

# Public Participation in Environmental Impact Assessment Follow-up of Metro Infrastructure Projects: A Comparative Study between Noord-Zuidlijn in Amsterdam and Cityringen in Copenhagen

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## Abstract

Urban areas have large transport networks. Metro infrastructure offers public transport that limits the need for cars and makes cities more sustainable. The construction of metro infrastructure is a megaproject and is highly complex, uncertain and involves major environmental impacts that influence the communities around them. This research compares two metro projects, Cityringen Copenhagen where a formal environmental impact assessment (EIA) was conducted and the Noord-Zuidlijn in Amsterdam where there was no formal EIA. A crucial part of EIA is public participation and follow-up. Public participation is seen primarily in the pre-consent decision stage and is lacking in post-consent decision stage. Public participation follows Arnstein's ladder of citizen participation where the higher up the ladder the more power the public has in decision making. When public participation and their interest are not taken into account it can result in protest, halting projects and leaving them with no option but to meet the demands of the public. Follow-up is part of the post-consent decision stage but is also lacking in practice. Follow-up is primarily associated with monitoring but is also about management, engagement, evaluation and governance. The combination of both, public participation and follow-up, is rather new and this research aims to explore both through the new IAIA best practice principles of public participation in EIA follow-up. A comparative analysis was conducted using interviews, project and policy document analysis and media analysis. For both cases there was limited public participation and follow-up in the post-consent decision stage until there was an incident, which for the case of Cityringen was late night drillings causing extreme noise levels and for the NZL subsidence resulting in damage to houses. As a result of protest and the large scale media coverage to these incidents the projects were halted and there was a complete overhaul in strategy for both cases. This enhanced both public participation and follow-up and resulted in successful projects. The key was to build trust. In regards to the principles there were instances of involvement of the community in adaptive management which is the highest level of empowerment. Adaptive management is essential for megaprojects due to their complexity and uncertainty requiring incremental changes to avoid delays and cost overruns. Therefore, it is recommended that a mix of the principles are applied in a project, through one-way communication and two-way communication to build and maintain trust which will limit protest and litigation thus limiting project delay and cost overruns.

**Key words:** public participation, follow-up, environmental impact assessment, adaptive management, metro infrastructure projects

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## Abbreviations

EIA Environmental Impact Assessment  
NZL Noord-Zuidlijn

# 1. Introduction

## 1.1 Urban Infrastructure Projects

As cities continue to expand and grow in population and size, there is a need for urban transport networks that can sufficiently tackle this growth. Additionally, with a focus on climate change and sustainability, the transition away from cars is becoming more relevant than ever. Finding solutions for urban transport has led cities to build as well as expand their metro infrastructure. Metro infrastructure is embedded into the complex and contested urban context with social goals and objectives of the city as a whole, but the negative impact of metro infrastructure is especially experienced on the neighborhood level (Mottee, 2020; Legacy, 2016). The impacts on the neighborhood level tend to be addressed rather poorly in comparison to larger scale impacts as there is a greater focus on the benefits for the urban area as a whole (Lee, 2020). Although this is the case, the neighborhood level is rather important as the people living there experience the impacts during construction and operation. Therefore, urban metro infrastructure projects are rather complex with a wide range of stakeholders that need to be engaged throughout the entire process of the project as contestation is experienced during screening and scoping, during construction, and in the operation phase. Such projects are also referred to as megaprojects. Flyvbjerg (2017, p.3), describes megaprojects as “large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people.” Transport projects of this magnitude can change the structure of our urban area socially, environmentally and politically (Flyvbjerg, 2014; Steele & Legacy, 2017).

## 1.2 Public Participation in Planning and EIA

During the early 20th century planning was considered very technical and top down (De Roo, 2016). During the 60s public awareness of the social and environmental impact grew and (the need for) public participation in planning began to surge (Allmendinger, 2017). An early seminal work stressing the importance of public engagement was Arnstein's (1969) 'ladder of citizen participation'. The higher up the ladder the more power the citizens have. As public participation in planning grew, the term collaborative planning was established (Healey, 2020). Innes and Booher (1999), also influenced the practice, with the concept of consensus building. As a result, planning became less technical and top down and started to include the public in shaping the future of their city by becoming part of the decision-making process. The inclusion of various stakeholders and their diverse values and needs results in shared understanding of urban challenges and thus innovative solutions that positively impact the needs of the community (Innes and Booher, 1999).

During the rise of public participation in planning, it saw a similar integration into the Environmental Impact Assessment (EIA) process, with literature discussing the potential benefits of public participation in EIA (Petts, 2003). EIA became an official European Directive in 1985 (85/337/EEC). Countries like the Netherlands already had public participation as a component of their EIA process in 1987, however the Aarhus Convention in 1998 further extended public participation into the European Union (Arts and de Vries, 2023; Hartley and Wood, 2005). Directive 2003/35/EC specifically focused on public participation in EIA (Hartley and Wood, 2005).

Arnstein's 'ladder of citizen participation' is frequently referenced within public participation EIA literature and has been adopted into the EIA best practice principles for public participation (Andre et al., 2006; O'Faircheallaigh, 2010; Glucker et al., 2013). These best practice principles follow a three-tier approach, basic principles, operating principles, and developing guidelines. Andre et al. (2006), mentions the importance of recognizing that different levels of public participation may be relevant at different stages of the process. Even though public participation is essential throughout the entire process Andre et al. (2006) argues that public participation during the initial stages of EIA, such as screening and scoping, is essential in building trust and acceptance of new developments. This is primarily what is seen in practice. Public participation plays a crucial role in the early stages, but is lacking if not missing entirely in EIA follow-up (Morrison-Saunders et al., 2023).

### 1.3 EIA Follow-up

Environmental Impact Assessment (EIA), "is the process for taking account of the potential environmental consequences of a project" (Morrison-Saunders & Arts, 2004, p.1). As part of EIA, there are three generic steps: preliminary assessment, detailed assessment, and follow-up (Morrison-Saunders & Arts, 2004). Follow-up is an established concept in EIA, but there is limited application in practice (Bernauer et al., 2023; Glasson and Therivel, 2019; Hunsberger et al., 2005; Olszynski, 2020). There are five key elements to EIA Follow-up: monitoring, evaluation, management, engagement and communication, and governance. Further 15 best practice principles have been developed (See Arts and Morrison-Saunders, 2022).

The concepts of public participation and follow-up, have been substantiated as part of the EIA process within the literature (Glucker et al., 2013; Morrison-Saunders et al., 2021). However, attention to the combination of both is more cumbersome and only recently more attention has been given to this issue (Morrison-Saunders and Arts, 2023; Morrison-Saunders et al., 2023). Follow-up can be defined as "understanding the outcomes of projects or plans subject to impact assessment" (Morrison-Saunders and Arts, 2023, p.1). Public participation can be defined as "the involvement of individuals and groups that are positively or negatively affected by, or that are interested in, a proposed project, program, plan or policy that is subject to a decision-making process" (André et al., 2006, p.1). With public participation being mentioned as part of follow-up principles, a complete set of best practice principles for public participation in follow-up was established by Morrison-Saunders and Arts (2023). This set of principles takes into consideration that different levels of public participation are needed at different stages of the EIA process as mentioned by André et al., (2006). Furthermore, the principles for public participation in EIA follow-up follow a similar structure to the 'Ladder of Arnstein' (1969). The ladder structure starts with the early set of principles being seen as more passive and informative while the latter half is more empowering (Morrison-Saunders et al., 2023).

The final step on the ladder of public participation in EIA follow-up is community involvement in adaptive management. Adaptive management is also one of the best practice principles for EIA follow-up. Adaptive management focuses on dealing with uncertainty and being flexible in its ability to respond to unanticipated findings and outcomes (Arts & Morrison-Saunders, 2004; Holling, 1978). Being able to deal with the uncertainty that



megaprojects have as well as having a strategy for EIA follow-up also allows for the public to participate and to feel empowered. As in urban areas the battle for space continues, underground space becomes increasingly important leading to more underground infrastructure, including in the form of metro lines. Considering the complexity of such megaprojects, this will result in future planning processes that face increased uncertainty. As this uncertainty is not able to be dealt with during the pre-consent face, follow-up is necessary to have ample strategies and measures that allow for the uncertainty to be dealt with efficiently and effectively. Part of dealing with that process is the involvement of the public by either informing them or having them participate in the solutions. Therefore, it is imperative that adaptive management is taken into consideration along with the additional best practice principles for public participation in follow-up as they focus on dealing with the uncertainty.

## 1.4 Scientific Relevance

With the best practice principles for public participation in EIA follow-up being published last year by the International Association for Impact Assessment (Morrison-Saunders and Arts, 2023), there is still no literature on how these principles can be used in existing projects (see Morrison-Saunders et al., 2023). There is also a gap in knowledge regarding public participation in follow-up, as well as regarding follow-up to public participation. While public participation efforts in EIA are completed in the stages before the consent decision; less attention is paid to public participation in the follow-up stages of construction and operation. Involving the public is mentioned in regards to follow-up and their potential contributions as public participation should start early and be an ongoing process (Glasson and Therivel, 2019; Sinclair and Burdett, 2024) Some attention for informing the public during construction stages has become common practice, but less so for the higher levels of public engagement. In the operational stages public participation is even more limited or completely lacking (Morrison-Saunders et al., 2023). Public participation in the post-consent decision stage should not purely be about informing the public or other one way communication strategies, but about adopting two way communication strategies and their involvement in the entire adaptive management cycle (Burdett and Sinclair, 2024; Olszynski, 2020).

Even though the title and the idea of the principles is public participation in EIA follow-up, it is also the other way around. It is also about follow-up to public participation. This public participation should also undergo follow-up (Grima, 1997; Sinclair and Burdett, 2024). This requires extensive public participation in the pre-consent stage, where they are influencing the planning and development of the project (Burdett and Sinclair, 2024). This extensive public participation should be seen in changes in the proposal or efforts made during the follow-up stage, through mitigation or other management strategies, because public participation is about achieving better outcomes for communities (Sinclair and Burdett, 2024; Stewart and Sinclair, 2007) This type of follow-up is more associated with good practice public participation but is nevertheless part of the follow-up process (Morrison-Saunders et al., 2023). The comparative analysis gives further insights into how public participation is tokenistic and simply completed to 'tick a box' as part of the legal requirement of EIA, because it should also be part of the follow-up stage, and should be incorporated into the pre-consent decision stage.

## 1.5 Societal Relevance

With the continuous expansion of cities like Copenhagen and Amsterdam, and Copenhagen's plans for further metro expansion along with their current construction of the M4 line, an understanding of public participation in follow-up and vice versa will allow for improvements in future projects. Similar talks are occurring around the Amsterdam metro. Metro infrastructure projects face issues during the construction process because of their size and being highly (complex) technical projects. This ultimately leads to issues that impact society. The projects cost more as well as get extended. These projects already take an extensive period of time that can span 10+ years to build, where communities will experience the impacts and issues that come with the construction of such projects. These issues and impacts are traffic, noise, vibration, land subsidence, groundwater impacts, property value appreciation-depreciation as well as land-use change (Falbe-Hansen et al., 2018; Mottee et al., 2020b; ). The community around the project also experiences impacts such as accessibility issues, health, and wellbeing (Vanclay, 2002). These issues can lead to the public resorting to protest, such as by taking legal action which results in project delay and cost overruns (Burdett and Sinclair, 2024). Therefore, dealing with these issues through follow-up such as monitoring noise and vibration and evaluating the strategies and making the necessary changes by using adaptive management is key. Furthermore, during this process there should be public participation as they are experiencing the issues and are a stakeholder in the project. Current practice sees limited public participation and the limited public participation that is taking place is the minimum legal requirement (Burdett and Sinclair, 2024; Elling and Nielsen, 2018). This form of public participation is not necessarily meaningful. The public has value to add and meaningful public participation should be part of the follow-up stage (Burdett and Sinclair, 2024). Public participation in follow-up sets a precedent for sustainable development and allows for future projects to achieve a better process and outcome (Morrison-Saunders et al., 2023). Once the principles are applied in projects, the public will expect the same participation in future projects. It puts pressure on the government, companies and regulators to conduct proper follow-up and to have public participation in both pre- and post-consent decision stages. Thus allowing meaningful public participation that will add value to the project and allowing for equity, trust and learning is important and can help avoid the public's need to resort to protest (Burdett and Sinclair, 2024; Reed, 2008).

## 1.6 Research Aim and Research Question

This research aims to explore current EIA practice in past metro projects with focus on the extent to which the best practice principles for public participation in EIA follow-up are present, by examining the barriers, success factors and conditions for the principles in existing urban metro projects. To this end, a comparative analysis is conducted about two metro lines: the Noord-Zuidlijn (NZL) in Amsterdam and Cityringen in Copenhagen. The NZL had no formal EIA and limited public participation until the locals were severely impacted, while the Cityringen project had a formal EIA and extensive public participation. This leads to the following research question: *How was public participation in EIA follow-up conducted to facilitate adaptive management for the Cityringen and the Noord-Zuidlijn?*

Secondary research questions:

1. What are the relationships between EIA follow-up, public participation, and adaptive management?
2. How are public participation and EIA follow-up conducted during construction and operation stages in metro line projects?
3. How does public participation in follow-up facilitate adaptive management in the case of Cityringen and NZL?
4. How was adaptive management conducted in the case of Cityringen and NZL?
5. What are the barriers, success factors and conditions of public participation in EIA follow-up?

The research will start by looking at the concepts of follow-up (section 2.1), public participation (section 2.2) and adaptive management (section 2.3) to help gain insight into the first secondary research question and to help guide the research. The methods for conducting research will be discussed in section 3 together with the case studies. The research will then be presented in section 4 and 5, with section 4 covering the case of Cityringen and section 5 covering the case of the NZL. The results will follow the structure of the theory by first presenting the results of follow-up (section 4.1 and 5.1) then public participation (section 4.2 and 5.2) and lastly adaptive management (section 4.3 and 5.3). Both cases are then compared in section 6 followed by section 7 which draws conclusions and provides answers to the research questions.

## 2. Theoretical Framework

As mentioned in sections 1.2 and 1.3, planning practice and EIA practice has become more collaborative, through increased public participation. Increased attention for public participation started in planning from the 1970s onwards and was also adopted into EIA practice shortly after. It has been primarily focused on the pre-consent decision stage, and during the follow-up stage it is rarely seen in practice. The theory associated with public participation in follow-up is centered around the potential benefits as well as how public participation in the follow-up differs from that of the pre-consent decision. Understanding the difference between the pre- and post-consent decision planning stages is important to understand how public participation can be beneficial in the follow-up stage. However, it is also important to realize that there is crossover between pre- and post-consent decision. The highest level of involvement and empowerment of the public in the new set of best practice principles is the involvement in adaptive management. Therefore, understanding how to implement it in practice is rather important.

