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# Vulnerable Groups in Climate Adaptation in Oslo Municipality

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## Forword

This thesis marks the end of my master's program in Urban and Regional Planning at NMBU. I am grateful for this opportunity and everything I have learned during my education. I have learned a lot about myself and an interesting subject that I otherwise would not have.

I wish to thank everyone who has assisted and supported me during an often frustrating and challenging process. Thanks to the informants from Oslo municipality for participating. Lastly, many thanks to my supervisor Matthew Cashmore for your patience and for always helping me when I asked.

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## Abstract

Cities are starting to feel the effects of climate change and climate adaptation is becoming increasingly important. It is the most vulnerable in society that are also the most affected by climate change. Concerns about equity and justice on who is responsible for climate change has moved to the urban environment and climate adaptation. Researchers are now more interested in the relationship between, political, economic, and social systems and adaptation. However, justice and fairness of vulnerable groups in decision-making and distribution of climate adaptation has not been significantly prioritized.

Oslo is a city that is feeling the effects of climate change and is implementing surface water measures to handle the projected precipitation. How are vulnerable groups considered and included in climate adaptation planning in Oslo municipality? This thesis utilises document analysis and interviews of adaptation planning documents and planners, that will give insight to the scope of the inclusion of vulnerable groups in adaptation by using Oslo as a case study.

This study shows that Oslo treats vulnerability as an end point, where exposure minus adaptation defines a systems vulnerability. Consequently, the built and natural environment is considered the most vulnerable in the city of Oslo. Climate adaptation is concerned with safeguarding the urban environment through blue-green infrastructure. Vulnerable groups are there for underrepresented in climate adaptation planning in Oslo though municipal planners ensure that adaptation measures are safe and accessible. Changing the way Oslo municipality evaluates vulnerability, to vulnerability as a starting point, might illuminate possible injustices with adaptation planning. Offer greater consideration to vulnerable groups.

# Innholdsfortegnelse

# Chapter 1. Introduction

## 1.1. Introduction

Climate change has been established as a result of human activity. Its impacts on ecosystems and human societies are already presenting themselves, and expected to worsen if action is not taken (IPCC, 2021; IPCC, 2022). In response to these threats measures have been made in the form of mitigation and adaptation to limit the effects of climate change. However, because temperature will continue to increase through the first half of the century and the effects of climate change are already evident (IPCC, 2021; IPCC, 2022) an increased effort in adaptation is needed (Carter et al., 2015; Eriksen et al., 2011).

Climate adaptation, defined as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007), has become more relevant in dealing with the effects of climate change. Research on climate adaptation has expanded significantly in the last decades (Meerow & Mitchell, 2017), from its evolution from studies of biophysical impacts of environmental change separate from urban studies and planning. Climate adaptation research is now increasingly concerned with the relationship between social, economic, political systems, and climate adaptation (Meerow & Mithcell, 2017). Though climate change is a global problem, it is manifested on the local scale, and adaptation is implemented locally. Thus, local governments have received growing attention as the main drivers for climate adaptation (Measham et al., 2011).

Many cities, including Oslo, are situated along coasts or other bodies of water making them vulnerable to flooding (Bulkeley, 2013). Over half the world's population live in cities and is expected to grow to 68 % by 2050 (United Nations, 2019). Growing urbanization, inequality, and the complex networks of infrastructure and concentration of cultural and economic assets further increase cities vulnerability to climate change (Carter et al., 2015). Cities also consume vast amounts of energy and produce about 70 % of global greenhouse gas emissions (Mukim & Roberts, 2022).

At the same time climate justice has focused more on individuals' responsibilities to climate change and justice in climate adaptation at the urban scale (Bulkeley et al., 2013). Because

vulnerability to climate change differ based on behaviour, pre-existing conditions, socio-economic factors and spatial distribution of different groups in society (Adger, 2006; Hiago Pereira Barbosa, 2020; IPCC, 2022; Kim et al., 2014). Creating unequal distribution of climate risks in cities. And connections between vulnerability and the ability to adapt, where groups who experience increased vulnerability have reduced adaptive capacity (O'Brien, 2004). Climate justice seeks to address these inequalities through three principals, distribution, procedural, and recognitional justice in adaptation planning (Newell et al., 2021). However, justice and fairness concerns when it comes to distribution of adaptation benefits and representation in decision-making in climate adaptation has been underprioritized (Owen, 2020).

There is a relationship between equity in climate adaptation and sustainability, as they both seek to address social inequality and ensure sustainable development. Oslo's proclaimed efforts on sustainable development and climate opens for the investigation of how Oslo sees the potential climate adaptation have in addressing issues related to social development. As Oslo has identified extreme precipitation as its prioritized climate challenge. It is now focusing on implementing measures to handle increased surface water and urban floods. At the same time Oslo has a diverse population with social differences in and between city districts which are increasing, as well as a strained housing market with high prices (Oslo kommune, 2019e). This thesis therefore seeks to identify the inclusion of vulnerable groups in climate adaptation in the city of Oslo, Norway based on planning documents and interviews of municipal planners.

## 1.2. Research question

Based on the introduction the research question is stated as follows:

- How are vulnerable groups accounted for in local climate change adaption by municipal planners in Oslo municipality?

To aid in answering the main research question the following sub-research questions have been constructed:

1. How are vulnerable groups taken into account in policy and planning documents that deal with climate change adaptation?

2. How do municipal planners work with climate change adaptation at the local level, and how are vulnerable groups considered and included?

## 1.3. Purpose and delimitation

The purpose of this master's thesis is to investigate how vulnerable groups are included in the process of adapting to climate change through consideration from the municipality and in participation processes. Through a case study of Oslo municipality, reviewing relevant literature on inclusion of vulnerable groups in planning and local planning documents regarding climate adaptation. Because this is a master's thesis time is limited and the assignments focus is on local climate adaptation in Oslo based on vulnerable groups vulnerability and using the IPCC reports as a guide to identify relevant and important topics related to the research question.

## 1.4. Structure

The thesis is structured through 7 chapters, starting with the introduction introducing the research question and vulnerable groups in relation to climate adaptation and how vulnerable groups are disproportionate affected. Chapter 2 presents literature and theories relevant to climate change regarding vulnerable groups. Chapter 3 Describes the methods used, research design, Oslo as a case study, and interviews. Oslo as a case is described in chapter 4 with expected climate changes in Norway, Oslo. Chapter 5 presents the findings from the document analysis and interviews. Chapter 6 discusses the findings from the document analysis and interviews. And the conclusion in chapter 7.

# Chapter 2. Theory

This chapter will present a review of the theory relevant to the objective of this thesis. The research question suggests a focus on vulnerability, inclusion, and climate adaptation, as well as climate justice from its relationship with vulnerability and inclusion.

## 2.1. Sustainable climate change Adaptation

Adaptation means "a response to a perceived risk or opportunity" (Pelling, 2011). And is one of the main types of responses to dealing with climate change. Climate adaptation is defined by the IPCC as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007). The goal of climate adaptation is to reduce the negative effects of climate change on natural and anthropogenic environments, economic resilience, and social vulnerabilities giving it similarities to sustainable development (Fiack et al., 2021).

There is agreement that social inequalities exacerbate exposure to climate impacts as marginalized groups are more likely to have pre-existing conditions, be more exposed to environmental harm, have less access to public services, infrastructure, and financial resources (Eriksen et al., 2011; Fiack et al., 2021). However, social equity concerns in climate adaptation planning has received limited focus (Fiack et al., 2021). Because climate change has been regarded as an environmental concern (Eriksen et al., 2011).

Sustainable climate adaptation implies that some climate actions result in social and environmental externalities, trade-offs, and negative consequences (Eriksen et al., 2011). Seeking to remedy this by including considerations of the effect of adaptation on social groups, places, and socio-ecological systems. Sustainable adaptation integrates social justice and environmental integrity in climate adaptation (Eriksen et al., 2011).

Eriksen et al. (2011) suggests that sustainable adaptation should include some principles when planning for adaptation. First, vulnerability is defined by more than just exposure to climate stress. Assessing vulnerability should include a holistic understanding of vulnerability also considering underlying drivers like social, institutional, cultural, and economic factors (Eriksen et al., 2011). Secondly, that there are different values and interests that affect adaptation strategies. That one group favours a particular strategy because it protects their interests, even though it might hinder sustainable adaptation or

neglecting the needs of other groups. Sustainable adaptation should be based on a transparent decision making process and access to information (Eriksen et al., 2011). Thirdly, adaptation should be based on a mix of knowledge. By including local knowledge in adaptation with other sources, perspectives and local communities understanding of climate challenges adaptation will be more sustainable and effective (Eriksen et al., 2011). Lastly, considering feedbacks between local and global processes. Local adaptation efforts do not exist in isolation from other adaptation and mitigation efforts spatial or temporal. Considering the effects adaptation may have will help create sustainable adaptation. For example, adaptation that require large amounts of energy may result in increased GHG emissions resulting in continuing global warming (Eriksen et al., 2011). Or green infrastructure and parks that can increase property value and displaces low-income residences resulting in green gentrification (Rigolon & Németh, 2020).

## 2.2. Adaptive Capacity

Adaptive Capacity in the climate change literature is defined as "the ability of a system to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (Brooks et al., 2005). It is related to climate adaptation as it describes a country, community, business, individual and so on ability to adapt. Adaptive capacity is also related to vulnerability. Either as a segment of vulnerability or the opposite, reducing when vulnerability increases (Pelling, 2011).

Adaptive capacity varies from individual, community, place, and over time. Affected by factors like health, education, social capital, living conditions, technology, and access to services and resources (Bulkeley, 2013).

