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Selling the Sponge City: Copenhagen's Strategy for Cloudburst Management

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Abstract

This research analyzes the climate adaptation strategy of Copenhagen, focusing on cloudburst (rain-based) flooding and the use of infrastructure to mitigate damage. This strategy is analyzed through document analysis and structured interviews, using a theoretical framework of political ecology and urban green assemblages. This framework focuses analysis on the role of actors (human and non-human) and the power they hold in the production of spatial transformations. These spatial transformations are understood through the lens of assemblage, wherein urban climate adaptation is a series of discrete projects and not one mega-project playing out across the city as a whole. This lens allows for an analysis of actors across scale, and how these scales converge in planning and in construction. Ultimately, this thesis showcases how the City of Copenhagen entangles together these infrastructure investments with economic, recreational, and aesthetic benefits to citizens, providing political legitimacy for cloudburst management.

Key words: Climate adaptation, flood mitigation, urban geography, assemblages, co-production

Word count: 19,302

Positionality Statement

I am a master's student at a Swedish University, born and raised in the United States. I am white and identify as male, which influences both my experience and my ability to conduct this research. I entered into this research with a bias wherein I believed climate change to be of great importance and that cities must work quickly to address it. As such, I do not claim to enter with objectivity or without a desire to utilize this research to further support for climate adaptation among readers.

Glossary of Terms

Climate/urban adaptation - The construction or modification of urban infrastructure—green, blue, and grey—to lessen the impacts of climate change-related risks and/or disasters.

Green-blue/blue-green infrastructure - The use of green spaces (trees, shrubs, grasses, etc.) in combination with natural or semi-natural water features for combined benefits.

Grey infrastructure - Engineered infrastructure which provides structure or services to a city, such as paved roads and underground pipes for water and sewage.

Cloudburst - A sudden and heavy downpour of rain. The Danish Meteorological Institute defines a cloudburst as “more than 15 mm of precipitation in the course of 30 minutes” (City of Copenhagen, 2012).

The City/the city - In this paper the use of “the City”, capitalized, refers to the municipal government as an actor. “The city” in lower case refers to the urban area of Copenhagen.

Walk and Talk - This is a style of interview wherein the interviewer and interviewee walk through an area while the interviewee narrates and answers questions as they go. This allows for the interviewee to control the pace and direction of the conversation.

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1. Introduction

In August of 2010, Copenhagen experienced a sudden massive downpour of rain, also known as a cloudburst, overwhelming sewers and storm drains and flooding large parts of the city (City of Copenhagen, 2012). Still pumping water and cleaning out flooded basements, Copenhagen's municipal government created the Climate Adaptation Plan (CAP) (Ziersen et al., 2017). The CAP was designed to be a more specific adaptation plan than the broader Copenhagen Climate Plan of 2009, itself a plan for reducing emissions until Copenhagen became carbon neutral by 2025 (City of Copenhagen, 2009, 2011). Although the CAP focuses mostly on water management, it had little cloudburst management included despite the 2010 flood, seeing those rainstorms as a rare problem to be addressed in the future (Baron & Petersen, 2015). The plan proposed that “[w]ith good planning, it is possible carry out [sic] activities that can direct some of the floods to places where they cause least damage, for example parks, sports grounds and open spaces” (City of Copenhagen, 2011, pg. 13). Confidence in many of these water-management strategies would barely last a year.

The CAP was sent for approval in June of 2011, and while deliberations over the plan were ongoing at City Hall Copenhagen was hit again with sudden and heavy rainfall. It was another summer rainstorm, this time in July, with 150 millimeters of rain falling in just two hours in some parts of the city (Haghighatafshar et al., 2014). The clouds were so thick and dark that it became as dark as night in the middle of the day (Petersen, 2025). It was considered an 858-year rain event (Reghev, 2025), meaning a rain-event which has a 1 in 858 chance of occurring in a given year, but is called a 1,000 year rain event in shorthand across various documents used for this research (City of Copenhagen, 2012, 2015). It was an extremely rare and unusual amount of rain which nobody could have predicted and for which Copenhagen was not prepared. Flooding left critical infrastructure inundated with water, closed hospitals, and blocked roads; parts of the city were under half a meter of water (Ramboll, 2013) as residents desperately tried to keep water out of their basements, businesses, and ground-floor apartments. Miraculously nobody died, but in some parts of the city rats floated to the surface of the high water in great numbers, drowned, drifting slowly out to the sea (The Copenhagen Post, 2011).

Although this massive flooding was rare, models by the Danish Meteorological Institute (DMI) suggested they would become more common. The DMI completed these models for the 2011 CAP, writing that they expected more rain in winter and more intense rainfall in summer. Heavy downpour was expected to rise 20-50% depending on the frequency or rarity of the cloudburst (City of Copenhagen, 2011). This shift in weather patterns is not random; it is closely linked to anthropogenic greenhouse gas emissions raising global average temperature, which in turn leads to intensified rain cycles according to projections by the IPCC (2021). The models by DMI suggest the 5 - 6 billion Danish Kroner (DKK) in damage (City of Copenhagen, 2012) caused by the water is only the first salvo in a long battle to come. Still reeling from the flood and knowing more would come, the City gave planners six months to develop the Cloudburst Management Plan (CMP) of 2012 (Reghev, 2025). Without the estimated five years planners and engineers would need to fully calculate the specifics of hydrological engineering for a city-wide drainage system, or to fully understand the relevant laws and regulations, the CMP instead outlines the broad strategy of using both surface solutions and new underground pipes to manage flood water (Reghev, 2025; City of Copenhagen, 2012). Surface solutions can take the form of parks and other green spaces that purposely flood during periods of heavy rain, diverting water away from homes and businesses and holding it while it seeps into the groundwater. Roads were slated to be modified as well, either retaining water locally or carrying it like streams until they met together at main roads, with rainwater flowing like a river towards the sea (in line with the 2011 CAP). Knowing this strategy alone wouldn't control the amount of water seen in this recent flood, the City proposed new underground pipes. Separate from the sewage system, these pipes would hold rainwater for treatment or flush immense amounts of water straight into the sea during cloudburst rain using new, large pumping stations at the edges of the city (City of Copenhagen, 2012).

With a proposed budget of DKK 3.8 billion over a 20 year period (City of Copenhagen, 2012), Copenhagen has gone about constructing and modifying the city to manage water and reduce the damage caused by floods. In the ten years since construction began, the CMP has been reshaped by the technical realities of water management and urban construction, municipal and national politics, opportunities for synergistic benefits with urban renewal, and the co-production process between the City and the residents of Copenhagen. This process is ongoing, and depends on funding secured via legislation (allowing the use of levies or new taxes)

and the political will of citizens and municipal leaders to continue drawing from resident incomes to fund construction. The municipalities of Copenhagen, the water utility HOFOR, and concerned citizens—sometimes wielding the power to kill proposed adaptation projects (Reghev, 2025; Engberg, 2018)—transform the plan in scale and strategy as the CMP transitions from an outline to a series of specific projects. This process showcases Copenhagen’s flexibility in determining how flood management will look as it remakes the city’s urban landscape.

My analysis will show that Copenhagen’s strategy for gaining and maintaining support among residents—both for the general process of raising levies or taxes as well as specific projects in their neighborhoods—is one of entangling together climate adaptation infrastructure with other quality-of-life benefits in order to create political legitimacy. The prospect of disruptive construction, often leaving people without a beloved local park for years (Petersen, 2025), requires the buy-in of people who have both a voice in the process and a belief that the investment is worthwhile. The form of these solutions is key in this process; adaptation surface solutions have the potential to provide a myriad of benefits to the city, such as reducing the urban heat island effect, providing an aesthetically pleasing space for residents, and providing space for playgrounds (Li & Wang, 2021). They also contribute to a positive reputation—the 2009 Climate Plan for Copenhagen describes Copenhagen “as a city giving high priority to the quality of life thanks to the numerous green solutions” (pg. 11), and that it is a globally recognized leader in quality of life.

Using interviews and document analysis, I will show how the City develops and implements their climate adaptation strategy with public planning documents and visualizations—such as the 2011 CAP and the 2012 CMP—before moving on to construction of location-specific projects. I will also discuss the production of these sites in the context of the complex political power structure of Copenhagen, which will be investigated. These projects started in Østerbro, christened as the Klimakvarter (climate quarter, or climate resilient neighborhood), complete with a website showcasing the green-blue transformations in places like Sankt Kjelds Plads and Tåsinge Plads. In dry periods, Sankt Kjelds Plads and Tåsinge Plads bring new aesthetic appeal and ecological health to a traffic circle and a rarely-used parking lot respectively. In periods of heavy rain, these bowl-shaped green spaces are designed to store and slowly drain water like a giant sponge, or even to treat and then return it back upwards in warmer months, giving residents an example of how this climate-focused urban renewal could look in

future projects. Residents who may be apprehensive to go ahead with plans to reshape their neighborhood park or apartment courtyard can be shown these examples of existing adaptation, providing a tactile prototype of future neighborhood transformation (Reghev, 2025). To investigate the efficacy of this municipal strategy and the power of relevant actors, I will seek to answer the questions outlined below.

1.1 Aim and Research Questions

The underlying problem in this research is a need to understand best strategies for how cities can and should adapt to meet the spectre of climate change. Climate adaptation requires new and modified infrastructure, yet these projects are expensive and require broad support to be achievable. There is also an issue of time; climate change has already begun to impact cities and their residents, and so cities must act quickly to mitigate risk. In researching this topic, I will investigate the case of Copenhagen and how adaptation infrastructure is designed to mitigate damage while also creating political legitimacy. Here, I define political legitimacy as a product of support from relevant stakeholders and the benefits realized when a strategy is effective and cost-efficient. Achieving political legitimacy requires the City to utilize a strategy that matches the desires of these stakeholder groups, combining various elements important to each actor to reach consensus and maintain funding. Political legitimacy is then a useful metric in determining the power a given actor has in shaping the urban landscape with respect to cloudburst management. To better understand this problem, I will investigate the following research questions using a layered analysis with a descriptive, mechanistic, and analytical component.

1. What structures or strategies have been implemented to adapt Copenhagen to increased cloudburst risk?
2. In what ways have official planning documents and the resulting physical infrastructure of cloudburst management been shaped by a desire for political legitimacy?
3. How is political power distributed among relevant actors and how does this impact the planning and construction of cloudburst management in Copenhagen?

2. Literature Review

Existing literature covers climate adaptation from a variety of scales and locations. At the broadest scale are systematic reviews using keyword searches in the ISI Web of Knowledge (WOK) in English (Berrang-Ford et al., 2011). Authors analyzed the number of climate adaptation papers published (1,741 documents) to look for patterns, themes, and research gaps. The majority of papers found were for cases of anticipatory climate adaptation (78%), as opposed to reactive (~50%). In terms of governance, Berrang-Ford et al. found that higher levels of government (such as national governments of states) were more likely to be undertaking anticipatory action on climate adaptation, while individual and household responses were reactive and attached to specific climate-related crises. This outcome showcases a key driver of adaptation, that being the scale of how a given actor is personally impacted. Local people and city governments focus on smaller scale (often very personal) damages caused by flooding, heat, or other crises. At higher levels, climate risks would instead appear as economic damage in terms of trade and GDP, or ecological damage at the national scale with national governments removed from the specific local effects (Berrang-Ford et al., 2011).

Lesnikowski et al., in 2011, took a similar approach to measuring adaptation actions being undertaken by the 117 parties in the United Nations Framework Convention on Climate Change (UNFCCC). Across these parties, 4,104 adaptive actions were analyzed by the authors to determine patterns and common traits. The largest share of these actions, at 1,400, were impact or vulnerability reports. Over 600 cases were actual adaptation infrastructure, technology, or innovations funded in response to the climate crisis (Lesnikowski et al., 2011). The climate adaptation most common in these 4,104 cases was to mitigate damage from flooding, heavy rain, landslides, and other water related crises. The authors note in their discussion that almost every UNFCCC party surveyed has conducted some kind of impact or vulnerability report, but that progress towards solutions outlined in these reports is still limited (Lesnikowski et al., 2011).

Existing research also covers climate policies and governance. The role of different levels of government, from local to national, establishes the competing priorities and differing levels of direct-power showcased (Mickwitz et al., 2009). Mickwitz et al. argue there is integration occurring in climate policies across cities, with some utilizing vertical (between different levels)

or horizontal (across departments) integration in crafting climate policy. According to Mickwitz et al., “adaptation has only recently become a legitimate and important policy issue” (2009, pg. 35). Keeping with research focused on states, Gagnon-Lebrun and Agrawala (2011) investigated the national communications of developed countries and found that countries analyzed (including Denmark) commonly reported intentions to act on climate change, but lacked concrete action to go along with it. In their research, the two authors identified case studies from North America, Australia, and Europe, including a plan in Italy to protect Venice from peak sea levels, Sweden’s plan to adapt coastal zones for rising sea levels and storm surge, and a number of plans to mitigate damage in the winter tourism sectors of mountainous areas. The authors conclude that local actions are not always reflected in national communications, and that more action is taking place than is being measured (Gagnon-Lebrun & Agrawala, 2011). A lack of concrete action across this case study suggests developed countries with perceived lower vulnerability and more advanced infrastructure, have been slow to adapt to climate change.

To better understand vulnerability for Copenhagen as a coastal city, we can look to research by Kuhl et al. (2021) and their analysis of coastal cities and climate adaptation. Authors note that risk is unevenly distributed, citing numerous cases from New Orleans, USA; Lagos, Nigeria; and Jakarta, Indonesia. In these cases, women and ethnic minorities, often in possession of less wealth or less political influence, experience more of the negative consequences of flooding or natural disaster. A key measurement for Kuhl et al. is in the level of transformation that occurs in adaptation, including a break from old methods or technologies, changing the political and economic pathway that the City is charting forward. This model can be applied to research on Copenhagen to better understand if their approach to risk and vulnerability is tantamount to transformation.

This research, as well as supporting research by Clifford Amoako (2018) from the informal settlements of Accra, showcases how vulnerability is not a static marker of proximity to coastlines or to areas of high rainfall. In the case of Accra, Ghana, vulnerability to flooding is related to poverty, spatial ownership and politics, quality of infrastructure, and the way water flows and collects during a flood (Amoako, 2018). Amoako’s research finds that at the hyper-local level, that being the home, climate adaptation takes place in piecemeal ways based on seasonal rains and the desire to protect valuables from flooding. Moving up the scales, Amoako showcases the way communities form bonds of resilience, working together on projects

to divert flows of water away from communities. Similar case studies can be found in South Africa (Drivdal, 2016) and Kenya (Tom et al., 2022). Relating back to Kuhl et al., we can see that Accra is not a case of transformation but of small changes, and that the impacts of this strategy are unequal.