### 2.1 EIA Follow-up

EIA follow-up is a well-established concept within the literature (Morrison-Saunders et al., 2021). EIA follow-up is a fundamental component of the EIA process. The EIA process is a systematic process used to identify and predict the environmental and social impact of a project (Glasson and Therivel, 2019; Noble, 2011). EIA follow-up is defined as “understanding the outcomes of projects or plans subject to impact assessment” (Morrison-Saunders and Arts, 2023). Follow-up is post-consent decision and associated with the construction and operation of the project. The focus of follow-up is to monitor and evaluate what happens after the decision-making process and to take action if needed with the involvement of the public (Morrison-Saunders and Arts, 2004; Noble, 2011). This is also seen in the best practice principles, where the five key elements are: monitoring, evaluation, management, engagement and governance (Arts and Morrison-Saunders, 2022). Although follow-up is primarily associated with the post decision-making process, it should be incorporated into the pre-decision process (Morrison-Saunders and Arts, 2004; Noble and Storey, 2005). In the pre-consent decision stage such as, screening and scoping, follow-up can be a tool to design strategies to deal with or monitor as well as evaluate certain environmental consequences. Similarly, this would be the place to introduce the strategies that are going to be implemented to provide follow-up to public participation. Because the early stages of the EIA process include extensive public participation as a legal requirement, having follow-up to what occurs in the primary stages of EIA can be crucial in maintaining trust and a social license to operate leading to a successful and positively viewed project (Jijelava and Vanclay, 2017; Shepherd and Bowler, 1997; Sinclair and Burdett, 2024). A social license to operate is obtained through the EIA process establishing impact that will affect the public but more importantly it is about two-way communication and having continuous meaningful dialogue from the start of the process in the pre-consent stage through to the follow-up stage (Hanna et al., 2016; Vanclay and Hanna, 2019)

EIA as a tool is used to identify the potential environmental consequences. Follow-up is a tool that is used during the stage of the construction process where these potential environmental consequences arise. EIA follow-up attempts to minimize the uncertainty, associated with pre-identified environmental consequences, through adaptable strategies

that help discover and understand the consequences (Arts and Morrison-Saunders, 2004). Follow-up allows for the outcomes of decisions and actions to be determined and for learning to occur (Arts and Morrison-Saunders, 2004). Therefore, EIA follow-up tends to be seen as rather technical and invisible to the public. However, as EIA follow-up has progressed, there has been a shift towards management as well as the inclusion of communication with the various stakeholders and undertaking the socio-political aspects of EIA (Morrison-Saunders and Arts, 2004; Noble and Storey, 2005). This is important in reference to megaprojects and urban transport projects, such as metro lines and their socio-political impact (Flyvbjerg, 2014; Steele & Legacy, 2017).

EIA follow-up also draws close attention to feedback and evaluation. For evaluation and for the project as a whole, the EIA process can be split into pre- and post-consent decision. In practice there is great focus on the pre-consent decision which is where ex-ante evaluation is found and little attention is given to follow-up which is where ex-post evaluation is (Arts and Morrison-Saunders, 2004). Ex-ante evaluation is the process of moving from project conceptualization to consent decision while ex-post evaluation goes further. Ex-post evaluation looks at adaptation for a project for its management also described as single loop learning, as well as double loop learning where the knowledge and learnings of mitigation methods and management strategies are used to improve new projects and plans (Arts and Morrison-Saunders, 2004; Noble, 2011). Such as for the next metro line or a new megaproject. Therefore, EIA follow-up should be used in practice to not only better the existing project but also to better future projects by improving follow-up programmes and management strategies as a result of the evaluation of the project (Noble, 2011; Noble and Storey, 2005). However, not only by examining and evaluating the project during construction, but also during long term operation (de Jong et al., 2019). Therefore, it is also crucial that documents associated with the project remain available after construction (Sinclair and Burdett, 2024). Currently there is a tendency for project websites to close down once the project is completed which results in the documents and information becoming difficult to retrieve afterwards.

Implementation of EIA follow-up into practice is faced with challenges. Arts and Morrison-Saunders (2004), mention five key barriers: limitations of environmental impact statements; less-developed techniques for follow-up; organizational and resource limitations; limited support for conducting EIA follow-up; and uncertainties about EIA follow-up benefits and cost-effectiveness. Therefore, finding a solution to the aforementioned barriers is crucial if follow-up is to become a stable part of EIA practice. Furthermore, these barriers might be associated with the limited public participation in EIA follow-up. As the influence of the public during construction and operation might be seen as not as influential due to the technical aspect of the project, however the public can stop the project from moving forward through litigation or other forms of protest (Shepherd and Bowler, 1997). Although considered rather technical, an effort should be made to put it into layman's terms and support the public for them to effectively and meaningfully participate (Sinclair and Burdett, 2024). This can be done through monetary and expert support or workshops where clarification is provided. Public participation in EIA follow-up aims to keep them included and engaged to maintain the social license to operate. If there is a breach or unacceptable action the public can resort to various forms of protest. Different forms of protest have different purposes. Hanna et al., (2016) suggest seven purposes: information, fundraising, publicity, mobilization, solidarity building, political pressure, and direct action. A combination of protest can achieve a

combination of functions ultimately trying to gain the leverage to force decision-makers to meet their demands. For example by improving follow-up and public participation and limiting the impacts that are experienced by the affected public. However, if the project team or government instead take counter-action, it can lead to an escalation which can have harmful consequences for both the company and community (Hanna et al., 2016; Vanclay and Hanna, 2019). Therefore, protest should be seen as an opportunity to address issues with the current project and engage in dialogue with the protesters (Hanna et al., 2016)

## 2.2 Public Participation

Public participation has many benefits from legitimizing projects and decisions to local knowledge being implemented. Public participation is an integral part of planning as well as the EIA process. Public participation in planning can be extended to governance and specifically urban governance, as metro lines impact the urban structure (Flyvbjerg, 2014; Legacy, 2016; Steele & Legacy, 2017). Firstly, public participation refers to the “involvement of stakeholders in decision-making about policies, plans or programs in which they have an interest” (Quick & Bryson, 2022, p157). Stakeholders are regarded as anyone whether a single individual or an organization that is affected by policy, plans or programs (Quick & Bryson, 2022). Furthermore, the participation exists in various forms, from more passive meetings and consultation to direct involvement. This can also be explained as one-way communication and two-way communication (Reed, 2008) It is about the formal and informal decision-making processes. The EIA process can also be seen as a tool that fosters and allows for public participation. Within the EIA process, public participation is extensive leading up to the consent decision, by informing and involving the public in broader planning and development (Glasson and Therivel, 2019). However in the follow-up stage the involvement of the public is lacking (Morrison-Saunders et al., 2023). Therefore, the governance associated with the early stages of EIA and megaprojects is directly related to government decision-making and the incorporation of public participation within that process. Nevertheless, governance should not only be seen as related to the government and the decision-making surrounding policy. Governance should be extended to various other organizations as well and the decisions associated with the projects and plans of those organizations should involve public participation (Quick & Bryson, 2022). Incorporating it into the entire process of projects and plans such as through adaptive management could lead to improvements within megaprojects and EIA follow-up.

Public participation has become central in planning in both Denmark and the Netherlands and is also part of the EIA process, especially in the initial stages of the EIA process (Suškevičs et al., 2023). As public participation grew in planning during the 60s with Arnstein’s (1969) ‘ladder of citizen participation’, see Figure 1, followed by collaborative planning by Healey (2020) and Innes and Booher (1999) consensus building, it became a part of the EIA process as well. The less technical approach created the possibility for the public to influence their city and help shape the city they wanted, by becoming part of the decision-making process. Public participation can be defined as “the involvement of individuals and groups that are positively or negatively affected by, or that are interested in, a proposed project, program, plan or policy that is subject to a decision-making process” (André et al., 2006, p1). Public participation is often referred to as stakeholder engagement. Essential to public participation is the engagement between all the stakeholders including regulators, proponents, decision-makers, and the public. Each stakeholder has specific

knowledge and the public will have knowledge regarding their local areas, but also concerns (Arts & Morrison-Saunders, 2004). Addressing these as well as taking the local area knowledge into consideration can be essential in establishing as well as maintaining trust between the public and other stakeholders. Furthermore, the size and complexity of the project results in prolonged and unexpected impacts which the public has the right to know about and is part of the planning approach. It provides transparency and legitimacy for governments as well as the project team and maintains accountability especially for metro lines, which have impacts on the structure of the city (Flyvbjerg, 2014; Hartley & Wood, 2005; Legacy, 2016). Additionally, public participation can be beneficial as it can provide new information or a different way of looking at an issue or plan but the public might also be very motivated in tackling some specific issue, which can lead to innovation and more information on specific public issues (Quick & Bryson, 2022).

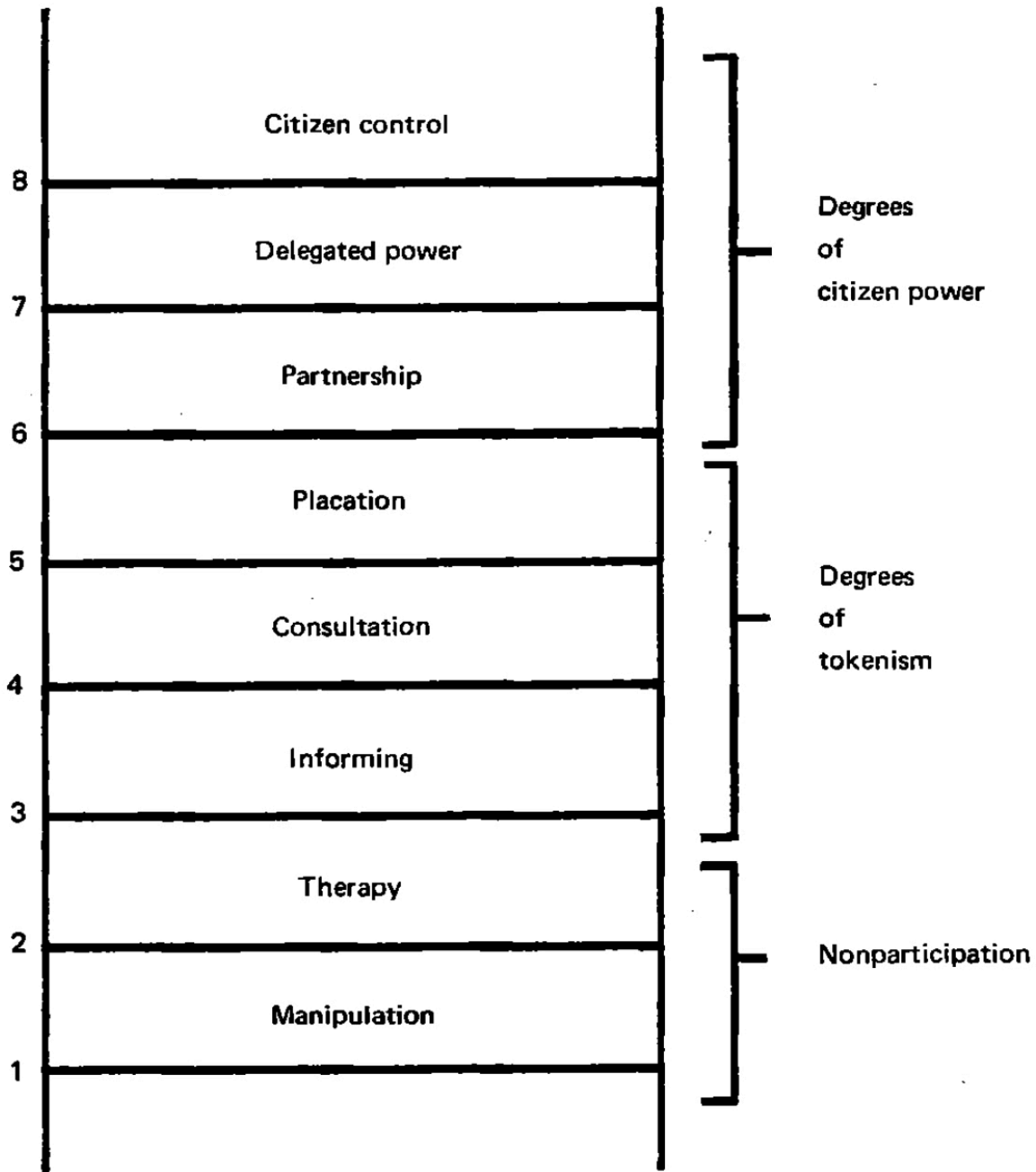


Figure 1. Ladder of Citizen Participation (Arnstein, 1969)

One of the concerns related to public participation is regarding implementation (Quick & Bryson, 2022; O’Faircheallaigh, 2010). As public participation has shifted to being recognized as a key part of planning and EIA, it has become rather clear that if done well, it has significant benefits by increasing the understanding of issues, contributing new ideas, enhancing ownership, and potential inclusion in mitigation and monitoring strategies (Burdett and Sinclair, 2024; Shepherd and Bowler, 1997; Quick & Bryson, 2022; O’Faircheallaigh, 2010). However, with the evolution of public participation, so has the methods, which leads to questions surrounding how and when to implement public participation. This leads back to Arnstein’s (1969) ‘ladder of citizen participation’ regarding ownership and belonging, but also about the time period in which participation should occur (Quick & Bryson, 2022). Arnstein’s eight rungs are further simplified into three categories, non-participation, tokenism, and



citizen control. The first two rungs are non-participation and focus on educating the public and building support for the project. Rung 3, 4 and 5 are the first steps that allow for the participant to be heard and have a voice, however the power and the decision making still falls with the proponent. At the top of the ladder the citizen's power and ability to make decisions increases. Rung 6, partnership, allows for the participants to engage in negotiations of decision making. Rung 7 and 8 give majority and full power of decision making and management to the participants, respectively. It is important to realize the importance of power relations and how large organizations should not be allowed to dominate in settings involving various stakeholders and the importance of giving a voice to the smaller groups and citizens as well (Healy, 2003; McQuirk, 2001). Being inclusive and giving a voice to the less powerful or marginalised communities increases legitimacy of the project and of public participation, and can help avoid protest from the less powerful actor (Burdett and Sinclair, 2024; Hanna et al., 2016). When observing the ladder of Arnstein (1969), which has since also been adapted by Edelenbos and Klijn (2006) to 'Participation Ladder', this refers to the empowerment that comes with going further up the ladder. Edelenbos and Klijn (2006) use the terms, informing, consulting, advising, coproducing, and co-deciding, to represent the increase in empowerment and the shift from one-way communication, to two-way communication. In the case of the best practice principles for public participation in EIA follow-up it involves active participation in adaptive management, see Figure 3 (Morrison-Saunders et al., 2023). Thus the public has meaningful participation throughout the entire adaptive management cycle for changes that occur during the follow-up stage and more importantly for changes they deem desirable (Morrison-Saunders et al., 2023). Being the 12th principle, involvement of community in adaptive management, it is the highest degree of empowerment and two way communication with the public. The first few principles are associated with one way communication through informing the public. The principles then move into consulting and advising by providing input and feedback, principles 5 and 6. Principles 9 and 8 are focused on co-producing and principles 11 and 12 on co-deciding. The higher principles and two-way communication are methods where the public is an active user, which require long-term participation, especially in megaprojects, whereas more passive hearings and consultation is short-term. The long term participation, which is also a result of the megaproject having a long construction time, can result in consultation fatigue for the community (Esteves et al., 2012). This is something that the proponent and government should be wary of as it can result in the community feeling their involvement and input is not being valued. This also tends to be a result of repeated hearings which are focused on informing and consultation where the power imbalance can be greatest, especially if it involves small groups (McGuirk, 2001; Quick & Bryson, 2022). This is in contrast to collaborative management and collaborative planning in which it is about working together to pursue their future city and tackle the problems they see fit (Innes and Booher, 1999; Quick & Bryson, 2022). Collaborative planning deals with the power conflicts that arise and therefore lend itself to more inclusion (Healey, 2003). Thus, allowing for the citizens to have ownership and equity through their decisions.