## 2.3. Vulnerability

There is no single definition of vulnerability and the identification of "the vulnerable" will vary depending on which metrics is chosen to determine vulnerability (Adger, 2006; Füssel, 2007; O'Brien, 2004). The IPCC defines vulnerability in the context of climate change as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes" (IPCC, 2007). O'Brien (2004) further distinguishes between vulnerability as an end point and vulnerability as a starting point within the discourse on climate change.

Vulnerability as an end point is determined by examining climate projections and adaptation measures. It focuses on the degree of exposure to climate change after adaptation efforts have been implemented (O'Brien, 2004). On the other hand, vulnerability as a starting point considers how different environmental and social factors interact leading to increased vulnerability, aggravated by climate change (O'Brien, 2004).

Adger (2006) note that vulnerability is tied to political economy and resource use. Distribution of power and human actions, whether deliberate or unconscious, as well as geographical and environmental exposure, determine vulnerability (Adger, 2006). Therefore, vulnerability is influenced by both biophysical and socioeconomic factors (O'Brien et al., 2004). Biophysical factors such as the location and residency of individuals, as well as the magnitude of climate change related hazards like extreme weather events, landslides, droughts, and flooding. How individuals are affected by these events and their ability to prepare for, respond to, and recover from them, is affected by socioeconomic factors. Wealth, status, access to resources, infrastructure, education, gender, and information, are examples of some socioeconomic factors that further contribute to vulnerability (Adger, 2006; O'Brien, 2004).

### 2.3.1. Vulnerability of different groups

The literature on people's vulnerability to climate change is mainly concerned about morbidity and mortality (Lawler & Patel, 2012). Children, elderly, socioeconomic disadvantaged groups, and people with disabilities are some groups that are identified as particularly vulnerable based on their age, physical, cognitive, and financial disadvantage. Vulnerability can be further affected by policies and political prioritization, geographic location, infrastructure, and access to services.

Childrens vulnerability to climate change is mainly related to health and well-being. Children are still undergoing physical, mental, and psychological development and their dependency on others make them more susceptible to direct and indirect consequences from climate change. Children are at higher risk of being killed, injured or psychological stress during and after natural hazards (Benevolenza & DeRigne, 2019; Lawler & Patel, 2012). Children are also threatened by diseases and other heat related incidences as malnutrition from food shortages, water contamination, diarrhoeal and vector-borne diseases (Lawler & Patel, 2012).

Older citizens, aged 65 and older, are another group that is identified as more vulnerable to climate change (Carter et al., 2016; Rhoades et al., 2018). Climate change stressors disproportionally affecting elderly include heat waves, flooding, droughts, poor air quality, and infectious diseases (Rhoades et al., 2018).

People with disabilities experience increased vulnerability to natural hazards (Abbott & Porter, 2013) as physical impairments can increase susceptibility to extreme temperatures or cognitive impairments limiting understanding of events and preparedness (Gaskin et al., 2017). The vulnerability of disabled people is further strengthened by their economic standing by being some of the poorest in high- and low-income countries (Priestley & Hemingway, 2006) and their reliance on public services, community and family (Abbott & Porter, 2013).

## 2.4. Climate justice

Climate justice is a concept that addresses responsibility for climate change and just distribution of resources. Climate change disproportionally affects the most vulnerable, who also are the ones contributing least to climate change and in turn have the weakest voice. Therefore, issues of justice have been an important part of the climate change discourse (Bulkeley et al., 2013; Newell et al., 2021). Initially attributed to the global climate debate, climate justice sought to negotiate responsibilities and duties of reducing GHG emissions and distribution of financial and mitigation/adaptation aid (Bulkeley et al., 2013; Bulkeley et al., 2014). However, the international level is argued to no longer be suitable for climate justice, as it does not cover all contributors to climate change (Bulkeley et al., 2013; Bulkeley et al., 2014). Urban climate justice is therefore relevant because contributors to climate change does not only exist in the global north. At the same time not everyone in the global north shares the same responsibility to climate change. Introducing a local focus to climate justice, to the individual, community, and corporations, spreads the responsibilities of climate change more equitable by including privileged entities within nation-states and also from the global south (Bulkeley et al., 2013).

Multiple types of justice or “pillars” form the foundation of climate justice. Seeking to ensure a fair, accountable, and transparent decision-making process for climate measures, procedural justice stresses the importance of inclusion of different views and values through

participation (Mohtat & Khirfan, 2021; Newell et al., 2021). Distributive justice entails just outcomes. How costs and benefits are distributed throughout and across society regardless of their adaptive capacity or socio-economic status (Mohtat & Khirfan, 2021). Recognitional justice underpins procedural and distributive justice. Recognising legitimization of different social groups, minorities, and other marginalized groups facing social, political, and cultural exclusion and their right to be included in decision-making processes (Bulkeley et al., 2014; Newell et al., 2021). As well as recognition and identification of past and present drivers of inequality, vulnerability, privilege, and segregation (Mohtat & Khirfan, 2021).

## 2.5. Participation

To participate in planning is to be included in some way in the planning process to affect decisions and is another form of democratic practice other than voting. Participation is argued to promote knowledge and democracy in planning, as well as providing community and a sense of citizenship and ownership (Aarsæther et al., 2018). Participation, particularly by the most vulnerable, in decision making processes is, as well, a central part of just climate action (IPCC, 2022). Countries have also introduced requirements for participation in the legislation, for example Norway with its Planning and Building Act (Plan- og bygningsloven, 2008).

Involving the public in planning introduces a wider range of perspectives and more voices are heard. It is believed that planners and decision makers will consider the views of participants creating just solutions and development (Aarsæther et al., 2018). When citizens are included and participate in decision making, they will also get ownership of the process and environment. And become better citizens by building tolerance and acceptance of different points of views from exposure and socialisation between beliefs and social groups (Aarsæther et al., 2018). Lastly, involving citizens may provide local knowledge not available to experts as it is the citizens who interact with cities and spaces. This is said to improve the decisions and create more appropriate responses and innovative solutions (Aarsæther et al., 2018).

Participation is therefore noted by Innes and Booher (2004) to have five purposes. (1) Participation seeks to capture the public's wishes. (2) Take advantage of the local knowledge. (3) Ensuring justice and fairness by enabling inclusion of less advantaged groups.

(4) Legitimising decisions by evaluating the publics input. (5) To satisfy legislative demands (Innes & Booher, 2004).

Arnstein (1969) conceptualises participation as an eight-rung ladder as shown in the illustration above (figure 1). Divided in three sections that represent nonparticipation, tokenism, and citizen power where higher rungs symbolise increased citizen empowerment and influence over decision-making. Illustrating that participation is not always participation (Arnstein, 1969). She argues that decision-makers must engage in power-sharing with citizens, empowering them with authority to make decisions, but that most participation as information meetings and hearing, where citizens are reliant on decision makers to take it to heart, result in nonparticipation or tokenism (Arnstein, 1969). Arnstein notes that her illustration of participation is a generalisation, as in the real world there may be many more "rungs" of participation. As well as the division of decision-makers and citizens into two opposite sides as there would be competing interests, point of views and sub-factions (Arnstein, 1969). Neither does Arnstein's typology consider barriers to participation such as social and political exclusion, unwillingness to share power, or lack of knowledge (Arnstein, 1969).

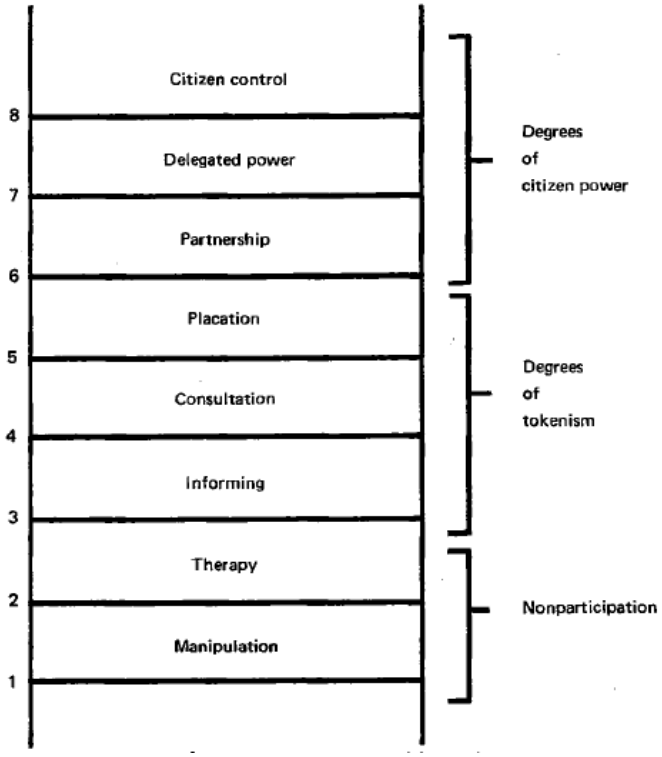


*Figure 1 Arnstein's Ladder of Citizen Participation (Arnstein, 1969)*

# Chapter 3. Method

## 3.1. Research design

Research design is, in short, the manor of how a study is conducted. Research design gives the researcher a framework of how they will conduct their work and serves as an outline for the project. It entails the method and scope of the study, starting with a research question and evaluation of how the study can be conducted from start to finish (Johannessen, 2011).

## 3.2. Case

A case can be both a subject of study and research design. A case is used to analyse and gather lots of data from e.g., a single event, location, individual, organization or activity. And is popular in business and social research often in combination with qualitative approaches as observations and interviews (Bell, 2019). A distinguishing feature of a case study is that it allows the researcher to focus on a particular case over a duration of time and gather extensive and detailed data. Case studies are suitable when investigating why and how something happens and to questions about understanding (Johannessen, 2011).

This thesis uses Oslo municipality as a case. The reasoning for using case study was the nature of the research question that seeks to gain an understanding of if and how involvement of vulnerable groups happens in climate adaptation. Oslo was chosen because of the availability of information, climate adaptations relevance to dense and developed areas, and Oslo's focus on green and sustainable development. Oslo municipality is in addition already experiencing challenges related to increased precipitation and urban flooding.

