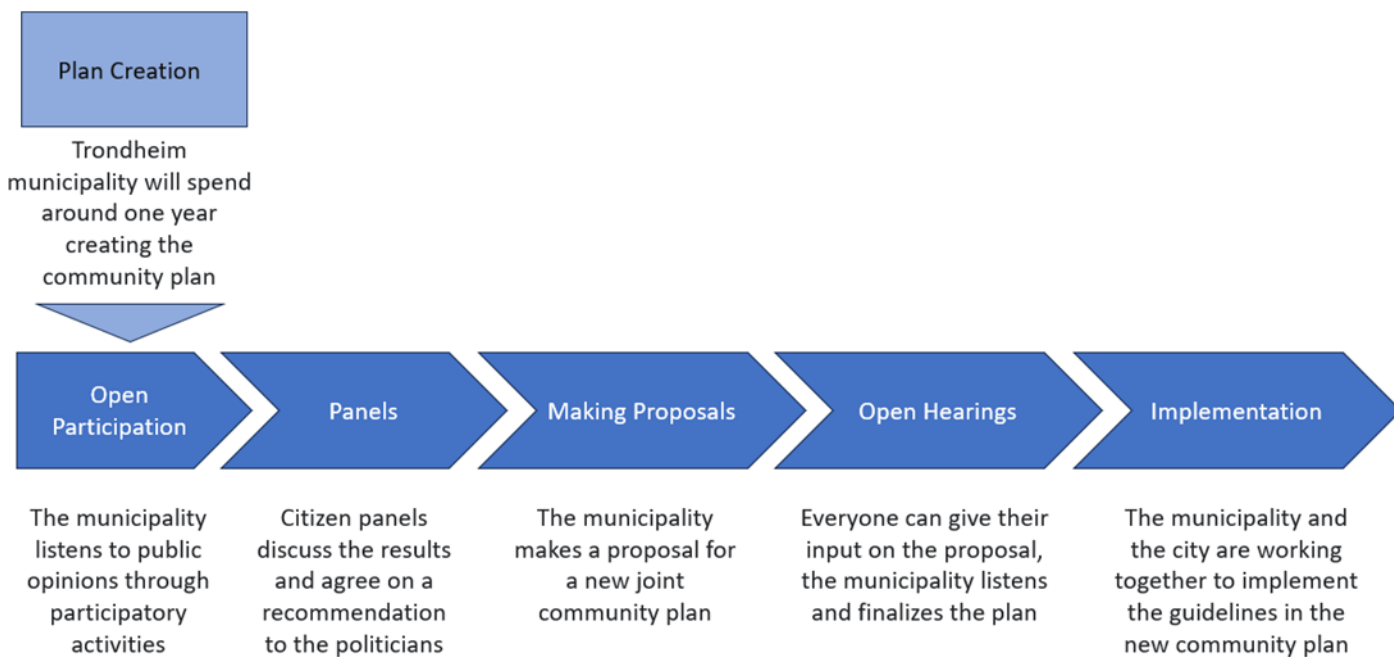
material, NRC [24] maintains that communication is more effective when targeted at specific groups rather than at a general audience.

Public perceptions of SUDS and other stormwater management measures have been extensively studied. Survey respondents in the UK and US have been found to appreciate the green space and beauty of well-maintained stormwater ponds [25–27] but may not necessarily be aware of or prioritize their hydrologic functions [25,27,28]. In the context of river restoration, Nassauer et al. [29] found that expectations of aesthetics may not always be compatible with hydrologic performance. Some public concerns about SUDS were also described in the literature. Survey respondents in UK surveys listed concerns of litter, pests, maintenance, and health and safety risks [26,30,31]. The economic benefits of SUDS have also been documented, but these benefits are often not known to the public [26,31,32].

To undertake the call set forth by Vaughan and Dessai [23], Kaupang [13], and Hauge et al. [6], we must identify the stumbling blocks within the planning and adoption process which are preventing the successful implementation of climate policy. One such stumbling block is conflicts between residents and public planners over the establishment and appearance of SUDS projects [33].

### 1.3. Planning Processes

In Norwegian city planning, public hearings and consultations form a critical aspect of the planning process. They invite residents, interest groups, and stakeholders to contribute feedback, objections, and insights on proposed developments or urban landscape changes. The intention is to ensure accessibility to planning documents and proposals to foster transparency and enable effective engagement. Embracing technological advancements, municipalities leverage digital platforms like websites, online forums, and social media to engage a wider audience and gather feedback on city planning initiatives. Additionally, provisions exist for residents and stakeholders to appeal planning decisions if they feel their interests have not been adequately considered or if procedural irregularities occur. These aspects are outlined as follows, while the process is illustrated in Figure 1.



**Figure 1.** The occurrence of various processes in design and public engagement process for SUDS projects in Norway, using Trondheim municipality as an example.

**Public Hearings and Consultations:** City planning projects in Norway typically involve public hearings and consultations, allowing residents, interest groups, and stakeholders to provide input, feedback, and objections regarding proposed developments or changes in the urban landscape.

**Information Accessibility:** There are requirements to make planning documents, proposals, and relevant information accessible to the public. This ensures transparency and allows stakeholders to understand and engage effectively in the planning process.

**Local Planning Regulations:** Each municipality may have its own specific regulations and guidelines regarding public engagement in city planning projects. These regulations might outline the procedures for public consultations, the duration of public review periods, and the methods for gathering public input.

**Digital Platforms for Engagement:** With technological advancements, there is an increasing emphasis on utilizing digital platforms to engage the public. Municipalities often employ websites, online forums, and social media channels to reach a broader audience and gather feedback on city planning initiatives.

**Appeal Processes:** There are provisions for residents and stakeholders to appeal planning decisions if they believe their interests have not been adequately considered or if there are procedural irregularities.

It is important to note that specific requirements and procedures can vary between municipalities, but the overarching principle across Norway is to involve the public in the decision-making processes related to city planning.