## 2.3 Adaptive Management

EIA and megaprojects face immense uncertainty. Megaprojects due to their sheer size and complexity and EIA as a predictive tool of potential environmental impacts. To combat this, adaptive management is a method for managing the uncertainty by being flexible in its ability to respond to unanticipated findings and outcomes (Arts & Morrison-Saunders, 2004;

Holling, 1978; Priemus et al., 2013). Therefore, in accordance with implementation theory, which is focused around the “relationship between the structure of the institution through which individuals interact and the outcome of that interaction” (Jackson, 2001, p655; Maskin & Sjöström, 2002), adaptive management is the strategy best designed to deal with the uncertainty related to the project because the outcome that satisfies the affected can be found whenever an issue arises. The concept of adaptive management started in reference to resource management (Holling, 1978). As part of EIA practice, it is a component of the follow-up stage as a management strategy. Similar to EIA follow-up, adaptive management is an ongoing process throughout the project's life cycle with roots in the pre-consent decision stage, with the majority taking place post-consent decision. Here the overlap with the other concepts also becomes apparent. Through EIA follow-up, adaptive management is implemented which combines action and communication with the stakeholders (Arts & Morrison-Saunders, 2004). The adaptive management cycle implements the action and communication in combination with the various other aspects of EIA follow-up through each change and consideration (Olszynski, 2020). Public participation in EIA and the transparency that follows is vital for adaptive management (Morrison-Saunders et al., 2004; Burdett and Sinclair, 2024).

The uncertainty of megaprojects allows for adaptive management to thrive (Morrison-Saunders et al., 2004). With the immense uncertainty associated with megaprojects precautions should be taken. In environmental management precaution refers to the implementation of a contingency plan to address the ‘worst-case scenario’. Being able to accommodate for a worst-case scenario means a project has no reason not to be granted the consent decision to proceed (Priemus et al., 2013). When looking at this through the lens of EIA, this refers to the implementation of follow-up strategies. The concepts of contingency and resilience can be drawn from adaptive management, and defined as allowing for changes to be taken into consideration and being able to adapt to the changes respectively. For this essay the concepts will remain part of adaptive management and will not be referred to individually (Priemus et al., 2013). Implementing adaptive management and having follow-up strategies appointed in the pre-consent stage is advantageous as utilizing adaptive management in follow-up is a means to deal with the uncertainty and having an ample strategy by being flexible and resilient (Morrison-Saunders et al., 2004; Priemus et al., 2013). However, adaptive management can not be the sole strategy and management in follow-up as it is not the solution to all uncertainty (Bernauer et al., 2023). Using adaptive management for project approval as part of the pre-consent decision, without proper strategy and plans for how it should be conducted and implemented in post-consent decision will result in ineffective adaptive management during the follow-up stage (Bernauer et al., 2023; Olszynski, 2020).

Adaptive management focuses on post-consent decisions in the EIA process and is part of the follow-up. Pre-consent decision, adaptive planning and the adaptive capacity is used to deal with changes and uncertainties. Adaptive capacity is defined as “the ability to adapt to actual changes in the context or changes in the perception of the context by the actors involved” (Giezen et al., 2015 p. 1001). Giezen et al. (2015) further described the importance of adaptive capacity in the planning and decision-making process for megaprojects. Megaprojects need to be sustainable long term as they transform a city and last for decades. The adaptive mechanisms that are related to adaptive capacity and are used for adaptive management in this essay are: Inertia, incremental, radical, socio-historical (Giezen et al.,

2015). Inertia is centered on stopping the project from moving forward without one's needs or interests being met (Priemus et al., 2013). This outcome is not desired as it results in the project not moving forward as there is no compromise in finding a solution (Giezen et al., 2015). The stoppage of a project tends to stem from litigation (Shepherd and Bowler, 1997) Incremental adaptation is the response most common with technical adversities. It is small mitigations or changes that have no impact on the overall goal of the project (Giezen et al., 2015; Priemus et al., 2013). Radical adaptations occur due to strong opposition and change the goal, design or outcome of the project (Giezen et al., 2015; Priemus et al., 2013). Lastly, socio-historical adaptation is a change in institutional design or stakeholders which results in a change in the way existing projects or future projects are carried out (Giezen et al., 2015; Priemus et al., 2013). Therefore, follow-up and public participation are crucial in avoiding inertia as they build trust with stakeholders (Shepherd and Bowler, 1997). Adaptive management can be used to prevent radical adaptation and focus on incremental adaptation. However, in terms of the overall EIA practice, radical change or socio-historical adaptation might be necessary to allow for public participation in follow-up which could be necessary in avoiding the continued issues that plague megaprojects and metro lines such as cost overruns and time delays (Flyvbjerg, 2014).

## 2.4 Conceptual Framework

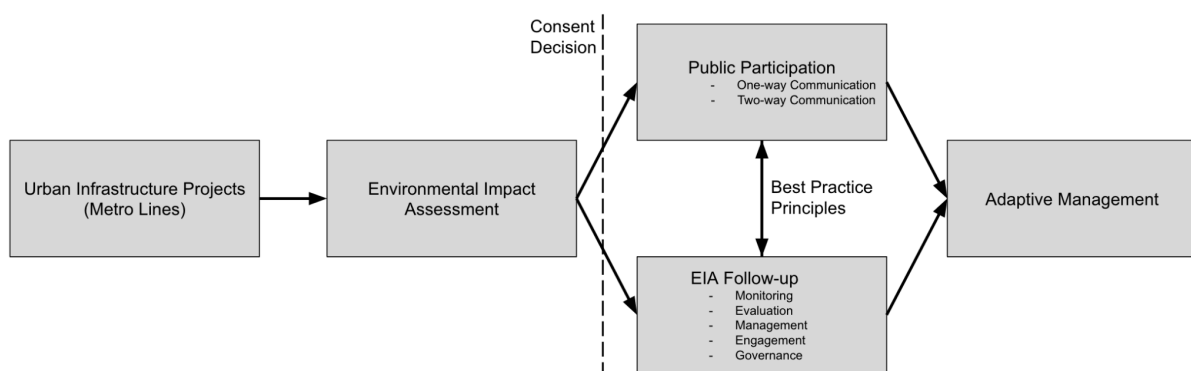


Figure 2. Conceptual Framework

As part of urban infrastructure projects, it is usually mandatory to conduct an EIA. The EIA process has different stages. During the pre-decision stage such as the screening and scoping, public participation is seen to great extent and gives power to the public in giving feedback and demanding changes to the project. Public participation also occurs after the EIA report has been finished and the formal consent decision is prepared, allowing for stakeholders to react to it and for changes to happen. This is both one- and two-way communication. The public is being informed, but also engaging in a dialogue where changes and concerns can be raised that are taken into consideration during the decision making process. This study aims to examine the public participation post-consent decision as well as the follow-up to the public participation that occurred pre-consent decision.

EIA follow-up is seen as best practice and primarily comes in the form of monitoring and is seen as rather technical, and therefore public participation is not customary. However, EIA follow-up encapsulates various other aspects that are important and links it closely to the adaptive management cycle as it also looks for engagement, monitoring and evaluation.

Furthermore, EIA follow-up should include public participation, but similarly, there should also be follow-up to public participation as public participation should start early and should be ongoing through the entire project. The issues and concerns raised by the public during the pre-decision stage, should be given attention. Especially if they arise during construction or operation. To accommodate for this, adaptive management incorporates both of these concepts is the highest form of power (cf. Arnstein, 1969) given to the public in the EIA follow-up stage. This study builds upon the recent IAIA best practice principles for public participation in EIA follow-up, see Figure 3 (Morrison-Saunders and Arts, 2023), that describes adaptive management as allowing for the public's ideas and changes to be easily adapted into the project.



Figure 3. Best Practice Principles for Public Participation in IA Follow-up (Morrison-Saunders et al., 2023)

These principles bring together the three concepts, public participation, EIA follow-up, and adaptive management and thus provide an answer to the sub-research question 1: What are the relationships between EIA follow-up, public participation and adaptive management? Public participation and follow-up are independent variables and concepts that can stand alone. In this set of best practice principles they are brought together due to having similarities and crossovers in existing EIA practice. As part of follow-up, you have engagement and communication. As a component of follow-up there is also management. Similarly, two-way communication in public participation is about engaging which overlaps with management and governance. Therefore, public participation and follow-up have a considerable number of similarities and crossover. Ultimately, dependent on these two concepts is adaptive management which is the strongest form of two-way communication that the public can experience in EIA follow-up. The concept can also be found in the

existing practice of the two concepts, public participation and follow-up, as the last step in the participation ladder framework.

## 2.5 Analytical Framework

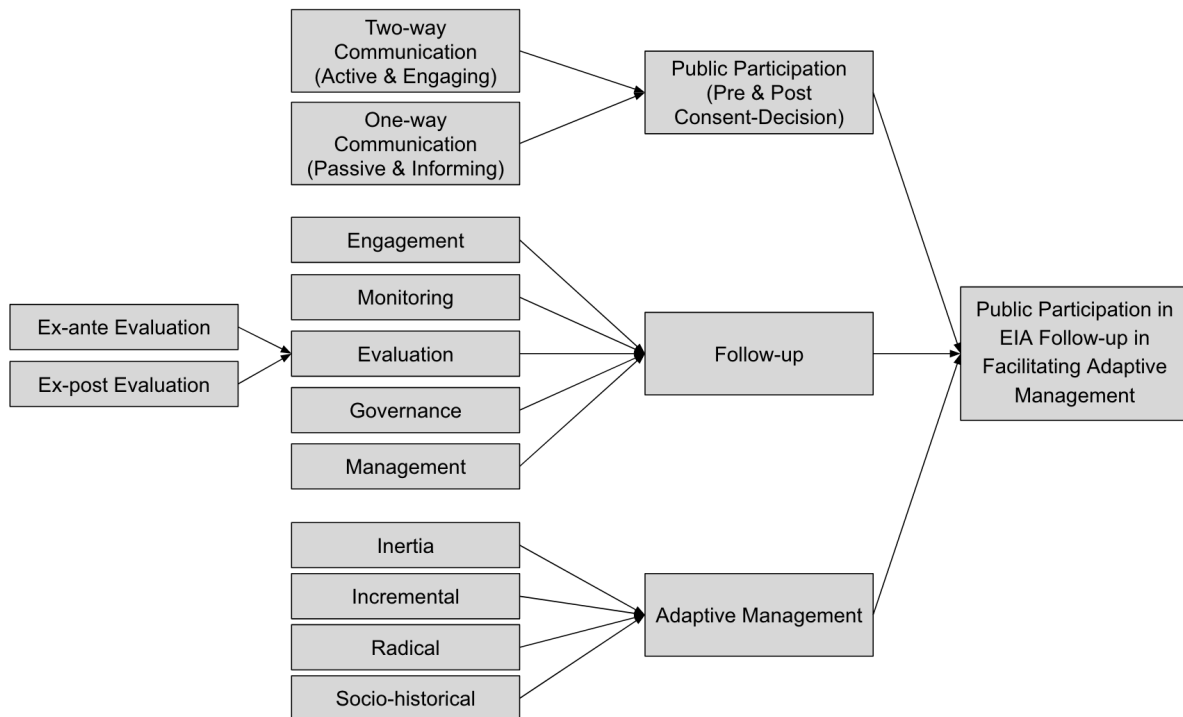


Figure 4. Analytical Framework

Based on the research, the relationship between follow-up, public participation and adaptive management can be seen in Figure 4. Follow-up and public participation are a part of the EIA process, and more recently they have been combined in the 12 best practice principles for public participation in EIA follow-up (Morrison-Saunders and Arts, 2023) as seen in Section 2.4. Adaptive management is the highest level of empowerment and could take the form of governance. For adaptive management to be effective, all stakeholders need to be involved and have the opportunity to provide input in decisions which is what governance and collaborative planning is about. Therefore, adaptive management allows for the public to be involved throughout the process and for any issue that arises to be tackled to avoid inertia, in which the project has to stop. Inertia leads to time delays and cost overruns which is often seen in megaprojects.

## 3. Methodology

### 3.1 Data collection

This research was conducted through a comparative analysis of two metro line project cases. The choice of a case study research allowed me to explore the best practice principles in existing projects. As the best practice principles are new, and thus not been implemented in practice, the research is exploratory in nature and case studies facilitate this need. The primary case study is Cityringen, Copenhagen and the additional case studied is Noord-Zuidlijn, Amsterdam. These two cases are both completed projects. As the research looks at EIA follow-up the metro line projects are both completed allowing for an in-depth examination of the follow-up stages, which is centered on the construction and operation phase. The two cases vary in their nature, in which Cityringen had a formal EIA while the NZL had no formal EIA. This allows for further examination in how the follow-up stage is approached, herein the role of EIA, and how they deal with the uncertainty related to the respective megaprojects.

The data for the case of Cityringen, Copenhagen was collected using in-depth media analysis and analysis of policy and project documents, see appendix IV. The policy and project documents were found on the company website as well as the website of the Ministry of Transport. These documents include the original EIA as well as the supplementary EIA, yearly reports, the Construction Act, and complaint and hearing/consultation documents. The media analysis was conducted using the most popular news networks, such as DR and TV2 Kosmopol, by searching using the keywords, but not limited to 'Cityring/Cityringen', 'nabo til Cityring/Cityringen' (neighbor to Cityringen), and 'påvirkninger af metrobyggeri' (effects of metro construction). Additionally, snowballing to other media materials from the available hyperlinks in the articles. Furthermore, an additional google search led to media materials outside of the aforementioned news networks. Additional in depth semi-structured interviews with various stakeholders, see appendix I, was conducted to gain insights into how public participation, follow-up and adaptive management was conducted as well as how these were experienced by the public/neighbors of the Cityringen project. Finding people willing to be interviewed was a real challenge. I approached 12 additional people to the ones that were interviewed using LinkedIn, email. Follow up messages were sent to everyone with no success. Neighborhood associations were also contacted with no success. Lastly, the metro company (Metroselskabet), the Danish Environmental Protection Agency (Miljøstyrelsen) and the various Ministers for Transport during the duration of the project were contacted and declined to participate in an interview.

For the case study on NZL the primary findings were drawn from the PhD-research of Lara Mottee (2020). In her research she used the NZL as a case study for two of her chapters. She did her research by examining policy and project documents as well as conducting interviews. The interviews for Lara Mottee's research, I used for the analysis of the NZL case as she had conducted interviews with a variety of stakeholders. The policy and project documents that were referenced were also analysed by myself as well as looking for updated information since Lara's research. However, as the project website has since shut down, and a limited number of documents could be accessed using Wayback Machine (<https://web.archive.org/>) Additionally, a semi-structured in-depth interview was conducted with her to discuss her findings. One additional interview was conducted by me for the case

of NZL to further discuss the case and the follow-up that took place. Table 1 provides an operationalisation of the sub-questions for how each is to be answered using the different data collection methods.

### 3.2 Data Analysis

For sub-question 1, the literature that was examined was done using Scopus and GoogleScholar. The key search terms were public participation/stakeholder engagement, EIA follow-up, adaptive management. These terms were used in combination together to find the literature that encompassed these topics. Furthermore, the best practice principles were used as a point of reference to see what literature cited them to see how they have been used in literature since their recent publication.

The interviews were transcribed to allow for analysis and can be found in Appendix III. The analysis of the interviews was conducted in atlas.ti guided by a deductive code tree. The deductive code tree is based on the analytical framework presented in section 2.5. By using 2 methods, the data collection is done using triangulation to ensure validity. By using qualitative methods, the data collection focused on the reasoning behind the choices made and the contributions those choices made. The document analysis allowed for insights into the pre-consent stage as well as the post-consent stage and the administrative background. It also provided guidance for the interviews.

*Table 1: Data Collection for Sub-Questions*

Sub-Question	Methodology
1. What are the relationships between EIA follow-up, public participation and adaptive management?	Literature
2. How are public participation and EIA follow-up conducted during construction and operation stages in metro line projects?	Document and media analysis Interviews
3. How does public participation in follow-up facilitate adaptive management in the case of Cityringen and NZL?	Document and media analysis Interviews
4. How is adaptive management conducted in the case of Cityringen and NZL?	Document and media analysis Interviews
5. What are the barriers, success factors and conditions of public participation in EIA follow-up?	Interviews

### 3.3 Ethical Considerations and Positionality

Several ethical considerations were to be taken into account during the interviews. Verbal consent was given at the start of every interview. Additionally, a consent form, see Appendix III, was sent out prior to the interviews to allow the participants to familiarize themselves with it and ask any clarifying questions they might have had. Participants were also informed that it was voluntary and they could opt out at any point. The participants were informed about privacy of their information, as well as confidentiality as the interviews are solely used for academic purposes and are only handled by the researcher. Furthermore, the participants personal information, such as their name have been changed to ensure anonymity which further ensures the participants privacy and safety. Lastly, all collected data has been handled with integrity to ensure correct and accurate information to ensure validity of the research.