When conducting research based on case studies the researchers should be mindful of limitations regarding generalization as it is based on a single instance.

## 3.3. Document analysis

Document studies are a complementary and suitable research method in case studies. The availability of public documents, plans, and strategies is a source of large amounts of data. Analysis of public documents can provide context to why and how Oslo municipality operate as it does. As well as supplement other research methods by verifying data from other sources, strengthening the data's reliability (Bowen, 2009).

The document analysis was identified as most suitable to answer the 1. sub research question as it sought to understand Oslo municipality's strategy and plans that lay the foundation for municipal planners to follow. This way the document analysis also functioned as background for the interview process giving context to their answers and the analysed data.

The documents that were used in the analysis were identified based on the 1. sub research question related to climate adaptation. Relevant documents were identified through the municipal master plan climate strategy that mentioned surface water as Oslo's adaptation strategy. As such documents related to climate goals and adaptation were gathered from the Oslo municipal's home page. Later, documents related to participation were included because the Planning and Building agency was unavailable for interviews to supply data on participation. The documents were analysed using content analysis where relevant themes identified from the research question was search for. keywords that were used were "climate adaptation", "vulnerable groups", "surface water", "vulnerability", "participation", "involvement" and variations of these like "adaptation", "children" and so on. This allowed to identify sections of relevance and understand their context.

| Document (year) | Document level/Type |
|---|---|
| **Our City, Our Future (2019)** | Local/Master Plan |
| **Climate Strategy for Oslo Towards 2030 (2020)** | Local/Strategy |
| **Strategy for Surface Water Management in Oslo (2013-2030)** | Local/Strategy |
| **Action Plan for Participation 2019-2020 (2019)** | |
| **Participation in Submitted Regulation Plans (2019)** | Local/Guidance document |

*Table 1: Municipal documents and strategies included in the document analysis.*

### 3.4. Interviews

The research question for this study called for the investigation of how planners worked with vulnerable groups. Interviews were chosen as a method of data gathering because there was a need to identify practical experiences from the planners on how they involved vulnerable groups in climate adaptation.

In qualitative researche semi structured interviews are preferred over structured interviews compared to quantitative research. Semi structured interviews can provide richer

descriptions of what the researcher wants to explore because the participants have the possibility to present their point of view and focus on what they deem relevant to the topic. in addition, freedom to answer on the participants side can introduce new points of view to the researcher (Bell, 2019). Compared to unstructured interviews, semi structured interviews also give the opportunity to hinder the informants of wandering completely of topic.

It was conducted five semi structured interviews with a total of eight participants from three municipal agencies and two city districts in Oslo during this thesis. Semi structured interviews were chosen because it allowed for focusing on the research questions of this thesis without wandering to far of topic, and letting the participants present their experiences on the subject (Bell, 2019). An interview guide was constructed with seven questions that was used for all the interviews. Several interviews were conducted in pairs, hence eight participants but only five sessions. This was because the informants asked if they could bring a colleague they thought had relevant information. By doing interviews in pairs a lot of time from conducting interviews was saved, and more experience were presented. However, there is a possibility that one informant "overshadows" the other, by talking more or being eager, this can be a problem if a person in the groups is shy, or more reserved than the other. This was the experience in one of the sessions. One interview was held digitally over teams as this suited the informant best, while the remaining were held in person at the place of work of the informants.

| Agency/City district | Interview format | In text reference | Date |
|---|---|---|---|
| City district Bjerke | Digital | Informant 1. | 23.03.2022 |
| City district Sagene | In person | Informant 2.<br>Informant 3. | 29.03.2022 |
| The Climate Agency (Klimaetaten) | In person | Informant 4. | 31.03.2022 |
| The City Environment Agency (Bymiljøetaten) | In person | Informant 5.<br>Informant 6. | 22.04.2022 |
| The Water and Sewage Agency (Vann- og avløpsetaten) | In person | Informant 7.<br>Informant 8. | 29.04.2022 |

*Table 2: List of informants*

Subjects for the interviews were chosen strategically based on the municipal agencies and city districts responsibilities that seemed relevant to the purpose of this thesis, namely climate adaptation. Because climate change adaptation is a sector wide topic that needs a trans disciplinary approach, the responsibilities for different agencies were identified on the municipality's home page. Agencies responsible for water management, city environment and development of public spaces, strategy development for climate change management, and city districts responsible for public services and community development were identified as relevant to the interview process due to their connection to local communities. The Planning and building agency (Plan- og bygningsetaten) who is responsible for overall city development and public participation in planning and development was an obvious candidate for interviewing, unfortunately attempts on getting representatives for interviewing failed. Workers from PBE were either too preoccupied or felt they had nothing to contribute with in relation to the thesis subject.

### 3.5. Ethics

During the interview phase handling of the informant personal data occurred. This thesis follows standard research ethical principles of informed and voluntary consent and is registered with the Norwegian Agency of Shared Services in Education and Research (Sikt) – formerly Norwegian Centre for Research Data AS (NSD) – who approved the handling of personal data and that it was in accordance with the privacy legislation.

The informants received information about the project before the interviews took place, that they had the right to withdraw from the project at any time. And asked for permission to record the interviews and informed that recordings from the interview would be deleted after transcription of the interview. All informants consented to participate in the interview and that the interview was recorded. The informants have been anonymised and they were sent the data from the interviews that has been used in this thesis for approval.

### 3.6. Reliability

Related to the use of data, how it is gathered and processed, reliability regards the believability of the research and to what extent the study can be replicated (Bell, 2019). Reliability in qualitative research can be somewhat difficult as data it is temporal and spatially context dependant.

To strengthen reliability, it is advised to give in-depth description of the context of the case and approach to the research.

### 3.7. Validity

Validity in qualitative researche entail if the method used in the study to answer the purpose of the study is suitable. Discussing the methods that have been used strengthen validity (Johannessen, 2011). By using multiple methods in the study, the data from the different methods may confirm each other strengthening validity this has been demonstrated in this study where the informants confirmed a finding in the document analysis, and vice versa.

# Chapter 4. Case

## 4.1 Oslo

Oslo is the capital and largest city in Norway. It is also a municipal and county. Oslo is a city that commits itself to climate and environmental work. It was the first municipality that published a climate adaptation strategy (Oslo kommune, 2020b), and has been doing well in international competitions related to climate. In 2019 Oslo won the European Green Capital Award (Oslo kommune, u.å.-a). As well as being appointed one of EU's 100 cities to participate in the EU Mission and become climate neutral by 2030 (Forskningsrådet, 2022).

**EU Green Capital Award**

Annual award given to cities with ambitious environmental and climate goals, that work towards improving the environment, economy, and quality of life (European Commission, u.å.).

Situated east in Norway at the end of the Oslofjord Oslo is a coastal city with the sea to the south and hills and forests to the north (Marka). The city and urban area make up approximately 1/3 of the municipality's area, mainly on low lying land by the fjord, with the remaining 2/3 being hills forests and water. There are 10 main rivers running through the municipality, most of them with outlet in the Oslofjord and catchment area in Marka.

**EU Mission**

An initiative to facilitate cooperation between the public and private sector, and citizens to reach goals that among other things relate to climate adaptation, water and ocean restoration, and climate-neutral and Smart Cities (European Commission, 2021).

## 4.1. Demographic

As one of the fastest growing capital cities in Europe (Andersen & Skrede, 2017), Oslo's population is expected to grow from almost 700 000 (2022) inhabitants to around 800 000 by 2050 (Oslo kommune, 2019e; Statistisk sentralbyrå, 2022) with about 40% of the population growth attributed to immigration (Andersen & Skrede, 2017). Oslo is using the year 2040 as a reference in their current municipal plan from 2018, where they state that Oslo in the coming years is expecting high population aging (Oslo kommune, 2019e). Towards 2040 Oslo is expecting an increase of around 44 % of people aged 50 years and older, with a doubling of the population above 80 years old (Oslo kommune, 2019e; Oslo

kommune, 2020c). Apart from the expected population ageing Oslo has a relatively young population with a large proportion of young adults (age 20 - 40) (Oslo kommune, 2020c).

Historically there has also been a spatial class division in Oslo between the wealthier west and poorer east side of the city divided by Akerselva (Ljunggren & Andersen, 2015). There still exists indications of social differences today between city districts. Most city districts on the west side compared to the east side have higher average housing prices. Higher income and wealth. Larger share of people with university education. Fewer people who receive social benefits. And fewer disabled people measured by reduced ability to work. As well as fewer people with immigration background (Oslo kommune, 2019d).

### 4.2. Climate change – Oslo

Climate change in Oslo is, as with the rest of Norway, expected to become, and already is, wetter and warmer. Norway may be regarded as a 'climate winner', because many of the assumed impacts of climate change are regarded as positives, or less consequential than in other regions (O'Brien, 2006). From when temperature measurements started in the early 1900s, the average temperature has increased by 1.7 degrees Celsius. In the same period, precipitation has increased by 15 percent and is manly an increase in extreme downpour (Oslo kommune, 2020a). In a climate vulnerability analysis Oslo presents which changes due to climate change they expect and how it will affect Oslo.

Oslo is expecting different changes in climate resulting in both direct and indirect consequences depending on the success in reducing global GHG emissions. Though, the biggest challenge for Oslo related to climate change will be surface water and urban flooding, which has already resulted in damages amounting to hundreds of millions Norwegian kroners yearly for both the public and private sector (Oslo kommune, 2020a). Surface water and flooding is not only a problem because of the increased intensity of precipitation, but because the sewage network does not have sufficient capacity. Leading to overflow, pollution, and bacterial spread to water ways and the fjord (Oslo kommune, 2020a).