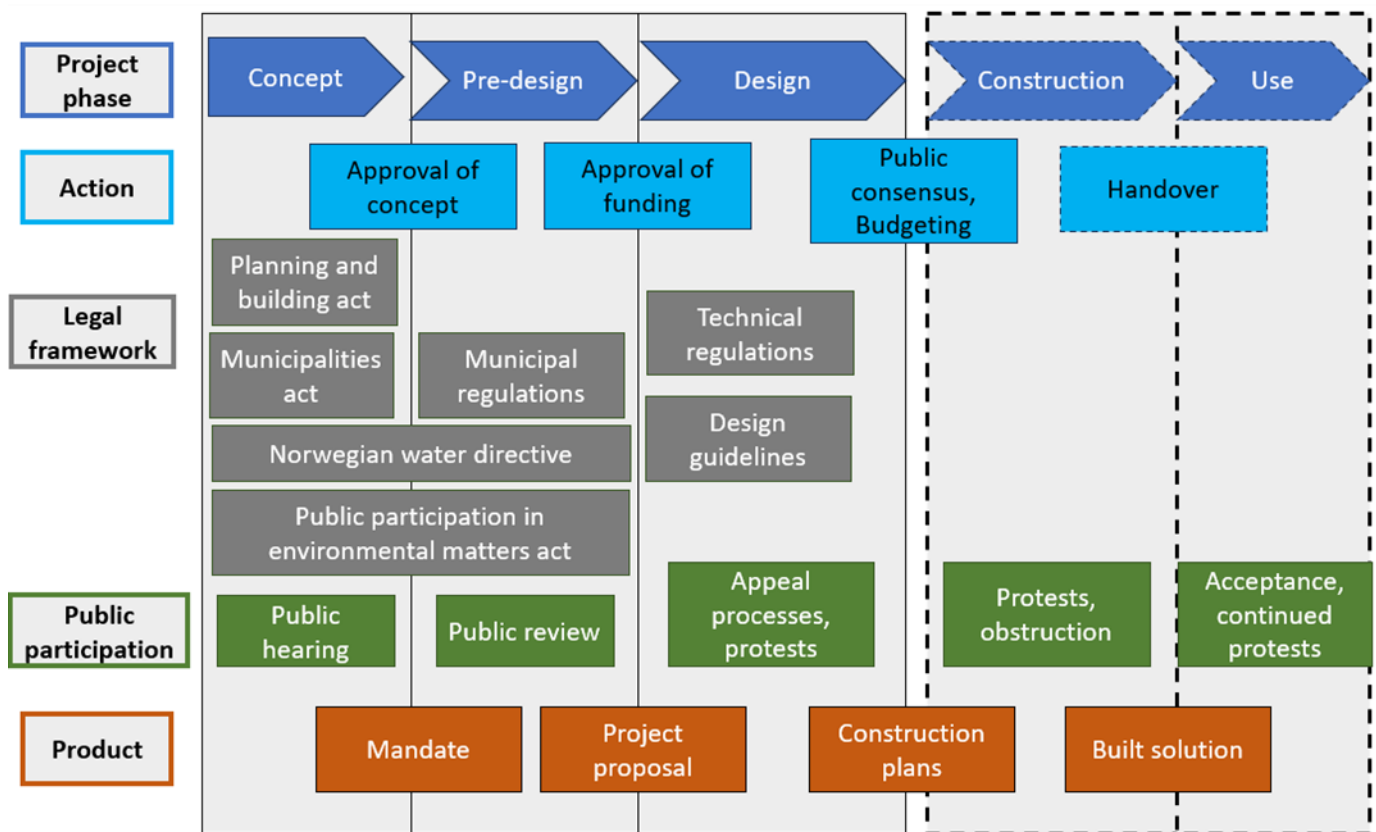
Local planning regulations vary by municipality, detailing procedures for public consultations, review period durations, and methods for gathering public input, but key aspects and regulations include:

**Planning and Building Act (Plan- og bygningsloven):** This act outlines the legal framework for urban planning in Norway. It emphasizes public participation and requires municipalities to involve residents, property owners, and other stakeholders in the planning process.

**Public Participation in Environmental Matters Act (Lov om rett til miljøinformasjon og deltakelse i offentlige beslutningsprosesser på miljøområdet):** This law ensures public access to environmental information and participation in decision-making processes related to the environment. It often applies to city planning projects that have environmental implications.

**Municipalities Act (Kommuneloven):** This act governs the operations of municipalities and emphasizes the importance of citizen participation in local governance, including city planning processes.

Processes to implement these acts and laws incorporate the following strategies, further illustrated in Figure 2. The diagram in the figure is based on the “next step” model as described by Tiltnes (2015) [34]. In the context of the SUDS project, the five phases can be understood as follows:



**Figure 2.** The occurrence of various processes in design and public engagement process for SUDS projects in Norway.

**Concept:** Identifying a need for stormwater management measures in a specific project and selecting the overall approach to addressing the need. For instance, determining whether a piped river will be re-surfaced or otherwise improved. This is the phase where the outcome of the project can be influenced the most for the lowest possible cost. Feasibility studies are carried out and used to decide which overall concept to proceed with.

**Pre-design:** Selecting the features of the chosen concept. For instance, determining the course of a re-surfaced river, selecting the placement of retention ponds, or deciding whether to include features like walking paths or playground equipment. Certain calculations or assumptions need to be made in this phase, as the pre-design phase will be used to inform the design decisions in the next phase. The opportunity to influence the outcome remains substantial but rapidly diminishing as pre-design progresses, while the cost of changes likewise increases.

**Design:** Calculating and specifying the design parameters of the project to create the plans and drawings used for construction. Relevant activities can be selecting the species of plants to be planted, determining the width of pathways, and specifying the placement of rocks to prevent riverbank erosion. In this phase, the overall design of the final product is mostly “locked”, with very limited opportunities to make changes.

**Construction:** Physically assembling the designed solution. The specifics of this phase are considered beyond the scope of the present study. In this phase, it is generally too late to make substantial changes to the concept and design of the solution.

**Use:** Maintenance, operation, and management of the as-built solution.

Public participation by phase:

**Concept:** The overall concept of the project will usually be prepared by the municipality and presented as a proposal before the public is involved. The proposal may be informed by public initiatives, like residents writing letters to the municipality about the need to improve infrastructure in their area. When a proposal is ready and presented, a

public hearing period will give residents and stakeholders the opportunity to give feedback on the proposed concept. The municipal board (kommunestyre) will determine whether the project is ready to proceed based on public feedback.