As the researcher, I was as prepared as I could be in my knowledge on the cases. I am also an outsider looking in on a project, not necessarily to criticize but to investigate and to understand the way the project was conducted in terms of public participation in EIA follow-up in facilitating adaptive management. Additionally, I do not live in either city, nor have I experienced any of the hardships of the project. However, I am Danish and currently live in the Netherlands so I am familiar with the context of both cases, and I have benefitted from both metro lines. I have used them previously when visiting both cities, which I do on a regular basis. Therefore, I am also in favor of both projects which is a bias that I am aware of. Being wary of this I approached the research in a neutral manner in an attempt to find answers to the research question.

### 3.4 Case Studies Cityringen and Noord-Zuidlijn

For this research the case of Cityringen metro line in Copenhagen as can be seen in figure 6, and the case of the Noord-Zuidlijn (NZL) metro line in Amsterdam as seen in figure 8, were picked as they are complex metro projects in similar sized cities, but with 1 distinct difference. For the NZL in Amsterdam there was no formal EIA whereas for the Cityringen Copenhagen a formal EIA was conducted for the planning and decision-making. In both Denmark and the Netherlands environmental impact assessment is common practice, for both of which the EU EIA-Directive (85/337/EEC) provides the legal framework, and in both countries EIA is a lengthy process that also includes aspects of social impact assessment.

#### *Copenhagen Cityringen*

As a growing city, facing transport issues due to the number of cars and wanting to become more sustainable and green, the expansion of the metro network was the solution that was decided upon back in 2002 as can be seen in the timeline in figure 5 (Transport- og Energiministeriet, 2005). The metro line has provided better connection between places within the city, as the metro can transport people around quickly, opening up spaces within the city. This also provides better connection to the already existing public transport network allowing for people coming outside of the inner city to connect to the metro easily. Following the initial investigative process between 2002 and 2005 the Municipality of Copenhagen, Municipality of Frederiksberg and the State through the Ministry of Transport agreed to the project. In 2007 when the Construction Act was signed for Cityringen, the metro company (metroselskabet) was also established. Metroselskabet is owned by the Municipality of



Copenhagen (50%), Municipality of Frederiksberg (8.3%) and the State (41.7%) (Metroselskabet, 2024). This ownership gives them a lot of power but also means delays and cost overruns have significant impact on the city and its people. As the EIA process began public participation took place as a formal requirement in the pre-consent decision stage. After the project was sent for tender and a project team was established, the construction of the metroline began in 2011, with drilling of the tunnels to commence in late 2012 and early 2013, with four machines (Rigsrevisionen, 2014). However, this did not hold true. Due to late starts on constructing the stations and service stations as well as the detailed designs, the drilling was delayed (Rigsrevisionen, 2014). This was further delayed when the tunnel boring machines arrived late. The machines were being assembled and prepared abroad and then shipped to Denmark, which resulted in the first two machines arriving and starting 8 and 11 months late respectively (Rigsrevisionen, 2014). Due to this delay, it was deemed necessary by the metro company to drill in the evenings and on Saturdays if they were to uphold the original schedule and avoid any further delays and cost overruns. Furthermore, the metro company argued that the tunnel boring machines were not designed for overnight shutdowns, and that purchasing and shipping new machines would result in significantly greater delays and cost overruns, further justifying the decision to drill outside scheduled hours (Andersen, 2013). The stopping and starting of the machine can cause groundwater problems and damage to buildings due to how the soil reacts during the start and stop process of the tunnel boring machine (Andersen, 2013). The drilling outside scheduled hours and the noise and vibration from it were the primary reasons for complaints by the citizens and neighbors of the project. As a result the drilling was halted completely as the legal dispute took place. This dispute was essentially between on one side the State, the two Municipalities and on the other side The Nature and Environment Complaints Board who won and got drilling past 18:00 deemed illegal (Klinke, 2016). However, this did not last long, as the timeline shows there was a new Construction Act which overruled the decision and allowed evening drilling to take place. This was due to the Chairman of the Board of the metro company appealing for a joint solution which the Transport Minister at that time deemed necessary as projections showed 2+ years delay which would simply cost too much (Klinke, 2016). In addition to the new Construction Act, there was a large compensation package for the most affected neighbors of the project (Statsrevisorerne, 2014). Due to the new Construction Act it was also necessary for a supplementary EIA to be conducted, which all led to changes in permitted noise levels and the approach to public participation (Statsrevisorerne, 2014).

The supplementary EIA also changed how follow-up was conducted on the project. During the initial post-consent decision period, there was very limited follow-up, focusing primarily on monitoring of issues such as land subsiding and damage to buildings with baseline monitoring having taken place prior to the start of the project (Falbe-Hansen et al., 2018; Metroselskabet I/S, 2008). After the supplementary EIA, monitoring of noise and vibration was conducted and published for everyone to access. Although there was a new set of regulations for noise and vibration for drilling past 18:00 and on Saturdays, the metro company proceeded to exceed the limit leading to further complaints. However the new Construction Act had prevented these complaints from halting the drilling, but demanded immediate action from the company to reduce the levels to acceptable standards. Complaints of noise and vibration have remained through the entire construction process as well as since completion during operation (Altinget, 2021). Additionally, since completion, the total number of passengers has been significantly lower than expected. It was expected

235.000 passengers would use it daily, however in 2023 there was an average of 150.000 passengers, which is about 40% less than expected (Klarlund and Bencke, 2023). This is of significance as the project gained permission based on an expected passenger number that would allow for the project to be paid back within a certain time period. Furthermore, the numbers were used to sell the project for its benefit to society, however now that it is being used less, the benefit is in question. Even with the complaints and lower passenger numbers the project is seen as an overall success for the future of Copenhagen and additional metro projects are being discussed.

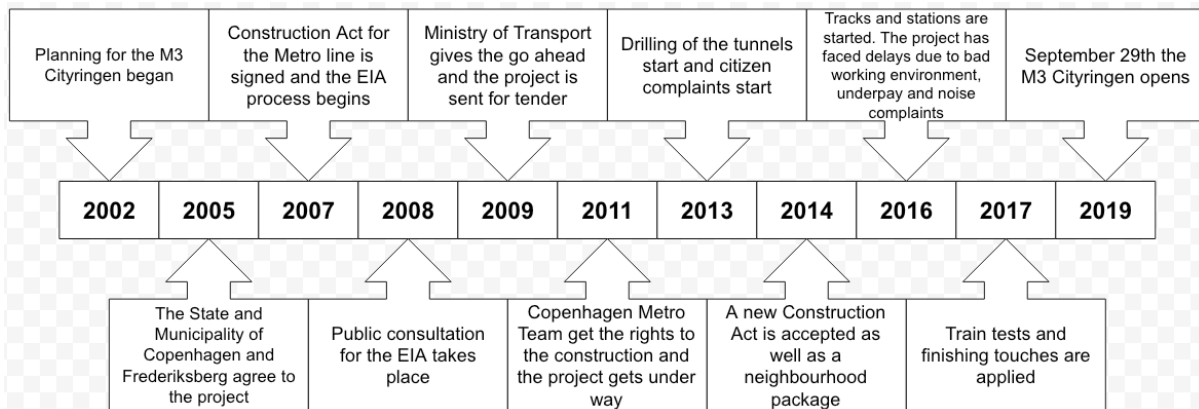


Figure 5. Timeline of key events for Cityringen (Herschend, 2015; Thomsen & Rene, 2017)



Figure 6. Metro network in Copenhagen displaying the Cityringen/M3 as the red circle (Cantene, 2021)

### *NZL Amsterdam*

When the metro network for Amsterdam was being planned in the 1960s, the north-south line was one of the 4 lines being planned (travelguide.amsterdam, 2024). However, following the many complications and demolition of buildings related to the first underground metro line, the eastline, the public did not want another underground metro line. Nevertheless, as congestion due to cars continued to grow the north-south line was once again discussed, with feasibility studies conducted to decide on the best plan moving forward (Vosman, 2018). Connecting the economic hub of Zuidas to the city center as well as the north across the IJ river was accepted with the Ministry of Transport paying 95% (Vosman, 2018). Most importantly there was to be no demolition of buildings, otherwise there would be no support at all. Thus tunnel boring was the only option, which had never taken place in the Netherlands before. Although there was going to be no demolition it was still not favored by the public as seen in the timeline in figure 7 (Mottee et al., 2020; Vosman, 2018). With the soil conditions and the need to protect the city center and the historical buildings, the project became very technical with concerns for subsidence and damage to buildings. Substantial testing was done before the start of the project to gain insights into how the soft soil of Amsterdam would react to tunnel boring (Vosman, 2018). There was also the decision to build the metro tunnels under the roads instead of under the houses to minimize potential

disturbance to buildings. Although studies and tests were conducted, there was no requirement under Dutch law for a formal EIA, as the project was within the built-up area of the city (Mottee et al., 2020). Therefore, these were part of the land use planning procedures which required technical and environmental studies to be conducted and the public to be given the opportunity to comment on the project (Mottee et al., 2020). However, these comments were not considered in the decision making process in the same way they would be required to if it was part of the EIA process.

As the project began and got underway it was clear the project was more complex than expected and delays started and cost began to increase (Vosman, 2018). At the station Vijzelgracht there were two major incidents of land subsidence. Because of the conditions with regards to the soft soil and tunnel boring under the city, a significant monitoring system was set up for land subsidence, which allowed the team to react instantaneously in the case of subsiding (Key and Verduyn, 2009; Royal HaskoningDHV, n.d.). However, even with the monitoring system and the ability to react and solve any issues that might arise, the two incidents had significant consequences for the project. The first incident occurred in 2004 where a few houses subsided a few centimeters due to a leak followed by the second incident in 2008 where another leak caused a significant group of houses and historic buildings to subside (Key and Verduyn, 2009). Some buildings subsided up to 25 centimeters, thus the worries and fears the public had expressed before the project came true (Key and Verduyn, 2009). This led to evacuation and frustration in the middle of the night and ultimately caused the project to be halted as well as the resignation of the Alderman for Traffic, Transport and Infrastructure in Amsterdam (Hein, 2021). Following the incident an independent committee was established to investigate and decide the future of the project. They discussed 3 main solutions: stopping the project, completing the north section or completing all of it. In the end the Veerman Committee decided on completion of the project as it was already far along and the cost was too high and the problems the project were going to solve would still persist (Hein, 2021). However, there were going to be major changes in the management strategy. In 2009, a year after the incident, the project's continuation began with a focus on transparency and increased public participation in an attempt to rebuild trust. This strategy resulted in creating positive social outcomes during the construction of the NZL (Mottee et al., 2020). Although the project took substantially longer than planned and cost significantly more, the project opened with a positive view, and is used to transport people through the city, with people going to work in Zuidas and people living in the North. Because of the NZL, transport is faster which has resulted in certain bus lines that used to transport people from the North, to be closed down (Amsterdam Institute, 2021). It also resulted in a shift towards higher metro usage as there was a change in tram lines and they became more integrated with the metro system.

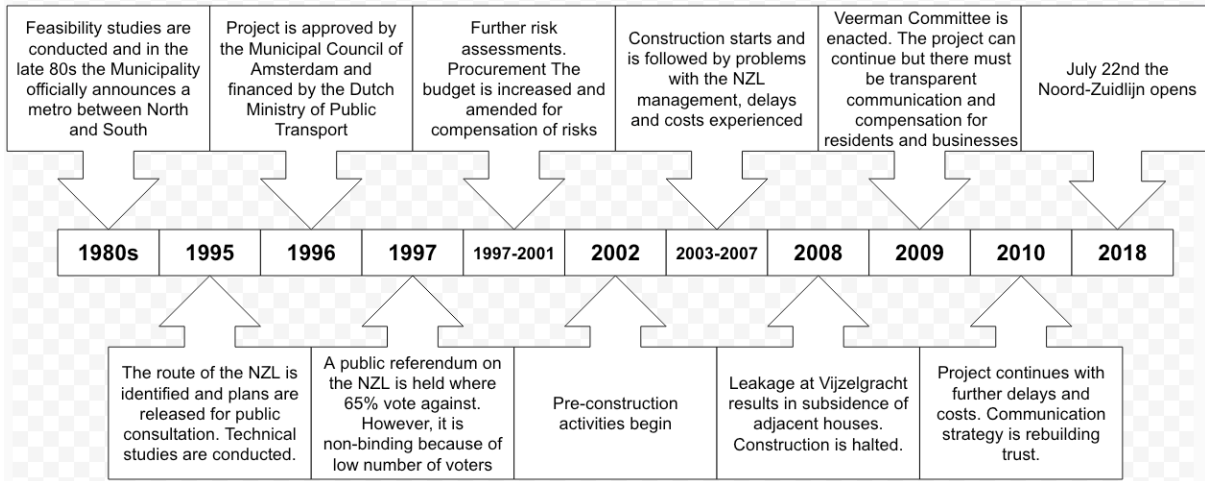


Figure 7. Timeline of key events for Noord-Zuidlijn (Adapted from Mottee et al., 2020)

# Noord/Zuidlijn

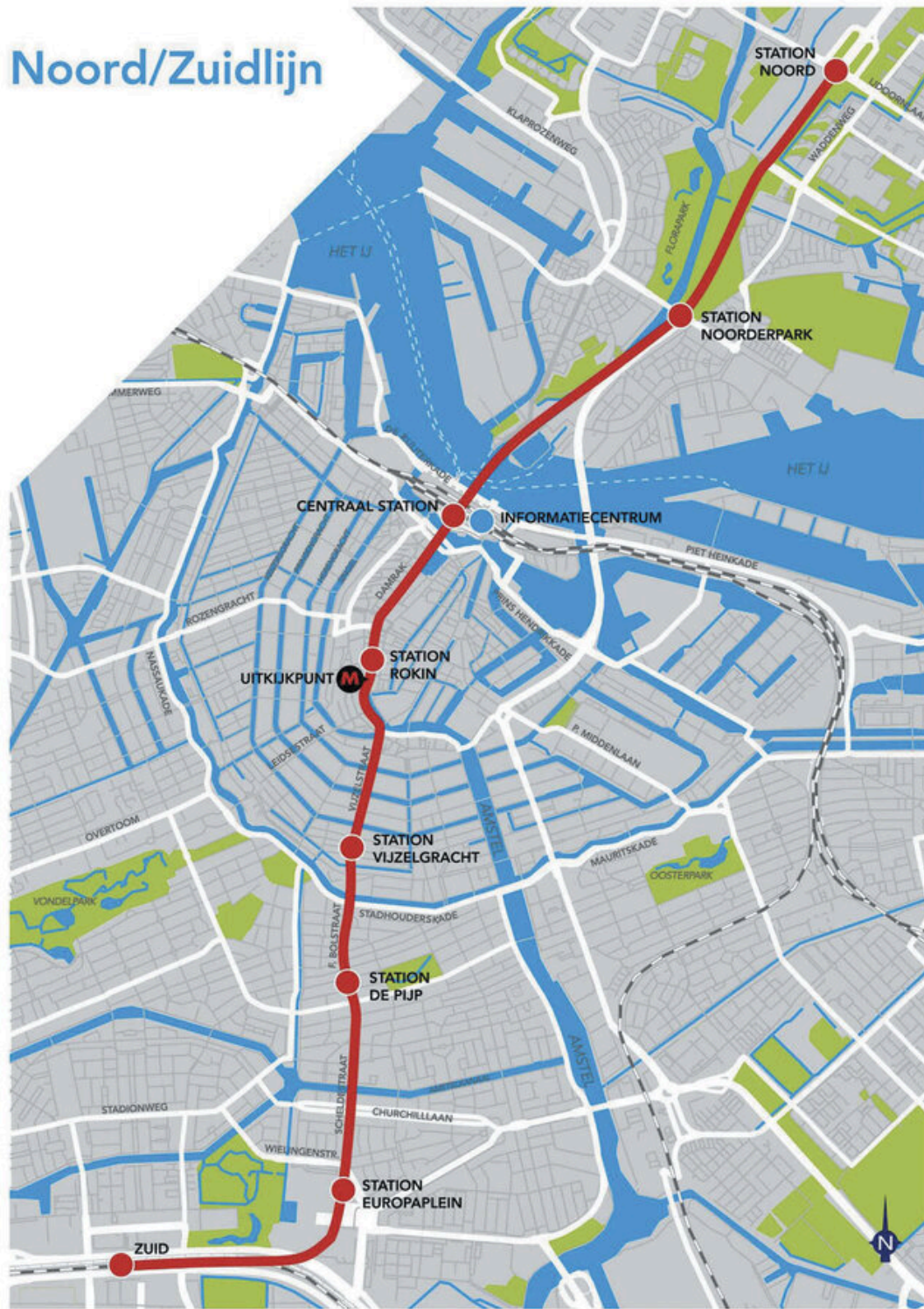


Figure 8. Amsterdam metro network displaying the NZL in blue (Mottee et al., 2020a)

## 4. Cityringen Results

Using the data collected through media, policy and project documents as well as the interviews the following section will first look at the results related to the Cityringen case followed by section 5 focusing on the case of NZL. The data is further divided into subsections based on the theory discussed in chapter 2: public participation, follow-up and adaptive management. In chapter 6: discussion, the comparative analysis between the two case studies is conducted with insights from the literature.