Other consequences related to climate change in Oslo are landslides, heat waves, and droughts. Quick clay is possibly found in the ground throughout Oslo. Which when disturbed by human activity, earthquakes, or heavy rainfall for instance, can change behaviour to a

watery fluid resulting in landslides, causing destruction and endangering human lives and well-being (Oslo kommune, 2020a). Heat waves in Oslo are defined as more than 3 consecutive days where the highest temperature is 28 degrees or more. It has been a doubling of heat waves in southern Norway from 1961-1990 to 1989-2018 (Oslo kommune, 2020a). High temperatures can pose health risks to people who are sick or elderly as well as reduce well-being for populations that are not accustomed to high temperatures, and efficiency in the workplace and schools because few buildings have air conditioning (Oslo kommune, 2020a). Extreme temperatures can as well damage infrastructure and is associated with elevated air pollution (Oslo kommune, 2020a). Drought is becoming more usual in parts of central- and southern Europe. Norway on the other hand is expected to become more humid with rising temperatures and periods with drought may decrease (Oslo kommune, 2020a). Though precipitation patterns vary more from year to year and earlier snow melting and evaporation may lead to periods with reduced water in the summer months (Oslo kommune, 2020a).

### 4.3. Planning system and organisation of municipal agencies responsibilities

Authorities and governments have a lesser or greater need for planning to further their agenda and steer social development to achieve desired outcomes or mitigate unwanted future events (Fainstein & Campbell, 2016). This section will present how planning is conducted in Oslo as well as climate adaptation and the different hierarchies that affect planning and development in Oslo. Starting with a short description of the different planning levels from national to local planning in Oslo, finishing with how Oslo plan climate adaptation.

Planning in Norway is mainly governed by the Norwegian Planning and Building Act (plan- og bygningsloven) (PBL), which make up the legal framework for public/governmental planning. PBL divides planning into three tiers – State, regional and local planning, and equips each level with tools to safeguard their interests and legitimize planning. Each level affects planning and strategy development of the underlying levels, and all levels must relate to the applicable plans and strategies of each level.

The national government, referred to as the government, is responsible for planning at the national level. The government have different tools to guide planning on the regional and local level. National expectations, state planning guidelines, state planning regulations, and

state land use plans are such tools (Holt & Winge, 2019), as well as the states responsibility to pass legislations that can affect planning. PBL is one example of legislation that governs planning and gives authorities legitimacy to plan and steer development in a desired direction.

The county is responsible for regional planning and development. Led by the county council (fylkestinget) the county functions as a link between state and municipal, as well as their own, interests. The county's responsibilities are inter-municipal and suitable to evaluate land use in a regional perspective across municipal boarders. The county develops regional strategies, plans and planning regulations (Holt & Winge, 2019).

The municipal is responsible for local planning. The municipality is given a substantial role in planning by the PBL and is the main authority on land use and development of the three planning levels. The municipality produces the municipalitys master plan that consists of a society section (samfunnsdel) and land use section (arealdel), which is the guiding document for development in the municipality. The society section presents goals and priorities in the municipality. Decisions in municipal development that are not in line with national and regional interests can be met with objections.

## 4.4. Climate adaptation in Oslo

As primary land use authority the municipality is responsible for adaptation to climate change. However, the municipality should follow goals and expectations set by national and regional authorities as to not be met with objections.

### 4.4.1. National goals and expectations for climate adaptation

NOU 2010:10 "Tilpassing til eit klima i endring" is an Official Norwegian Report that maps vulnerabilities, and the need for adaptation to climate change in the society. Highlighting municipalities and plannings role as the main actor for climate work. Also building on the precautionary principle, where doubt or missing knowledge shall benefit nature. (NOU 2010:10, 2010). Meld. St. 33 (2012-2013) "Klimatilpassing i Norge" is a government white paper building upon NOU 2010:10 presenting the notion that everyone (individuals, businesses, NGOs, authorities, and so on) is responsible in adapting to climate change. And that municipalities should have a strategy for surface water management. (Meld. St. 33, (2012-2013)). These documents provide the basis for how climate adaptation should be carried out in Norway.

In *National expectations regarding regional and municipal planning 2019-2023* climate adaptation is mentioned as a challenge for planning, and that high alternatives for climate projections should be the foundation for adaptation. Surface water is a challenge and should be delt with outside of drainage pipes and sewage lines, in nature based solutions like water ways and green areas (Ministry of Local Govornment and Modernisation, 2019).

### 4.4.2. Organization of climate adaptation in Oslo

In Oslo, planning and climate adaptation involve multiple planning documents and actors who need to coordinate their efforts across different sectors and agencies. Collaboration is necessary to ensure effective implementation of projects related to each agency's specific responsibilities.

Documents related to climate adaptation in Oslo municipality are the masterplan *Vår by, vår framtid* identifying urban flooding and surface water as the biggest challenge for Oslo and priority for climate adaptation (Oslo kommune, 2019e). The climate strategy *Klimastrategi for Oslo mot 2030* that presents Oslo's climate goals and how to develop a climate resilient city (Oslo kommune, 2020b). The surface water strategy *Strategi for overvannshåndterin* with accompanying action plan *Handlingsplan for overvannshåndtering* describing strategies for surface water management and how it should be implemented (Oslo kommune, 2014; Oslo kommune, 2019b).

In addition to documents pertaining climate adaptation, participation and involvement from the public and private sector is a priority in Oslo and an integrated part of land use planning in Norway. An action plan for participation *Handlingsplan for medvirkning 2019-2020* was developed. This document describes how Oslo municipality should improve involvement and participation in city development (Oslo kommune, 2019a). And a guide document for proposers of projects *Medvirkning i insendte reguleringsplaner* explaining why participation is important, when and how it should be facilitated, whom to include, and responsibilities (Oslo kommune, 2019c). These documents and the ones in the previous paragraph are reviewed closer in chapter 5.

Several agencies play significant roles in planning and climate adaptation in Oslo. For example, the Planning and Building Agency (Plan- og bygningsetaten) (PBE) has overall responsibility for land use planning, planning processes, construction case processing, and

participation processes. The Climate Agency (Klimaetaten) (KLI) is responsible for developing the climate strategy, implementing climate adaptation measures, and supporting other agencies in achieving municipal climate goals. The City Environment Agency (Bymiljøetaten) (BYM) manages public areas such as streets, parks, plazas, water bodies, and the natural reserve area known as "marka." BYM is involved in projects related to public areas, biodiversity, and ecosystems. They also process applications for transferring surface water to recipients such as rivers or fjords. The Water and Sewage Agency (Vann- og avløpsetaten) (VAV) is responsible for maintaining the city's pipelines, managing drinking and sewage water, and assisting developers in implementing surface water management measures.

It is important to note that agencies collaborate and coordinate their efforts based on the specific responsibilities they hold. For example, when projects are related to an agency's jurisdiction, they may be involved in permission applications or express their interests during hearing instances.

# Chapter 5. Findings

This chapter will present the findings from the document analysis and interviews. The findings from the document analysis are presented first, then the interviews.

## 5.1. Document Review

The document review looks at different documents relevant to the research questions affecting development in Oslo municipality. Public documents entailing climate adaptation and participation was identified as relevant. Documents on climate adaptation may reveal strategies, priorities, and considerations that are made when planning adaptation measures. Documents on participation may reveal priorities in the participatory process of development and construction projects which climate adaptation projects are a part of. The documents are presented from general to specific ending with participation.

## 5.2. Municipal Climate Adaptation Planning

The local plans are presented in order of general to specific planning documents. Starting with Oslo municipality's master plan; The master plan for Oslo functions as the main planning strategy for the municipality and describe overarching goals and strategies more generally. The climate strategy is more detailed on Oslo's goals related to climate change, emission reduction, and adaptation. While the surface water management guide is a specialised guiding document on surface water management as its only topic, and action plans describe how the municipality will work to reach specific goals. The above-mentioned documents have been analysed to understand Oslo's priorities in climate adaptation. If and how the documents include and consider vulnerable groups in climate adaptation are discussed in chapter 6.

### 5.2.1. Climate Adaptation in Oslo's Master Plan

In the master plan Oslo municipality highlights the challenges the municipality will face in the coming years. A growing and ageing population, increasing diversity and social differences, and climate change are some of the challenges Oslo municipality must plan for (Oslo kommune, 2019e).

The master plan recognises that climate change is happening fast and that a warmer and wetter climate will be guiding for city development, as it constitutes a preparedness challenge and may have negative consequences for the economy, cultural heritage, and wellbeing. Climate adaptation must therefore be a natural part of city planning. And air pollution is a problem as citizens must stay inside during winter due to bad air quality, subsequently GHG emissions must be brought down (Oslo kommune, 2019e).

Oslo municipality has prioritized surface water management as an adaptation measure. Through surface water management with green structure the city will be prepared to handle climate change, and blue-green structures are important for biodiversity, recreation, and wellbeing. Different actions will be taken to implement the surface water strategy to handle the expected precipitation (Oslo kommune, 2019e). Including opening rivers, mapping flood-exposed areas, preserving valuable vegetation, and installation of green roofs. The municipality also utilises blue-green factor as a tool to determine a surface's ability to absorb water. This tool can ensure that surface water requirements in construction cases are documented and met (Oslo kommune, 2019e).

#### 5.2.2. Participation

Participation and involvement in the planning process is another area that receives attention in the master plan. Oslo municipality emphasizes thorough participation processes regardless of plan type, to ensure that knowledge from citizens and landowners are considered and used. Planning initiatives must facilitate for the involvement of all groups in society including elderly, children and youth, mobility impaired, and other groups in need of special facilitation. Children are particularly mentioned as having a right to be involved in participation processes (Oslo kommune, 2019e).