**Pre-design:** After the acceptance of the initial concept, a preliminary design is prepared by the municipality, possibly assisted by external consultants. The preliminary design is presented to the public in a public review at the end of the pre-design phase. The public may use the public review process to comment on details of the preliminary design or express disagreement with the project altogether. The municipal board will then decide whether to proceed with the project based on the preliminary design reports, public feedback, and the availability of funds.

**Design:** Ideally, opposition to the process is addressed in or before the pre-design phase and resolved before the pre-design is approved. However, in some cases, the project may be approved by the municipality while there remains substantial public opposition. The public opposition may then turn to protest in an attempt to influence the project further. In the concept of the present work, “protest” is defined as an opposition to a project after approval, while “objections” is an opposition that occurs in the earlier phases.

Examples of protest may be to call upon the local politicians to block an approved project or to create organized protest groups.

Public engagement may also occur in the design phase, even if there are no protests. Design details, like the placement of fences, plants, or playground equipment, may be influenced by the residents through communication with the municipality or designers.

**Construction:** Public resistance to the project is usually resolved before construction begins. If significant public resistance remains at the point of construction, physical obstruction may be attempted as a last-ditch effort. This is, however, a rare occurrence for SUDS projects.

If there is no substantial public resistance at the time of construction, public engagement with the process is usually very limited.

**Use:** Public engagement in the use phase occurs in the form of complaints about the as-built solution. Complaints may be addressed to the municipality directly or through the media.

#### 1.4. Objectives

The objective of the present study is to identify what conflicts can arise related to brook restoration within the Norwegian context. This paper is part of a series of studies on brook restorations in Trondheim, Norway. The first study [33] examined the implemented Blaklibekken project and feedback from its users and stakeholders to identify themes of dissatisfaction with the process and the finished product. The second study employed the Hofstede Cultural Compass survey to examine cultural differences between stakeholders in SUDS projects [35]. Within the present paper, the specific group dynamics targeted are those occurring between the municipality and residents in a stalled project along Fredlybekken, a brook south of Trondheim. By better understanding this dynamic, the research aims to better inform proposals for guidance material to be used by municipal actors in SUDS implementation processes. Specific attention will be paid to gaps and failures in the implementation process that result in poorly executed or abandoned measures.

The following research questions have been formed to guide this research project:

1. What are the general opinions and knowledge of the project by the locally effected public?
2. What insights can be drawn from the leaders ‘Fredlydalen Velforening’ protest group regarding breakdowns between the municipality and the public?
3. What themes emerged from the experience and perceptions of the public during the planning process?
4. What recommendations can be given to improve engagement and build support for SUDS climate adaptation initiatives?

The present study provides new insight through surveys and interviews with stakeholders in a project that stalled over a ten-year period due to resistance from residents. It is evident that more knowledge is needed on the dynamic interactions between planners and residents to identify points of friction that may delay or indefinitely stall SUDS implementation.

The following limitations to the study are acknowledged: This study was conducted using a case study of a brook restoration project in Trondheim, Norway. The findings are aimed at public policy makers and municipal administrations within the Norwegian and European contexts. The general conclusions are also relevant for countries within the EU and other egalitarian countries with similar climate challenges. The presented study is conducted within the scope of the greater Norwegian Water Management Plan and in fulfillment of EU and Norwegian water policy directives.

## 2. Case Study

The Trondheim municipal authority in Norway proposed the restoration of the brook Fredlybekken, a two-kilometer-long piped drainage tributary to the Nidelven river, located in the Stubban area of Trondheim [36]. A total of 1200 meters of the brook were proposed to be restored.

### 2.1. Study Area History

Trondheim is a city of 212,660 inhabitants (1 January 2023) [37] and is the third most populated municipality in Norway. The city is situated along the mouth and lower portion of the Nidelven river. Approximately half of the drainage network of Trondheim municipality has been piped into a drainage system which manages both sewage and stormwater [36]. The Fredlybekken overflow is one of the two largest in Trondheim [36]. Historically, the brook Fredlybekken was a naturally occurring drainage tributary that expelled into the Nidelven river from agricultural lands south of the historic city. The Fredlybekken was piped as this area transitioned from agricultural lands to industrial, commercial, and residential uses in the 1950s. In Figure 3, images are presented from 1947, 1957, and 2022, illustrating the stream's natural path as shown by the white line and post piping in 1957. The 2022 image shows the further development of the area over time.