### 4.1 Cityringen EIA Follow-up

In the case of the Cityringen, it was not mandatory by law to include follow-up. However, in the original EIA from 2008, certain impacts were assessed to be over the allowed limit, such as noise at certain stations. These impacts had plans for monitoring as well as a potential management strategy as they were aware that it would not be possible to completely limit the noise using the proposed measures. Furthermore, there were plans to inform neighbors and the public regarding the project. There was no strategy on how to keep them informed about the impacts that were going to be potentially harmful. Here the EIA simply stated *“There is a need for good information for neighbors and others concerned about the purpose, nature and extent of the activities”* (Metroselskabet I/S, 2008, p. 115). In the post consent decision stage the project proceeded with these follow-up measures until a supplementary EIA had to be conducted in 2014 due to changes in operation as a result of an issue which would lead to increased drilling.

As the project encountered a delay, radical change had to be taken. This led to drilling outside standard working hours into the late evenings and even at night. As the metro company applied for this there was no additional screening done as the Ministry of Transport concluded the environmental impacts were within the limits that were assessed in the original EIA from 2008 (Jensen, 2015). As a result citizens challenged this decision and the response was the need for a supplementary EIA, which was conducted to accommodate for the changes that were going to happen. This was in the form of round the clock drilling which would lead to an increase in noise as well as other impacts, and this would be at a level which would be harmful to the neighbors. For this a preliminary estimation was completed and a follow-up scheme was created to make sure everything was done in the correct order. However, interviewee 1 mentioned this was not mandatory: *“The follow-up that we did at Metroselskabet or for Cityringen, was not strictly a legal requirement. You could have just not done it.”*

However, interviewee 1 also further explained that it was something that was brought up in the hearing, specifically regarding the monitoring of noise. The neighbors advocated to have these numbers published. Although interviewee 1, as well as the documents talk about the follow-up, and the monitoring of the harmful impacts, the numbers were not accurate or published according to interviewee 2. This resulted in the initiative from the neighbors to conduct some citizen science and collect data to present to the company and the municipality. As interviewee 2 described it: *“Metroselskabet had made some simulations ... there were those calculations, which we quickly found out didn't hold any truth. Then we were some neighbors and housing associations who bought some measuring equipment ... In combination with the pictures and videos they could no longer deny reality”*

This resulted in a loss of trust as well as feeling disrespected. However, it also led to what can now be seen in the law, in which it is a requirement to collect data where there is possibility for excessive impacts (Miljøvurderingsloven, 2023). However, the publishing of this data is not mandatory. In the case of Cityringen it was done because of transparency. Here there is further contrast between the two interviewees. Interviewee 1, stated that the interest to be able to see this data was brought up during the hearings associated with the supplementary EIA done in 2014, whereas interviewee 2, stated it was done as a result of the actions of the neighbors. The measures taken for Cityringen have since been adopted for projects like Fehmarn Belt Fixed Link as Cityringen set a precedent for it according to interviewee 1.

The supplementary EIA from 2014 also came with a more nuanced compensation and rehousing strategy (Transportministeriet, 2014). Due to the increase in noise, more homes were affected and some would experience increased nuisance. Thus, there was a change in the scheme. This scheme saw further changes, which provided facilities at hotels to be used by citizens to avoid the nuisance (Metroselskabet I/S, 2014). Furthermore, as the contractors and certain materials had not been decided on in the first EIA in 2008, a more holistic and detailed report regarding the impacts could be made resulting in more accurate assessment of the impacts. However, as this was lacking in the original EIA from 2008, a comparison was not possible. Interviewee 3 believed there was a fundamental problem with the original EIA and that they had not followed the EIA law correctly which is what ultimately led to the abuse of power which resulted in the supplementary EIA. Furthermore, the original EIA had not made an assessment based on having to drill at night, which would now become the case and the reason for the supplementary EIA.

In terms of governance and the implementation of follow-up and the citizens power, one of the challenges is the complexity in stakeholders. From the metro company to the contractors to the 2 municipalities that it goes through. Copenhagen has 2 municipalities. There is Copenhagen and there is Frederiksberg. Some processes were valid by citizens in Copenhagen but not in Frederiksberg. For example, in Copenhagen the night drilling was stopped due to complaints. However, in Frederiksberg this was not possible originally (Vestergaard and Pedersen, 2013). It took significant resistance for this to happen. Therefore, the governance structure played a big part in how certain aspects were carried out. Additionally, the continued change of Transport Minister and other elected officials meant there was a continued change in the compensation scheme. First it was increased, then it was increased again but limiting citizens' rights to complain and take legal action which was ultimately lifted to allow citizens to complain but not take legal action, this change also came with an increase in compensation. This also meant some people received substantially more in compensation than others depending on when they applied for it and the circumstances they were experiencing at the time. It was the largest compensation scheme in Danish history (Hansen, 2019) In regards to the compensation and the political challenges that were faced, one of the Ministers went and slept in one of the affected apartments (Petersen, 2014). He felt it was hard to get a proper sense of what it was like so he took it upon himself to educate himself more. However, it was also a publicity stunt as he was the one who had just increased compensation but limited the ability of the citizens to complain.



Since the completion of Cityringen and during its operation stage, there have been further complaints in regards to vibration (Altinget, 2021). This has resulted in further monitoring activities and an active effort to reduce the current nuisance. So far, this has yielded positive results and less homes are experiencing vibrations (Kollektivtraffik, 2021). Furthermore, the monitoring will continue as they will have to make incremental adjustments in order to continue to fix these issues that people are facing. The knowledge that they are gathering surrounding the reason for vibration and noise complaints is to be used in the future metro projects that are already planned such as the extension of the M4 line.

## 4.2 Cityringen Public Participation

During the pre-consent decision stage, public participation took place as part of the EIA directive and was conducted through hearings. According to interviewee 2 this was primarily informing, however, neighbors were allowed to contribute and give their input. However, due to the scope of the project and lack of understanding what was really going to happen, providing good feedback and knowing what might be necessary or what might happen during construction was tough to imagine, was the feeling of interviewee 2. In an interview with TV2 Kosmopol another resident commented on the hearing process *“the consultation process showed a lack of understanding for us who live here. I was terribly worried about that”* (Therkildsen, 2019b). Another citizen wrote in a complaint *“There has never been a serious consultation in connection with this huge construction”* (Vestergaard, 2013a). Interviewee 2, followed up by discussing how the concerns that were raised were not followed up on during the construction phase. The neighbor from the TV2 interview expressed similar frustration as the project started and there were immediate problems.

When it comes to public participation during post-consent decision, there was essentially none until the project faced its major issue, which resulted in a mandatory supplementary EIA in 2014. This led to further public participation during construction. However, as mentioned before the supplementary EIA the metro company had gotten acceptance to drill during the late evening and nights from the municipality. There was an opportunity to complain but as one family interviewed by the Danish news media DR said *“I know there are many who did not know that there was a short period of time to complain - and there are many who do not have the resources to read all the documents and understand what they mean - we had to read them four or five times ourselves”* (Vestergaard, 2013b). Interviewee 3, filed a complaint on behalf of citizens, referencing the timing of the hearings being during a period where people were on summer holidays, and therefore did not follow the Aarhus Convention (Vestergaard, 2013a). A similar opinion was shared when the hearing process for the supplementary EIA took place. A citizen wrote in a complaint *“After more than a year under conditions that have made me ill and have seriously affected my mental health, I only learn of this hearing by casual conversation”* (Vestergaard, 2013a). In contrast, interviewee 3 felt that the public participation that took place during the supplementary EIA was sufficient. However, the late evening and night drilling had severe social impacts that were felt throughout the entire construction phase. The citizens desperately wanted it gone, however the drilling was deemed necessary due to the high costs if the project got delayed. High costs and delays are synonymous with megaprojects.

In the supplementary EIA there was a dedicated section regarding informing the neighbors (Transportministeriet, 2014). This was going to be providing information for each

construction site in various ways which was carried out throughout the follow-up stage. Additionally, there were meetings with the neighbors as well as events on the construction site for the neighbors to partake in. This was very similar to what was seen before the supplementary EIA and during the pre-consent decision it was one-way communication and was primarily centered around informing the neighbors about the project and what was going on. The metro company also set up a 24/7 hotline in which neighbors could call or send an email with any question and experts would be available to answer and help solve potential problems (Metroselskabet I/S, 2014; Transportministeriet, 2014).

Although most of the public participation in the follow-up stage was one-way communication and focused on informing, it later evolved into more two-way communication as the neighbors took it upon themselves to challenge the municipality and the metro company. After that it became more about including the public and the neighbors in the project and rebuilding some of the trust that had been lost due to the lying that had been going on. Interviewee 1 and 2 clash on this topic. Interviewee 2, felt they were lied to in terms of the amount of noise whereas interviewee 1 felt this was not the case. Regardless, the metro company started the neighbor communications department (nabokommunikation) that was centered around communicating with affected neighbors as well as providing general information. In an interview with Kommunikationsforum, close to the opening of the metro line, the communications and market manager Lise Hein talked about the importance of understanding each target group as well as being transparent about potential delays (Kforum, 2019). Interviewee 1 also talked about the importance of not always being general, but the importance of connecting and understanding the individuals concerns so these concerns can be dealt with and receive the necessary follow-up *“There is a tendency to inform people with lots of impersonal general information. It is important to ask who the recipient is. I think that is the key to it all, that you don’t think that you are a big company and you roll them over.”*

This also brings up the importance of establishing a connection between the different stakeholders and giving even the smallest group or individual a voice. The citizens wanted the metro and were in favor of it, even the ones living next to it. They were even willing to deal with noise. However, they had not been contacted or properly informed. They had not been part of the decision and were not able to give input on what they felt was acceptable and what noise levels they could deal with and at what times of day. This was expressed in the report the residents made to the metro company (Metromonitor, 2013) The power relationships need to be taken into consideration. Although Metroselskabet had the primary responsibility in terms of communication, there were other people involved as well. Some from the municipality and others from the construction company. It is important to note that the Metroselskabet, the metro company, is owned by both the Danish state and municipality of Copenhagen and of Frederiksberg. Interviewee 2 stressed how the involvement of all these different stakeholders sometimes made it complicated as it was not always the same person they communicated with or had spoken to about a certain issue. Therefore, making sure everyone is on the same page is important. However, one thing was also certain, it was not the same people for the entire project either, which might be a result of megaprojects and the time it takes for them to complete. This was also something Mottee et al., (2020a) discussed and was evident in the NZL project.

At the later stages of the construction phase, issues were being raised regarding what the Cityringen would mean for the future of the area. People had fears regarding break ins, the amount of bikes as well as what would happen to their quaint and quiet street. These were not taken into consideration when the EIA was conducted as it was about the overall accessibility and mobility of the city. The long-term management and monitoring of such issues was not considered. As these issues were raised, responses and measures were applied such as cameras, as well as professionals in the form of police and investigators informing the affected public about their concerns and what it will look like and what will be done to limit this (Therkildsen, 2019a). In terms of the quietness of the street due to users, this was not dealt with.

### 4.3 Cityringen Adaptive Management

When the project ran into a major issue, they made changes in the schedule to deal with the time delay as they wanted to avoid the project taking longer which would cost significantly more. Initially, they were allowed to go forth with the late night drilling, but soon the project was halted. The public was against it, due to the impact it would have on their lives, however after a supplementary EIA it went forth. After a while and considerable mistrust the neighbors started seeing some involvement in the adaptive management. Interviewee 2 described the situation after 2014 as inclusive and two way and the attempt to incorporate adaptive management: *“Metroselskabet then actually tried to involve us and we also tried. But you can try all their combinations, you can attend meetings and they actually tried to get us to decide on what kind of noise protection to put up and how to get the job done right ...”*

Although the metro company tried to include the neighbors in all sort of decisions and inform them about everything, interviewee 2 proceeded to describe it as not very beneficial as at one point it becomes too technical: *“We tried to have some meetings to discuss but at some point we also just had to admit that it was insanely technical.”*

To feel heard and to feel listened to was nice, although the real issue was still present and that was the noise and vibration that the neighbors were experiencing. There is still value in the involvement of individuals especially if they help bring up issues. This was something that was reiterated by interviewee 1, who believes it is not feasible to include neighbors in everything due the complicated and technical nature of the project but there are still important topics that citizens bring up that should be followed up on, but most importantly he said: *“It’s not about the technical aspect, it’s about the feelings”*.

Although attempts were made on the public participation side to incorporate adaptive management the technical might mean it is not feasible, however that does not mean that the company was well prepared. In contrast, by forcing the situation of late-night drilling on the neighbors, they ended up losing trust with the neighbors and making them feel unheard. However, this might be the flaw of megaprojects and not this project specifically. As megaprojects are so complex and are given consent without taking into account proper financing and eventual delays, it results in problematic situations during the construction phase. Bent Flyvbjerg discusses this extensively in his literature and was a point of contention for interviewee 2 *“You run it small to get it accepted politically.”* Interviewee 1 also believed that projects of this magnitude require adaptive management and that the

management strategy always has to be adaptive due to the complexity and uncertainty involved in these projects.

#### 4.4 Cityringen Conclusion

As there was a formal EIA conducted, public participation was part of the pre-consent decision stage, however during the follow-up stage there was very limited. The public participation that was conducted during the project was primarily one-way communication. It was rather passive and was focused on informing and doing what was legally required. The project was focused on keeping a strict time schedule to avoid delays and cost overruns and two-way communication was not something they had considered and planned for. The majority of people were in favor of a new metro and therefore it was about getting it completed as quickly as possible. Furthermore, the communication issues started in the pre-consent decision stage as the public felt that the project was rather technical and it was difficult to actively engage in proper communication and dialogue with the project team. This was an issue that persisted throughout the entire project, even during the scenarios where two-way communication was taking place, for example in regards to ways to mitigate noise. Here the public felt it was rather difficult to understand all the different solutions and what exactly they would do for them. This could be the result of there being no proper department and team set up for communication with the neighbors until the supplementary EIA. However, as mentioned this issue persisted even afterwards and should be explored further.