#### 5.2.3. Climate vulnerability analysis for Oslo

This document presents a comprehensive analysis of Oslo's preparedness and vulnerability to climate change, and identifies where climate adaptation is needed. It is part of the professional basis for Oslo's climate strategy. And is produced by the Climate agency with the help of other government institutions and professionals (Oslo kommune, 2020a). The analysis has only evaluated the consequences for the municipality as a place and institution, not the consequences for the population or businesses but recommends that they are included in the next analysis. Neither has city districts been included in the production of the analysis (Oslo kommune, 2020a).

The climate vulnerability analysis presents climate change as an economic, social, and environmental challenge, that climate adaptation is about preventing the negative consequences from these challenges. Making climate adaptation a prerequisite for sustainable development (Oslo kommune, 2020a). It describes the relationship between vulnerability and resilience, that climate adaptation creates resilience through addressing

vulnerability. That vulnerability to climate is a function of the consequences of climate change and society's adaptive capacity. Adaptive capacity is described as a systems ability to adapt to climate change, take advantage of possibilities, and prevent and cope with consequences of climate change (Oslo kommune, 2020a).

### 5.2.4. Climate Strategy

Oslo's climate strategy is a comprehensive document with goals and strategies for GHG emission reduction and climate adaptation. Oslo municipality has set five climate goals with 16 investment areas – of the 16 investment areas 15 are partially or completely related to emission reduction, while two are related to climate adaptation measures. The climate strategy states that the purpose of climate adaptation is to build and develop the city to handle a changing climate. And identifies increased precipitation and surface water as Oslo's biggest climate challenge. Heatwaves and droughts are also mentioned as possible consequences (Oslo kommune, 2020b). The climate strategy only describes Oslo's current and expected climate challenges and principles for climate adaptation, e.g., the "three-step-strategy" and "blue-green factor" – it does not say anything about possible consequences of adaptation measures, how they should be implemented or considerations that should be included in the planning processes.

**Oslo's Climate Goals**

- Direct emissions – Oslo's climate gas emissions are reduced in 2030 by 95 % compared to 2009, with an interim goal of 52 % reduction by 2023.
- Climate robust – the city ability to handle climate change is strengthened towards 2030, and the city is developed so that it is prepared for projected climate changes in 2100.
- Forrest and land – Oslo's nature is managed so that the vegetation and soils natural carbon stores are conserved, and GHG absorption in forests and vegetation will increase towards 2030.
- Energy – Oslo's combined energy consumption is reduced by 10 % in 2030 compared to 2009.
- Indirect emissions – Oslo's GHG emission contribution outside the

### 5.2.5. Strategy- and Action Plan for Surface Water Management

Oslo has identified increased precipitation, surface water, and urban flooding as one of the biggest climate related challenges for the city and has devised a strategy for surface water management with an accompanying action plan. The *Strategy for Surface Water Management* (Oslo kommune, 2014) describe the challenges of more frequent and intense precipitation and strategy for how the city, developers and individuals should adapt. The goal is to use surface- and flood water locally with natural, open, multi-functional solutions, that the water transferred to a recipient satisfy are in line with water regulations and avoiding damages (Oslo kommune, 2014). The *Action Plan for Surface Water Management* describes how the municipality and private sector should reach the goals in the surface water management strategy. Cooperation between municipal agencies, private sector, and individuals is an important aspect for reaching the goals in the surface water strategy. (Oslo kommune, 2019b) The municipality is dependent on private actors implementing measures for surface water from the three-step-strategy and create a successful, comprehensive, and interconnected surface water management system. This solution will also give "aesthetics and life back to the city" (Oslo kommune, 2014; Oslo kommune, 2019b). How to prioritise implementation of surface water measures are also presented. Map tools showing where damages have been registered, where damages result in the highest compensation pay-outs (Figure 2), and the risk of flooding and erosion. The cost of damages and reoccurring instances are reported as an important prioritising tool (Oslo kommune, 2019b).

**Goals for Surface Water Management**

Oslo will manage surface water with open and local solutions that:

- Meet the challenges of climate change and minimise damages to people, buildings, property, and infrastructure.
- Safeguards the environment and ensures good ecologic and chemical water conditions.
- Uses surface water as a resource in the cityscape (Oslo kommune, 2014).

**Tree-step-strategy**

1) Gather and infiltrate locally. Urban greening and permeable surfaces, rain beds, green roofs, and trees.

2) Delay and infiltrate. Utilising areas that tolerate temporary flooding, rain beds, and infiltration basins.

3) Safely guide to recipient. Safe guidance of water during extreme precipitation through planned water ways and open brooks and rivers. (Oslo kommune, 2014; Oslo kommune, 2019b)

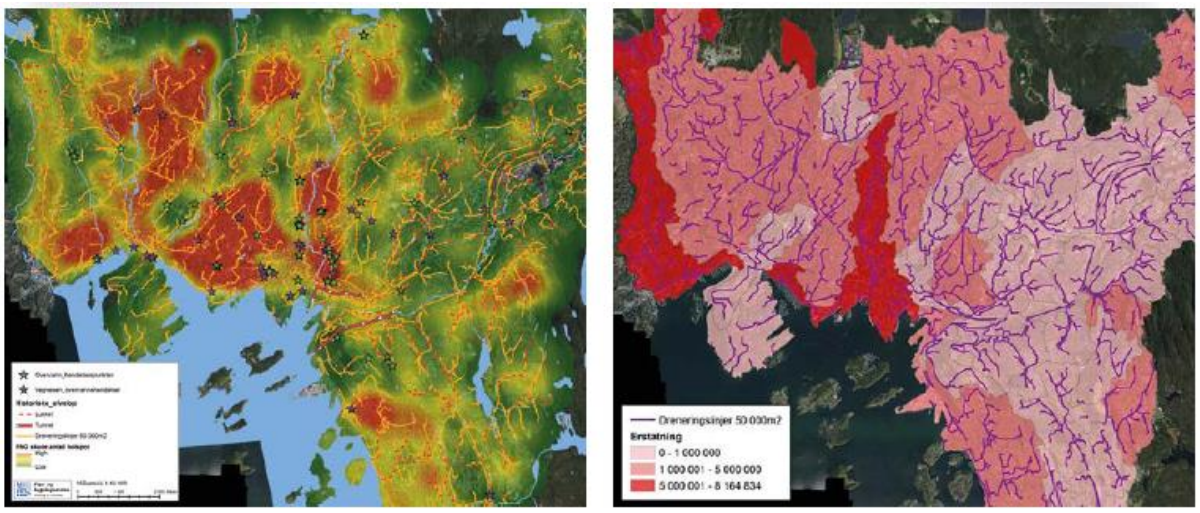


*Figure 2: Left, damages due to basement flooding. Right, cost of damages (Oslo kommune, 2019b).*

### 5.2.6. Action Plan and Guidelines for Participation

In the "Action plan for participation" Oslo municipality describes the need for increased participation and how they can improve the participation process. It is an internal document mainly for agency use in the municipality (Oslo kommune, 2019a). The action plan for participation admits that the municipality has potential for improvement on participation, and that the quality of participation in the municipality's own plans varies from project to project. It is also likely that citizens are not aware or have knowledge of how the participation process functions, and that documents are usually long and technical. Making it difficult to know how and when they can involve themselves. The action plan further recognises that the legal framework is generally formulated and not comprehensive, giving room for discretionary assessment and willingness from the planners side for how to conduct participation and who to include (Oslo kommune, 2019a).

Time has been recognised as a limitation for participation processes. Deadlines in the legislation, and pressure from plan proposers, and politicians results in deprioritization of 'good' participation because of other aspects in the planning process that need attention (Oslo kommune, 2019a). The action plan continues to explain that to improve the participation process time, effort, and resources are necessary – better routines and planning is not sufficient.

Most participants in planning processes, both lead by the agency and private actors, are the same group of informants who actively involve themselves in participation processes (Oslo

kommune, 2019a). Expanding the audience by reaching a more diverse group based on age, sex, disability, affiliation, socio-economic background, ethnicity, and interest groups are goals presented in the action plan. Improvements on how, when, and where, are methods proposed to improve participation. Public meetings and information meetings may not be appropriate or accessible for every audience and should be accompanied by alternative participation methods (Oslo kommune, 2019a). How the agency communicate is also an area where there is room for improvement. Information that is understandable to laymen, and short and precise documents help create an available process and reduces confusion and discontent (Oslo kommune, 2019a).

"Participation in Submitted Regulation Plans" is a guide on participation for public use on what the law demand and municipality expect of participation for anyone planning a development project in Oslo. In this document Oslo explains their goal to strengthen public involvement in city development. The guide states that the municipality will usually demand that children and youths participate in projects, because of national guidelines, and elderly due to Oslo's efforts in becoming age friendly (Oslo kommune, 2019c). Vulnerable groups, not including children and elderly, are also mentioned and here Oslo municipality states that they will include themselves or take ownership of the participation process if the project will affect these groups (Oslo kommune, 2019c).

## 5.3. Findings from Interviews

### 5.3.1. Planners understanding of vulnerable groups related to climate change.

The interviews showed a difference in how vulnerable groups were considered between the two sectors, city districts and municipal agencies, that the informants belonged to within the municipal government.

The city districts are responsible for administrating the social, elder- and primary health care programs in the city and are not directly involved in physical climate change adaptation measures but works as hearing bodies in cases affecting the districts interests where they issue statements.

One informant from one of the city districts told of their increased effort towards areas with reduced well-being, which may mean groups with lower socio-economic standing, also trying to promote the voices of those who rent due to their weaker rights and influence in their local communities (Informant 1. 23.02.2022, digital, Oslo). The other city district also noting a class divide among kids playing in parks in the summer, where the more well of children can buy bottled water in stores on hot days, whereas the less affluent cannot. Consequently, they installed drinking fountains (Informant 3. 29.02.2022, Oslo). Showing the city districts work on social cohesion aimed at levelling out social differences.