1947



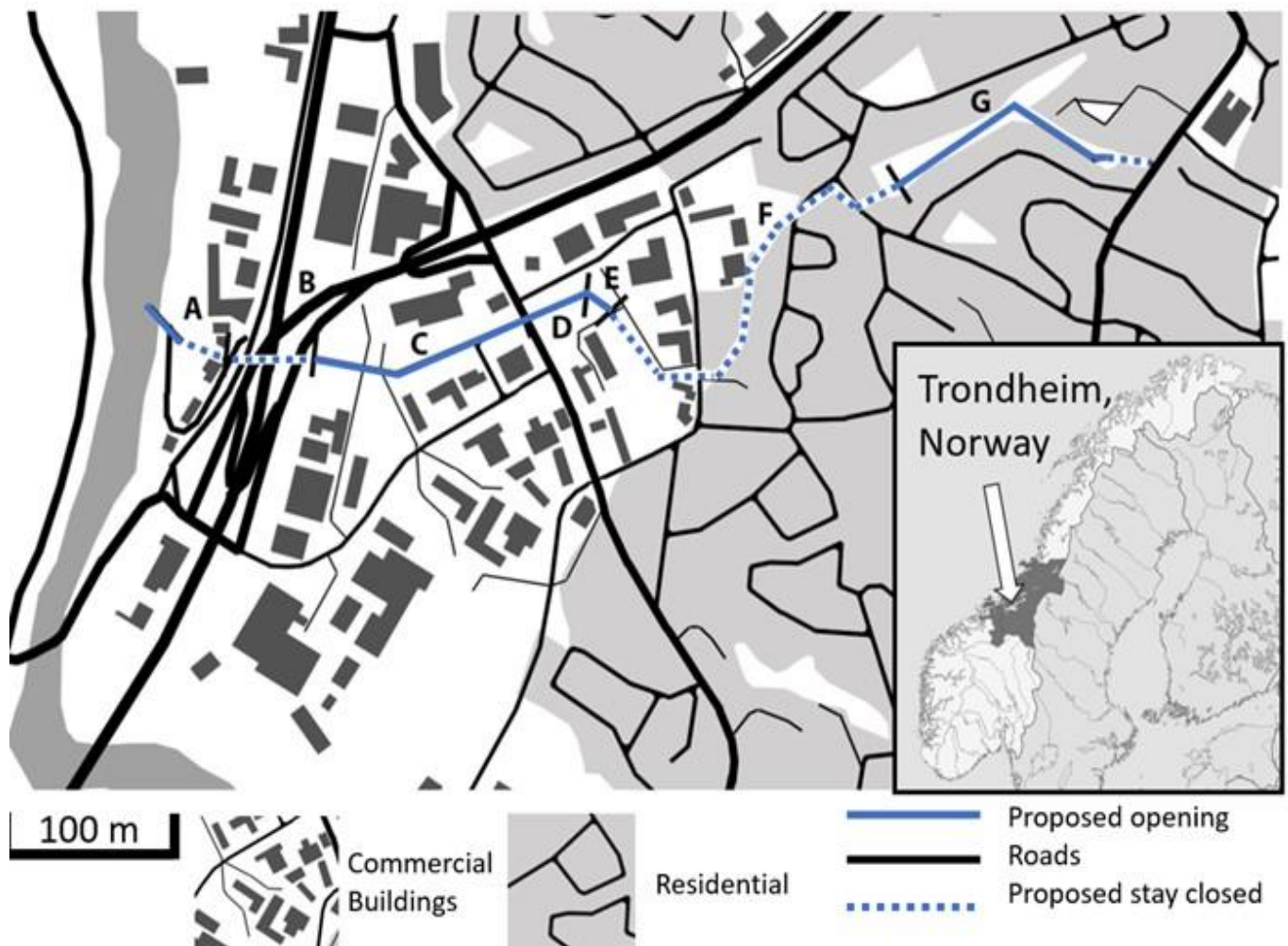




**Figure 3.** Aerial images of the Fredlybekken stream from 1947, 1957, and 2022. Images collected from Maxar Technologies, map data © 2024).

Figure 4 shows a map of the area, with the path of Fredlybekken indicated by the blue line. The areas traversed by the brook include residential and industrial areas, a school site, open green space along the Nidelven river, and a commercial/industrial site built over an old landfill for the Trondheim area. The Fredlybekken is divided into seven sections, as shown in Figures 3 and 4. Table 1 provides an overview of the different sections of Fredlybekken in the upstream direction from the outlet at the river Nideleven [35]. Table 2 shows the different land uses in the Fredlybekken catchment area and their percentage of land cover.





**Figure 4.** Overview of the Sluppen, Nidarvoll, Stubban, and Nardo area of Trondheim and the segments of the Fredlybekken brook.

**Table 1.** Overview of the different sections of Fredlybekken [35] in the upstream direction from the outlet at the river Nidelven.

Section	Terrain	Length (m)	Proposed Development	Recommendation/Plans
A	Natural landscape	110	Open	Terminus
B	High volume road	180	Pipe	Remains piped
C	Urban	420	Open stream (Asphalted with little or no vegetation)	Park, ponds, vegetation, and activity areas
D	Urban	150 (120 m open/30 m culvert)	Open stream	Ponds, retainers, riparian buffers, etc.
E	Public Space/School	40	Open channel	Forest, riparian buffer
F	Residential	760	Culvert/Pipe	Remains piped
G	Residential/ Forested	520	Open stream	Ponds, retainers, riparian buffers, etc.

**Table 2.** Land use of the Fredlybekken catchment area.

Land Type	Area (ha)	Percentage (%)
Built Development	194	56.8%
Open Area	92	26.9%
Roadways	24	7.4%
Forest	21	6.2%
Cultivated Lands (Agriculture)	7	2.1%
Cycle Paths	1	0.4%
Sports Fields	1	0.2%
Sum	341	100.0%

### 2.2. Fredlybekken Water Issues

There is substantial variability in the volume of water that flows into the Fredlybekken. During average precipitation periods, water collection can vary from about 20 L/s (liters per second) in the upper-eastern, residential half of the basin to approximately 50 L/s in the lower-western, industrial half of the site. Extreme weather, such as a 100-year flood event, is estimated to carry over 3000 L/s into the upper basin, swelling to 7–9000 L/s in the basin of the lower-western section of the Fredlybekken [38,39].

Over the last decade, the river Nidelven has maintained high levels of water quality [36]. The Fredlybekken continues to be essential in the collection and expulsion of excess water in the Sluppen, Nidarvoll, Stubban, and Nardo areas into the Nidelven. However, as the catchment area has been increasingly developed and now contains a large residential area of 28,000 inhabitants, the Fredlybekken no longer has the capacity to manage the area's water [36]. Overflow events occur 1000–1500 hours a year, and during these periods, the water quality deteriorates dramatically, with diluted sewage entering the river Nidelven [36,40].

### 2.3. Goals of the Fredlybekken Project

Trondheim municipality had an intention to reduce overflow emissions in Fredlybekken to 4 percent between 2006 and 2021 [40]. The project proposal was intended to improve the water quality through ecological and chemical protection while preventing the occurrence of eutrophication and algae blooms within the water system [38]. The proposal recommended opening the Fredlybekken as a brook that collects and drains off surface water from the Nardo and Stubban area into a common outlet at the river Nidelven. This catchment area includes all the surface water from rain runoff, snowmelt, and tertiary streams that run downslope towards the river Nidelven. The project proposes the Fredlybekken basin as the singular collection system for excess water/overflow in the area (except for overflow collected from the highway, which will be managed separately). This would also ensure enough water would supply the riparian vegetative system along the brook during dry periods.

The management of the stormwater runoff into and through the Fredlybekken basin will not be conducted through the application of active mechanical installations but rather passive constructs, including the introduction of riparian buffers, vegetative filters, rain beds, water spills, watermark filters, retainers, and dams. Additionally, hiking and tourism paths, as well as a park area, would be established. The new public pedestrian path would connect paths running along the river Nidelven, west of the site, to the Strindmarka forest area to the east of Figure 4. The strategic, tactical, and operational goals of the Fredlybekken proposal were as follows:

- Strategic: Develop and implement water protection and climate adaptation measures to mitigate the negative impacts of urban densification and climate change.
- Tactical: Implementation of Norwegian water management standards via water regulation policy.

- Operational: The rehabilitation of the Fredlybekken and the incorporation of a flood zone and public green space.