Climate adaptation research showcases both grey and green infrastructure solutions with different purposes (Kuhl et al., 2021). In discussing transformation, Kuhl et al. identifies what creates or stifles transformational adaptation in coastal cities; factors like scalability, ease of replication, time frame for adaptive measure, desire for incremental change, and other factors can all impact outcomes. Research by Torabi et al. (2018) also analyzes adaptation as either coping, incremental, or transformational. In this framework, small-scale actions are “incremental steps that focus on reactive response to the impacts of climate-related disasters in the short to medium-term” (Torabi et al., 2018, p. 302). On the other hand, transformational adaptation explores considerable changes to how climate change is currently being managed at the municipal level. This transformational adaptation includes questioning current practices, taking a more long-term view, or taking a systems approach that integrates multiple institutions (such as the public-private co-creation model in Copenhagen).

Existing research outlines the value of different institutions of the City in developing adaptation or resilience planning; there is a role for the government, civil society, and the private sector. Research by Lars Engberg (2018) showcases the Danish model of public-private co-creation, which often takes the form of Integrated Urban Renewal projects (IURs) in Copenhagen. Here, the City designates an urban area for upgrading and retooling and then works with the residents of the area in the planning and development process. After pluvial (rain-based) flooding occurred in 2011, a new IUR was reworked to be the Copenhagen Climate District (formerly the Skt. Kjelds District), where the City would pilot ideas for flood-proof design (Engberg, 2018). The Copenhagen city council, with 55 members elected to seven Standing Committees, steers and encourages new development while businesses and residents (private and civil sectors) help shape the design and function. While planners and staff from HOFOR (the water utility) come up with the technical designs for flood mitigation, residents have great oversight into the use of these spaces when they *don't* flood, such as multi-purpose parks which can flood or divert water away from homes during cloudburst rainfall (Engberg, 2018). Engberg

calls this a top-down structure for bottom-up approaches, where Copenhagen is acutely interested in each solution being localized to the specific urban geography of a given place.

Engberg outlines a historical narrative for this process, beginning with the development of a social-democratic welfare state in the post-war period, initially taking the form of “slum clearance” in Copenhagen with largely top-down solutions to poor housing quality. Later in the 20th and into the 21st centuries, Copenhagen’s residents became resistant to bulldozing parks and neighborhoods, as in the case of Folkets Park (Rutt & Loveless, 2018). With the urban development process becoming more collaborative, public planning was also more place-based, developing neighborhoods differently based on the desire for recreation, education, housing, commercial space, and related factors at the time of development (Engberg, 2018). However, the City always maintained control of the essential function of a space, with this role growing after 2011 to ensure flood mitigation (or climate resilience more broadly) remained a core part of new urban development plans across Copenhagen.

Regarding the co-production of climate adaptation, existing research can show us how power structures, hierarchies, and needs are balanced. Klein et al. (2016) analyzed the role of local authorities and private actors in climate adaptation, writing about both Copenhagen and Helsinki. In their research, the authors look into problem owners, implementation responsibility (and resources), financing, and risk. In their matrix, the authors compared different methods of governance, whether by regulation, provision, enabling, or municipal self governance. Their research shows how the governance approach to adaptation shapes the relationship between the City and its residents in their co-creation. In both Helsinki and Copenhagen, the municipality used legislation and funding to ‘steer’ adaptation measures, leaving space for residents to request the surface solutions (parks and courtyards) to include certain desired elements. The authors also write that the CMP has helped to clarify responsibility and relationships, helping to outline the role of these different actors in the development process. The authors describe events and activities held in Sankt Kjelds Plads, a pilot project for surface water management in Copenhagen, and how they helped local authorities and citizens to interact and share ideas about the adaptation process once it began across the rest of the city (Klein et al., 2016).

To better understand the role of ‘greening’ and the use of green-blue strategies for urban renewal, I draw from Andrew Jamison (2008) in his research on the history of urban environmentalism (with a focus on Malmö). Jamison writes about the development of this

movement from a romantic critique of industrial design to the social movement in the 1960s, mirroring counter-culture critiques of the time. Jamison describes a process where urban greening became specialized, the realm of planners and architects. Here, sustainability becomes a scientific part of urban planning, using emissions from buildings, recycled water, and other sustainability benchmarks as tools to measure success in design. The history also shows how long these ideas have had support in Copenhagen, with Jamison writing that in Denmark “a special 'green guide' program was established in the 1990s to place environmental change agents within public sector organizations and schools” (Jamison, 2008, p. 293).”

Baron and Petersen (2015) cover more of the research regarding the relationship between public and private interests in adaptation. As adaptation requires construction and modification, the authors showcase how that process is shaped depending on the legislative strategy. Using the framework of urban green assemblages and drawing heavily from actor network theory, Baron and Petersen examine how both human and non-human actors or events play a part in shaping adaptation in Copenhagen. Focusing on a Sustainable Drainage System (SUDS) project that was never completed in a housing co-op, the authors show how the municipal government utilized a plan which focused on city-wide macro solutions that de-emphasized the role of private residents. Only 12 private SUDS projects, such as green roofs or a separated water management system, exist in Copenhagen compared to the 300 planned Cloudburst Management projects under the 2012 plan (Baron & Petersen, 2015). Using their urban green assemblages framework, the authors view the 2011 flood in Copenhagen as an important actor contributing to the City seeking a large-scale solution rather than a piecemeal one. Political momentum spurred by the flood shaped a strategy connecting the entirety of Copenhagen together in one big SUDS, with residents providing input on individual projects. Overall strategy and funding, meanwhile, was shaped by municipal priorities (Baron & Petersen, 2015).

The reviewed research covers climate adaptation from different angles, helping us understand vulnerability, power structures, political strategies, and the state of adaptation worldwide. Authors such as Lesnikowski et al. (2011) show how groundwork and reports are frequent across cities while concrete action is lacking. Available research suggests climate adaptation infrastructure and land-use are not poised to address projected impacts of climate change on our cities (Berrang-Ford et al., 2011; Gagnon-Lebru, Agrawala, 2011; Lesnikowski et al., 2011). This is perhaps due to two factors: climate change has only recently become an

important policy area for cities in the global north (Mickwitz et al., 2009), and many cities in the global south lack the capital to carry out climate adaptation despite the need (Anjanappa et al., 2024). The United Nations Environment Programme (2024) claims the climate adaptation finance gap is \$187-359 billion USD per year.

The research on climate adaptation, as well as official reports and plans provided by the City of Copenhagen (2011, 2012), both suggest that Copenhagen is considered a leader in climate mitigation and adaptation and that significant investment is being procured to protect residents and property against climate damage (Engberg, 2018). Authors have analyzed the way the City co-develops adaptation with residents, the role and power of different stakeholders, and how the municipality uses legislation and financing to steer that process (Klein et al., 2016; Engberg, 2018; Baron & Petersen, 2015). This research also outlines the way this co-production is designed to implement the needs and wants of residents, as well as how responsibilities are structured.

However, further research is needed to fully understand the current political relationships and power structures which underlie the development of adaptation infrastructure in Copenhagen. These can be analyzed alongside the current legislative environment (related to funding of climate projects) in order to understand political will and what factors have contributed in the years since the flooding of 2010 and 2011. Importantly, research is needed on the role of narrative and framing devices in driving or shaping this political will, and how this represents a kind of power in setting visions and ideation about the future. In this thesis I will attempt to provide further analysis to supplement prior research discussed above.

3. Theory

This thesis will utilize a constructivist epistemology whereby reactions to climate change and the process of urban transformation are socially constructed by numerous stakeholders. Official planning documents and climate modeling do not represent an objective reality of what is, but rather are representations of the normative process of socially constructed knowledge and beliefs. Within this epistemology, this thesis will analyze Copenhagen's climate adaptation using theory from political and urban ecology, as well as urban green assemblages.

Overview

Political ecology emerged in the second half of the 20th century as a response to environmental degradation and a new desire to understand the role of political economy (Bassett & Peimer, 2015). The theory investigates nature-society relationships regarding the management and production of nature, and includes cultural conceptions of landscape and land-use (such as agriculture) (Bassett & Peimer). In a constructivist approach, political ecology studies “how environmental knowledge and social order are co-produced” (2015, pg. 160). In the case of Copenhagen this approach involves the socio-political framing of climate change and the urban environment, producing conceptions of resilience, risk, ecological health, and social sustainability. These conceptions then support the production of political will, which reinforces the authority of certain conceptions of environmental risk and resilience.

Political ecology also examines power relationships, as Svarstad et al. (2018) writes, analyzing who has control over and access to the environment. These power relationships are place-based and are determined by the will of actors and global economic and political processes. Svarstad outlines different modes of power in political ecology as actor-oriented, neo-Marxist, and Foucauldian. In this thesis I will consider the role of actor-oriented power structures in the way power is “exercised by actors, in contrast to views in which power is perceived as a force that may pass through people without consciousness or accountability” (Svarstad et al., pg. 352). In the case of Copenhagen, this power structure includes a consideration for the unequal power held by the municipality, the water utility, and the residents

(or their representatives in local committees). The distribution of power impacts the way the environment is shaped and managed, or in the case of adaptation, whose conception of resilience takes shape most precisely in Copenhagen.

Urban political ecology adds to this analysis with a distinctly critical perspective, where analysis includes the agency of actors and “the process through which all forms of nature are socially mobilized, economically incorporated and physically metabolized/transformed in order to support the urbanization process” (Swyngedouw & Kaika, 2014, pg. 459). Swyngedouw and Kaika utilize a critical lens in understanding urbanization not so much as a process of construction or emigration, but of the global flow of capital, energy, labor, and resources (as nature) in order to commodify and consume these components for urban growth (Swyngedouw & Kaika, 2014). Part of this critical lens is a more explicit acknowledgement of the role of modern capitalist development in accelerating the ecological crisis which underlies the need for adaptation in the first place. This critical lens will be useful when analyzing narratives around climate adaptation and the positive impacts of adaptation projects present in official documents.

Finally, urban green assemblages (UGA) combines studies of urban political ecology with actor-network theory to produce a relational understanding of how places are produced (assembled) by heterogeneous actors (Blok, 2013). UGA involves an analysis of both human and non-human actors in the “gradual redesign of urban ecosocio-technical relations in ‘green’ (or ‘sustainable’) directions” (Blok, 2013, pg. 10). UGA also helps this research stay grounded in space by viewing the urban not as one site but as a series of distinct sites which are constructed and managed by local political and economic processes. In the case of this thesis I follow the idea of assemblages in viewing urban climate adaptation as not one large-scale transformation but a series of distinct localized projects. This process of assemblage allows analysis of distinct sites to differ based on the actors involved and the power they utilized in that deliberation. Each adaptation project is impacted by these heterogeneous actors, including official planning documents, residents and their local committees, the water utility HOFOR, the municipal government, parks and green spaces as sentimental and productive spaces, and finally the changing climate and risk of flood.

Theory in Practice

Together, this framework sets out to analyze urban climate adaptation in Copenhagen as a socially produced, politically contentious, and spatially distinct process of transformation. Political ecology will be used when analyzing official documents and interview responses on a broader scale, framing their production as a result of political deliberations. Social and cultural views on nature and green-blue infrastructure will also be discussed in the context of narrative framing, co-production, and political legitimacy. The use of political ecology is valuable in analyzing the production and management of the urban landscape, as well as the role of political power in how key actors interact and influence climate adaptation in Copenhagen.

UGA is a valuable addition in analysis of interviews and documents because of the way the theory views the urban landscape as a “plurality of sites” (Blok, 2013, pg. 9). These distinct cloudburst management projects include Tåsinge Plads, Sankt Kjelds Plads, Rantzausgade, Hans Tavsens Park, and Enghaveparken. UGA will be useful in document analysis when analyzing descriptions of co-production, such as those found in the Klimakvarter website discussed below. The theory is also useful in analyzing interview responses, particularly when discussing the perspective of residents (and their local representatives), as “situational micro-struggles” (Blok, 2013, pg. 7) where such factors as the width of a sidewalk or the grading of a park come into view.

This theoretical framework focuses analysis on the actor-centered process of co-production where power and priorities interact in the planning and construction of cloudburst management. Importantly, the framework will aid in understanding the role and power of future imaginaries, meaning how each actor envisions the correct response to climate risks in Copenhagen. It will also aid in analyzing the framing and narrative tools created to aid one of these future visions, and what power and influence these tools exert on the process of co-production. The critical elements of this theoretical framework, while not the primary mode of analysis, aid in understanding the broader implications of power imbalances in the shaping of Copenhagen’s climate adaptation strategy.

4. Methodology

This thesis utilizes an interpretive qualitative methodology informed by political ecology and urban green assemblages. This method does not test a hypothesis, but instead will analyze the way climate adaptation strategies and the subsequent infrastructure projects in Copenhagen are socially and politically produced as a result of multi-actor contention and compromise. The purpose is to understand the successes or drawbacks of Copenhagen's strategy and process, such that readers can compare and contrast this strategy to other case studies, or proposed alternatives within Copenhagen itself. These methods described follow the theoretical framework outlined above, focusing on actors, socio-political conceptions of (and resulting production of) space, and the process that produces distinct adaptation projects in Copenhagen.

In addressing the research questions posed in this thesis, I utilized a literature review, document analysis, and structured interviews. The document analysis was conducted using official documents authored or published by the City of Copenhagen, as well as a website created by the City to showcase and promote Østerbro as a 'climate resilient neighbourhood'. These documents are analyzed in a particular order, beginning with the Climate Adaptation Plan from 2011 before moving on to the Cloudburst Management Plan of 2012, the Climate Change Adaptation and Investment Statement of 2015, then on to the Cloudburst Masterplan for Ladegårdså, Frederiksberg East & Vesterbro, and finally the Klimakvarter (climate resilient neighborhood) website. These documents were chosen because they are available in English, and because they provide valuable insight into the City's strategies regarding climate adaptation.

The order of analysis is important because it begins with a broad report produced before the 2011 flooding, which shows where municipal priorities and political will stood in those early years. From there, reports move forward in time (relevant due to the 2011 flooding and the changing of political will in the years since) and become smaller in scale, ending with a document which focuses on a select few distinct projects rather than broad municipal strategies. This document analysis attempts to draw out broader themes and understandings of municipal strategies for climate adaptation, the role of political will, and the City's view of what residents want in their infrastructure. This thematic and framing analysis primarily focuses on written

descriptions for common themes and language, but also uses a visual analysis of pictures and visualizations.

Also utilized are structured interviews with two city planners, the Chief Consultant at HOFOR, and a semi-structured interview with the Chairman of a local committee in Copenhagen (representing residents and local democracy). The interviews with planners were in-person, and took place in a municipal office building, while the interview with the Chief Consultant at HOFOR was conducted online through a video call. The interview with a local committee Chairman was partially at his home, but also contained a section of “walk and talk” led by the interviewee. This allowed him to take the lead in the interview process, showing me what he thought was important and filling in details as we went. These interviews provide detailed information on each person’s understanding and experience regarding cloudburst management and climate adaptation broadly, as well as some insights in the role and power of each group as a whole. The interviews also help in providing more up-to-date information on cloudburst management in Copenhagen, given the documents analyzed primarily cover events and strategies from the early period of this strategy’s development (2010-2015).