The municipal agencies focused more on the physical planning aspect of climate change where the inclusion of vulnerable groups did not seem like a priority. Though the planners themselves presented insight to the vulnerabilities of different groups and the physical challenges from climate change they might face.

The Climate Agency referred to vulnerable groups as the elderly, children, the sick, and possibly people with special needs, which they work with through different actors as the Health agency and Oslobygg (municipal property company responsible for care/education buildings). Further mentioning the remaining vulnerable groups, people suffering from drug abuse and disabilities, who the Well-fare Agency (*Velferdsetaten*) are responsible for, but they report not having worked with much. Other remarks that were made on vulnerable groups are that they do not think surface water and heavy rain is the biggest challenge and that heat stress is a more pressing concern.

Vann- og avløpsetaten identify children as a vulnerable group due to concerns from the population of safety and drowning hazards regarding their surface water facilities. Interviewee 7. reflected around people with lower income being vulnerable to damages from flooding e.g., basement floodings because they live on the ground floor, or they cannot afford preventative measures. Interviewee 8. presented thoughts in regard to self-rescue capabilities among people with physical and psychological handicaps during dangerous weather events and flooding.

### 5.3.2. Involvement of vulnerable groups in climate planning processes

When asked about the involvement of vulnerable groups participants said that it either was not a priority or that the municipality was working on methods to improve participation of some groups. And planners and municipal workers showed awareness to challenges of reaching a broad audience with conventional participation methods. Also, vulnerable groups were believed to be less likely to involve themselves in participation processes. Children was a group that interviewees reported received increased effort on involvement from the municipality's side. "I know we have worked a bit with children and youth in Grønland (city district). I don't think that was in relation to climate adaptation" (Informant 6. 22.04.2022, Oslo) Another interviewee said: "Now we are looking into if we can get a group of teenagers to plant trees in our parks as part of a summer job project. Oslo has a goal to plant 100 000 trees over the next few years" (Informant 2. 29.02.2022, Oslo). The projects the interviewees mentioned where children were involved were for the most part larger projects. "(…) on bigger projects, like our "stamnettprosjekt", where statements came from the children's representative and district senior physician, and there was participation where they invited school classes to tell us where they walked to school and where it was scary, where they played and such" (Informant 7. 29.04.2022, Oslo).

Stamnettprosjektet

A project for upgrading the pipe network for supplying drinking water to Oslo residents. It is part of Oslo municipality's plan to build a new drinking water source (Oslo kommune, u.å.-b).

In another project – New Water Ways[1] – school children were included as well. "(…) Teglverket school, we ran a scheme where they learned about green roofs, and they learned about climate adaptation," (Informant 8. 29.04.2022, Oslo).

New Water Ways

A research project lead by the Norwegian Institute for Water Research (NIVA), in collaboration with other actors, aimed at exploring new ways to manage water in urban settings, e.g., surface water (Norwegian Institute for Water Research, 2022).

Children were not the only group that has been targeted for participation. Oslo municipality has been trying out Citizens' Reference Panel, for the first time. A method of involvement by creating a panel of representatives from an area. By using random selection based on postal code and ensuring representation from different age groups, sex, and place of residency within the project area. The participants receive extensive knowledge about the project, deliberate, and produce propositions for the decision-makers (SoCentral, u.å.).

"(…) it was that citizen panel in Grefsen where they sent SMSs to all that lived there and got responses from those that were interested, then they randomly selected based on age, maybe not children, but under 20 and retired" (Informant 6. 22.04.2022, Oslo).

The Climate agency (*Klimaetaten*) reported that they as a professional resource for other agencies had not worked with participation and involvement of the public. However, they distribute information about how people can reduce their carbon footprint (Informant 4. 31.03.2022, Oslo).

### 5,3,3. Identified considerations municipal planners/workers do when doing ccap

Surface water management was a reoccurring theme when the planners spoke about climate adaptation. This focus Oslo municipality has on urban flooding was justified by the cost and damages it exposed the city of (Informant 7. 29.04.22, Oslo). Surface water management is one area of adaptation that receives attention, "the biggest challenge for Oslo is increased heavy rain and urban flooding, and it's this that also costs the most for the city" (Informant 4. 31.03.2022, Oslo), "it has gained a lot of attention, partially because there are large damages registered by the insurance companies, and it is increasing" (Informant 7. 29.04.2022, Oslo), "Money talks" (Informant 8. 29.04.2022, Oslo). When

[1] https://www.niva.no/en/projectweb/newwaterways, https://www.paadriv.no/prosjekt/new-water-ways

planning and implementing adaptation measures to meet the changing climate different considerations should be made so that the adaptation measure is safe, effective, and achieve the desired outcome without compromising or negatively affect systems or shift vulnerability elsewhere – one planner described it as: “Don’t cut down trees to build rain beds, don’t shoot yourself in the foot” (Informant 6. 22.04.2022, Oslo). Trees cast shade cooling an area, soak up water in the soil, reduces erosion by binding soil with its roots, and captures carbon dioxide. Also, the placement of physical adaptation measures is not necessarily where the initial problem resides, and measures may be beneficial to multiple challenges. One Interviewee presented a project for gathering surface water from the surrounding area and leading it through the park. This was viewed positively by the Water and Sewage agency (*Vann- og avløpsetaten*) because of large gatherings of water further down outside of the project area when it rained. The planners are also conscious of the possible multiple benefits of surface water management reported by several interviewees. Bluegreen solutions and blue-green infrastructure have many more positive effects than just alleviating urban flooding. “Surface water and urban flooding measures (…) If done smart, help against heat waves, drought and possibly water scarcity” (Informant 6. 22.04.2022, Oslo) and “With a warmer, wetter, and wilder as key words, vegetation plays an important part for biological diversity as well” (Informant 3. 29.03.2022, Oslo).

Safety regarding blue-green solutions was reported to be a concern of the public with input from adults regarding children, as well as people with reduced self-help capabilities, “we are pretty aware of water depths, that people are concerned that children might drown, so we are aware of that limitation where water is infiltrated” (Informant 8. 29.04.2022, Oslo). Water and Sewage agency continued with an example where a brook was reopened that has some deep sections. Where the water is deep and easily accessible, they reduce drowning hazards by constructing shallow areas before the deeper parts a kind of measure for children (Informant 8. 29.04.2022, Oslo).

Maintaining comfortable indoor climates were reported as a concern as well, as Oslo municipality provides housing for vulnerable groups (social housing) and is responsible for schools, kindergartens, and care homes, “We have to build these buildings climate robust so that they are comfortable to be in” (Informant 4. 31.03.2022, Oslo). Lastly, Universal design was brought up by several participants as an important consideration of vulnerable groups

when implementing climate adaptation measures “Universal design is a theme we work with when we are upgrading and maintaining parks, that is facilitation for everyone” (Informant 3. 29.03.2022, Oslo), “age adaptation of Torshovparken, where I believe they looked at the importance of trees to cool down an area.” (Informant 6. 22.04.2022, Oslo), and “Universal design (…) is about accessibility (…) we see it in projects, it is one way the municipality takes responsibility” (Informant 7. 29.04.2022, Oslo).

#### 5.3.4. Challenges when planning with vulnerable groups

The challenges mentioned when planning for vulnerable groups in mind related to participation, conveying information, knowledge on the municipality side, and because Norway is believed to be well equipped to handle projected challenges from climate change and the relative mild consequences compared to other countries, climate adaptation might not be the main priority.

Regular public meetings were identified as unsuitable for involving vulnerable groups as the participants usually are resourceful people. One of the interviewees pointed out that the usual participant in public meetings was middle aged white males (Informant 1. 23.03.2022, digital, Oslo), while another commented that it is quite evident that the bar for involvement is higher for vulnerable groups, and that it might be that it is mostly people well off, in terms of intellectual capacity, that attend participation processes (Informant 7. 29.04.2022, Oslo). Informants from Sagene agreed that they had to increase their effort to involve vulnerable groups: “absolutely we have to, it depends on what kind of participation we use” (Informant 2. 29.03.2022, Oslo),

> “public meetings, workshop and voluntary idea work (idédugnad) we invite to, there is a lot of different people attending, it’s not that, but it’s clear that it is a particular engaged and maybe also strong recourse-wise selection of people who attend those kind of meetings” (Informant 3. 29.03.2022, Oslo).

As the first participant pointed out, they are aware that public meetings do not reach everyone, and they are trying to do something about it (interviewee 1. 23.03.2022, digital, Oslo).

Knowledge as a challenge was mentioned because climate change adaptation is still a new field constantly developing with new demands and strategies (Informant 5. 22.04.2022,

Oslo). Knowledge about future health effects due to the changing climate was brought up and that it for the moment is uncertain what will happen and what they should plan for "We have been in dialog with the Public Health Institute to get a better overview of the future health challenges in Oslo due to climate" (Informant 4. 31.03.2022, Oslo), however, there is uncertainties surrounding the changes climate change might bring, "For the moment it is still not clear what will happen and what to plan for, we know there might be new vector carriers and such" (Informant 4. 31.03.2022, Oslo).

How information is conveyed, information about climate change, invitations to public meetings and participation, is also identified as a challenge. One planner talked about how the municipality conveyed information and that much of it was digital, making it harder to reach elderly and children and that analogue methods may be more suitable (Informant 6. 22.04.2022, Oslo). The planner goes on explaining that the SMS-method that was used in an earlier project where they aimed for a wide age group worked well.

Priorities and a sense of urgency from government officials and the population as well as available resources are some obstacles when planning adaptation measures. "I experience, not sure if there are studies, climate adaptation is not at the bottom of Maslow's hierarchy of needs, you have to feel it" (Informant 1. 23.03.2022, digital, Oslo). Without empirical data or physical damages concerns might be neglected by both the public and private "It will be more focus if people begin to see and feel it" (Informant 5. 22.04.2022, Oslo).