#### 2.4. Project History

The adoption of this project was based on the findings of a 2009 pre-study conducted by the engineering consultancy group Multiconsult in conjunction with the Norwegian University of Science and Technology (NTNU) and Trondheim municipality [38]. This study was then further developed into a feasibility and zoning assessment by Multiconsult, which was submitted in April 2010. By August 2010, the political decision to go forward with the project was unanimously approved by the leadership of the Trondheim City Council. However, residents in the area have protested the plans, citing concerns about costs, health and safety, and land use change along the course of the brook restoration project. A local protest group, the 'Fredlydalen Velforening', was formed in 2011, seeking a re-evaluation of the project [41]. In 2014, a comprehensive system was designed, including an open stream and pipeline, drainage, wastewater collection, and overflow buffers. Further overflow management approaches, such as open grades and green vegetative structures, were also included. The project was to be executed within a cost framework of 268 million NOK (approx. 23.7 million EUR) [42]. As of March 2023, the downstream parts of the project (Figure 4, sections A to D) have been implemented as planned or are under construction. However, upstream parts of the project (Figure 4, section G) remain indefinitely postponed due to local resistance.

### 3. Methods

#### 3.1. Grounded Theory and a Psychological Approach

Grounded theory is the methodological approach that has been applied to the qualitative research within this study and has followed the prescriptions of Martin (1986), Strauss and Corbin (1994), and Faggiolani (2011) [40–42]. Following this methodology, hypotheses and theories are constructed through the collection and analysis of data. Ideas and concepts emerged as data were collected. These ideas and concepts were drawn from a preliminary literature review, which informed theory development. The concepts and theory development were then further informed by open-ended, semi-structured interviews with the municipality. The results of the preliminary literature review and interview with municipal actors informed the interview approach and focused on residents. Data were then collected in each phase of the research, where ideas and concepts were developed into higher-level concepts and then into categorized themes through the application of inductive reasoning [43]. These themes then provided the basis of our recommendations presented in the discussion section.

In the thematic analysis, the psychological approach is significant as it informs the chosen themes. By considering psychological factors alongside socio-cultural and environmental dimensions, researchers can better understand the issues. For example, insights from psychological theories on persuasion, social influence, and communication strategies can enrich themes related to communication and engagement. Similarly, examining environmental awareness from a psychological standpoint can uncover biases and emotional responses influencing residents' attitudes and behaviors towards environmental issues.

The correlation between the grounded theory methodology and the psychological approach is noteworthy. Grounded theory emphasizes the iterative process of data collection and analysis, allowing themes and theories to emerge from the data itself [40–42]. In this study, the psychological approach influenced the initial research questions and theoretical frameworks, guiding the exploration of relevant psychological constructs. As data were analyzed, psychological insights shaped emerging concepts and themes. Grounded theory's inductive reasoning aligns well with the psychological perspective, as both prioritize exploring phenomena based on empirical observations and participant experiences

[43]. This iterative process led to identifying themes grounded in psychological and empirical evidence, enriching the study's implications. The themes were derived from the semi-structured interviews and coded document collection and then analyzed with descriptive statistics.

### 3.2. Document Study

An overview of existing documentation of the Fredlybekken project informed the analysis of public perceptions by providing the historical background of the site and existing assessments of its performance. This overview included a review of all available project documentation, public records, site evaluations, and newspaper articles. All statements regarding public perceptions of the site were cataloged and coded to inform the development of the themes. The reviewed texts were as follows:

- One consultancy evaluation [38];
- The Municipal planning commission summaries [44];
- Six newspaper articles [36,40,42,45,46];
- One national review evaluation [47];
- One municipal plan.

### 3.3. Interviews with Planners and Residents

Qualitative interviews were conducted as an open-ended approach to provide participants the freedom and flexibility to describe their own understanding and experiences of the Blaklibekken site and engagement processes. These interviews were both unstructured and semi-structured, following the prescriptions of Yin (2009) and Brinkman and Kvale (2014) [48,49]. The intention of the interviews was to assess the participants' impressions and whether they felt the planning process and engagement with the municipality met their expectations. Key to the process were personal opinions and impressions, values, and priorities. The interviews were undertaken to determine whether any common perceptions existed among the public which would influence the overall acceptance and satisfaction of the project. The interviews document the evolution of public perceptions as recorded in interviews with the municipal planning office and the 'Fredlydalen Velforening' neighborhood resistance group, spanning six years from 2017 through 2023.

It was not part of the study to gauge the participant's actual understanding of the engineering and scientific principles behind the project or its policy/regulatory legitimacy. It is important to note that these interviews are based on respondents' personal experiences and perceptions. The participants are stakeholders in the process with invested interests; their responses must, therefore, be subject to a high potential for bias. Nonetheless, these interviews directly source the motivations and intent of protesting residents. Only interview quotes pertaining to the recollections and impressions of the residents have been added to this report. The interviewees had an opportunity to review the quotes and sections referring to their experience. Their identities have been withheld to protect their privacy.

#### 3.3.1. Semi-Structured Interviews with the Municipality

To record what commonalities and variants of opinion existed between the municipality and users of the site, an interview with municipal key personnel was conducted. One common interview was carried out with the project leader for the Blaklibekken project and a municipal representative from "Kommunal Teknikk VA" (Municipal Engineering, Water and Wastewater). The interview was conducted by phone on 27 June 2020. Notes were taken throughout to document the responses of the participants. The municipality was also asked to provide the context in which the project was undertaken, an overview of the project's history, and a summary of the current challenges to the site as identified by the municipality. They were also given the opportunity to give their response to

local newspaper reports about the project. To protect the privacy of the actors, their identities have been withheld.

Additional semi-structured, in-depth interviews were conducted to better inform the study. One interview was conducted with a primary author of the original 'Fredlybekken water management proposal' commissioned by Trondheim Municipality and undertaken by Multiconsult, an engineering consultancy firm. One interview was undertaken with an expert in Norwegian municipal planning structures at SINTEF, an independent research organization. Four interviews were conducted within the municipal planning office. The interviews were conducted with employees of the municipality who participated in the Fredlybekken project, both in the planning and public processes. These interviews were undertaken to better inform the timeline of the planning and public processes directed by the municipality.