The interviews help to fill in gaps of knowledge not discussed in existing research or official documents, and are useful when analyzing the power and priorities of different groups. The interview guide for these interviews (found in Appendix 2) was written with distinct questions for planners, HOFOR, and residents/local representatives. The questions were developed and written out over time, matching the rate at which interviews could be scheduled and conducted. The structure of the questions posed to urban planners changed between the two interviews, as the first interview gave insight into the flow of information and how better to organize the interview. I conducted interviews with planners before interviewing a senior member of HOFOR, after which I interviewed the Chairman of a local committee, and so the questions and their order were shaped by knowledge I had gained from previous interviews.

Reflections and Drawbacks

This approach heavily utilizes official sources, which limited my exposure to positions or experiences not discussed in those documents. The timeframe of this thesis, and the fact that I cannot read documents in Danish, also impact what official documents I can read and analyze. A

greater number of semi-structured interviews with residents could have provided a more accurate picture of that group's experiences, bolstering the information gained from the semi-structured interview of the local committee Chairman. Similar issues arise in understanding the perspectives or role of the City, as the government is not a monolith but rather a series of individuals in a series of departments making decisions in a collaborative/deliberative process not unlike that which produces cloudburst projects. A greater use of "walk and talk" in interviews would have also been beneficial in both grounding the knowledge in space, but also because it gives more power to interviewees to lead the discussion outside of structured questions. This method may have elucidated information that wasn't discussed because of the interview guide I utilized.

5. Document Analysis

In this section I will summarize key passages and conduct thematic and framing analysis from official reports and planning documents published by the Copenhagen municipality. These documents have all been read and analyzed in English. The purpose is to showcase the municipal strategy of entangling new construction and modifications for climate adaptation with urban renewal and quality-of-life improvements. Throughout this analysis I will highlight the repeated use of this strategy and how it has stayed consistent across time and in scale, despite other themes and framings shifting over time and in scale. The documents also give insight into the technical details of this construction, valuable in answering the descriptive research question posed at the outset of this thesis. Finally, I will also discuss the way these documents depict the collaborative approach of co-production when planning adaptation projects.

5.1 The Climate Adaptation Plan

Copenhagen's Climate Adaptation Plan (City of Copenhagen, 2011) presents the municipality's plan for addressing increased risks from climate change in the near future. Early in the document, this plan shows the overarching philosophy of climate adaptation, that being the "municipality's work on climate adaptation must therefore promote integrated planning of the city and its infrastructure to the benefit of the population and the environment" (pg. 6). The plan gives examples, such as providing green spaces for management of heat, improving the management of stormwater, and improved recreational facilities for residents.

In regards to the efficacy of financial investment, the plan prioritizes both flexibility and a high level of technicality so investments can adjust to new conditions and to ensure "that wrong investments are not made" (pg. 6) respectively. Many of the other key pillars of the plan suggest that climate adaptation is meant to be tied directly with benefits to the city and its residents, even when the direct adaptive purpose is not in use. These factors include synergy (adaptation infrastructure working together with other priorities), attractiveness, and green growth (growing the already substantial "green" industries in the area). This green growth is meant to attract new investments, offsetting costs for these municipal investments.

Managing Water

The primary challenge addressed in this planning document is cloudburst rain. The document includes studies by the Danish Meteorological Institute which predicts that “in climate scenario A2, which as mentioned assumes a rise in temperature of 2-3 degrees, there will be 25-55% more precipitation in the winter months in 2100” (2011, pg. 13), as well as an increase in intensity for cloudburst rain by 20-50%. The study averages these values in saying that the drainage system (via the sewer) will see a 30% increase in water in the climate future predicted. Notably, the plan lists these values and concludes that most of this water can be managed on the surface of the city with improved surface water management. As part of this hydrological and hydraulic modeling the document creates three distinct flooding scenarios; 10-year, 20-year, and 100-year rain. At the time of this report's creation, the models predicted the following areas would flood (figure 1).

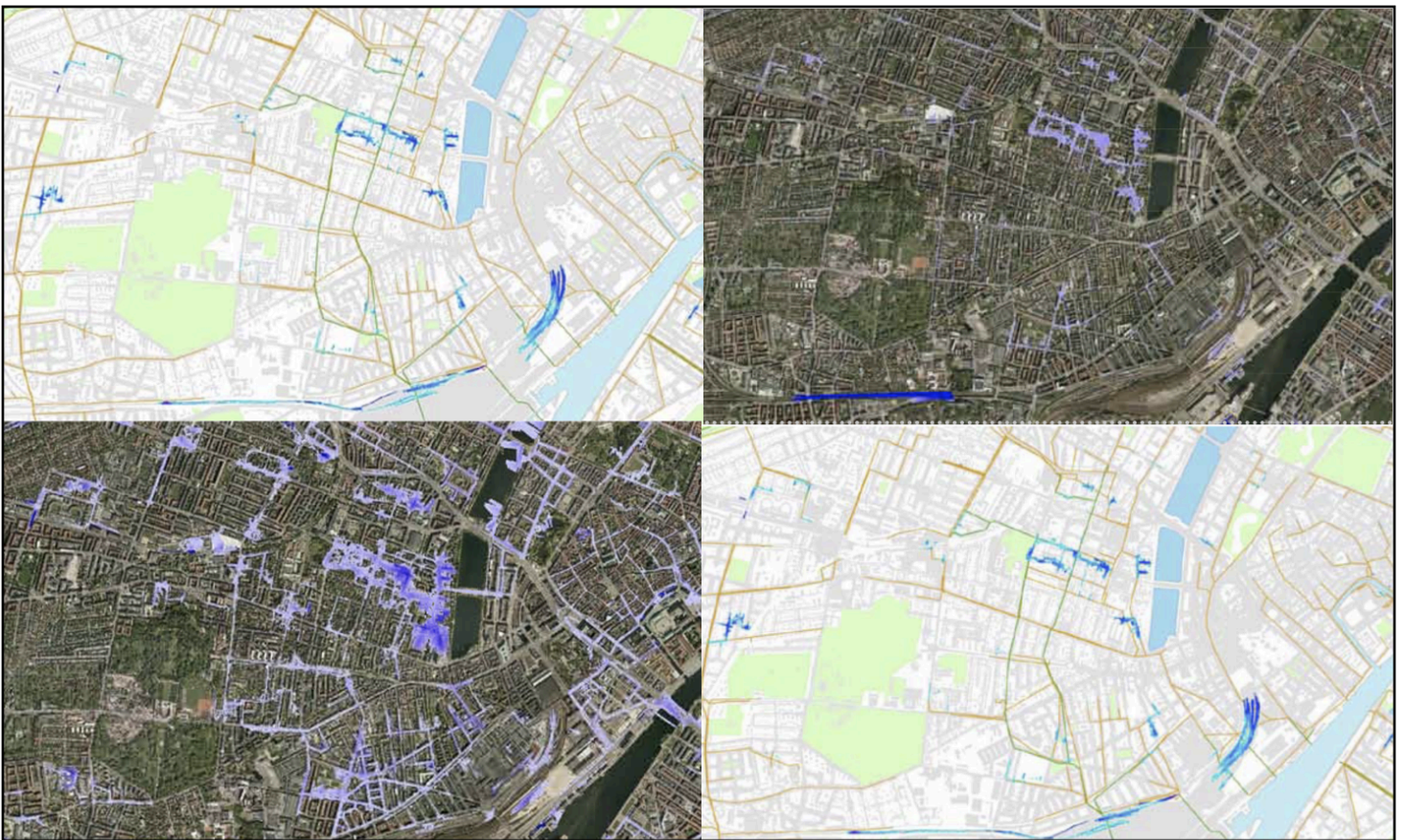


Figure 1: Clockwise: floods in a 10-year rain event in 2010, floods in a 20-year rain event in 2010, floods in a 100-year rain event in 2010, floods in a 100-year rain event in 2110 with climate adaptation measures (City of Copenhagen, 2011)

Directly comparing the two 100 year rain events (bottom left, bottom right), one without adaptation and one with the infrastructure built, shows how much of the city would be saved from flooding based on adaptive strategies.

In the CAP the City utilizes a cost analysis, comparing the predicted cost of damage to the price of investment in Danish Kroner. The report utilizes multiple scenarios to showcase the potential cost and savings of different strategies, such as sewer maintenance, installation of pumps in all cellars, surface water management, and integrated SUDS. In connection with a discussion of these strategies is a risk assessment showcasing the potential for flood in the near future. A map was produced (figure 2) which shows risk by calculating the *cost of damage*.

Although flood risk is included in calculations, it is notable that high property values will inflate their associated risk, increasing the risk profile based on cost instead of other factors such as loss of income, health vulnerabilities, or housing insecurity.

Based on these risks and proposed strategies, the City recommends a series of solutions in the CAP. These include a Sustainable Drainage System (SUDS) meant to reduce the burden of rainwater on the existing sewer system. For surface management, this includes the delay and storage of surface water so as not to overwhelm underground water management, which would be a combination of rainwater pipes and traditional sewer pipes. These SUDS surface solutions are depicted as green and low-tech, meaning they require little innovations or engineering and instead utilize the natural water management of soil, plants, and trees.

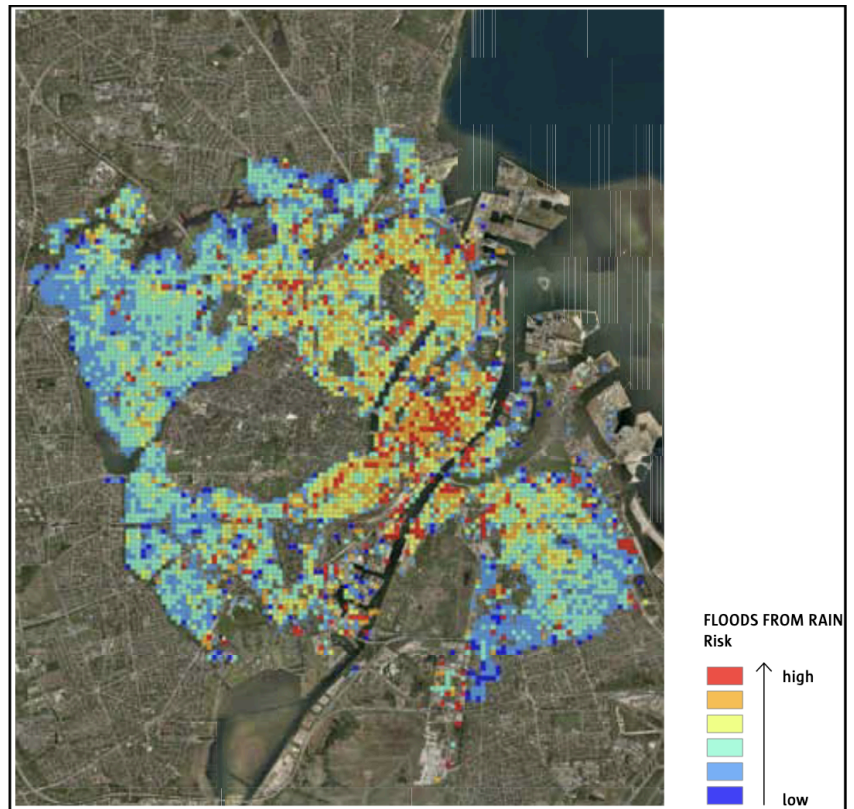


Figure 2: Risk of floods in the event of extreme rain (City of Copenhagen, 2011)

Another aspect of the plan's surface water management is "Plan B", a secondary task for water management in the case of cloudburst rain and subsequent flooding. Plan B consists of using roads—which would need modification—to move water to areas where it will cause less damage, such as city squares, sports facilities, and parks. Throughout this section, language depicts the synergistic benefits of this plan: that it will make for a greener city, allowing residents to enjoy all the benefits that come along with that investment.

Other Benefits from Climate Adaptation

The next section of the plan is essential to this research. Here, the report outlines the potential opportunities presented in this climate strategy and how these specific co-benefits improve various aspects of life in Copenhagen for residents. The authors write that "[b]y choosing solutions that improve the city's physical environment and create attractive urban spaces in relation to residence, transport and experiences, we can use climate adaptation efforts to raise the quality of life of the people [...] which will also help secure the economic foundation for the future of Copenhagen" (City of Copenhagen, 2011, pg. 57). Whenever the report describes a climate priority, such as the use of green spaces, it is followed by similar language describing the high priority of co-benefits. This language is quite optimistic, almost utopian, in the way it sees adaptation to climate change as an opportunity rather than a threat to the city's safety. In another case the report describes "a high level of quality of life, health and satisfaction for the city's population" (pg. 57) coming from green spaces, which are described as flexible and attentive to the needs of Copenhagen residents. Repeatedly the report describes climate adaptation as one part of a broader strategy to utilize the mandate given by their constituents to always think about how to improve the infrastructure, and therefore experiences, of the public.

Another co-benefit of this new investment, according to the CAP, is "green growth". This green growth is meant to take the form of increased domestic production of green technologies, but also the attraction of foreign investment in the city as a hub of green innovation. The authors write that the goal is "to make [Copenhagen] a shop window for green technologies and solutions" (pg. 63), using these surface climate adaptation measures to showcase the success of their model. The report is explicit about the desire for larger projects to demonstrate Copenhagen's leadership status in adaptation and green growth. In summary, "[the] aim of the

climate adaptation plan is to protect the city, its citizens, the business community and the city's many assets. But the plan is also a development plan, focused on opportunities" (pg. 63).

Legal Framework

This section outlines existing legislation that either supports or hinders the implementation of these climate adaptation goals. Notably the language used in this section showcases the degree to which the City, even in a 100 page official document, is unsure of the legal frameworks that exist and how they would need to change. The SUDS planning, where surface water management is changed to reduce burdens on sewers, lists that clarification is still needed to understand the legality of implementation. Similar language is used for Plan B, the name for the idea to use road networks to control the flow of water, describing a need to consult with lawyers to see if this plan is even possible under current law. This section shows the complexity of implementing urban transformations and the power structures that interact to create them. The legal framework is not just municipal but also national, meaning political will is required at multiple levels of government for the suggestions in this document to succeed.

Takeaways

Analyzing the language and framing of the climate change problem for Copenhagen, this document is not a planning document for specific projects (although it can be highly technical, particularly in cost-benefit analyses found in each section), but rather is an outline on future municipal strategies for adaptation and the legal/financial framework that will build it. The authors considered this framework to be a starting point in a longer process of planning across multiple documents, and that "the plan will therefore have to be regularly updated so that it reflects the latest knowledge at all times" (pg. 84). This framework is ultimately focused on the ability for the City to address climate risks while also developing, renewing, and improving quality of life for residents and businesses.

The CAP is additionally focused on cost and risk analysis, referring often to the need to prioritize important public assets and not make poor investments. In the words of the report, "[c]limate adaptation is planned by continuously assessing the picture of risk and looking at the

opportunities that are presented by the solutions” (pg. 7). This document also acts as an important backbone to the climate adaptation planning that has occurred over the past 15 years, with projects like rainwater pipes, surface water hydraulics (using roads), and retention of water in key sites all still in use today (Andreasen, 2025; Reghev, 2025). Descriptions of these solutions, as well as graphics drawn up to depict their planning process, are measured and pragmatic, which will be contrasted to the tone of the CMP analyzed below.