Some of the interviewees mentioned that they had not noticed any priority of climate adaptation from management and politicians, while others reported the opposite and pointing at the city council, climate strategy, and mandate, "I haven't noticed much yet, any political pressure or interest" (Informant 6. 22.04.2022, Oslo), "we mostly work for ourselves, without any clear political guidelines or from the management" (Informant 6.22.04.2022, Oslo). As many other departments have received direct orders, e.g., with the publication of the Oslo fjord report creating political focus. "We have the Climate strategy which is binding, and we are lucky to have a very green city council who are interested in implementing the climate strategy" (Informant 4. 31.03.2022, Oslo)

# Chapter 6. Discussion

In this section the findings from chapter 5. Will be discussed in relation to the research questions. As presented in the beginning there is one research question with two sub research questions dividing this chapter into two parts each attributed to one research question, discussing the findings, and answering the research question. The first section answers how vulnerable groups are considered in policy and planning documents relating to climate change adaptation. The second section investigates how municipal planners work with climate change, and how vulnerable groups are included and considered. Together these two sections help discuss in what ways, and to what degree, vulnerable groups are considered in municipal climate change adaptation planning in Oslo.

## 6.1. How are vulnerable groups taken into account in policy and planning documents that deal with climate change adaptation?

The document analysis has shown no mention of vulnerable groups in relation to climate adaptation in Oslo municipality's planning documents, except for the *climate vulnerability analysis* that recognises children, elderly, homeless, and people with preexisting conditions as more susceptible to climate hazards affecting health. The question then becomes why are they not mentioned when the purpose of climate adaptation is to reduce vulnerability and prevent harm from climate change? And the literature on sustainable climate adaptation, climate justice, and vulnerability present the importance of including vulnerable groups in adaptation to climate change because they are more vulnerable. However, even though vulnerable groups are not mentioned specifically in planning documents, it does not mean they are not considered, as the vulnerability analysis showed. To get insight on how vulnerable groups are considered, understanding Oslo municipality's approach to climate adaptation and how vulnerability to climate change is understood may help.

The document analysis shows that Oslo municipality has a technical approach to climate adaptation. Climate adaptation is seen as a solution to practical tangible challenges from climate change that threatens the built and natural environment, and the documents describe how adaptation measures should be implemented, where the responsibility for implementation lies, what type of measures to use, and the purpose of the measures. This technical approach to climate adaptation, based on measurements of blue-green factor,

flood maps, and registered damages and costs does not include involvement or considerations of vulnerable groups. Nor their ability to implement these measures or how these measures affect socio-spatial development.

How Oslo municipality regards vulnerability to climate change, and what or who they regard as vulnerable explains their approach to climate adaptation. If vulnerable groups are not considered more vulnerable to climate change, than the rest of the population, there would be no reason to include them in a special way. The rationale for this is found in the principals for sustainable climate adaptation and climate justice. Both sustainable climate adaptation and climate justice require recognition of different drivers of vulnerability in addition to exposure to climate change. Vulnerability, as described in chapter 2, can be defined in two ways, as end point where exposure to climate hazards determine vulnerability, or starting point determined by underlying social, economic, political, and institutional factors exacerbated by climate change (O'Brien, 2004). This means that if vulnerability is determined only by exposure to climate hazards vulnerable groups may be considered to a lesser degree in climate adaptation. Even though vulnerable groups can be included if the only determinant for vulnerability is exposure to climate hazards they would be treated equally with any other individual, regardless of the exponential effect climate change has on vulnerable groups due to their reduced adaptive capacity. And if only the built and natural environment is identified vulnerable to climate change it would suggest limited consideration of vulnerable groups in climate adaptation.

The *Climate vulnerability analysis* that is the basis for Oslo municipality's present climate adaptation strategy specifically states that it has not evaluated the consequences of climate change for the population, only the municipality. Mainly focusing on the vulnerability of the built and natural environment and infrastructure based on its exposure to climate hazards (Oslo kommune, 2020a). However, throughout the analysis the *Climate vulnerability analysis* presents negative consequences climate change has on health and quality of life. These effects are all related to exposure from climate change as heat, hazards like flooding and landslides, air quality, and humidity. Elderly, children, people with preexisting conditions, and homeless people are those who are most susceptible to these conditions. And the adaptation measures that are proposed reduce exposure to these effects e.g., updating building codes that consider increased temperature (Oslo kommune, 2020a). In

the surface water management strategy the goals of surface water management is to prevent damage and unfortunate effects on people, buildings, property, and infrastructure. In addition, the action plan for surface water management presents tools for prioritising where measures for climate adaptation should be implemented. These tools include mapping where there are registered damages and where the cost of damages is highest, as well as which areas are prone to flooding and erosion.

Together, the vulnerability analysis, goals and tools suggest that vulnerability is defined as end point, because who to consider and prioritisation of where to implement measures is determined by exposure to climate hazards and the goal is to prevent damages from exposure. And the main beneficiaries from climate adaptation are the built and natural environment, and people based on their susceptibility to negative health effects from climate change.

This approach to climate adaptation and vulnerability does not consider the full spectrum of the driver of vulnerability to climate change, and is not in accordance with principals of just adaptation as recognition and distributional justice. Failing to recognise that vulnerability to climate change is rooted in more than exposure to climate hazards may result in policies and adaptation strategies that exacerbate vulnerability to climate. Examples from the surface water management strategy is used to further illustrate the lack of consideration to recognitional and distributional justice.

The way climate adaptation strategies are planned implemented can indicate how vulnerable groups are considered. Oslo aims for management of local surface water within the boundaries of a property. Meaning that every landowner is responsible for surface water on their property. For this strategy to be effective everyone who owns land must be able to implement measures for surface water management. In other words, everyone must have adaptive capacity to adjust to climate change. Expecting vulnerable groups to have equal responsibility to adapt as the rest of the population (Oslo kommune, 2019b), but their reduced adaptive capacity suggested by the literature (Bulkeley, 2013) puts an unfair burden on them because they might not be able to adapt. This represents lack of recognitional justice from Oslo municipality. As vulnerable groups vulnerability is determined by fewer resources and competing priorities (Adger, 2006). Though there might exist programs and initiatives to help with implementation and subsidies for climate

adaptation measures, poorer individuals may still struggle to cover the costs of adaptation. Or prioritise competing expenses. Burdening them with adaptation costs for climate changes they have not contributed to on the same scale as large corporations or individuals, with larger carbon footprints due to more extravagant lifestyles.

The method for prioritisation of where to implement surface water management measures may as well suggest a disadvantage for vulnerable groups and lack of distributional justice. As it partially relies on data related to damage costs from insurance companies (Oslo kommune, 2019b) which potentially paints a skewed picture of where adaptation is needed. For example, individuals with higher value properties and goods or better insurance resulting in larger compensation from insurance companies will come across as more exposed to climate hazards. And those without insurance are left out from the data set. Prioritisation based on insurance pay-outs can also favour the interests of insurance companies more than citizens, as individuals must bear the economic burden of adaptation, while insurance companies save on damage compensation.

The maps that show flood risk and cost of damaged coincide with the historic, but still existing, social differences in Oslo (Oslo kommune, 2019d; Oslo kommune, 2019e). Suggesting that Oslo west, the more affluent areas, is more vulnerable to climate than Oslo east, the less affluent. Though it is correct that the map identifies Oslo west as more exposed to flooding, and measures should be implemented to prevent damages and harm. It would also suggest a greater concentration of efforts to reduce flood risk in Oslo west. Combining this with the strategy to introduce aesthetics and amenities together with surface water management and the connection that has been made with urban greening and gentrification (Rigolon & Németh, 2020), may result in further social differences between east and west Oslo. Suggesting that the consideration of the distributional effects of climate adaptation has vulnerable groups in Oslo is not strong. By not considering that climate adaptation measures can have unintended effects on objectives associated with sustainable development social cohesion.

In summary vulnerable groups are not directly considered in climate adaptation planning documents. Though they are part of the justification for climate adaptation due to the negative effects climate change may have on vulnerable group's health and wellbeing. The reason that vulnerable groups are not included can be attributed to Oslo municipality's

definition of vulnerability as the amount of exposure after adaptation measures are implemented. Together with the assessment that it is the built and natural environment that is most at risk.

### 6.2. How do municipal planners work with climate change adaptation at the local level, and how are vulnerable groups considered and included?

The planners from the agencies in Oslo had similar considerations for vulnerable groups in climate adaptation as the documents. This is unsurprising as climate adaptation strategies are guiding for the planners to develop the city and municipality. Municipal planners were therefore concerned with surface water management when doing climate adaptation and its potential to negate damage in the built and natural environment. And the considerations municipal planners have for vulnerable groups are like those the documents indirectly present. With focus on the physical effects that climate change has on people – vulnerability determined by exposure. The city district planners considered vulnerable groups based on underlying drivers of vulnerability, and presented adaptation measures that treated underlying factors of vulnerability like access to resources.

In contrast to Oslo municipality's planning documents, agency professionals reported greater consideration and thought to vulnerable groups on concerns about the health, wellbeing, and safety. As the Climate Agency considered the increasing temperatures as more worrying than urban flooding. Focus for vulnerable groups, namely children, elderly, sick, and those with special needs, revolved around wellbeing and health effects related to diseases. With comfortable indoor climate in public buildings, schools, and care centres as measures and improvement of knowledge on uncertainties pertaining to the health effects of climate change and new diseases (Informant 4. 31.03.2022, Oslo). The Water and Sewage Agency on the other hand was concerned with safety in surface water management installations. This was due to input from the public who was concerned with the safety of children around surface water management installations and drowning hazards (Informant 8. 29.04.2022, Oslo). The heat island effect was another concern indirectly identified from the interviews, as the City Environment Agency looked at the cooling effect of trees in outdoor public spaces related to age adaptation (Informant 6. 22.04.2022, Oslo).