### 3.3.2. Structured Interviews with Protesting Residents

Out of 72 members of the 'Fredlydalen Velforening' neighborhood resistance group, 61 participated in structured interviews in which six questions were asked. The interviews were conducted over the summer of 2020. The main objective was to assess people's impressions of the site, their satisfaction with the project's outcome, and whether they believed that the project met the expected results set forth by the Trondheim municipal planning office. The interviews were also intended to capture the residents' and users' opinions of the project's value and necessity and to identify common perceptions that may have influenced the project's acceptance and satisfaction among the public. It is important to note that the interviews were not designed to assess the public's understanding of the project's engineering and scientific principles or the policy/regulatory legitimacy. The focus was on the public's perceptions and opinions rather than their knowledge of technical or regulatory aspects of the project. The questions asked were as follows:

1. A confirmation of whether you support or resist the proposed Fredlybekken project.
2. How familiar do you consider yourself to be with the project?
3. What do you know about the purpose of the project?
4. What concerns do you have regarding the proposed project?
5. What are your opinions regarding how the municipality has engaged the residents?
6. What recommendations do you have for better engagement?

These questions are designed to provide a deeper understanding of the members' concerns, opinions, and recommendations regarding the proposed project and the municipality's engagement with the residents. The answers to these questions can help inform the municipality's decision-making process and improve its communication and engagement strategies with the residents.

### 3.3.3. Unstructured Interviews with Leaders of the 'Fredlydalen Velforening'

The acting leaders of the Fredlybekken citizens protest group 'Fredlydalen Velforening' were interviewed. The group was formed after the residents had received notice from the municipal authority during the planning process and comprised those who owned property directly impacted by the Fredlybekken proposal. Unstructured, in-depth interviews were conducted with the four leaders of the protest group over a three-year period between 2020 through 2023. The intention was to determine the motivations and reasons driving the residents' protest. Most importantly, the interviews were conducted to recount the residents' experiences, impressions, and personal opinions as they pertained to the Trondheim municipality public planning process. All interviews were conducted face to face. Each interview was one-to-one and lasted for approximately an hour and was recorded and later transcribed.

### 3.4. Reflexive Thematic Analysis (TA)

A psychological approach offers valuable insight into typical challenges found with human behaviors, perceptions, and motivations toward how we engage [50]. A distinctive feature of this approach is 'the recognition, even embracing, of the value of multiple perspectives on issues' [51]. Applying this approach to the research questions posed within this case study informs our understanding of local perspectives and how to build consensus and support for SUDS.

This approach allows for the work to be undertaken by one coder [36]. While the work is that of one coder, the process goes through several iterations and is subject to the review of additional experts. The conclusions are drawn from the findings and while reflecting the values of a qualitative paradigm, must be classified as subjective and interpretive [42]. While sociological and cultural theories also value multiple perspectives, the psychological approach allows the coder greater flexibility to go deeper into individual-level processes that shape perceptions and behaviors, complementing broader sociocultural analyses.

Reflexive thematic analysis does not merely summarize and organize the data but provides an analyzed interpretation of it. Here, the prescriptions of Braun and Clarke's (2006) six-step framework for thematic analysis were followed [43,52]. Replication of this method can be achieved following Braun and Clarke's (2013) recommendations and the practical step-by-step guidelines laid out by Maguire and Delahunt [53]. This six-step framework is not necessarily linear, and the researcher may move between steps many times. The findings drawn from this work have been generated and occur at the intersection of the data and the researcher's interpretative framework and assumptions. Braun and Clarke's six-phase framework for performing a thematic analysis involves:

- Step 1: Become familiar with the data;
- Step 2: Generate initial codes;
- Step 3: Search for themes;
- Step 4: Review themes;
- Step 5: Define themes;
- Step 6: Write-up.

Statements regarding public perception and priorities were collected and cataloged by source. These statements then went through a review process, which categorized relevant statements by dimension. An analysis was performed of the collected documentation and interviews, which involved transcribing and coding quotes to develop phenomenological themes of public interest. This work follows the methodology and structure presented in Thodesen et al., which, again, has been presented here [33]. Building off this work, themes specific to the Fredlybekken case study have been presented to better inform front-end planning and public engagement. These themes were established to inform where conflicts were occurring around SUDS planning, thus giving greater context to the residents' perspectives and resistance.

## 4. Results

### 4.1. Interview Responses

Table 3 presents the responses of the members of the 'Fredlydalen Velforening' neighborhood resistance group regarding their site impressions and enjoyment of the proposed Fredlybekken project. The table shows the distribution of responses to the first three questions of the semi-structured interview.

For the first question, 86% of the respondents indicated that they were resistant to the project (score of 0 to 2 on a scale of 0 to 5), and 16% of the respondents indicated that they do not support the project at all. Moreover, 38% indicated a lower level of support (score of 2). Only 3% of the respondents indicated a high level of support (score of 4), while no one responded with a score of 5 (very much).



For the second question, 63% of the respondents indicated that they are somewhat familiar with the project, while 24% indicated that they are very familiar with it. Only 12% of the respondents indicated that they are not familiar with the project.

For the third question, 76% of the respondents indicated that they know some information about the purpose of the project, while 11% indicated that they know a lot about it. Only 12% of the respondents indicated that they do not know much about the purpose of the project.

The responses suggest that the members of the ‘Fredlydalen Velforening’ neighborhood resistance group have varying levels of support for the proposed Fredlybekken project, with a majority indicating a low to moderately low level of support. The respondents also have varying levels of familiarity and knowledge about the project, with a majority indicating some level of familiarity and knowledge.

**Table 3.** Responses regarding site impressions and enjoyment questions 1–3.

Question	Response	Total
1. Do you support or resist the proposed Fredlybekken project?	0 (do not support at all)	16%
	1	32%
	2	38%
	3	10%
	4	3%
	5 (support very much)	0%
2. How familiar are you with the project?	Not much	12%
	Somewhat	63%
	Very	24%
3. What do you know about the purpose of the project?	Not much	12%
	Some	76%
	A lot	11%

The proposed Fredlybekken project has sparked concerns among members of the Fredlydalen Velforening neighborhood resistance group. The results of questions four through six are found in Table 4. For the fourth question, the members have expressed their worries about the potential disruption from construction (32%), loss of property value (22%), increased public access/foot traffic (18%), the possibility that the project will not be maintained properly (15%), and decreased privacy (12%). Other concerns mentioned include the use of eminent domain (12%), not having enough funding (8%), safety (5%), and unsanitary water (4%).