In the theoretical framework set for this thesis, this document can be analyzed for how it depicts municipal priorities and the production of the urban landscape. The focus on cost-analysis is indicative of the need for the City to legitimize the investments in the language of economics and growth. The framing of climate adaptation as a source of green growth, as well as a means of improving quality of life for residents and businesses, both signify the role of economic returns on investment needed to gather political legitimacy to these projects. The document also frames itself as highly technical and measured, creating a legitimacy of purpose for the suggested outcomes of the plan moving forward. Although it is not explicit in this document, the power relations among actors are present in the way the City is driving and shaping the planning process for climate adaptation. Notably, local committee members and residents of Copenhagen are not mentioned as collaborators or co-authors of this report.

5.2 Cloudburst Management Plan 2012

The Copenhagen Cloudburst Management Plan (CMP), developed in addition to the broader Climate Adaptation Plan (CAP), outlines the City’s infrastructure strategy to counter potential damage caused by cloudburst rain and subsequent flooding (City of Copenhagen, 2012). The document was written as a response to a massive flood which occurred in 2011, the same year the CAP was published. The plan is notably shorter and less detailed than the CAP, acting more as a modification of the existing stormwater management plan under the CAP of 2011. This strategy focuses on a two-pronged solution—using modified surface infrastructure to manage as much water as possible, and then using large underground pipes to hold and flush water out of the city during cloudburst rain.

The document plans for a budget of DKK 3.8 billion from the beginning of implementation until 2033. The report describes what could be built with this budget with more details on an underground pipe system to separate rainwater from wastewater, which was considered in the CAP as one suggestion to relieve pressure on sewer pipes. The plan to use these pipes was a response to the 2011 flood, shown by the explicit language used in describing the inadequacy of surface-only water solutions proposed in the CAP a year earlier.

Supplementing the pipes are the new methods of managing water on the surface. Borrowing some ideas from Plan B of the CAP, the CMP calls for the use of modified road infrastructure to move water around the city. However, Plan B is considered “inadequate in preventing pluvial flooding in large parts of the city” (pg. 7), meaning the new CMP strategy would move more water off of the street and into either waterways or towards the sea. In areas where modifying roads is too expensive or difficult, the pipes are meant to manage the flow of water in order to reduce the water held in retention areas.

The plan calls for green-blue infrastructure on the surface in order to manage flooding and daily rain, similar to the proposal under the CAP. This is described as a companion to the grey drainage systems of roads and pipes, working together to reduce costs. The report notes that green-blue infrastructure alone would not provide enough water storage to manage cloudburst rain, even when including car parks or large parks in the city. Overall, this strategy is described for its technical benefits but also as part of a broader strategy “that will make the city greener and bluer” (pg. 8), language similar to the focus on green co-benefits from the CAP.



Figure 3: A man-made canal depicted in the CMP (City of Copenhagen, 2012)

Assessing Risk

Where the CAP had no set limit for water, the CMP sets a new acceptable limit for surface water of 10 cm of flood every 100 years (during a 100-year rain event). This number was set because of an understanding that, below this value, it is unlikely that water will be able to get into basements via street-level windows. Similarly, it is believed to be generally passable by most means of transport. Although the CMP notes this risk is based on uncertain prediction, the measurement of success is explicitly linked to a cost-benefit analysis. Under their calculations the City estimates savings begin from a 20-year flood event and increase with the severity of stormwater, peaking at a 100-year flood. In offsetting this risk, the City recommends the building of canals (figure 3) which will support the other infrastructure discussed above.

Prioritization

The City's plan involves seven catchment areas each with a map of water flow routes (based on streams and natural waterways) and an assessment of risk and vulnerability (City of Copenhagen, 2012). Catchment areas are also given different priorities for cloudburst management projects based on a three-tier system (figure 4). According to the CMP, "[e]ach water catchment area is assessed according to the following four elements: risk, implementation, coherence with urban development projects and synergistic effect." (pg. 15). Areas of high priority (in 2012) included Østerbro, Nørrebro, København SV along the canal, and other surrounding neighborhoods with priority cascading out from these central areas in declining importance. With multiple overlapping reasons for this priority system,

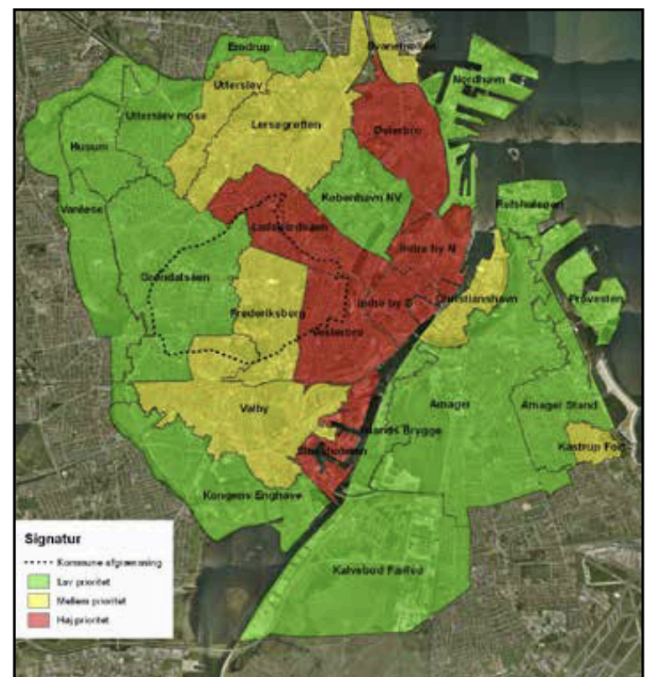


Figure 4: This map shows the prioritization of each catchment area in the CMP on three levels. This prioritization is determined based on risk, implementation, coherence with urban development projects and synergistic effect (City of Copenhagen, 2012)

understanding the influence of this prioritization on the implementation of early projects requires more investigation.

Stakeholders

The CMP divides responsibility into three pillars: the municipality, the utility (HOFOR), and private residents. Residents are expected to make any changes necessary to protect their residences from up to 10 cm of water. Anything more than 10 cm is considered the domain of HOFOR and the City, who work together to ensure water never gets that high. The City, with a budget of DKK 400 million from taxes, promised to manage the surface solutions of water management, such as green roads and parks. HOFOR, with the largest share of financing at DKK 2.2 billion (raised via a levy on water prices under the CMP), was assigned the role of managing the water drainage. Although the use of underground pipes for water are a part of this plan, they are not explicitly assigned to HOFOR for management. There is also language in multiple sections which point to a lack of clarity over whether the utility would be allowed to finance anything beyond the sewage system in Copenhagen due to legislation regarding what constitutes a legitimate need for levy.

Takeaways

This document modifies the City's strategy for addressing cloudburst rain from the strategies first put forward only a year earlier in the CAP. The 2011 flood spurred this rapid response by the City, who have borrowed and refined some strategies from the CAP (such as the use of green-blue retention areas and roads for the movement of water) and added new ones, such as the use of underground pipes to manage rainwater. Yet the CMP is explicit about the need for new legislation to support this system. For example, the plan writes that "[e]xisting legislation obstructs the implementation of measures where existing roads will be used as flood ways for pluvial flood water" (pg. 17). As alluded to above, the ability for HOFOR to participate was left open to interpretation pending new legislation. This document is explicitly *not* legally binding, but rather it is a framework which should be used when implementing other projects of urban renewal, or facelift schemes (2012). Despite providing an outline of strategy, the CMP is light on

specifics. For example, the number of projects or the form they will take is not indicated in this document. Since publication, the City decided on between 300 (Engberg, 2018) and 350 cloudburst projects (Ziersen et al., 2017), in line with the plan's promise to provide more specifics after this plan's publication (City of Copenhagen, 2012).

Similar to the CAP, the CMP discusses the co-benefits of this kind of investment and urban transformation. The co-benefits of surface solutions are outlined in the CMP as an “ambition to

increase the blue and green infrastructure in future [sic]” (pg. 8). However, the CMP spends less time on these co-benefits and on the social values of green-blue infrastructure investments compared to the CAP. This could be a result of the 2011 flood and the need for a more technical framework, or due to the feeling that the larger CAP covered this strategy thoroughly already. An analysis of the imagery used in this report is important to understand what narrative or framing it provides. Images from the 2011 flood are present throughout, showing the height of the water and the disruption it caused.

The juxtaposition of disaster imagery with descriptions of climate adaptation strategies (figure 5) shows readers what is at stake, attempting to create a kind of political legitimacy for the investments and disruptive construction proposed in the document. By doing so this report acts as a powerful framing device for the purpose of cloudburst management, drawing on a shared experience of flood to create political legitimacy. Overall this report is tonally different from the CAP, showing the impact of the 2011 flood, and provides more specific and distinct infrastructure strategies for managing cloudburst rain.



Figure 5: A compilation of photos used in the CMP from the 2011 flooding (City of Copenhagen, 2012)

5.3 Climate Change Adaptation and Investment Statement

Part I

In Part I of this report, published in 2015, the City outlines specific aspects of cloudburst management which were only in the ideas stage when written in the CMP of 2012. Most of Part I describes new plans and the details that planners would need to ensure each new CMP project fits the updated framework. The report strikes an optimistic tone about progress made, telling readers that “Copenhagen has come a long way in its efforts to protect itself against the heavier rains of the future” (City of Copenhagen, 2015, pg. 8). The document provides details on the combined use of surface solutions and pipes outlined in the CMP,

describing how pipes will be used in a given catchment area to drain water to Sankt Jørgens Sø (one of the small man-made lakes in central Copenhagen), Nordhavn Harbour, or Svanemollen Bay.

Unlike the CAP and CMP, this report showcases existing construction and one finished project in Østerbro. Tåsinge Plads had been completed in time for this report, and after a summer of rain the design worked as intended (City of Copenhagen, 2015). These projects are determined by two actors: the Secretariat for Water Supplies and the City itself. The Secretariat is in charge of determining if projects can be funded by charges to the water bill of Copenhagen residents, without which these projects would likely stall or need re-designs to ensure access to this funding. This report also helps us to understand the process of deliberation which occurs during design and funding periods, outlined with a graphic (right). The report also discusses the inclusion of local committees as “an important partner in cooperation, as their local knowledge may help enhance the resilience of the individual projects” (2015, pg. 12). This section explains

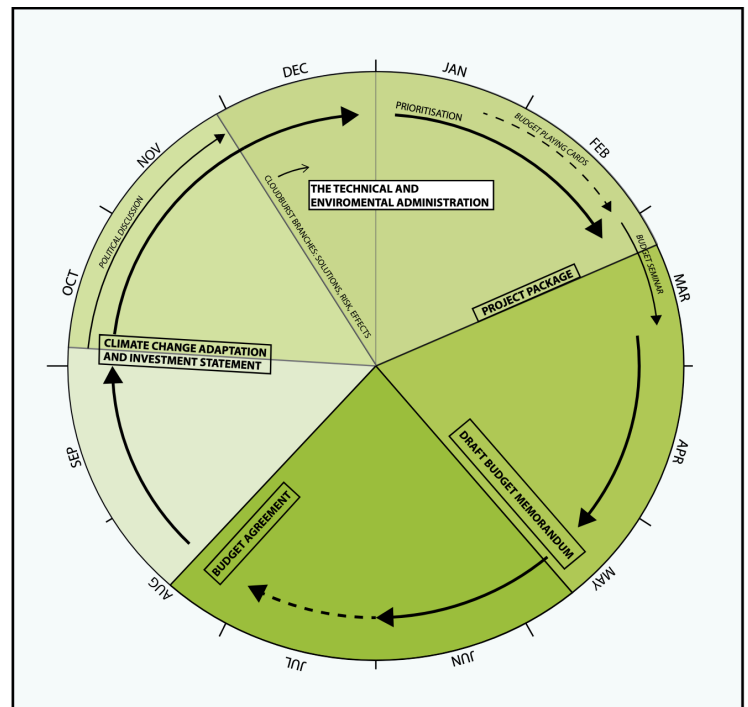


Figure 6: A graphic showing the timeline of project planning (City of Copenhagen, 2015)

how residents are included in the process, as they can liaise and influence local committees depending on local issues and political will. Later, the report describes the use of a structured platform for co-planning adaptation projects, which ensures feedback from residents and businesses on any new project. Finally, the report writes about their internal prioritization process for new projects, listing on multiple occasions the need for projects to “be effective quickly” or “function from day one” (2015, pg. 12). This language expresses the level of political pressure that the City feels relating to flooding and property damage.

As with other reports and official planning documents, this report is explicit in connecting climate adaptation with urban renewal. Specifically, the report notes that cloudburst management infrastructure will ensure the city sees benefits from new construction and modified urban landscaping, making back the cost of the project in increased property values and subsequent taxes. The City expects that property prices will rise by DKK 1.4 billion, outstripping the DKK 1 billion which the City plans to spend on these upgraded surface parks and recreational spaces. An added benefit listed in this report is the growth of the water and environmental technology sector, which employs 100,000 people and makes up 10% of Danish exports (City of Copenhagen, 2015). With the majority of these products being made for foreign markets, the document describes the potential benefits of investing in this sector for the overall Danish export economy with a particular focus on the Copenhagen region.

A key section of this report is the financial statement where the municipality shows their calculations for the cost of projects and the expected returns. The City expects that the cost of damage would be between DKK 16-18 billion, the cost of action would be DKK 12-13 billion for the proposed solution, and the cost to grow and maintain a traditional sewer system would be DKK 20 billion. With a reduction in damage of DKK 16-17 billion, the projects are expected to save the City DKK 3-5 billion over the timeline of the projects (City of Copenhagen, 2015). The majority of this cost is expected to be surface solutions, with double the budget compared to the cloudburst pipes which HOFOR will build underground. The cost to residents to fund HOFOR for their part of the budget is expected to be DKK 890-1375 per household per year over 75 years, depending on water usage (City of Copenhagen).

In return for increased water prices, the City expects insurance premiums to reduce compared to a “business as usual” scenario. This would reduce the yearly costs for homeowners, which the City expects will reduce pressure on a growing housing market. However, the decrease

in premiums is expected to go along with an increase in property values, which will increase yearly tax bills for homeowners and may be passed on with increased rent or higher costs for buying apartments in the city.

Part II

Part II of this report outlines specific details on locations, infrastructure, and expected costs for the proposed wave of cloudburst management projects. This second part, coming in at 192 pages, is a series of branch projects with photographs and descriptions of the urban and green-blue character followed by the potential for urban renewal. This section writes how “300 cloudburst management projects are the start of 300 new better urban spaces” (City of Copenhagen, 2015, pg. 203). This section takes a given area and uses both a map of project proposals (figure 7) and a description of existing infrastructure to outline what kind of cloudburst management strategy the City believes best suits the area.