Due to the lack of two-way communication and feeling heard, there was a lack of trust from the pre-consent decision stage through to the post-consent decision stage where the project was halted as a result of boring and drilling late in the evening and night which were causing severe noise and vibration levels. The metro company getting permission to work during the night without proper consultation is part of the reason for distrust because the public felt this happened due to the involvement of the government in the company and could not risk it becoming more expensive. The loss of trust could have potentially been avoided by giving the public the opportunity for two-way communication as they expressed themselves that they would have allowed for the drilling to take place, if they had been consulted on what was acceptable in terms of hours and noise levels. Thus being upfront about the issue of delay and needing to drill at odd hours could have allowed for understanding and willingness to accept unfavorable circumstances. This might have avoided the loss of trust and avoided litigation which further delayed the project as did the supplementary EIA as additional studies were required.

Post supplementary EIA there was an improvement in follow-up, with focus on compensation as well as monitoring of noise and vibration and with improvements to communication. There were instances of two-way communication as well as involvement in adaptive management. However, these instances were rare and fell short in areas such as allowing for the citizens to properly understand the information as it was rather technical. However, the metro company had understood the importance of asking what people need and showing sympathy, which allowed for the project to finish without any further delays and be seen as an overall success. The reason for no further delays could also be the government's counter-actions as complaints could no longer lead to legal action, which would halt the project, as that had been part of the new compensation scheme. Thus pressure through the

media on the company and government only resulted in increased compensation and other small changes in regards to access to hotels and rehousing.

## 5. Results NZL

### 5.1 NZL Follow-up

For the NZL a government representative who talked about the follow-up management strategy and the how strategy was focused on project risks in which some impacts were considered (Mottee et al., 2020a). The strategy was to then compensate stakeholders (Mottee et al., 2020b). A project manager reiterated a similar statement discussing the risk management philosophy that was implemented at the very start (Mottee et al., 2020a). The project management was centered around the technical and financial aspects of tunneling in Amsterdam's soils. Interviewee 4 discussed how the technical risks were the priority and someone was in charge of looking after the environment from the beginning. A former engineer discussed the project management team's unwillingness to accept that there could be additional costly risks and challenges (Mottee et al., 2020a).

As mentioned, compensation was part of the management strategy that was implemented early on. This strategy was implemented from the project planning in the early 1990s. The target was landowners, businesses and residents (Mottee et al., 2020a). Mottee et al., (2020a) found that the existing compensation scheme that existed in the Municipality for construction of infrastructure was expanded for the NZL. A committee was created to determine eligibility and amount of compensation. These came in the form of inspections of building foundations with repairs, noise insulation, financial compensation, relocation, or under specific circumstances hearing protection or a hotel (Mottee et al., 2020a). After the incident at Vijzelgracht, there was a change in the compensation scheme. There were additional funds and the Municipality was more generous. An environmental professional stated: *"So actually we turned it around, so when there's damage within a reasonable area around where you are working, then we automatically assume that it is our fault, which costs us way less money than when they have to prove it and we have to research it"* (Mottee et al., 2020a, p.328).

These changes helped rebuild the trust and reduce litigation against the project. Furthermore, after the Vijzelgracht incident some homes were severely damaged and people were no longer able to live in their homes. The Municipality agreed to buy these homes due to uncertainty about the repairs. This change in management strategy was also about the personal attitude. An Alderman said *"It helped that I considered treating them as I would myself"* (Mottee et al., 2020a, p.329). Interviewee 5 also stated it was about being aware of their situation and their suffering and therefore you should not over- or under-promise and just give them the real story.

Although there was no formal EIA and follow-up strategies around monitoring it still took place as there was a requirement for environmental permits which had requirements for the contractor to identify management strategies and to monitor noise, vibration, surface water, groundwater, soil and subsidence (Mottee et al., 2020a). However, as the project was considered to have low environmental impact in especially the North, the assessment done was quite poor. An environmental professional stated that *"We did do some research of course, we had to do some research on the noise aspects ... and I must say also, in those days, the environmental aspects of land-use plans .. were not taken as seriously as nowadays"* (Mottee et al., 2020a, p.326). Therefore, these permits contribute to a

management strategy and monitoring however, due to the separated nature and differences, there is no combined thorough plan which limits the usefulness. The issue of a combined thorough plan continued after the incident. As interviewee 4 mentioned, the management strategy remained rather reactionary as issues arose and an environmental manager that interviewee 4 had spoken to mentioned how he would have liked for them to have been more proactive. Furthermore, another interviewee in Mottee et al., (2020a) reiterated the lack of a baseline to evaluate against and the individual permits for individual areas which also creates a separate and reactionary approach. Interviewee 4 also talked about the separation and mismatch in terms of the structure and communication between departments and contractors. The people communicating with the public did not necessarily engage extensively with the project management and construction teams. This also became a focus point after the incident to improve cooperation and collaboration between teams (Veerman, 2009).

The strategy that was incorporated after the Vijzelgracht incident with the use of the contractors and the construction workers that the face of the project and involving them in the direct communication with the public and the neighbors has since been used by the contractors on new projects. Interviewee 5 said: *“the contractor even has been using these experiences in their proposals for new projects.”* Additionally, during the project as they opened their own website, there was a desire for knowledge sharing and learning, resulting in workshops and the cooperation with associations and universities to conduct this knowledge sharing and learning (Shuurman and Sheerazi, 2013).

Since the project finished and has been in its operation stage, operational management strategies and monitoring has been under the operators schedule and the Municipality of Amsterdam’s permit requirements (Mottee et al., 2020a). Additionally, a number of universities got together to do an evaluation study on various topics from mobility patterns to socio-economic aspects. This has since been completed and published and has data to demonstrate the impact that the project has had, comparing it to before the NZL (Amsterdam Institute, 2021).

## 5.2 NZL Public Participation

For the NZL, public participation was part of the project with a manager appointed in the early 1990s who would communicate with affected people (Mottee et al., 2020a). The consultation that took place prior to construction was one-way communication and was focused on informing rather than engaging with the public. One citizens’ representative explained how when they would make recommendations they would get turned down (Mottee et al., 2020b). This was due to the project team believing the project was too complex for the public to provide valuable feedback on. Interviewee 5 described it as a mindset that was all about the technical challenge of the project. Interviewee 4 also mentioned the communications team trying to implement best practice for engaging with people, but *“they didn’t place value in the citizens’ voice”*. Similarly, an environmental professional said: *“It was not participation in the sense of you can give your opinion and will work with you. No, no. Our opinion was that the technical project was so complicated and difficult that you cannot discuss it with non-technical people. So the whole communications was set up from that idea.”* (Mottee et al., 2020a, p.326)

In further interviews it was expressed by additional project team members that they felt they had successfully engaged with the public due to the various route changes that had occurred (Mottee et al., 2020a). This occurred as a result of several information evenings, consultation points and consultation with individual residents and landlords. However, a citizen said this was primarily due to political influence that some people or groups had. Interviewee 4 reaffirmed this. She mentioned that the changes happened because someone knew someone who worked at the municipality. Political power was the reason not necessarily the individuals affected.

As the project progressed public participation consisted of monthly meetings as well as roundtable meetings and smaller household and individual meetings with neighbors to the project. However, one of the stakeholder engagement professionals said: *"It wasn't enough, we were doing the repairs and the construction was going on, just as always. I mean, we tried to repair it by doing better communication, but in the end, if a project is this big, with this much nuisance, it's not enough."* (Mottee et al., 2020a, p.327). Interviewee 5 also explained that there was no open policy about informing the public about potential risks. Within the project there was still a sense that trust had been built during this time. Interviewee 4 also mentioned how the communications team tried to get them to stop lying and opening up because people were aware things were going wrong, however it didn't change until after the incident. There were a lot of changes after houses were damaged as a result of the Vijzelgracht incident. Interviewee 5 believes that there was no trust from the citizens in the people responsible and in their way of working. Rebuilding trust and the relationship with the city and the local residents became the primary focus (Shuurman and Sheerazi, 2013; Veerman, 2009). A stakeholder engagement professional said: *"What we really needed was to regain some kind of credibility, some kind of trust within the project ... And now the crucial aspect was reputation, credibility and belief of people in the organisation."* (Mottee et al., 2020a, p.327)

After the incident the way communication took place had completely changed. It was open and two-way communication. Interviewee 4 said it was more face to face, as well as a change in the social media usage. They even created a new website where they focused on no moderation to allow for people to express their opinions and be heard and try to respond to as many as possible, which they kept up with after the completion of the project, but has since been shut down (Shuurman and Sheerazi, 2013). There was a shift in public image and the people that were being put on camera as well as in front of the neighbors. This was to create a new identity with the builder and tunneler at the center (Shuurman and Sheerazi, 2013). A project manager said: *"Technical people were no longer in the media anymore, ... it was the people who did the work. Let the people who drive the machine and want to go home at the end of the day, let them tell the story."* (Mottee et al., 2020a, p.327). It was about sensitivity, realism, expertise and the megaproject (Shuurman and Sheerazi, 2013). Therefore, the construction contractors became essential in the public participation. A stakeholder engagement professional commented on the importance of the workers and contractors and how giving them a role in the meetings allowed for neighbors to express their concerns to them and for the workers to feel that. It also provided the neighbors with the opportunity to understand and learn what they do and give them a face and allow for them to be recognised. Visiting the construction site also helped in this regard, said interviewee 5. The stakeholder engagement professional said *"for both sides, it worked very well."* (Mottee et al., 2020a, p.328). Additionally, the communication experts were



decentralized and were now working where the project was going on. Interviewee 5 stated the importance of having people who can hear and feel the noise as well as a *“feeling for the sentiment surrounding the building site”*. This provides the opportunity to gain insight into what more or less is needed in terms of communication. Interviewee 4 mentioned the importance of building trust with the project team and the people responsible for the project and not so much the communication consultation people. Furthermore, it was discussed how consultation fatigue sets in during these long projects and having a consistent face and building rapport is important. Thus putting all your trust in one person can be difficult if they suddenly leave.

Besides a change in the individuals there was also a shift in what was said to help rebuild the trust. An environmental professional explained how it went from being very dismissive of issues and saying nothing can go wrong to explaining the potential risks and communicating when certain issues arose. The environmental professional stated: *“This was quite a new approach and the city government was first quite shaky about it, but actually I think it worked very well.”* (Mottee et al., 2020a, p.328). People are aware that risks are involved and being upfront and not lying is the best approach, especially when explaining how these potential risks are being managed. As interviewee 4 said *“a huge indicator that the community consultation is actually working, that it’s building the trust and being communicated in a way that is informing and empowering people to be part of the project as opposed to another risk to be managed.”*

### 5.3 NZL Adaptive Management

Although originally the project had limited management strategies and public participation, there was a shift that occurred after the Vijzelgracht incident. The incident forced a change in not only how public participation was done, but also the empowerment of this public participation into the management strategy. As the project continued to face smaller incidents and some larger, the involvement of the public was necessary as this was the new approach that had been taken after the Vijzelgracht incident. Interviewee 5 described a situation where a freezing unit had to be installed which would cause significant hindrance. They worked together with the neighbors to find a location that was suitable. Interviewee 5 also stated that: *“we of course are responsible for the final decision, how or what? But you can see that there becomes much more ownership and much more insight of the complication of a decision-making process.”* The involvement of the public in adaptive management is beneficial for both parties but requires an open mind from the people in charge. Interviewee 5 also explained that the public had access to resources so they could hire their own advisors or consultants to help them.

This was also expressed in Mottee et al., (2020a, p.329), *“Citizens were proactively engaging in the project to resolve concerns”*. The importance of adaptive management was also brought up by a focus group participant in Mottee (Mottee et al., 2020b, p.46) who suggested *“flexibility is needed to manage uncertainty about the future environment in planning processes.”* and argued *“plans were made to last for too long”* (Mottee et al., 2020b, p.46). One of the stakeholder engagement professionals also reiterated a similar idea: *“Sometimes organic isn’t a bad thing, if you have too much planning up front, the plan can be quite a big hindrance. ... If it’s only organic, that gives you very little structure or framework.”* (Mottee et al., 2020a, p.329). Lastly, interviewee 5 mentioned the complexity

and that is involved and sometimes engineers do not have the solution to these problems. Asking for the input of the public might not come up with a solution, but it is appreciated and they can put in time and effort as well. Similarly, social media was used in the same way for two-way communication, through sending and responding and showing vulnerability if they were having issues.

## 5.4 NZL Conclusion

The NZL had a lack of public participation from the pre-consent decision stage. What took place was one-way communication that focused purely on informing as there was no requirement and the project team felt the input from the public was not valued. They deemed it too technical and therefore the opinions the public had were not worth consideration. This lack of public participation and will to listen and two-way communication resulted in a lack of trust before the project had even begun. This lack of trust was also a result of the previous metro project in the city, and therefore the reluctance from the project team to engage in a dialogue with the public did not help build trust. As a result when the incident of subsidence at Vijzelgracht happened, it resulted in the project being halted as they lost their social license to operate. The response was for a committee to get together and figure out the future of the project. The committee decided on completion of the project but with an overhaul in strategy, specifically focused on communication and building trust and a new identity for the project.

The first major change was the face of the project. From being a very closed project where the public only engaged with communication consultation specialists to being open and giving a voice to the builder and tunneler. This strategy allowed for the public to directly engage with the people working and hearing their story and also for the tunnelers and builders to hear the concerns of the citizens. Thus this two-way communication strategy was crucial in rebuilding trust as the dialogue between all stakeholders was now taking place in person face to face but also through their social media. The social media policy with a new website where there was no moderation allowed for everyone to share their opinion and get responses, but also for the project team to share news and updates on the project that could easily be followed by the public.

In addition to an overhaul in the communications strategy which helped build trust and engage people in the project, there were improvements in the follow-up in regards to monitoring. Increased monitoring as well as visibility both internally and externally to the public. Additionally, the changes in the compensation scheme made it easier and quicker for the public to get compensated for damage that they incurred.

These changes plus the occasional involvement in adaptive management for smaller changes allowed for the public to actively engage in two way communication and give their opinion and ideas, even when technical as they got access to experts that could help. Thus avoiding further litigation and public protest when issues would arise. Thus, if there had been a focus on two-way communication from the beginning and building trust and being open, litigation and the halting of the project could potentially have been avoided all together. After the change the public understood there were risks involved and were willing to forgive when issues arose as they understood it was troubling for the project team and themselves.

## 6. Comparative Analysis

### 6.1 Public Participation

Although the cases varied in the sense the Cityringen had a formal EIA and the NZL did not, both cases had some degree of public participation throughout the entire project. However, the majority of the public participation was during the pre-consent stage rather than during the follow-up stage. This was a result of the legal requirements either because of the EIA for Cityringen or as a result of permit and land use planning procedures for the NZL. The public participation during the pre-consent stage was focused on one-way communication. In the case of the NZL, informing the public on what was going to happen was done well, but that was the extent of the public participation. It was considered too technical for the public to have any meaningful input. Thus, the project team did not put any effort into making it accessible and understandable for the public, to allow for meaningful participation. In contrast, the case of Cityringen had a legal requirement of informing and consulting, which they did to tick a box, as the public felt they had not really been heard.