For the fifth question, regarding the municipality’s engagement with the residents, the members had mixed views. Of particular interest, when asked, “What are your opinions regarding how the municipality has engaged the residents?” a significant proportion of members (43%) thought the interaction was hostile, while (5%) thought that the engagement had been good, and (31%) of members felt that the municipality had not listened to them. Some members suggested that the municipality needs to engage more (12%); others mentioned being bullied (7%), offered better guidance (3%), felt that the municipality lacked technical expertise (1%), or provided more information (1%).

In response to the sixth question, “What recommendations do you have for better engagement?” the members suggested several measures. The most common recommendation was to make changes to the plans (36%) and involve more residents (34%). Some members suggested that the municipality should not be so ambitious (23%) and should provide more information (17%) or make the process more transparent (8%). Other recommendations included offering child-related activities (13%), improving existing projects (14%), not taking private land (8%), improving safety for children (4%), and general safety (2%).

**Table 4.** Responses regarding site impressions and enjoyment questions 4–6.

Free Text	Aggregated Response	Total
4. What concerns do you have regarding the proposed project? (N = 345)	Disruption from construction	32%
	Loss of property value	22%
	Increased public access/foot traffic	18%
	Will not be maintained	15%
	Decreased privacy	12%
	Eminent domain	12%
	Not enough funding	8%
	Safety	5%
	Unsanitary water	4%
5. What are your opinions regarding how the municipality has engaged the residents? (N = 87)	Hostile	43%
	Have not listened	31%
	Needs to engagement more	12%
	Bullied residents	7%
	Has been good	5%
	Needs better guidance	3%
	Lacked technical expertise	1%
	Provide more information	1%
6. What recommendations do you have for better engagement? (N = 362)	Make changes to plans	36%
	More resident involvement	34%
	Don't be so ambitious	23%
	Provide more information	17%
	Improve existing projects	14%
	Child activities	13%
	Make the process more transparent	8%
	Don't take private land	8%
	Improved safety for children	4%
Improve general safety	2%	

The members of the 'Fredlydalen Velforening' neighborhood resistance group expressed their concerns, opinions, and recommendations on the proposed project and how the municipality has engaged with the residents. Their feedback provides valuable insights for the municipality to consider as they move forward with the project, and the recommendations presented suggest ways in which the municipality can improve communication and engagement with the residents.

#### 4.2. Establishing Themes

Statements were collected and coded, which provided critical observations and feedback pertaining to the conflict between the municipality and residents. The statements were coded following Braun and Clarke's (2013) recommendations and the practical step-by-step guidelines laid out by Maguire and Delahunt [53]. There were 1388 critical statements collected from the document study (42), interviews with the municipal planners (214), and interviews with the 'Fredlydalen Velforening' representatives (1132). The analysis reveals significant trends across the various groups, resulting in three main themes being established: communication, engagement, and environmental awareness.

Communication emerges as a predominant theme, constituting 64% of the critical statements from documentation analysis, 28% of statements collected from municipal planner interviews, and 31% of statements collected from 'Fredlydalen Velforening' representatives. Of particular interest, only 8% of critical statements collected from the municipality addressed challenges or failures in engagement, whereas 44% of the statements

collected from ‘Fredlydalen Velforening’ representatives express engagement-related issues. While environmental awareness is lacking in documentation, 62% of critical statements from municipal planner interviews address it, with a general sense that the residents did not understand or appreciate project-related environmental concerns. The ‘Fredlydalen Velforening’ representatives express environmental concerns in 23% of their statements.

These findings highlight the importance of addressing these areas to improve the overall planning process. The ‘Fredlydalen Velforening’ representatives were particularly vocal about communication and engagement, while the municipal planners expressed greater concerns in the area of environmental awareness. These findings are documented in Table 5.

**Table 5.** Theme-coded critical statements.

	Documentation	% Critical	Municipal Planners	% Critical	‘Fredlydalen Velforening’	% Critical
Communication	27	64%	62	28%	361	31%
Engagement	15	35%	18	8%	504	44%
Environmental Awareness	N/A		134	62%	267	23%
Total Statements	42	3%	214	15%	1132	81%

These themes arose at the intersection of data and interpretation, with the researcher exercising personal involvement and empathetic understanding. It is worth noting that in reflexive TA, there is room for flexibility and variability. The themes were derived from the semi-structured interviews and then analyzed with descriptive statistics, as well. The conclusions drawn from the research were based on the findings of one coder and further committee review, while reflecting the values of a qualitative paradigm, should be considered subjective and interpretive.

## 5. Recommendations

Through the coding and analysis of the results, the themes of communication, engagement/inclusion, and environmental scope and purpose were established. Within this discussion, the authors have put forward the following recommendations.

### 5.1. Communication

The findings highlight the importance of effective communication and community engagement in projects that affect residents. The planning office could have benefited from consulting with residents before project planning began, addressing their concerns and needs, and working pre-project to build trust with the residents. By doing so, the planning office could have avoided the negative reaction from residents and created a more positive and collaborative environment for the project. The Planning and Building Act mandates the facilitation of public engagement, but this typically involves submitting a completed proposal for a public hearing instead of using local feedback to shape the proposal during its development. The extent of public participation is often limited to accepting or rejecting a finished proposal. While the municipality has emphasized that they followed the ‘letter of the law’, the residents did not feel that they were encouraged to provide feedback. The residents felt the municipality intended to fulfill the required protocols but was not interested in engaging the residents in a productive debate about the plan and uses. Additionally, complaints were made of a ‘heavy-handed approach’, including opening public meetings with lawyers presenting the municipality’s right to eminent domain. Based on the statements provided, here are four recommendations for improving communication between the planning office and the local community:

- **Consult with the residents before initiating pre-project planning:** The planning office should engage with residents and stakeholders to understand their concerns and wants. This can involve organizing meetings or focus groups, sending out surveys, or other methods of community consultation.
- **Use clear and empathetic language:** During meetings, the planning office should use clear and simple language to explain the project and its potential impact on the community. They should also demonstrate empathy by actively listening to residents' concerns and following them up in a timely manner.
- **Build relationships with local representatives:** The planning office can work with the local community to identify and facilitate communication and engagement with residential leaders. This can involve organizing joint meetings or events, leveraging local networks to reach more residents, and establishing ongoing communication channels between the planning office and the community.
- **Follow up with residents:** The planning office should follow up with residents after meetings or consultations to address any remaining concerns or questions. They can also open direct channels to provide information on how residents can stay engaged with the project and provide feedback.