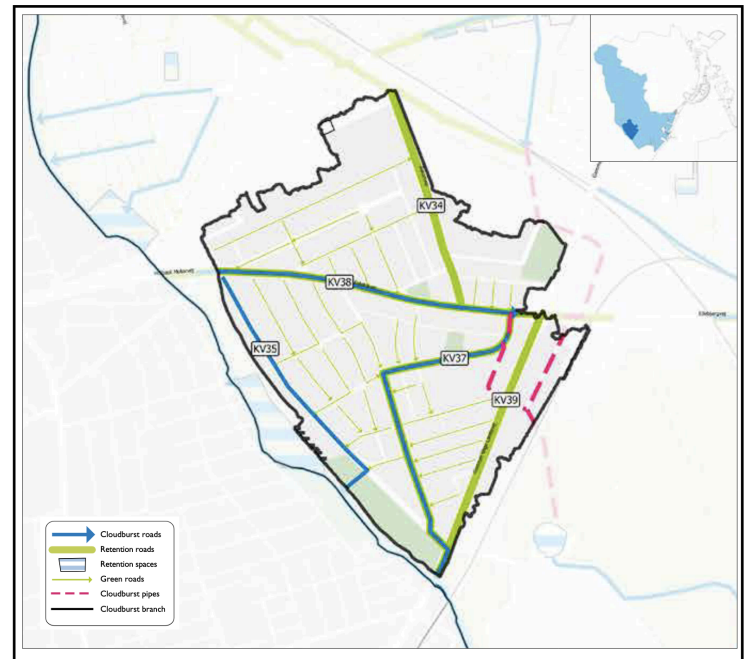


Figure 7: Locations of each proposed project in the Folehaven cloudburst branch (City of Copenhagen, 2015)

In the example of Folehaven (shown in the map above) we can see the exact projects intended for roads, parks, and other urban spaces which can be modified to be cloudburst roads, retention roads and spaces, or be supported with pipes (shown with the dashed pink line). This aspect is helpful in identifying the specifics missing from the 2012 CMP. This report also lists the synergistic benefits of these projects, in line with the municipal strategy to entangle these benefits in with project designs. In this case of Folehaven the projects were written out with a financial cost analysis and a description of proposed synergies. Across all projects in the city, a theme arises with repeated use of cycle paths, green climate adaptation, and road renovation. Also common are terms like “neighborhood regeneration” and “deprived areas” (pg. 69). In the

repetition of these terms we can see not just the most common perceived synergies but ultimately what those synergies are meant to achieve. With road renovation and cycle paths focusing on connectivity and safety, the use of green climate adaptation, neighborhood regeneration, and deprived areas show a distinct understanding of the ability for investments to create urban renewal. This language matches well with wording from Part I of this report, where improved property values and more tax revenue were presented as primary goals for cloudburst management.

The final section combines these branches back into their respective neighborhoods to give an overview of the urban character of each district and the potential for improvement with the CMP strategy. Here, the most common benefits described are connective tissue, new green spaces, walking paths, and park modifications to facilitate the easy movement of people in the city. In the Østerbro section, the urban character is described as primarily residential, and that a few large parks and green spaces will be connected with dense urban areas through these “connecting links” (pg. 209).

In another section on Vesterbro, a similar pattern emerges. With cloudburst management this document states that the City can enhance local green features, provide better connecting links, enhance walking and cycling paths, and improve recreation. In this pattern, we can see the desire for the City, through this report, to describe cloudburst management investments as an injection of funds to the most attractive and widely used public spaces across the city.

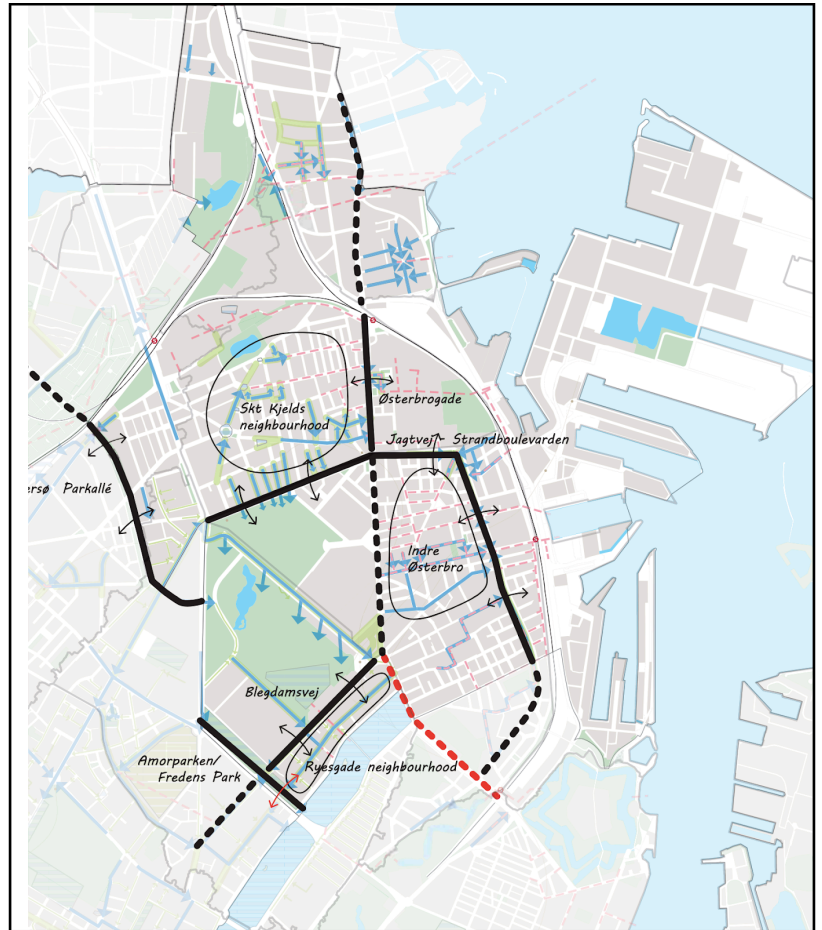


Figure 8: A graphic showing the locations of the cloudburst branches in Østerbro, and the potential for connectivity (City of Copenhagen, 2015)

Connective tissue between these places helps with accessibility but also neighborhood integration, which can be a helpful tool in reducing inequality and disrupting negative cycles of poverty, crime, and disinvestment.

Takeaways

Part I of this report clarifies numerous unanswered questions from the CMP, such as the budgeting and planning process, the inclusion of residents and local committees, and technical strategy applied to individual project designs. With new clarity on finances, including the role of the Secretariat for Water Supplies and their impact on HOFOR's financing scheme, we can better understand the political power structures of Copenhagen's climate adaptation. With sufficient political will the Secretariat would continue approving funding, but if things shift HOFOR's ability to continue financing construction would be in peril. This is the situation the City finds itself in now as a result of declining political support for climate adaptation since 2016 (Andreasen, 2025; Clauson-Kaas, 2025a). Finally, Part I outlines the finances and how the City calculates the cost-benefit ratio of each project. Pushing beyond their water-management capacity creates space for other synergized benefits, allowing the City to argue that these investments essentially pay for themselves.

Part II provides detailed descriptions of urban greening and how it will lead to better accessibility, connectivity, and improved recreation. These sections describe how the projects will "strengthen the overall green features and recreational connecting links of the district and create better cohesion in the city" (pg. 218). Notably absent from the final chapter on potential benefits for each neighborhood are descriptions of flood mitigation or climate risks. Instead, these benefits are implicit or assumed, known and described in detail in Part I but not repeated in this later analysis. This repetition in the use of terms around connectivity, walkability, and green spaces presents cloudburst management as a strategy of neighborhood management and improvement through the transformation of Copenhagen's infrastructure. The specific use of terms such as "neighborhood regeneration" and "deprived area" in the context of additional benefits clarify how urban renewal and economic equality as an important goal for the City. Connecting places with better green buffers, walking paths, and cycle routes allows the City to

argue that everyone in the neighborhood can benefit from a project, even if it is built in another part of town.

Noting the use of language around exports and the growth of the ‘green’ economy, this report also prioritizes the use of these cloudburst strategies as distinct innovations which can be packaged and sold, growing the economy of greater Copenhagen. Other economic benefits include raising property values (and therefore tax revenue), improving connectivity across public sites, growing the green economy with innovations and think tanks, and renewing urban spaces for burgeoning and struggling neighborhoods alike. Tying together new investments and urban renewal in this way showcases a distinct strategy to maintain political legitimacy and financial buy-in among the residents who will pay for and then benefit from this investment.



Figure 9: Visual storytelling from the 2015 Investment Report, alternating between images of flooding and well adapted infrastructure in the dry (City of Copenhagen, 2015)

These documents also discuss the process of co-production and how different actors share the responsibility to plan and develop adaptation projects. This sharing of power provides another opportunity for gathering political legitimacy for cloudburst management, yet power sharing favors the City in the shaping of strategies and in determining what areas are of higher priority. HOFOR’s role is also made more explicit, calling on the utility to draw up hydraulic modeling for the whole of Copenhagen to ensure every project fits into a unified system. The report also uses visual storytelling (figure 9) by using pictures of flooded streets contrasted with dry and well-used parks. Together, these components depict a City confident in its new strategy, outlining this in greater detail in order to communicate its success and intention to continue pushing forward.

5.4 Cloudburst Masterplan for Ladegårdså, Frederiksberg East & Vesterbro

This document published by the City of Copenhagen (Ramboll, 2013) provides detail on how the CMP will be implemented on a smaller scale, in this case the catchment area containing Ladegårdså, Frederiksberg East, and Vesterbro. The expressed priority of cloudburst management in this document is to build resilience against rain as well as “to include added value and elements, which contribute to making the city more green, more blue, more attractive and more liveable” (pg. 2). This language follows patterns from prior documents entangling together adaptation and resilience with improved quality of life.

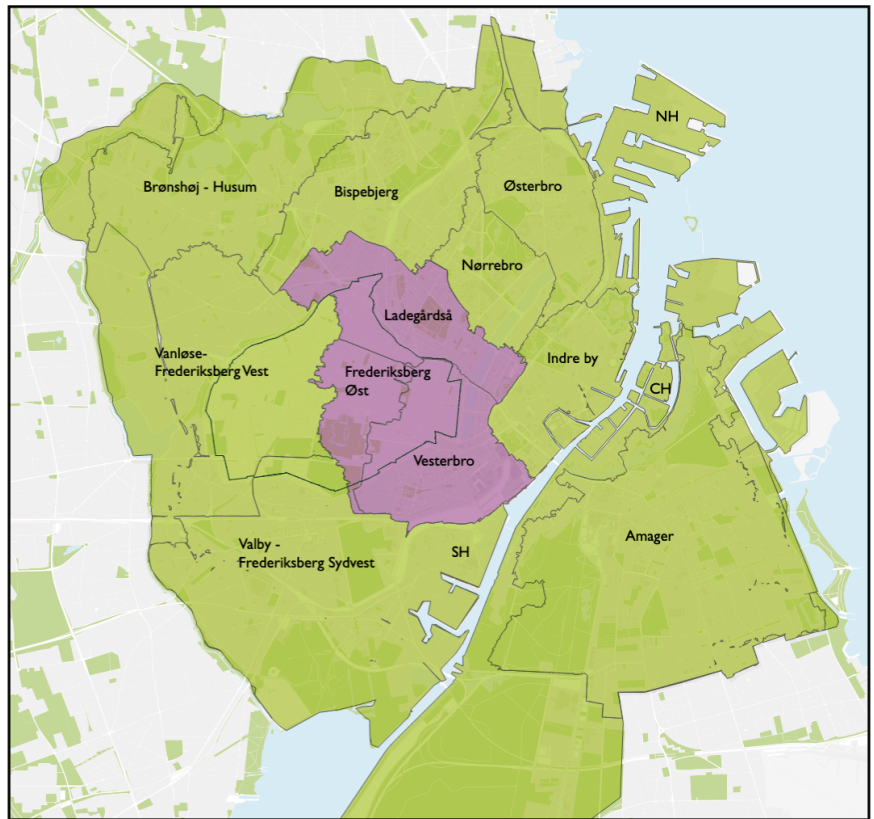


Figure 10: A map of the area discussed in this Cloudburst Masterplan document (Ramboll, 2013)

The document describes two proposed masterplans, both of which contain many of the same elements but differ in some key aspects of the strategy. Notably that in one plan a lake will be lowered down to create more shoreline, similar to how the lake was before it was made into a reservoir, wherein more space can be utilized for recreation and leisure (Ramboll, 2013). In the other plan, greater use of cloudburst pipes would move water underground to the harbor instead of modifying the lake area. In both plans, the overarching strategy for the area is the use of green roads for localized retention and cloudburst roads for movement of water to central retention zones. Ultimately one of these masterplans will be chosen, and so they represent two different paths the City could take.

Using artistic visualizations, this document shows what each of the proposed solutions would look like during different periods of rain. In a dry period, they depict people enjoying nice

sidewalks lined with businesses, green buffers, and safe streets. In the case of a green road modification to Sønder Boulevard, the graphic shows a large green area in the middle of the road which holds water during daily rain in a small reservoir or can completely flood during cloudburst rain. These visualizations help to show the form and the benefits of the strategies, depicting the way spaces can be used at different times as opposed to infrastructure which can only be useful in one amount of rain.

In the final two pages the document outlines the costs—wherein 75% of costs for terrain-based solutions and 100% of piping solutions will be financed by HOFOR—and the contribution to municipal strategies. The document describes this strategy as one of lifting the quality of urban life with “increased greening and increased biodiversity, [helping to] convert sealed surfaces to blue green elements and areas” (pg. 12). These places are meant to connect together in corridors of recreational space, improving bicycle infrastructure and aiding in the process of “urban renewal and neighborhood improvements” (pg. 12). The City then compares the two Masterplans against one another using an assessment visualized in a table. The factors considered are synergy with municipal strategy and other planning efforts, visibility, multifunctionality, feasibility, robustness (effectiveness), added value and liveability, environmental impact, and cost.

Takeaways

All together, this document provides an example of the localized form of Copenhagen’s strategy to manage cloudburst rain. Despite the change in scale, the document reads very similar to the CAP, CMP, and the Climate Change Adaptation and Investment Statement. Descriptions of climate adaptation strategies tie together infrastructure investments with greening, accessibility, recreation, improved quality of air and access to shade, and economic benefits to property values and the business health. This pattern of language is made explicit in the section on contribution to City strategies, where those strategies (also found in the CAP and CMP) are highlighted and addressed by this plan. Explicit descriptions of the ‘brand’ of Copenhagen as a green city are present here as well, describing this in the way it will impact international perceptions while leaving implicit the domestic political benefits that come along with this powerful messaging.

The use of visualizations also ties in with the strategy of visually framing climate infrastructure as multi-purpose, effective, and popular. The side-by-side comparisons of new infrastructure in dry, daily rain, and cloudburst rain scenarios also give readers a better idea of what is at stake, which is valuable considering cloudburst rain is relatively rare and many people may never see these places flooded in-person. The comparisons of the two masterplans provide valuable insight into the City's priorities and the framing of climate adaptation. The factors considered, as well as the written reasonings for each masterplan, show what considerations are most important when choosing between multiple approaches to infrastructure. One of these factors is directly linked to managing water, yet the other three relate to improvements in quality of life or recreational value. This document shows the power the City has in framing and prioritizing certain outcomes in this reshaping of Copenhagen's urban landscape, both in written descriptions of priorities and in the visual power this report has in idealizing one form of space.