The considerations above do not represent considerations presented in strategy documents on climate adaptation e.g., the *Strategy for Surface Water Management*. But they reflect the rationale for the choices and design behind surface water management and blue-green infrastructure. That surface water should be handled with multifunctional solutions (Oslo kommune, 2014), that incorporate vegetation to absorb and infiltrate water and cool down urban environments. It also means that the planners work with climate adaptation as a technical solution to a practical tangible problem from climate change. "We have to build these buildings climate robust so that they are comfortable to be in" (Informant 4. 31.03.2022, Oslo), "Don't cut down trees to build rain beds, don't shoot yourself in the foot" (Informant 6. 22.04.2022, Oslo). These are easy to understand solutions to climate challenges. If the temperatures are getting higher and precipitation increases, do not cut down trees as they infiltrate water, provide shade and cooling effects, and make sure buildings are able to maintain comfortable temperatures.

That comfortable indoor temperatures are not identified in the document analysis together with trees temperature regulation ability can point to discrepancies in data collection. Or it can mean that temperature regulation in buildings is not defined as climate adaptation in the same way as surface water management. Therefore, regulated in other documents e.g., building codes. Or it is a new challenge that has been identified, and not yet made its way into the planning documents. Trees' ability to regulate temperature may also be likely to be a subject in other strategy or guiding documents that has not been included in the document analysis.

Age adaptation and the use of trees for cooling, which was not mentioned in the planning documents, can be connected to universal design that informants referred to as important and as a way of considering vulnerable groups in planning. "Universal design is a theme we work with when we are upgrading and maintaining parks, that is facilitation for everyone" (Informant 3. 29.03.2022, Oslo), "Universal design (…) is about accessibility (…) we see it in projects, it is one way the municipality takes responsibility" (Informant 7. 29.04.2022, Oslo). Because universal design is a measure to provide everyone, regardless of disability, with access to public places, as well as a goal for the municipality, to provide access to public spaces for everyone (Oslo kommune, 2019e). But because universal design is not referenced in the climate adaptation strategy or any documents related to surface water management,

it implies that socio-spatial development as access to the city are kept separate from climate adaptation. Included in addition as an integrated aspect in urban development.

The city districts approach to vulnerable groups and climate change and adaptation, however, was different than Oslo municipality's agencies and planning documents. Contrary to the agencies and documents consideration of vulnerable groups based on exposure to climate change, the city districts identified vulnerability as a starting point – determined by socio-economic factors (O'Brien, 2004). The informants from the city district who reported the initiative to install drinking fountains in parks, for children unable to afford store bought water on hot summer days (Informant 3. 29.03.2022, Oslo). Indicating that it was not only the heat that made the children vulnerable, but their economic background and access to resources. By installing drinking fountains the city district provided access to resource that would help mitigate heat stress. Potentially also building community by making parks more accessible. People would not need to disrupt their activities to go home for water if they cannot afford to buy it, providing more opportunity to interact and play with others.

The informant from the other district who try to promote the weaker voices of renters, as they did not have as much influence in communities compared to landowners (Informant 1. 23.03.20222, Digital), also present considerations from the other side of the vulnerability discourse. Where they focus on social aspects that shape vulnerability. Though, the initiatives these city districts reported are not part of the climate adaptation strategy for Oslo municipality. They are measures that are identified as important in climate justice and sustainable adaptation.

### 6.2.1 Inclusion of vulnerable groups in climate adaptation participation processes

Inclusion in planning is mainly related to participation processes. Unfortunately, the Planning and Building Agency (PBE) was not available to participate in this study. This has resulted in limited data on the involvement of vulnerable groups in participation processes related to climate adaptation. As it is PBE who is responsible for participation processes, especially when it comes to vulnerable groups. However, Informants have provided some data and the documents on participation included in the document analysis, might give some indication to the extent vulnerable groups are involved in climate adaptation.

The interviews suggest that participation from the public, including vulnerable groups in climate adaptation planning varied based on the type of project, e.g., strategy and policy development, specific construction cases, or research projects. The Climate Agency responsible for Oslo's climate goals reported that they had not worked with participation. Some informants mentioned the *New Water Ways* project where a Citizens' Reference Panel was used. And the Water and Sewage Agency said that they had received input from citizens on safety issues and mobility of children in construction projects.

In construction projects like "stamnettprosjektet" was specifically targeting children because the project involved areas children used to travel to and from school. This can be explained by legislation and municipal guides for participation specifically stating that groups and individuals that are affected by planning proposals shall be included in participation (Oslo kommune, 2019c), as well as national expectations for strengthening children's rights in planning (Kommunal- og moderninseringsdepartementet, 2021). Though this show deliberate attention to children in participation processes it only applies if they are affected by the proposed plan. Because climate adaptation is considered to not affect any particular group this would mean that there is no demand to involve them in the planning process. Except in cases where measures are implemented near e.g., schools.

The *New Water Ways* project is not applicable for the municipals participation practices as it was an external research project, not facilitated by Oslo municipality.

On a more general note, Oslo municipality evaluated their own participation practices and discovered multiple challenges surrounding how participation was conducted and the people who attended participation. Identifies weaknesses to Oslo's participation processes was that quality of participation is not consistent, that citizens are not aware of how participation functions or when and how they can express themselves. As well as homogeneity of those that involved themselves in participation (Oslo kommune, 2019a). This group of people have been identified by the informants from the interview process as "white middle-aged men" (Informant 1. 23.03.2022, Digital) and "particular engaged and maybe also strong recourse-wise selection of people" (Informant 3. 29.03.2022, Oslo). That participation processes are dominated by a particular group point at the underrepresentation of vulnerable groups.

If vulnerable groups have less representation in decision-making, they also have less possibility to present their point of view and contribute with knowledge. Reducing the likelihood of them being considered. This makes vulnerable groups dependent on professional who advocate for them. As well as dependant on updated planning documents, that include the latest knowledge on climate change as a social problem, with implications for vulnerable groups not directly exposed to climate hazards.

Participation in decision-making is a core principle in climate justice related to procedural justice. And is needed to legitimise policies on climate change. empowering individuals to voice their concerns about distribution of resources and how climate change affects them. Participation is also tied to recognitional justice that advocates for the recognition that vulnerable groups have an equal right to be included in decision-making. Participation being supported by professionals as improving planning. Involvement of the public is said to increase efficiency and appropriateness of measures from decision makers. As well as strengthening democratic processes with transparency, trust, and understanding. Vulnerable and marginalised groups are highlighted as groups that should receive extra attention and effort in being included in these processes.

In short, municipal planners follow the reasoning for climate adaptation in the planning documents. Where the focus is to safeguard the built and natural environment. But with greater consideration to vulnerable groups in terms of multifunctionality, safety, accessibility, and wellbeing. Ensuring that the adaptation measures were safe and provided functions that made them accessible for everyone. The involvement of vulnerable groups in adaptation planning showed signs of limited inclusion except for measures that directly affected their daily lives, though because of limited data the certainty of this should be said to be inconclusive.

# Chapter 7. Conclusion

With the increasing relevance of climate adaptation in the urban environment. Concerns about justice and equity in in climate adaptation planning has received traction over the last years. This study has therefore aimed to identify how vulnerable groups are included in climate adaptation with the research question:

3. How are vulnerable groups accounted for in local climate change adaption by municipal planners in Oslo municipality?

Based on a case study of Oslo municipality, with a document analysis of Oslo's climate adaptation strategy and planning documents. As well as interviews of municipal planners working with climate adaptation. This study has shown that the consideration of vulnerable groups by planners in climate adaptation planning is limited to safety and wellbeing. Planners' consideration of vulnerable groups is explained by understanding the role of climate adaptation. The climate strategy and surface water management documents treat adaptation as a protective measure for the built and natural environment against climate change, surface water and flooding. That also presents an opportunity to implement special features of beauty and recreation. With the understanding that vulnerability to climate change is defined by exposure to hazards after climate adaptation. This means that if adaptation measures are implemented nothing happens. Suggesting that there is no need to consider vulnerable groups in adaptation as the measures do not concern them.

It should be noted that ensuring that buildings could maintain comfortable indoor temperatures was an adaptation measure that was mentioned by the Climate Agency. However, this was not mentioned in the adaptation strategy in Oslo's climate strategy that focused on surface water management. This indicates that this study may have overlooked some adaptation measures.

It does however not change the fact that Oslo municipality does not consider climate change adaptation in a wider context of socio-spatial development. As well as few considerations of fairness and justice regarding vulnerable groups, in the prioritization of where measures should be implemented and who is responsible for implementing measures. The effect blue-green infrastructure and spaces have, outside of its capacity to alleviate hazards associated with precipitation and heat(waves), in the form of elevated

spatial aesthetic and recreational value may lead to homogenization and displacement of wanted social mix. Climate adaptation without consideration of the social aspect and inclusion of vulnerable groups might counteract Oslo municipality's goal of a warmer and more inclusive city, clashing with the idea of sustainable development.

Further studies could be made looking at the possible effects of blue-green infrastructure related to climate adaptation has on the urban social environment.

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Attachment

# Intervjuguide

Kan du introdusere deg selv og hva du gjør i kommunen?

Hva legger dere/ i begrepet klimatilpassing?

Kan du fortelle litt om hvordan du/dere jobber med klimatilpassing?

Hvordan samarbeider dere med utbygger rundt klimatilpassing?

Hvordan er engasjementet/oppmøtet fra utsatte grupper (eldre, barn, nedsatt funksjonsevne, bostedsløse)?

Hva er drivere og barrierer for arbeidet med utsatte grupper når det kommer til klimatilpassing/klimaplanlegging?

Hvor kommer engasjementet til å arbeide med lokal klimatilpassing fra?


**Norges miljø- og biovitenskapelige universitet**
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