During the post-consent decision stage, both cases incurred incidents of unacceptable conditions, which caused a shift in strategy regarding the follow-up, specifically with monitoring, as a result of an additional study while the project was halted. Moreover, the approach to their public participation changed drastically in regards to who was involved in communicating and how that communication was conducted. For Cityringen, after the supplementary EIA there was an entirely new department focused on neighbor communication who were engaging in both one- and two-way communication with the public. For the NZL, after the Veerman Committee completed their inquiry, there was an open policy and a new website established as well as changing the people communicating with the public from the specialists to the builders and tunnellers. This shift in strategy was focussed on more empowerment to the public and two-way communication. These changes were done in an attempt to build back the trust that was lost between the public and the government. Some might question if the trust had ever really been there. In the case of Cityringen, although there was an EIA and public participation in the pre-consent decision stage, there was still a lack of trust because the public felt like their voice was not being heard, which only worsened during the follow-up stage. This was a result of the complex nature of communicating with the company and the government when they had issues and questions. In the case of NZL the proponent as well as the contractors thought they had built up some level of trust, however with the incident at Vijzelgracht that caused major subsidence, which they had been concerned about from the beginning of the project, it was quickly proven that there was no trust (left) at all. Thus, in both cases the shift in strategy started with very low levels of trust. In the case of Cityringen, this was not improved when the neighbors felt like they had been lied to with regards to the expected noise levels which turned out to be significantly louder than what they had been told. The public conducted citizen science as a form of protest to display the real numbers and their experience to the metro company who, in the citizens opinion, had told them incorrect noise levels that they would experience. Therefore, the metro company was doing quite poorly in informing the public about the expected impacts and the decisions they were making. This did change as the project progressed and there was an increase in two-way communication when major changes had to happen or issues of noise were raised by the public. Furthermore, with the metro company being owned by the two municipalities, Copenhagen and Frederiksberg, and

by the Danish state it gave them a lot of power in decision making. The public felt the metro company were using this power and position as they gave the neighbors no say in the late night drillings. A lack of two-way communication or even a lack of simple consultation from the metro company about their actions caused a complete collapse in trust between the public and the metro company.

With the NZL, the Veerman Committee had to complete their study before there was a change in strategy which saw a complete overhaul in who the face of the project was. It had originally been communication managers who had meetings with the affected public and the neighbors of the project on a regular basis. They had tried to establish some level of rapport with the public. However, after the study there was a shift away from communication managers towards the contractors and tunnellers. Using them and their credibility proved effective in rebuilding the trust. This allowed for two-way communication between the parties as both could explain and expressed their concerns without a middle man. The workers could directly hear as well as answer questions that the public had and they were also able to explain what they were going through and the troubles they were facing as well which allowed the public to understand the risks involved with the project. Using the workers and their credibility in combination with the open policy and no mediation on the new website proved effective in rebuilding trust.

In both cases an additional or supplementary study was the reasoning behind the change in strategy as it was necessary to rebuild the trust that had been lost or missing from the beginning, when the project encountered unacceptable circumstances. In combination with public protest through litigation, the overhaul in strategy led to an increase in empowerment and more focus on two-way communication rather than one-way communication. The NZL conducted two-way communication quite well due to the change in their approach whereas Cityringen, was still largely focused on one-way communication with instances of two-way communication when the company deemed it necessary.

## 6.2 Follow-up

There was rather limited follow-up before the incident and public protests in both cases. However, there was initial monitoring in regards to subsidence that was taking place. Both had installed monitoring systems that were detecting subsidence and damage to buildings. This monitoring was a result of permits and legal requirements rather than voluntary and with the best interest of the citizens at heart. This monitoring was internal and was not visible to the public. After the incident there was an increase in monitoring for the NZL which became public and there was an increase in internal reports to avoid this sort of incident from happening again. For the case of Cityringen following the litigation and the large scale media coverage as well as public demand, there was a push for monitoring of certain impacts. The data from the monitoring was available to the public on the metro website. However as mentioned this was only due to protest, specifically the citizen science that was conducted, which showed different results to what the legal requirement was and what the public had been told by the metro company. Therefore, before the change they were doing poorly, however afterwards the monitoring was done well and was easily accessible to the public. In terms of management both cases had a compensation strategy for people and houses that were going to be severely affected by noise and vibrations from the construction of the project. Both cases also saw change in the compensation scheme, from increasing the

amount to making it easier and quicker for the affected parties to benefit from it. One major difference, was for the case of NZL, they changed it to be anyone within a certain radius was eligible and as all damage was deemed to be a result of the project. For the case of Cityringen, they did not do this, and rather took it case by case. As part of the compensation scheme, both also included rehousing. This was a contentious issue in both cases. In both cases there was a belief that some of the people and houses should have been rehoused earlier than they did. For the case of Cityringen it was believed that rehousing should have been done from the initial EIA as they were already aware of where it was going to be the worst. Furthermore, it should also have been part of the supplementary EIA. One of the issues that they faced was that some people did not want to be rehoused, which made it rather difficult to properly assist them. Additionally, for Cityringen spaces were made available in hotels for people to stay and work, which were used diligently by the neighbors during working hours, however these measures were set up rather late and were not part of the supplementary EIA. Thus, the metro company took a long time before they were doing well in assisting people in avoiding the noise and getting the right compensation. Furthermore, Cityringen also had other management strategies for noise, which included certain barriers to limit noise, however in the original EIA the measures that were going to be used, had not been finalized and only got so as the project started its construction. Therefore, they were once again doing a poor job of informing the public about the follow-up. Evaluation as a component of follow-up is both part of the construction and operation stage. Ex-post evaluation is focused on the follow-up stage and attempts to improve management strategies during construction as well as improve follow-up and management strategies for future projects. In both cases the ex-post evaluation that occurred during the construction phase came in the form of a study, after the incident and public protest as well as the large-scale media coverage, which resulted in the project being halted. After this, management strategy, monitoring and engagement all changed for the better. In terms of ex-post evaluation during the operation stage of the case of Cityringen the learnings have been carried over from the Cityringen to the new metro extension. Most prominent is the dedicated neighbor communications department (Nabokommunikation). This received great feedback from the stakeholders due to the ease of communication between the parties and raising questions and concerns. The department is still active for any problem with current projects or existing projects. From the ongoing complaints that are being reported by people next to the Cityringen project to neighbors for the new extension. The ongoing complaints have in itself resulted in further follow-up monitoring and management. There have been new sensors and methods adopted on the existing line to try and decrease noise and vibrations. However, they are very aware that this is not an overnight fix and is something they are in constant communication with the affected people about. This also shows an improvement in their public participation and that they follow-up on the public participation which was something they were lacking at the beginning of the project. Additionally, these technologies are being installed in the new metro extension. Furthermore, the monitoring strategy has been adopted by the Fehmarn Belt Fixed Link. They collect data which is easily accessible on their project website. They also have a dedicated neighbor communications department (nabokommunikation), similar to that of the metro company. This might be due to both companies being state owned and thus, the adoption of certain methods are being carried over. For the case of NZL, the ex-post evaluation has shown that the contractors still adopt the strategy of heavy involvement of the workers in the public participation, which proved to build trust in the NZL case.

### 6.3 Adaptive Management

The case of Cityringen and the case of NZL are two highly complex and technical projects that face issues along the way. The adaptive management, if any, that took place before the incident was not visible to the public and still led to project delay an incident that forced litigation and protest, resulting in a change in strategy. The lack of trust and two-way communication about risks and strategies resulted in the projects being halted for an extended period of time. Thus the lack of involvement of the public and the loss of trust, forced a radical change in strategy. This change in strategy saw instances of public involvement in adaptive management and the decisions that were being made. These occasions were specifically on issues the public raised or on impacts that directly affected them. Such as the cooling unit for the NZL, or noise mitigation measures for both cases. These incremental changes that were happening as issues arose or decisions regarding certain aspects were being raised, the public were involved in that decision making process or at least there was some degree of two-way communication happening. This was the case for both the Cityringen and the NZL, but more so for the NZL. Cityringen was still primarily focused on one-way communication and consultation. For the case of Cityringen, the public felt the highly technical aspects of the project meant their involvement in adaptive management was rather difficult as they felt they could not contribute in a significant way due to their lack of knowledge. This issue falls on the proponent to provide the information in a manner that the public can understand and meaningfully engage with. Even though the proponents did not do this, and the public felt this way, they still expressed that it helped build trust and understanding of the project and the issues that the contractors and proponents were dealing with. For the case of NZL, they were given resources to contact outside council to make informed decisions when they were participating in adaptive management, which proved to be very useful.

### 6.4 Best Practice Principles for Public Participation in EIA Follow-up

The best practice principles for public participation in EIA follow-up by Morrison-Saunders and Arts (2023), follow the participation ladder of Arnstein (1969). The higher up the ladder the more empowerment to the people. An attempt has been made to quantify the principles for the case of Cityringen and NZL before and after the strategy change that occurred as a result of the protest that occurred to the incidents of land subsidence and extreme noise levels at night, see figure 9.



Figure 9. Best Practice Principles for Public Participation in IA Follow-up quantified for Cityringen and NZL pre (black) and post (gray) strategy change

Both cases saw limited use of the principles before the change in strategy. Both had some one-way communication with the major difference between the two cases being the access to materials. Documents were and are easily accessible for the case of Cityringen through the transport ministry. Therefore, even with a formal EIA for the case of Cityringen, there was limited public participation to EIA follow-up, as follow-up in general was lacking. For the NZL there was no formal EIA and the follow-up that took place was a result of permits and other legal requirements.

After the change in strategy, there was an increase in reporting of follow-up activities, principle 1, through the websites as well as the regular meetings taking place. For principle 2, the NZL made a new website as well as had an open policy of giving access to everything for the public, however the website has since closed down making it difficult to retrieve documents. Similarly the case of Cityringen moved all documents to their website. However, they are still scattered between the Ministry website and the metro company website but still remain accessible to this day. Cityringen remained quite technical even after the strategy change, therefore not doing well in transparency, principle 3. Whereas the NZL had an open policy as well as providing the necessary resources and assistance for the public to understand the technical aspects. Principle 4 does not score too highly for both cases due to the complexity that involves many stakeholders. For Cityringen it was particularly brought up how the public were dealing with various actors from the metro company and government which made it rather difficult. The NZL faced some of the similar issues with the separation between project team and government. Principle 5 has a drastic contrast between the two cases. This is largely due to the frequency and the people involved in the meetings of the NZL case in comparison to the limited nature of meetings for the Cityringen case. Furthermore, the open policy and no moderation on their website allowing for people to comment and express their opinion made it easy for the public to give input and provide continuous feedback, principle 6. Cityringens continued use of the neighbor communications department (nabokommunikation), makes this rather easy for the public to contact and give their opinion and complaints even during operation. There was no independent verification,

principle 7, for the case of Cityringen, whereas the case of the NZL saw resources provided to the public by the proponents, so they could engage in independent verification. Principle 8 focusing on two-way communication showed improvements for both cases. Two-way communication was part of the change and strategy for the NZL, specifically enabling the workers and contractors to communicate with the public. This also allowed the public to get to know who was working on the project and for both parties to understand each other and their concerns. For Cityringen this was only taking place during certain instances or when large issues were being raised by the public. However, there was a clear communication path, with the new department as well as increased communication with contractors allowing for better understanding between the different actors. For Principle 9, Cityringen did not establish partnerships for shared responsibilities, however the NZL partially did. The municipality taking a step back and allowing the workers to step forward, was the most significant change that allowed for the project to continue without any further litigation and thus avoiding delays. The municipality working with the workers to communicate and for the workers and community to work together on the project proved to be very effective. Neither case focused on principle 10, inclusion of indigenous values. Additionally for principle 11, both cases conducted all monitoring themselves. They only made it available for the public to see. Principle 12, the highest form of empowerment through the involvement of the public in adaptive management was seen for certain instances in the case of Cityringen. For these occasions the public had a say in the decision making, however the involvement was limited to these specific occasions. This was the same for the NZL, however there the public was involved in more instances than that of Cityringen and in combination with the other principles their influence on the decision making was to a greater extent than that of Cityringen.



## 7. Conclusion

### 7.1. Research Aim

The aim of the research was to explore the current EIA practice in past metro projects with the focus being on the recently published best practice principles for public participation in EIA follow-up. The research compared the two case studies of the NZL with no formal EIA and that of Cityringen with a formal EIA. Both cases faced a major incident which resulted in an overhaul of the follow-up, specifically the public participation. With the explorative nature of the research, it sought to examine the barriers, success factors and conditions for the best practice principles in existing metro lines.

### 7.2 Research Questions

The research's two main concepts were public participation and EIA follow-up. The last best practice principle with the highest level of empowerment of public participation in the EIA follow-up stage looked at the involvement of the community in adaptive management. Thus the research sought out to answer the question: How was public participation in EIA follow-up conducted to facilitate adaptive management for the Cityringen and the Noord-Zuidlijn? To help answer this question 5 secondary research questions were posed.

*Secondary research question 1: What are the relationships between EIA follow-up, public participation, and adaptive management?*

The first secondary research question was answered using the literature. EIA follow-up has 5 key elements: monitoring, evaluation, management, engagement and governance (Arts and Morrison-Saunders, 2022). Engagement of the public is a crucial part of follow-up practice, which is the link between follow-up and public participation. The key element of management is the link to adaptive management which is a useful management strategy that is used in megaprojects, to deal with the complexity and the uncertainty. Furthermore, regarding public participation the well-known participation ladder indicating levels of intensity of participation is relevant, where co-deciding is the highest level of empowerment. That level of empowerment can be achieved through community involvement in adaptive management. Therefore, the relationship between EIA follow-up, public participation and adaptive management, can be seen within EIA follow-up and the main elements of engagement and management.

*Secondary research question 2: How are public participation and EIA follow-up conducted during construction and operation stages in metro line projects?*

To answer the secondary research question interviews as well as media analysis and policy and document analysis were used. Although the NZL had no formal EIA and the case of Cityringen did, the public participation and (EIA) follow-up that was conducted during construction and operation stages were quite similar. Both cases started off with one-way communication, mainly focused on informing. Unacceptable circumstances led to protest, specifically in the form of litigation in combination with large scale media coverage resulted in both projects being halted and followed by supplementary studies led to a change in strategy which saw two-way communication in combination with one-way communication for public participation. Thus the agency of the community in terms of changing the way follow-up was conducted through protest was immense but also the agency the community

had after in terms of providing feedback and being given the opportunity for more empowerment. There was an increase in coproducing and co-deciding between the proponent and community as they involved them in the process and let them make decisions as issues arose during the remaining construction phase. They further improved informing and consultation by making it easier as well as providing more information, such as data from monitoring. The NZL project primarily used the workers and contractors to do the communication after the Vijzelgracht incident and giving the workers a voice ended up rebuilding the trust with the public. For Cityringen, the neighbor communication department, was set up to increase and better informing but also to allow for coproducing and co-deciding to take place as they brought them to the construction site and sought them out when issues arose.

In terms of follow-up, both cases had similar management strategies from the pre-consent decision stage. Compensation schemes were established which changed throughout the construction phase. Both saw an increase in compensation and ease of receiving compensation. For the NZL this was said to help rebuild trust. For the case of Cityringen it was also a great contributor to building trust and acceptance. Rehousing was also part of the compensation scheme in both places. Additionally, the case of the NZL had monitoring for certain permits however this was only internal and later became public, whereas, monitoring only started after the supplementary EIA and citizen science for the case of Cityringen. This links to the best practice principle 11. Participatory monitoring, however, although they carried this out, it stopped once the monitoring and data became public and when the proponents took action to mitigate the noise during the night.