5.5 Klimakvarter Website

Klimakvarter is the Danish name for the pilot project of cloudburst management infrastructure in the neighborhood of Østerbro, also called the climate resilient neighborhood. This document analysis covers a website created by the City (together with HOFOR) to showcase and promote the strategies used in Østerbro, highlighting the pilot projects with descriptions, technical details, and images. The construction of these projects came just after the CMP had been published, and showcases the dual strategy of surface solutions and underground pipes outlined in that document. These projects include Tåsinge Plads, Sankt Kjelds Plads, the Fremtidens Gårdhave (Courtyards of the Future), the Klimmakaré (climate block), and new cloudburst pipes and roads (City of Copenhagen, n.d.).

The way these projects were completed, and the enduring legacy they have as tactile examples of planned ideas, are described in detail here. The structure and framing of these projects in the website differ from other official reports in their clarity of intention. As the authors write in the *About* page, “[t]he Climate-Resilient Neighbourhood is the demonstration project, which is to inspire the rest of the city to think green when we think about torrential downpours.” (City of Copenhagen, n.d.-A, paragraph 8). Through an analysis of the language

framing and visualizations on the website, this section will investigate the more specific intended outcomes of “thinking green”, and how their description follows patterns seen in previous official documents.

Tåsinge Plads

Tåsinge Plads was the first project completed in cloudburst management, finished in December of 2014 (City of Copenhagen, n.d.-F). It is a small wedge-shaped park with an area of 7,500 square meters, which was previously unused pavement according to the site. Description of its design uses the language of synergistic benefits and green expansion, describing how greenery will revitalize the area, create new green spaces for leisure and recreation, and “will show the connections between nature, learning and culture” (City of Copenhagen, n.d.-F). This description goes along with technical details outlining the cost, the amount of water that will be managed, and the advisors of the project.

Like projects described in the CMP and Investment Statement from 2015, these projects lean heavily on the need for proficient water management, made clear in the description of Tåsinge Plads’ water capacity and management of roof water from the surrounding area (City of Copenhagen, n.d.-F).

Pictures used on the website are from after construction is finished, and give a clear image of the



Figure 11: A photo of Tåsinge Plads from the Klimakvarter website (City of Copenhagen, n.d.-F)

green-blue upgrades made to water retention, re-grading, and intelligent use of space. The re-grading creates a sloping effect to keep one side of the small park dry by moving water to another zone where it can be more effectively managed. In that lower section, the ground was dug out to create a bowl-shaped retention area full of shrubs, grasses, and trees (pictured above, figure 11). The park design also includes an underground cistern and the ability for water to then

be pumped out onto the surface for play. These designs were created in conjunction with residents, as the City describes, via a series of experiments and workshops. These allowed for a high degree of input from locals, utilizing this ongoing dialogue to build political legitimacy for the investment and in the disruption construction would cause people in the area.

The page for Tåsinge Plads includes a link to a brochure created to outline the form and intention of the project. In line with the website, this project is described as a combination of technical water management and quality public space. The language makes a departure from the descriptive wording of prior official documents (such as the CAP), with authors writing that the project not only manages water but “supports social life and the soul and rhythm of the city” (City of Copenhagen, n.d.-G, pg. 2). Together, the brochure and the website depict

Tåsinge Plads as a necessary piece of infrastructure for managing flood risk, created in close partnership with local residents, which provides a myriad of benefits beyond retaining water. Accompanying this description are pictures of the park, highlighting water features and public outreach events.



Figure 12: Water flowing into green buffer along Tåsinge Plads (photo taken by author)

Sankt Kjelds Plads

At a cost of DKK 48 million, Sankt Kjelds Plads is a traffic circle with separated bike lanes, walkways, benches, and green spaces all throughout using various grasses, bushes, and trees. Descriptions highlight the green transformation of the project together with water management, entangling the two throughout the page (City of Copenhagen, n.d.-D). The project is based on a proposal titled “Brug Naturen i Byen” (Use Nature in the City), which is a 79 page document authored by a firm called SLA. The contents are outside the scope of this document analysis, but it is noteworthy that the proposal contains artistic visualizations of the project which tell a story

of their own. The depictions of both flooding and dry-usage show a very bright vision of how people will perceive and use this space (SLA, 2015).



Figure 13: Photos from the Brug Naturen i Byen proposal from SLA (SLA, 2015)

This page describes Sankt Kjelds Plads as a beacon of urban nature. The use of green infrastructure, and by extension this traffic circle re-design, are meant to tackle heat, rain, air quality, and the recreational and social value of public space. According to the page, Sankt Kjelds manages 30% of rainwater on the surface through these new green areas, with excess water being managed by cloudburst pipes taking water to the harbour. This number coincides perfectly with the CAP of 2011, which calls for Copenhagen to reduce inflow to sewers by 30% with SUDS surface management (City of Copenhagen, 2011).

The website describes the development process in similar terms as Tåsinge Plads, wherein meetings and workshops were held with residents to co-produce this outcome. The website describes this process not as a technical re-design, but a shaping of priorities and components such that residents have both a sense of ownership and an intention to fully utilize the space. Tåsinge Plads and Sankt Kjelds Plads are next to each other on the same block, and would likely have drawn from a very similar group of people for consultation.

Courtyards

Another series of projects on the Klimakvarter website are the “Courtyards of the Future”, each an individual project done in collaboration with the residents of the nearby buildings, together

with HOFOR and the municipality. These courtyards create a localized drainage system for water, reducing inflow into pipes or out onto the road. These have garnered their own acclaim—this courtyard design was awarded as “one of Denmark’s best climate adaptation projects” in 2018 (City of Copenhagen, n.d.-B, paragraph 6). The award was part of a report called Klima100 by Sustainia and Realdania, listing out notable adaptations across 80 municipalities in Denmark (Sustainia & Realdania, 2018).



Figure 14: A photo from before the courtyard’s construction (left) compared with a photo after the project was complete (right). Note that the photos are not a direct comparison, but rather show the overall improvement of the courtyard (City of Copenhagen, n.d.)

One example is the Future Courtyard at Tomsgårdsvej (City of Copenhagen, n.d.-C). This project, a partnership between residents, HOFOR, and the municipality (as the developer), kicked off in 2018 with four workshops with residents. This planning process resulted in new light features, upgrades to windows for noise insulation, and new landscaping and terrain grading to manage and drain rain water. Rain from rooftops is channeled to an underground cistern in order to reduce the burden on this space and the drainage system of the surrounding area. The components of this courtyard have names: The Promenade and Path of Discovery, The Grove, and The Meadow. This website shows us these places with photographs of finished construction—children are playing on winding pathways alongside tall wild grasses and blooming flowers; people sit together at a shaded table on a sunny day next to patches of lush ferns and shaded forest. Comparing the look of the courtyard before, the website shows the way things were changed, and how much more green and lush the area looks in contrast. Together

these names and photographs depict an almost utopian vision of climate adaptation, where water management looks like wild nature, community enrichment, and improved quality of public life.

Streets

This short section uses much of the same language found in other planning documents, describing roads as either a channel for moving water or a retention area for holding water. Most of the language on this page is more descriptive, telling readers what different road designs (green roads, cloudburst roads) can achieve for this neighborhood. The section on green roads, titled “Greener roads – without it costing parking spaces”, describes the plan to add green beds between sidewalks and roads (City of Copenhagen, n.d.-E). This attention to political priorities and desires among residents is yet another example of how climate adaptation is built in Copenhagen within a framework of political legitimacy and resident buy-in. The only project listed for this section is the Østerbro Tunnel, a cloudburst pipe project taking water underground and out of the city (City of Copenhagen, n.d.-G). This tunnel, being one of the first, gives HOFOR more visibility and an opportunity to show off the pipes (at least in drawings) before they are placed underground and can no longer be “shown” to residents.

Takeaways

The Klimakvarter website depicts climate adaptation in positive and optimistic terms. Here, the investments being made in green-blue infrastructure across different project types (roads, parks, etc.) are promoted as improvements and not simply necessary changes for resilience. Instead of survival, the City intends to thrive with this new strategy of infrastructure. This website is valuable as a source of analysis in part because of its different tone and use of visual tools. This website describes places which are already completed, moving beyond designs and strategies from the CAP, CMP, and Investment Report and into a model of spotlighting and promoting the designs once completed.

The use of artistic visualizations, as well as photos from the finished project, together tell their own story of cloudburst management. The photographs from completed projects show community gatherings, children playing, lush green spaces in the sunshine. The visualizations,

sometimes found in brochures from projects like Tåsinge Plads and Sankt Kjelds Plads or else in the winning project proposal, sketch out what these projects were intended to be before construction. The water is not seen as an enemy, but rather a source of recreation and play for children (City of Copenhagen, n.d.; SLA, 2015). Excess rain has not so much flooded a place as brought it alive, given it a new form and purpose. This is an effective tool in framing climate adaptation, using images and descriptions of pilot projects to collapse imaginaries into tangible space. The enduring legacy of these projects was present in the way it was still referenced by planners and a local committee member when interviewed for this research (Andreasen, 2025; Reghev, 2025; Petersen, 2025).

Between visual components, descriptive language, and more technical detail, this website provides new information on both the technical and strategic design of adaptation and the way it is framed and promoted. Taken together with previous documents, this material gives insight into the municipal strategy for gathering political legitimacy and buy-in among the residents of Østerbro, and subsequently the municipalities of Copenhagen at large. Projects described on this website, with involvement across working groups, workshops, and design meetings, provides new insight into the process of assemblage that generates these adaptation spaces.

5.6 Putting It All Together

Together these documents provide valuable insight into the strategy of the City in tying together investments in climate adaptation with a myriad of other tangible benefits for residents. These documents are written and produced differently depending on scale and time, tracking with political shifts following flooding in 2010 and 2011. The documents also have different levels of accessibility and length, providing for different intended audiences or levels of technical detail (the inclusion of HOFOR provides greater technical detail on hydraulic engineering, for example). Images used across these reports work together with written descriptions of strategies or designs to frame Copenhagen's climate adaptation in a positive, optimistic light, showing the way designs can provide value in all rain conditions.

Beginning with the CAP—the first report in the timeline and with the grandest scale—this document outlines a broad strategy for addressing numerous risks, such as urban heat, storm

surge along the coastline, and increased cloudburst rain. This document was published before the 2011 flood, and the lack of a strong mandate is apparent. Moving into the CMP and the Climate Change Adaptation and Investment Statement of 2015, the documents become more specific in their scope and in their urgency, frequently citing the flood of 2011 as the cause. The Investment Statement, together with the Masterplan for Ladegårdså, Frederiksberg East & Vesterbro, show how this framework transitions to specific projects, and what conception of resilience is being implemented. They also provide insight into the involvement of different actors in designing a given cloudburst project, where public projects are produced together with HOFOR's engineering, resident input, and municipal organization. Parks, roads, and courtyards are no longer simply public or private spaces but shields against the risk of cloudburst rain. In one visualization from the Klimakvarter website, a flooded park is depicted as a new water feature for play instead of a hazard to be avoided (City of Copenhagen, n.d.).

Consistent across time and scale is the entangling of technical water management with other quality-of-life benefits. The CAP describes this entangling as a desire to “emphasise the greatest possible number of secondary gains and the greatest possible synergy with other planning being achieved” (City of Copenhagen, 2011, pg. 12). The CMP uses similar language, but spends less time on the subject of synergistic benefits given the proximity to the 2011 flooding. In the other two documents and the Klimakvarter website, the language becomes more explicit and consistent; the Investment Report described these adaptations as “capable of providing the people of Copenhagen with better urban spaces” (City of Copenhagen, 2015, pg. 6) and that over the 20 year period of construction the city will be given a “boost in the shape of urban space improvements” (pg. 22). The Cloudburst Masterplan document uses similar language, depicting the value of blue-green infrastructure as “hydraulic functions for flood mitigation, but also in terms of recreational, environmental, social and economic values.” (Ramboll, 2013, pg. 3). These descriptions, together with both photographic and artistic visualizations in the Klimakvarter website, show a consistent strategy of framing these investments together with improved urban spaces, financial returns, and better quality of life.

These documents together provide insight into the social and political production of Copenhagen's urban landscape. In some documents the purpose is anticipatory, planning out future projects with framing and technical know-how. In others, the projects are already completed, and so they exist as means of promoting the political legitimacy of those investments.

This political legitimacy has carried over and continues to benefit the funding and construction of new projects, as revealed in interviews (Andreasen 2025; Reghev 2025; Petersen 2025). These plans and their resulting infrastructure almost always go along with descriptions of their economic benefit, showing how closely tied costs and economic growth are in the formation of that legitimacy. The earliest descriptions in the CAP of green growth are found again in the Investment Report four years later, and described in different terms across all documents through cost-benefit analysis.

The process of co-producing these projects, described as a plan in earlier documents and then described in practice in both the 2015 Investment Report and the Klimakvarter website, also aid in analyzing the process of assemblage. This assemblage involves landscape architects, hydraulic engineers, local political representatives, residents of the area surrounding a project, planners at the Technical and Environmental Administration, other departments of the Copenhagen government (in determining budgets and municipal priorities), and the Secretariat for Water Supplies as a representative of the Danish government's power over funding. Every project involves a different combination of actors, each with their own priorities and vision, often with that very vision influenced by the narrative and framing devices analyzed here. The visualizations used to promote a certain project often lead to awards and profiles in local media (Clauson-Kaas, 2025), expanding the influence of these visions further beyond the deliberations of a single place.

This thematic and framing analysis has shown patterns and repeated themes regarding the role of actors, political and social power structures in planning, and the municipal strategy of tying together adaptation investments with other tangible benefits. Although this strategy has led to a number of successful projects, the scale and complexity of it has also left the City vulnerable to disruptions in that grand strategy (as will be discussed in the next section). Although some of the documents, such as the CMP, have become less relevant in recent years as a result of a changing municipal strategy (Reghev, 2025), each subsequent document draws from previous ones in order to keep hold of central strategies seen as essential to a successful water management system.

6. Power and Priorities: a Stakeholder Analysis

Using information gathered from expert interviews (combined with some passages from key documents as outlined above), this section will articulate the perspective of each key stakeholder group and analyze their role in the development of climate adaptation. The CMP from 2012 divides the responsibilities and financing for infrastructure among three parties: Copenhagen's municipal government(s), the greater Copenhagen water utility HOFOR, and the residents of the city. The expert interviews used in this section included two city planners, a project director at HOFOR, and the Chairman of a local committee in Copenhagen. This section will provide new information not found in documents, but will also showcase conflicts and power disparities in the political framework that produces cloudburst projects.