These recommendations can help build trust and establish a more collaborative relationship between the planning office and the community, ensuring that residents feel heard and that their concerns are addressed effectively. These actions will build trust and demonstrate that the planning office values the community's input and involvement.

### 5.2. Engagement

The findings suggest the residents felt that the municipal planning office did not adequately take their concerns into account. They believe that changes made by politicians to city planning projects that counter the interests or desired solutions favored by the municipality are often shelved until an election cycle results in a more favorable political board. They believe that there are not enough checks and balances on the municipality and that there is very little holding them accountable to the protests of the residents and the decisions of the politicians. It should be noted that the project was partially halted due to community protests, so public engagement did have a tangible effect on the outcome of the case. As such, the project was affected by the rights to protest as enshrined in the Planning and Building Act, although with unsatisfactory results. Effectively, the residents could not influence the project in any other way than rejecting it. Meanwhile, the municipality remained intent on eventually completing the project as initially envisioned. This highlights the need for a mechanism to make projects more adaptive to public priorities. Based on the results, some recommendations to improve engagement in a municipal planning office have been made, detailed as follows:

- **Increase transparency:** The municipal planning office should aim to be more transparent by providing clear and concise information on the proposed projects. This could be performed by providing visual aids, such as maps, diagrams, and charts, to help residents better understand the project.
- **Allow for open dialogue:** The municipal planning office should allow for open dialogue with residents during the meetings. This can be performed by setting aside more time and availability for residents to ask questions and express their concerns. The municipal planning office should also respond to all questions and concerns raised by residents. This can be performed by providing written responses to questions or by setting up a follow-up meeting to address any remaining concerns. The municipal planning office also should offer more meetings to ensure that residents have ample opportunities to express their concerns and ask questions.
- **Collaborate with political representatives:** The municipal planning office should work with political representatives to ensure that the residents' concerns are heard and addressed. This can be performed by holding joint meetings with residents and

political representatives. The municipal planning office should then seek feedback from residents on the engagement process itself to identify areas for improvement, which can be done through surveys or focus groups.

- **Establish accountability measures:** The municipal planning office should establish accountability measures to ensure that they are held accountable for the protests of the residents and the decisions of the politicians, possibly by setting up a feedback system or by creating a citizen oversight committee.

These recommendations can improve engagement by increasing transparency, allowing for open dialogue, collaborating with political representatives, and establishing accountability measures. By being more transparent and providing clear information, residents can better understand the proposed projects. Allowing for open dialogue and responding to residents' concerns can help build trust and improve engagement. Collaborating with political representatives can ensure that residents' concerns are heard and addressed. Finally, establishing accountability measures can ensure that the municipal planning office is held accountable for its decisions and actions.

### 5.3. Environmental Awareness

The municipal planning office plays a crucial role in educating the public about the environmental benefits of various projects. However, municipal–public interaction about a project may be limited to the municipality presenting a proposal for a public hearing, which gives residents the opportunity to accept or reject it partially or in full, but without necessarily learning the key concepts behind the plan or giving recommendations on key changes. Residents did not exhibit an understanding of the environmental benefits of opening the stream, SUDS in general, and had no knowledge of the regulatory policy structures guiding the municipality required by the Norwegian Water Directive. Here is a short summary of how the municipality can improve public education in individual projects:

- **Public consultations and workshops:** Organizing public consultations and workshops to explain the environmental benefits of projects in detail, address concerns, and gather feedback. By actively involving the public, the planning office can foster a sense of ownership and environmental stewardship.
- **Online platforms and resources:** Utilizing online platforms, such as the municipal website or social media channels, to provide a comprehensive understanding of the environmental benefits.
- **Collaboration with local organizations:** Partnering with local environmental organizations can enhance the planning efforts. Collaborations like joint awareness campaigns, sharing educational materials, or organizing joint events to educate the public about the environmental impacts of a project.
- **Educational campaigns and events:** Launching educational campaigns and local events. The planning office can organize workshops, seminars, or public exhibitions specifically focused on environmental benefits. Collaborating with local educational institutions can also reach a wider audience, including students and young people.

By employing these strategies, the municipal planning office can effectively educate the public about the environmental benefits of projects, building greater community support for sustainable development initiatives by informing and engaging the community.

## 6. Conclusions

Analysis of the Fredlybekken brook restoration project revealed key issues that were sorted into three themes from which lessons can be learned. The themes help explain the faults of this project and provide guidance for future projects. The three themes are communication, engagement, and environmental awareness. Together, they show that the municipality's approach to implementing the Fredlybekken project lacked consideration for the residents' perspective and failed to make clear the needs for and benefits of the

brook restoration. The municipality also failed to predict and respond to the reactions and responses from the residents. Meanwhile, the residents had limited opportunities to affect the project other than accepting or rejecting it. Local protests led to the extended delay and eventually partial cancellation of the project, but no fundamental changes to the plan. As of the publication of this article, the portion of the Fredlybekken project that runs through the residential area remains stalled indefinitely.

The themes show that for the timely implementation of future projects, the municipality should improve its communication through a higher degree of collaboration and engagement with residents on awareness of the environmental necessities of SUDS infrastructure. The Planning and Building Act enshrines the right to protest, but current practices do not necessarily provide residents the opportunity to change the planned concepts. It is left to the municipality to create a plan that may be accepted or rejected, but there is a lack of mechanisms for public engagement to shape the plans according to local feedback. A more open and transparent process improves the probability of public acceptance and support.

These findings are aimed at public policy makers and municipal administrations within the Norwegian and European contexts. The general conclusions are also relevant for countries within the EU and other egalitarian countries with similar climate challenges and comparable processes for implementing public building projects. Future work should be seen to verify the results of the present study through analysis of more projects. A case study project should be carried out with the recommendations in mind and followed up with interviews of all stakeholders to assess the effectiveness of the recommendations. The recommendations could then be structured in a guiding framework and made available to municipalities to aid future projects. International studies would also be valuable in studying how cultural dimensions affect the acceptance of SUDS implementation affecting residential areas.

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