*Secondary research question 3: How does public participation in follow-up facilitate adaptive management in the case of Cityringen and NZL?*

Following on from the second secondary research question, the third dives into the combination of both public participation and follow-up and looks at adaptive management. Based on the research it cannot be said that public participation in follow-up facilitates adaptive management because adaptive management is crucial in dealing with the issues that arise through the project, and the highly technical aspect of the project makes it rather difficult for the public to effectively engage and contribute in a timely manner. However, what the research showed was that two-way communication and the involvement of the community in adaptive management, makes adaptive management more visible to the public and can provide improved solutions to issues which directly affect the public such as where something is placed. Such as the freezing unit in Amsterdam, whereas the inclusion in the methods to reduce noise for Cityringen the public found rather difficult. One of the aspects that are mentioned in terms of the public participation in follow-up was the very technical aspects and complexity involved in these cases. For the case of Cityringen it was mentioned that they felt their involvement in adaptive management was very difficult due to these aspects. For the NZL it was also mentioned that they were given resources to contact outside help, but also that people were willing to put in the time and effort to learn. This relates to the best practice principle 7. Inclusion of independent verification. Having access to conduct verification from a third party allowed for them to build trust but also to have someone better represent their interests. For the case of Cityringen there were no resources for outside help and even though they put in the effort it still felt like they were not able to contribute very well. Therefore, it is difficult to say that public participation in follow-up facilitates adaptive management.

*Secondary research question 4: How was adaptive management conducted in the case of Cityringen and NZL?*

The complexity and uncertainty involved in these two megaprojects allow for adaptive management to thrive. Adaptive management took the form of incremental adjustment to issues that arose through the project. However, both projects still ran into a major incident which led to litigation. Whether this could have been avoided through adaptive management for NZL is not clear from this research. In some ways, the decision to drill at night for Cityringen was adaptive management, but lacked the approval of the public. However, following the incidents there was a radical change to the strategy in terms of public participation and follow-up, in an attempt to rebuild trust that had been lost. This proved to be very effective in delivering a project that people were satisfied with. Furthermore, the socio-historical mechanism of adaptive management was also shown in both projects. Learnings from both have been adapted for new projects and have become part of contractors practice or the practice of the government in the case of Cityringen using the communication department and monitoring systems setup for Cityringen in their new endeavors.

*Secondary research question 5: What are the barriers, success factors and conditions of public participation in EIA follow-up?*

The barriers are the technical aspect of these projects and the mindset of the individuals working on it thinking the public has nothing to contribute. This is specifically a barrier to the implementation of higher best practice principles because the lower levels can still be included such as principle 2 and 3 which focus on access and transparency of information. However, both cases also failed to do this before the incidents but improved once the circumstances were acceptable as a result of the protest from the public. In both cases it was expressed that the technical side of the project was the primary focus. In combination with the complexity and uncertainty of megaprojects, it can be rather difficult for the public to understand and feel like their input is valuable. And if the proponents have the same mindset, they will rather not include them and is thus a barrier to the implementation of the higher principles.

Trust seems to be a key part of the success of these projects. Building trust through good informing and consultation, and making the public feel heard is essential from the very beginning. This starts in the pre-consent decision stage and carries over into follow-up. Follow-up to public participation needs to be part of the process. Therefore, having good public participation in the pre-consent is required and can be seen as a success factor in achieving public participation in EIA follow-up. Additionally, the proponents and regulators need to facilitate public participation in EIA follow-up, through site visits as well as meetings but also a constant communication platform to allow for complaints and questions to be answered quickly and throughout the day. This also provides the opportunity for the public to gain insight into the world of the workers and the project which is beneficial for both cases as was seen in the case of NZL.

### 7.3. Discussion

The best practice principles for public participation in EIA have 12 principles that follow the participation ladder. However, it is not necessary for a project to follow the ladder or to use

all the principles for every issue that arises. Mixing the principles to fit the project and the needs of the public based on the pre-consent decision public participation will allow for trust to be built and litigation to be avoided. However, the first few principles help establish a baseline of trust as well as allowing for the public to understand the follow-up process. Having access to information and the follow-up being transparent is rather important in building and maintaining trust. This is in alignment with the literature, which discusses transparency and legitimacy and the importance of maintaining accountability (Flyvbjerg, 2014; Hartley and Wood, 2005; Legacy, 2016) Informing and building rapport with the affected public is necessary for them to trust and also be involved in the later principles (Edelenbos and Klijn, 2006). Both cases showed a complete overhaul in strategy following protest because of unfavorable circumstances that had arisen due to the project (Hanna et al., 2016). This overhaul in strategy was necessary for the empowerment of the public and for two-way communication principles to be seen. This radical change in strategy in combination with the incremental change that were made following the change in strategy relates to the literature of Giezen et al., (2015). The overhaul in strategy enhanced public participation and follow-up and led to the implementation of the 12th best practice principle, involvement of the community in adaptive management. This ultimately led to both projects finishing rather successfully with some of the implementations being used in projects today. However, it should not require a large incident and protest for these principles to be implemented; they should be implemented from the beginning based on public participation in the pre-consent decision stage. Furthermore, they proponent should have used the protest as an opportunity to learn instead of using countermeasures which increased media coverage and ultimately resulted in the demands of the people to be met (Hanna et al., 2016, Vanclay and Hanna, 2019) Therefore, linking it to the socio-historical mechanism of Giezen et al., (2015), changing the institutional design and current practice to implement the principles or a mix of the principles in projects is crucial for success.

The research showed that the complexity and the technical side of these projects make it difficult to carry out these principles, it does not mean that they are not effective or necessary. Quite the contrary, it gives the public insight into the work and an understanding of the difficulties they deal with. The public are aware of the fact things can go wrong and that there are risks, and when they are involved they are able to show sympathy for setbacks and issues which was the case of the NZL near the end when a new incident happened. It is also necessary as these projects will be part of people's lives for a long period of time. Having them feel some ownership is important and makes it more understandable for them. Giving them a voice although the project is technical is still important and should not be diminished. Relating to the literature of Healy (2003) and McQuirk (2001) and the importance of giving smaller groups a voice and avoiding the power imbalance. Involving the community in adaptive management directly eliminates that power imbalance and allows for the community to have a say in the project.

In section 2.1 the barriers to implementing EIA follow-up by Arts and Morisson-Saunders (2004) are discussed. These five barriers were: limitations of environmental impact statements; less-developed techniques for follow-up; organizational and resource limitations; limited support for conducting EIA follow-up; and uncertainties about EIA follow-up benefits and cost-effectiveness. For the case of Cityringen with an EIA, there was a limitation of the environmental impact statements. There was information missing on what methods would be used to reduce noise which led to calculations not being accurate. Additionally, the

statements were vague specifically in association with informing the public and the methods that would be used there. Looking at the less-developed techniques for follow-up. The EIA was conducted not long after the release of the literature. The EIA directive in Denmark was limited and as seen in the results the way it was interpreted resulted in issues. Barrier three, organizational and resource limitations, Cityringen was not focused on follow-up. It became more prominent after the supplementary EIA, for example when there were dedicated resources for follow-up engagement, such as the specific department. The project lacked follow-up like most projects do in practice. Thus there is an argument for limited support for conducting EIA follow-up as well as the benefits and cost effectiveness for it. However, the research shows that although the project might have had similar barriers to the implementation of follow-up as well as public participation in EIA follow-up after the supplementary EIA and the observed practice of some of the principles the project rebuilt trust that was lost and when opened was seen as a success. Therefore, there is a strong argument to be made to find a way around these barriers and to implement the principles in practice to achieve successful projects.

#### 7.4. Strengths and Limitations

The strengths of the research was looking at two cases that differed in terms of having an EIA. As the research showed, although there was extensive public participation in the pre-consent stage of Cityringen, it did not make a great difference in how public participation was conducted in the follow-up compared with the NZL that had no formal EIA. However, this could also be due to the time period in which these cases occurred. The cases being completed allowed for the entire follow-up stage to be researched, however it also meant the projects started a long time ago. Since then there have been changes to how EIA is conducted, therefore, the research does not give insight into how things are conducted in current practice. However, as the project is completed, there were some insights into how the evaluation and the learnings have been carried over to new projects, which provides a bit of insight into how the methods that were effective are still being used.

Although the research uses both media analysis and policy and document analysis in combination with semi-structured interviews the research would have benefitted from a wider range of interviews. I put in substantial effort to contact a wide range of interviewees, especially from the metro company and their communications department to try and gain further insights into the public participation strategy implemented pre and post incident and the management strategies involved. However, it proved to be very difficult to receive cooperation in interviews. Because of the limited interviews, these had to be supplemented with the policy and document analysis which might be incomplete due to the lack of follow-up methods being written down.

Further research should look at recent cases and what is being implemented now as the cases are rather old and monitoring was not part of the EIA directive whereas it is now. Therefore, recent projects could potentially display greater follow-up than these older projects. The focus on these new projects should also be the transition from pre-consent to post-consent decision and how the pre-consent decision has helped build trust that is now being acted. Moreover, the follow-up activities should be reported as part of the EIA. Additionally, the follow-up to public participation is essential for the public participation in EIA

follow-up principles to be used in the right manner and to avoid project delays due to litigation.

## 7.5. Recommendations for practice

For practice it is recommended to use a variety of the principles. The principles that focus on one-way communication are essential in establishing and maintaining trust and allow for meaningful two-way communication to take place. Making the technical and complexity of the project understandable allows for trust to be built and for meaningful involvement of the community in adaptive management for both parties. Both parties benefit from public participation in follow-up. I would also recommend using all stakeholders. In Cityringen there was limited communication with the workers, which showed to not be as effective as that of NZL. The use of the workers and their credibility was essential in rebuilding trust. The neighbors of Cityringen felt there was no respect between both parties whereas giving the workers a position to speak and that they became the face for the public proved to build compassion and understanding between both parties.

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## Appendix I: Interviewees

*Table of: Interviewees*

Interviewee	Role of interviewee
Interviewee 1:	Worked for Metroselskabet as an EIA specialist. He worked specifically on the case following the 2014 accident which led to a supplementary EIA which included follow-up measures and further public participation
Interviewee 2:	Chairman of the association for Neighbors to metro which existed during the construction of Cityringen. Represented the neighbors during communication. Conducted interviews with various media outlets and was the main contact person for the neighbors. He was also a neighbor himself who experienced issues such as noise and vibration.
Interviewee 3:	University Professor and practice attorney, who focuses on environmental law. He helped the Neighbors to Metro and was very involved in their case as he represented them on all legal matters to increase compensation as well as to stop the construction during the evening and nights.
Interviewee 4:	Completed a PhD, in which one of her case studies was on the NZL. She conducted interviews with various stakeholders of the project.
Interviewee 5:	Post-Vijzelgracht Communications Manager, who was largely involved in the change of strategy and was part of the project till completion. Had direct contact and involvement with the affected people.

# Appendix II: Interview Guide

## Interview Questions

### *Background and aim of the thesis/introducing myself*

#### *Participant introduction*

- What was your role in the project?
- How long did you work on the project?

#### *Generic Questions*

- How was the EIA process?
- Did follow-up take place during the EIA process or was it separate? - Was it more monitoring?

#### *Public participation*

- How was public participation conducted?
- Should public participation have played a larger role in the project?

#### *EIA follow-up*

- How is follow-up conducted in the EIA process?
- How were the follow-up methods presented in the EIA used in the follow-up stage? - On reflection would other follow-up strategies have been more suitable? - Should the public have been part of those solutions?
  - Were the methods adequate?
- How could you improve follow-up guidelines to help avoid the issues faced during the construction?

#### *Public participation in EIA follow-up*

- Was there public participation throughout the follow-up stages?
  - To what extent is public participation a component of the follow-up stage? - Would public participation in the follow-up stage have been beneficial? - Was there follow-up to the public participation conducted in the pre decision stage? - How was the public participation in the pre decision stage used to prevent issues in the construction phase?
    - How can the follow-up to public participation in the pre decision-making stages be improved?
    - How can public participation play a role in follow-up stages to avoid issues during construction and operation?
- Should public participation be part of the follow-up stage?

#### *Management/Adaptive Management*

- What management strategies were implemented in the follow-up stages? 49

- Were these sufficient?
- How could adaptive management have been used in the follow-up stage? -  
What are the challenges in implementing adaptive management?
- Is adaptive management a strategy that can be used during these large scale infrastructure projects?
- What learnings are being taken from this metro project and being carried over to the next?

*Public participation, EIA follow-up and Adaptive management*

- How would public participation in follow-up help facilitate adaptive management? -  
How can the EIA process be improved to help tackle issues in the operation stage?



## Appendix III: Consent Form

### **Informed Consent Form for Interviews**

**Project Title:** Public Participation in Environmental Impact Assessment Follow-up of Metro Infrastructure Projects: A Comparative Study between Noord-Zuidlijn in Amsterdam and Cityringen in Copenhagen

**Contact Researcher:** Philip Andersen Master Student, Faculty of Spatial Sciences, University of Groningen Email: p.a.andersen@student.rug.nl

**Description:** The purpose of this study is to examine public participation in EIA follow-up. The study uses the new set of best practice principles for public participation in EIA follow-up as a guideline. The study is conducted using two metro line case studies: Cityringen, Copenhagen and Noord-Zuidlijn, Amsterdam. Questions will be asked in relation to the topics of public participation, EIA follow-up and adaptive management. The interview will be recorded and was designed to be approximately one hour in length. Please feel free to expand on the topic or talk about related ideas. Also, if there are any questions you feel you cannot answer or that you do not feel comfortable answering, feel free to indicate this and we will move on to the next question.

All the information will be kept in such a way that you can't be identified. The data will be kept in a secure place. Only the researcher and supervisor will have access to this information. Following completion of the project, the data will be destroyed.

If you have any comments or complaints about this research, you may contact my supervisor Prof Jos Arts (jos.arts@rug.nl).

## Appendix IV: Document and Media Analysis

### Document and Media Analysis Cityringen

From: <https://m.dk/om-metroen/organisation/oekonomi-og-selskabsdokumenter/>

- Årsrapport 2008 - 2023
- Metroens miljøregnskab 2012
- Lov om en Cityring
- Støjhandlingsplan for den eksisterende metro
- Hvidbog over indsigelser og bemærkninger
- VVM-redegørelse for Cityringen: Del 1-3
- CSR-Rapport 2016-2021

From: <https://www.trm.dk/soegeresultat/?query=Cityringen>

- Supplerende VVM-Redegørelse
- Implementeringsplan for review af støjmålinger på Cityringens byggepladser
- Rapport: Vurdering af støjmålinger ved byggepladser
- Hvidbog over indsigelser og bemærkninger til supplerende VVM og bekendtgørelser for Cityringen

Additional:

- Helbredsmæssige konsekvenser ved at være nabo til metrobyggeriet i Nørrebroparken - Analyse af betydningen af døgnarbejde
- Beretning til Statsrevisorerne om status på byggeriet af Cityringen
- Beretning om Status på byggeriet af Cityringen
- Resumérapport Udredning om Cityringen

Media:

- En kommunikationsstrategi uden tunnelsyn
- Dokumentation det klager metro naboerne over
- Transportminister overnatter hos nabo til metrobyggeri
- Metro naboer frygter endnu længere periode med støj fra metroen
- Frederiksberg borgere maa finde sig i metrostøj
- Metro naboer far ret
- Sove aftale med ministeren sygdom og larm sådan var det være nabo til metrobyggeri
- Metro naboer vi boede i støjhelve frygter nu tyveri og narkomaner
- Få husstande er berørt af gener fra den nye metro i københavn
- Mere erstatning på vej til metronaboer
- Metroselskabet afviser analyse
- Metro nabo kald mig bare sart vores sundhed er vigtigere
- Minister advarer mod mere metrostøj

Document and Media Analysis NZL

- Bouwen aan omgevingsmanagement
- Vision Document for the Dienst Metro / Noord/Zuidlijn web strategy
- Bouwen aan verbinding: Advies van de onafhankelijke Commissie Veerman over de toekomst van de Noord/Zuidlijn te Amsterdam

<https://www.raadvanstate.nl/uitspraken/@113659/e01-99-0226-1/>

#### Media

- Noord/Zuidlijn web strategy: opportunities and obstacles
- Discussiedossier: Wel of niet aanbesteden van communicatie?
- Projectcommunicatie gaat over creëren van betekenis