6.1 The City

This section draws primarily from two interviews, both with urban planners at the Technical and Environmental Administration who together have over two decades of experience at the municipality (Andreasen, 2025; Reghev, 2025). These interviews show that the priorities of the City adjusted dramatically after the cloudburst of 2011, quickly shifting resources towards cloudburst-focused adaptation infrastructure. The city-wide scale of the project was enormous, outstripping the expectations of the Danish government and putting Copenhagen on the forefront of global adaptation planning (Andreasen, 2025). The hydraulic modeling and legal/financial framework would have taken years to plan out, but the City asked planners to present a plan in six months (Reghev, 2025). In order to materialize this prioritization, the City funded the construction of Tåsinge Plads and Sankt Kjelds Plads as pilot projects to showcase their plans for the future. In that production, the City set the standard for these construction projects, where they identify sites and set priorities for climate adaptation before involving citizens for feedback on elements of design. This power structure of top-down urban renewal planning would continue for a decade, but has begun to change in recent years as more bottom-up planning takes place (Petersen, 2025).

The City must also contend with the power the Danish government has in determining their funding and ability to transform Copenhagen's landscape. In the early years of climate adaptation, the Danish Environmental Ministry gave the go-ahead for Copenhagen's cloudburst funding system, utilizing a tariff on water via HOFOR, but have since become more critical of the investments (Andreasen). As discussed in analysis of the 2015 Investment Report, the Secretariat on Water Supplies must give permission for the City to utilize this levy. The loss of some political will among the Danish government and calls for cuts in spending have contributed to a steady decline in financing for climate adaptation in Copenhagen from 2016 until today, creating a crisis for the future of climate adaptation (Reghev). As one interviewee put it, another big flood this summer would put funding and construction priorities back on track, showing the way these events influence political will within the government (Clauson-Kaas, 2025a).

The effectiveness of the City in building cloudburst infrastructure varies across scale. In the smaller municipality of Frederiksberg (within greater Copenhagen), the construction of cloudburst management infrastructure has been focused and effective (Andreasen). Meanwhile, in the larger scale of Copenhagen proper, managing hydraulic models, pipes, retention areas, and the road modifications needed to move surface water is complicated and requires more time and money than are currently being afforded to the City (Reghev). For example, Engehaveparken—modified to retain large amounts of water in a cloudburst scenario—actually has too much water storage for how much water can be redirected there based on the current layout of cloudburst roads (Andreasen). This is because the scheme to use cloudburst roads to redirect water ultimately never materialized (Reghev, 2025; Clauson-Kaas, 2025b). In essence, the power of the municipality works best in distinct, localized project development, but struggles in larger scale city-wide planning due to the complicated hydraulic modeling and challenges in maintaining financial sustainability.

Another manifestation of power in the development of adaptation is the role of pilot projects as a means of gathering and maintaining political legitimacy. In every interview conducted for this research, the influence of these initial projects in gathering that political support was seen as essential despite the fact that these projects were built a decade ago. Interviewees describe the buy-in from residents as strong following the 2011 flooding, but citizens were hesitant to allow for disruptive and expensive construction to happen in their neighborhoods (Reghev). As one planner described it, “you know what you have, it's often times

very difficult to see what you could get” (Andreasen, 2025). These pilot projects then act as an effective framing device in depicting spatial transformations as safe, aesthetically pleasing, and produced with plenty of input from area residents.

Planners corroborate much of what can be found in official planning documents, namely that the priority for the City after 2011 was to quickly build functional and attractive infrastructure, involve HOFOR in hydraulic modeling and financing, and mainstreaming adaptation across all public-space projects in Copenhagen. Similarly, the planners report that the City prioritizes surface water management because of the ability to synergize technical achievements with social benefits and urban renewal. However, new insights into the struggling financial health and unclear future of climate adaptation provide a picture of ongoing challenges. Copenhagen’s government holds significant power with regards to setting priorities, yet they are at the mercy of both national and local political support. Interviewees have shown social benefits and political support are sometimes in conflict—the City wants to provide numerous social benefits in projects to maintain legitimacy among residents, but then must focus only on costs and damage in deliberations with the Ministry of Environment (Clauson-Kaas, 2025). As political will shifts, so too does the power and priorities of the City of Copenhagen.

6.2 HOFOR

The discussion of HOFOR’s role in climate adaptation here primarily draws from an interview with the Chief Consultant, who has 14 years of experience at the utility (Clauson-Kaas, 2025a). HOFOR, armed with advanced knowledge of hydro-engineering, has gone about designing solutions for both surface and subterranean water management together with various experts in their fields (Clauson-Kaas, 2025a). HOFOR consults with the municipality whenever an urban renewal project involves water management or could impact an existing component of the catchment area (Ziersen et al., 2017). They also consult directly on the formation of new planning documents, such as the CMP. In this way, HOFOR is shaping the strategy for water management on a city-wide level, influencing the form of projects as they connect together in the utility’s hydraulic planning.

The other main contribution from HOFOR is financial. A law passed in the national parliament in 2013 gave HOFOR the power to finance any adaptation which involves water management, including surface solutions, which before was the domain of the municipality (Clauson-Kaas). This change created a reliable financial framework to fund climate adaptation, dividing the financial burden between HOFOR and the municipality (who fund surface non-hydraulic components, like benches and playsets). However, this financial system is strained by new regulation. Because the new regulation requires a direct comparison of financial losses to the new investment, not including reconstruction or loss of income, “lowering parks and sports fields will no longer be a feasible option” (Clauson-Kaas, 2025b). Regardless of the purpose of this law, the outcome has been a reduction in water levies and therefore a reduction in funding available for cloudburst management. Stronger economic control of HOFOR has also limited the operating budget, which is now required to reduce their annual expenditure by 4% (Clauson-Kaas, 2025a). Although the political fight over this funding impacts HOFOR, they have largely tried to avoid this arena (Clauson-Kaas, 2025a).

The priorities of HOFOR are set on ensuring effective water management through infrastructure and rebuilding of the financial system that allowed for adequate funding of cloudburst management in the early years of this regime. This funding necessitates a renewal of political will, which the interviewee from HOFOR believes would be made possible were another heavy downpour to occur this summer. This hypothetical cloudburst would act as a reminder of what is at stake and what the investment in adaptation is for, as well as a practical reminder of how many of these cloudburst projects work in practice. While the City seeks political legitimacy through the synergistic benefits of surface solutions, the utility prioritizes the health of a large-scale hydraulic system which requires heavy rain to showcase its true benefit. This more technical approach includes elements which have less visibility, such as the cloudburst pipes, as they provide an essential service in the management of water. HOFOR’s priorities exist alongside that of the municipality, such as the Finance Department and the Technical and Environmental Administration. The municipality is not a monolith but rather departments representing the diverse range of priorities and views on climate change and climate adaptation, just as the residents of the city would themselves hold (Clauson-Kaas, 2025a; Petersen, 2025).

This discussion has also shown the power HOFOR has in this network. Their close partnership with the City shows that they hold a seat at the table when deliberating priorities and

budgets, but their more technical role in water management has led them steering clear of political debate (Clauson-Kaas, 2025a). Despite this separation, the utility still has power in the technical management and the financial health of cloudburst management. Their hydraulic modeling set the standards for infrastructure designs, and their budget outstrips the funding the City has available for cloudburst projects. When their priorities align, as they did in the aftermath of the 2011 flooding, the municipality and HOFOR have shown the effectiveness of their combined drive. The scope and ambition of the 2015 Climate Change Adaptation and Investment Statement is proof of this efficacy. However, as this political will has waned in recent years, the power HOFOR has to set priorities and obtain funding has been reduced in kind.

6.3 Residents & Local Democracy

The perspectives and priorities of residents discussed in this section are informed by the Chairman of a local committee in Nørrebro, who has been in that role for 10 years. Local committees are volunteer-based and represent the interests of a given neighborhood of Copenhagen. Descriptions of the political power structure between residents and the municipal government is represented by his personal experience with deliberations over urban renewal and cloudburst projects, while the views of residents at large are represented by the regular correspondence the committee has with people both in person and online via their approximately 25,000 Facebook followers (Petersen, 2025). In analyzing the production of cloudburst infrastructure, this section will primarily discuss the case of Hans Tavsens Park and the nearby road of Rantzausgade.

The initial plan for Hans Tavsens Park was to regrade the surface—adding hills and valleys—as well as planting new flora in order to facilitate the trapping and management of rainwater (figure 15). This initial proposal expected the park to hold 33,000 cubic meters of water, however deliberations with the local committee exposed conflicts over the changing of a well-used park (Petersen). The flat, grassy park allowed ample space for sitting together and for ease of visibility due to unobstructed sight lines (valuable for teachers and parents, who would bring groups of children there to play). Residents were on board with some changes to address flooding and so planning went forward, yet the regrading of the park to create hills and valleys

never went through (figure 15). As HOFOR and the City continued with the planning process, the slated water capacity changed multiple times, and now the current model plans for only 7,000 cubic meters of water to be stored (Petersen).

The plan for this development can be found from SLA, the consulting and landscape architecture firm who designed it. The descriptions and images follow a very similar pattern as Tåsinge Plads and Sankt Kjelds Plads, creating a visualization of project outcomes where water is not a damaging force but a natural outcome of design. In one visualization, heavy rain creates flooded bioswales for children to play in and in another the park is a lush and well-adapted semi-flooded green space that brings the community together (SLA, n.d.). The lush landscape proposed was contentious for residents, who felt that this kind of space could already be found in the nearby cemetery. The park, on the other hand, was more useful for picnics and recreation (Petersen). The City went ahead with modifications in a part of the park that had bones buried underneath, buried without gravestones, which the local committee was aware of but which the City ignored. When the remains were discovered during construction, it stretched the budget for the project to the point that excavating and moving the remains cost a quarter of the budget (Petersen).

The planning for Rantzausgade followed a similar pattern wherein relevant concerns for the design of the road were included in the management of rainwater. The main driver for this road redevelopment was safety as two cyclists had been killed in recent years (Petersen). In the end, the sidewalk was expanded on one side of the street to include green buffers and new benches for seating. These were welcomed by residents, but ultimately left too little room on the



Figure 15: (Top) visualization of Hans Tavsens Park from SLA's website (SLA, n.d.), (bottom) photograph of Hans Tavsens Park today (photo taken by author)

road for buses, trucks, and cyclists all together (figure 16), particularly during rush hour when the number of cyclists swells (Petersen).

The description of the planning process across both projects was one of top-down development and limited power for the local committee. The flooding from 2011 created a great amount of political will within the government for construction, yet clear planning had not been done and plans were changing all the time as a result. The hydraulic modeling done by HOFOR also changed plans in catchment areas, adding more variables to the ongoing process (Clauson-Kaas, 2025a). Yet the power structure was also made clear, with the

City bringing existing plans to residents for deliberation instead of grass-roots proposals being considered. The interviewee described it as such: "[w]hy do you ask us? [...] when we say what we want [...] we say this is the best project in our eyes. Then [the municipality] says well but not in ours, so you cannot choose that one. Why ask us?" (Petersen, 2025).

However, this dynamic is changing—in recent years the proposals brought forward by the Nørrebro local committee have been getting more traction, and their voice has found purchase in the process of co-planning municipal projects. The priorities of the residents in this neighborhood are for more green spaces, more trees for shade, and open water features for use in the hot summer. Priorities were less impacted by the 2011 flooding than for the City or for HOFOR, with most people experiencing the impact on a personal level (such as the flooding of basements) and not thinking about the political and infrastructural process that should come after (Petersen).

Using the case of Hans Tavsens Park and Rantzausgade, this section shows how the power and priorities of residents and the local committees interact with that of the City and HOFOR. The residents were less influential in this process despite the structured process of gathering resident input, which puts this case in contrast with how Tåsinge Plads is described in



Figure 16: A photo of Rantzausgade during rush hour (photo taken by author)

the Klimakvarter website (City of Copenhagen, n.d.). The priorities of the residents here also show the way their desires for public spaces seem to align with the municipal prioritization of surface solutions for cloudburst management, with both focusing on green-blue infrastructure and recreation. However, the priorities differ when it comes to water management, which is a lower priority for residents than for the City, and even lower when compared to HOFOR.

6.4 Putting It All Together

Each of these stakeholder groups hold a certain amount of power and influence, and each comes with their own priorities. HOFOR is most interested in managing water and executing a well-designed hydraulic plan, the residents want good public spaces and more green-blue infrastructure, and the City wants to do both. The hydraulic models and water management will deliver on promises made in the CAP and CMP and will reduce the cost of damage in future flood events. However, as these interviews and previous official documents have shown, the City wishes to carry out cloudburst management with the political legitimacy afforded by a high degree of buy-in from both residents and the national government. The City's role, then, is the most complicated in this network of deliberations.

The power of HOFOR is perhaps best represented by their role in designing water-systems, yet either as a result of steering clear of political debates or because of their separation from municipal government their power in setting priorities or agendas is limited beyond that technical role. Because of the funding they have available, they also have a kind of power akin to fuel, without which the engine of construction cannot go on (Clauson-Kaas). The power of residents is also limited by their ability to influence political priorities, although this appears to be changing as local voices are given more weight (Petersen). The power of the municipality is the greatest of the three, as they set political priorities and determine which projects will go ahead. As Denmark is a democracy, this power is derived from the external source of willing and invested voters. Because voters are a diverse group, the priorities of both municipal and national politics pull political will in different directions, shown by the high-degree of support for cloudburst projects in Copenhagen but the more cautious and

conservative approach of the national Ministry of Environment (Andreasen, 2025; Reghev, 2025).

This power is a deliberative process that requires coordination and cooperation, as none of the three actors could carry out their vision alone. In the framing of Urban Green Assemblages (UGA), these stakeholder groups interact in the spatial scale of individual projects. In these cases, such as in Hans Tavsens Park or Tåsinge Plads, future imaginaries and political legitimacy collide and collapse into a single design. Whose priorities and vision survive this process relates to funding, political power, and how climate adaptation has been framed and debated leading up to the design phase. The difference in support for design changes to Tåsinge Plads and Hans Tavsens Park shows how emotional connections to places, and their current use, is essential when understanding what supports or hinders legitimacy. Tåsinge Plads was an unused patch of concrete before development, while Hans Tavsens Park is a well-used space which residents are wary of changing. In the framework of UGA, these are not static places but rather are moving projects whose purpose, invested parties, and function shift over time. Perhaps the most important actor in this setting is political legitimacy. This can be seen in the different levels of efficacy when designing Tåsinge Plads compared with Hans Tavsens Park or Rantzausgade. Political legitimacy afforded Tåsinge Plads such power that it is still used as a success story in discourse surrounding the design strategy Copenhagen uses in cloudburst management across the city.

This section has shown the different scales of contestation, whether they be national, municipal, or local. It has also illuminated the different levels of power these actors have in shaping the urban landscape that will result from cloudburst management investments. It has shown that although each group is involved in important ways, the ability to shape conversations and values in urban planning (held almost entirely by the City and, to a lesser extent, HOFOR) go a long way in determining what designs will be selected for resilient infrastructure. As political will and power structures have shifted over time, Copenhagen's plans for climate adaptation and what form they take have changed along with them.

7. Analysis and Conclusions: Selling the Sponge City

Through analysis of official documents and structured interviews, this research has shown the strategy utilized by Copenhagen in addressing the increased risk of cloudburst rain and subsequent flooding. Using both surface solutions and underground pipes, the City has utilized flexible and localized planning to reduce the risk of damage and disruption during heavy rain. The use of green-blue infrastructure in these surface solutions allows these investments to synergize with other municipal priorities—improving ecological health, adding more and better recreational spaces, improving safe walking and cycling infrastructure, and promoting economic growth. The City uses narrative tools and policy framing to ‘sell’ climate adaptation by explicitly entangling together these benefits with climate adaptation and the costs associated with their development. In doing so, the City has been successful in securing political legitimacy for cloudburst management, aiding in securing the financing and resident buy-in required to continue with expensive and disruptive modifications to Copenhagen’s urban landscape. However, this research has also found that over the last decade this legitimacy has eroded with decreasing support and reduced funding.

Through the theoretical framework of political ecology, urban political ecology, and urban green assemblages (UGA), this research has focused on actors and their role in producing the urban landscape. The framework of political ecology was used when analyzing the development of a specific framework of resilience in Copenhagen, that being the entangling of climate adaptation with economic, recreational, and ecological benefits for the city. This process of determining nature-urban or nature-society relationships was not devoid of power structures. Rather, municipal and national governments have power over what form of climate adaptation is viable (via legal frameworks and financing) and what are seen as the best for Copenhagen’s future. This latter power can manifest in framing the problem and its solutions, seen in the use of pilot projects in Østerbro, but also in the power the City has in determining project designs and locations compared with residents and local committees (Petersen, 2025). In the framework of UGA, cloudburst management is not one singular system of adaptation but rather a series of discrete projects across the city. Each is assembled by actors, who interact and deliberate over the best course of action in addressing the risks caused by climate change. These actors are

human and non-human, and so throughout this thesis I have discussed the power of places (such as Hans Tavsens Park), and events (such as the 2011 cloudburst flooding) and the influence they have on the development of climate adaptation.

This analysis was the result of a layered approach, utilizing a descriptive, mechanistic, and analytical question. Below, I will revisit these questions to show how this research has answered them or provided analysis based on their prompts.

What structures or strategies have been implemented to adapt Copenhagen to increased cloudburst risk?

The descriptive question was posed to provide background and to better understand the approach Copenhagen has taken to cloudburst management. Information provided in official documents and in interviews show the use of surface solutions—such as parks, plazas, and roads, to manage rainwater, as well as cloudburst pipes to move that water off the surface and out of the city. While this core strategy has remained consistent over time, other details (such as the use of cloudburst roads) have changed.

In what way have official planning documents and the resulting physical infrastructure of cloudburst management been shaped by a desire for political legitimacy?

This mechanistic question sought more insight into the implementation of the above strategy to better understand the factors at play in its development and execution. This research has found that the entangling of adaptation with other quality-of-life benefits is used repeatedly across documents and in infrastructure as a strategy by the municipality to gather and maintain political legitimacy. This includes legitimacy of cost drawn from cost-benefit analysis, legitimacy of purpose related to the water capacity of infrastructure compared to expected cloudburst rain, and legitimacy drawn from resident buy-in through the process of co-planning sites and the presentation of that democratic process (City of Copenhagen, n.d., Andreasen, 2025). The political legitimacy of the project on the whole has also been tied in with international acclaim, describing Copenhagen as a leader of climate adaptation planning and green technologies (City of Copenhagen, 2015).

There is also a pattern in the use of economic growth as a source of legitimacy. In some documents this growth is in the form of increased property values; in one case it is simply described as ‘green growth’, and in others it is described as a means of instigating growth in an economically depressed neighborhood. This entangling of green growth and climate resilience is another way to gather political legitimacy, to showcase the economic value of upgraded public spaces (or the inherent value of flood protection via pipes) and how it relates to the cost of that infrastructure. Ultimately, what constitutes political legitimacy is dependent on social, cultural, and political factors related to the population who instills it in these projects. As such, this legitimacy is always in flux as values and priorities change, shown by the decreased will by the national government to allow for water tariffs needed to fund adaptation.

How is political power distributed among relevant actors and how does this impact the planning and construction of cloudburst management in Copenhagen?

This question is necessary in order to dive deeper into the structures that underpin the processes described above. The strategies utilized, the planning and development process, the meetings held, the decisions made by the government (national or municipal)—underneath them all is a network of actors with unequally distributed power. While design documents and promotional tools show the outcomes of political deliberations, they do not depict the viewpoints which either didn’t make it through deliberations or were simply not present there at all. Interview responses by the Chairman of a local committee in Copenhagen provided a portal into that world, one where thousands of people are putting forward their desires for Copenhagen with little effect (although as described, this is changing). Grassroots priorities over climate adaptation projects have not historically made significant impact in Nørrebro (Petersen, 2025), and as such the shape of cloudburst management has followed the priorities of other parties more closely.

The power dynamics between these parties, human and non-human, differ in the case of each cloudburst project. The parties involved, the owners of the land (public vs. private), the other planning priorities present at that site, and other factors previously discussed in this thesis all contribute to the shaping of each site. The power distribution is spatial; the City has power over the Copenhagen area broadly but has far less power to develop on private land than do the owners of homes and apartments near those sites (Reghev, 2025). Calculations by the City of

Copenhagen (2011) have shown that damage is not equal across space, and that the risk some buildings and homes face is greater than others. Therefore, the power structures and how they manifest in space across each project are of great importance in determining who is vulnerable and who is not. Analysis from interviews conducted, discussed in the prior section, provide more detail on the role of each actor and how their role relates to this process of assemblage.

Reflections and Future Implications

The case of Copenhagen tells a story. A flood comes from the sky and covers a city in water, drowning it in the dark. The reaction to this was swift and decisive, setting the stage for a multi-year process of development plans, hydraulic models, and financial frameworks. In the 14 years since that flood in 2011, the City has shown itself to be adaptive to changing priorities and design strategies and receptive to a growing desire for involvement by citizens and their local representatives. Copenhagen has also proven to contain a critical mass of people dedicated (or stubborn) enough not to give up on climate adaptation when politics and finances make it hard. This group of dedicated actors come from all across the city, and the fervor of their discourse on cloudburst management has given life to a complex and challenging project.

Other cities can learn from this example when drafting their own climate adaptation strategies. Engineering can and should be done early to ensure projects work together and have the capacity to address relevant climate risks. Cities must then also translate these designs into reality through a deliberative sociopolitical process, which is dependent on culture, political power structures, and the availability of financing. Because these factors differ for every project, and in every neighborhood, and for each city, addressing climate adaptation should be understood as a process that both governments and individuals can influence. In doing so, the production of a new resilient landscape will be reactive to local needs and the local environment, providing for a more popular and sustainable outcome for all.

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Appendices

Appendix 1. Table of Interviewees

Name	Affiliation	Notes
Per Andreasen	Technical and Environmental Administration, City of Copenhagen	Special Consultant, specialization in storm surge protection
Jonathan Reghev	Technical and Environmental Administration, City of Copenhagen	Project Manager, specialization in climate adaptation
Jes Clauson-Kaas	HOFOR	Chief Consultant for HOFOR, project manager on numerous cloudburst management projects including the development of the Cloudburst Management Plan of 2012 2025a - structured interview 2025b - written email correspondence
Mogens Petersen	Nørrebro local committee	Chairman of the local committee for Nørrebro for 10 years

Appendix 2. Interview Guide

Questions for planners and city officials

Intro

- I. [Introduce thesis to interviewee, answer questions]
- II. Can you introduce yourself and tell me a little about your background?
 - A. How long have you been working in planning/adaptation/sustainability? What is your connection to the climate plans for Copenhagen?

Overview

- III. Can you help me understand the current status of cloudburst management? How is progress compared with the Cloudburst Management Plan?
 - A. Do you know the technical details of the infrastructure for water management?
 - 1. [if yes] Can you tell me about the way the pipes and the green roads connect or work together?
 - 2. Jan Rasmussen (project director) said in a presentation that there are 254 surface projects (in 2023). What portion of surface solutions are green spaces and what portion are modifications to roads?
 - 3. Is there an **updated map** showing where the city/HOFOR have constructed projects?
- IV. Did Copenhagen learn from other cities in the process of developing the Climate Adaptation or Cloudburst Management Plans?
 - A. Such as Helsinki, which had been developing adaptation plans around the same time.

Planning and Outreach

- V. What process is usually undertaken when designing a surface solution for adaptation, such as a park or a building courtyard? Is there a structure to the process, how much involvement do residents usually have?
 - A. Is it always part of an **urban renewal** project or can it be separate?

- B. How much influence do private developers have versus the city, how are interests ranked or balanced in the design process?
- VI. How do you/the City of Copenhagen balance the technical planning process of adaptive measures with the **needs and wants** of the community?
 - A. Has there been any resistance to surface solutions, such as the plan to flood parks? Or resistance to adaptation in general, to the costs passed on through levies and taxes?
 - B. [if applicable based on interviewee experience] has there been resistance to the plans to mitigate coastal flooding and storm surge? Such as in the case of Lynetteholmen?
- VII. On a related note, I want to ask about the **Climate Quarter, or Klimakvarter**, in Østerbro.
 - A. Was that area used as the testing ground for new ideas? Did the green spaces and road modifications in the Klimakvarter ‘market’ the idea to residents or to other stakeholders?
 - B. Is that area still important in the visibility of climate adaptation or was it more for the early years of these new ideas? If not, is there a new area that replaces it for that same purpose?
- VIII. [Depending on level of experience, years of work in Copenhagen] Initial mapping in the Cloudburst Management Plan showed flood vulnerability **[present interviewee maps]**, but also showed priority based on a number of factors (risk, implementation, and synergistic effect with existing urban development). Have the priority areas been adjusted since the creation of that plan?
 - A. How has **vulnerability/prioritization** changed in the city, has that map been updated based on the adaptive solutions utilized?

Politics and Funding

- IX. How do national policies in Denmark impact the Copenhagen plan? Is there any national funding or legislation that requires certain elements in this adaptation?
 - A. What about EU funding, is there an EU plan for adaptation?

- B. How does the Copenhagen Climate Adaptation and Cloudburst Management Plans sit in the current regulatory environment, do they still have political support? Has there been much change since the plans were developed or started construction 10/15 years ago?
- X. What impact did the 2011 flood have on political will for adaptation? Would the Cloudburst Management Plan exist if that hadn't happened?
- XI. How important is urban renewal and economic growth in mind in the planning process of these surface solutions for water management?
 - A. How important is economics when designing a surface solution, or planning out the grand scheme? Is there pressure to provide some kind of property or economic value when constructing?

Outro

- XII. Thank you so much, do you have any questions about my project?
- XIII. Is there anyone else you know or work with that I can reach out to for further interviews?

Questions for HOFOR

Intro

- I. [Introduce thesis to interviewee, answer questions]
- II. Can you introduce yourself and tell me a little about your background?
 - A. How long have you been working in planning/adaptation/sustainability? What is your connection to the climate plans for Copenhagen?

Overview

- III. Can you help me understand the current status of Cloudburst Management, how is progress compared with the Cloudburst Management Plan?
- IV. Do you know the technical details of the infrastructure for water management?

- A. [if yes] Can you tell me about the way the pipes and the green roads connect or work together?
 - B. Is there an **updated map** showing where the city/HOFOR have constructed projects?
- V. Did HOFOR consult other municipalities or rely on new engineering?

Planning and Outreach

- VI. What role does HOFOR have in the planning of urban adaptation projects?
- VII. What are priorities for HOFOR in planning climate adaptation infrastructure?
 - A. In your experience what are the priorities of the municipality, how do they differ?
 - B. Does HOFOR ever interface with residents or always through the municipal government?
- VIII. Plan B from the Climate Adaptation Plan (use of roads to redirect flood water) was a high priority and was considered to be a project for HOFOR. Does HOFOR still think the use of streets to move water works as a strategy?
 - A. If not how has that plan changed, what role do roads play in cloudburst management?
- IX. What progress has been made with underground pipes, how do you view the **prioritization** of those components compared with surface solutions in planning discussions?
 - A. What kind of ROI was considered necessary for the pipes? Can they serve benefits when there isn't cloudburst rain?

Politics and Funding

- X. Denmark passed a law allowing HOFOR to finance surface water management along with underground systems in 2013, is that still the law or has it changed?
 - A. What is the current state of financing measures, how restricted is HOFOR in raising money for these water management measures under the Climate or Cloudburst Management Plans?
 - B. Are climate projects eligible for loans? According to the CAP they were not in 2010/2011, **has that changed?**

- XI. In a presentation prepared by Jes Clauson-Kaas he wrote that the law had been changed after the Climate Adaptation Plan was written which allowed HOFOR to co-finance projects with the city. Is this still true?
 - A. If not, how does this impact the budget for adaptation projects?
- XII. What impact did the 2011 flood have on political will for adaptation? Would the Cloudburst Management Plan exist if that hadn't happened?
- XIII. How important is urban renewal and economic growth in mind in the planning process of these surface solutions for water management?
 - A. How important are economics when designing a surface solution, or planning out the grand scheme? Is there pressure to provide some kind of property or economic value when constructing?

Outro

- XIV. Thank you so much, do you have any questions about my project?
- XV. Is there anyone else you know or work with that I can reach out to for further interviews?

Questions for residents/local council

Overview

- I. [Provide background on my thesis and what I am researching]
- II. Can you briefly introduce yourself and your background?
- III. What is your connection to the climate adaptation plan in Copenhagen, or to its individual projects?
- IV. Did you or anyone you know experience flooding in 2011?
 - A. How did that shape your view of flood risk in Copenhagen? Do you see it as connected to Climate Change?
 - B. Did you notice a change in municipal priorities in regards to projects in your neighborhood?

Planning and Coordination

- V. How did you experience the planning process of adaptation projects in your neighborhood? How did the city reach out to you, at all, did you/residents feel consulted?
- VI. Have you ever attended a meeting where climate adaptation designs were discussed for your neighborhood or courtyard?
 - A. Generally, what needs or desires are expressed by residents in that design process? Is climate a common theme or are other aspects more important?
 - B. What other forums have there been to include residents and local councils in the planning process?
- VII. When the city discussed these adaptations with residents, what felt most important? Water management, urban renewal, recreational or ecological value?
 - A. What aspect of the adaptation (green space, road modification) seemed most important to the city when describing it?
- VIII. I read that local committees are brought in on discussing project packages in January with the city, is that still ongoing? Has there been any discussion of issues with funding?
- IX. Is there a particular project you can highlight? The process of planning and how it is now? Was it a success?
 - A. **[use blank map of the area as a visual guide]**

Perceptions and Buy-In

- X. What efforts do you think the city has enacted to get residents interested in these projects? Was there any kind of ‘marketing’?
 - A. Have you heard about the “climate quarter” or Klimakvarter in Østerbro?
 - 1. [If yes] What are your thoughts on that campaign, did it help convince you about this Cloudburst Management Plan?
 - 2. Have similar projects in your neighborhood acted as a local representation of climate adaptation investments?

- XI. What are your overall thoughts on the way the City has addressed cloudbursts and flood risk? Do you think about the broader project or more so the project being built in your neighborhood?

Outro

- XII. Do you have any questions about my research or this project?
- XIII. Do you know of any contacts you think I should reach out to for more interviews?

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