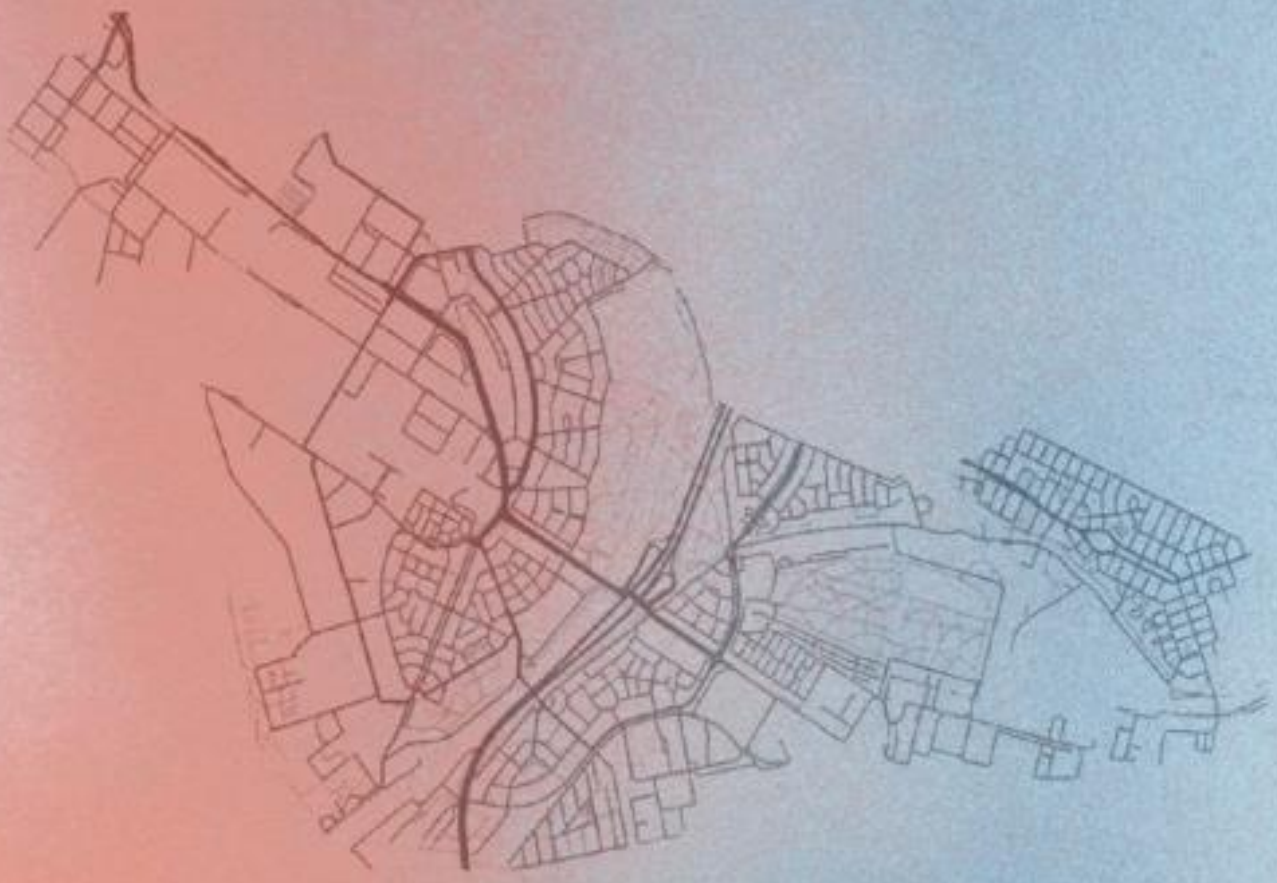
# Continuous Adaptation of Climate Adaptation

## Understanding climate adaptation governance and its capacities in Amsterdam Oud-Noord



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# Abstract

This research aims to understand the local governance capacity of Amsterdam Oud-Noord and discover how this area, together with its stakeholders, can improve its climate resilience through transformative climate adaptation governance. This was done by first understanding the research area, its challenges and needed climate adaptation, and by identifying the present climate adaptation stakeholders. Secondly, the governance climate adaptation governance capacity was analysed, according to the redevelopment and extension of an existing framework. Transformative governance climate adaptation governance capacity was analysed through four governance capacities; Stewarding, Unlocking, Transformative and Orchestrating capacity, and related indicators. This led to the identification of governance capacity gaps, followed by recommendations for improvement.

The findings indicate that climate adaptation governance capacity is perceived as promising, but all identified indicators show that there is a need for improvement. The most pressing gaps identified are insufficient smart monitoring and insufficient stakeholder synergies. These are suggested to be improved by increasing the awareness and recognition of the value of monitoring. Next to that, accessible general methods should be developed, enabling all types of stakeholders to monitor their climate adaptation. Lastly, our results suggest that a platform should be created where stakeholders can share and coordinate their activities and possible concerns regarding climate adaptation.

**Keywords:** Climate adaptation – Urban climate adaptation governance – Transformative governance capacities – Local governance – Public space

Het doel van dit onderzoek was om inzicht te krijgen in de lokale governance capaciteit van Amsterdam Oud-Noord, en in kaart te brengen hoe dit gebied, samen met haar stakeholders, zijn klimaatadaptatie governance kan verbeteren. Dit is onderzocht door eerst inzicht te krijgen in het onderzoeksgebied, de lokale uitdagingen en de lokaal benodigde klimaatadaptie. Daarnaast is gepoogd duidelijk in kaart te brengen wie de huidige stakeholders op dit gebied zijn. Ten tweede is de governance capaciteit voor klimaatadaptatie geanalyseerd aan de hand van de uitbreiding van een bestaand framework. Aan de hand van vier bestuurscapaciteiten; Stewarding, Unlocking, Transformative and Orchestrating capacity en daaruit voorkomende indicatoren is de bestuurlijke capaciteit voor klimaatadaptatie geanalyseerd. Op basis hiervan zijn verbeterpunten op het gebied van governance capaciteit geformuleerd, leidend tot een set van aanbevelingen voor verbetering.

De resultaten van dit onderzoek laten zien dat de governance capaciteit voor klimaatadaptatie als veelbelovend wordt beschouw. Echter, dit onderzoek laat ook zien dat er alle geïdentificeerde indicatoren voor verbetering vatbaar zijn. De twee belangrijkste verbeterpunten zijn de (huidige) onvoldoende slimme monitoring en de op dit moment als onvoldoende ervaren synergie tussen stakeholders. Dit onderzoek draagt hiervoor verbetermogelijkheden aan, zijnde het verbeteren van bewustzijn en het erkennen van de waarde van monitoring, samen met het ontwikkelen van toegankelijke methodes waarmee alle stakeholders kunnen monitoren. Daarnaast toont dit onderzoek aan dat er behoefte is aan een platform waar stakeholders hun activiteiten en zorgen rondom klimaatadaptatie kunnen delen en coördineren.

**Trefwoorden**: Klimaatadaptatie - Governance van stedelijke klimaatadaptatie - Transformatieve governance capaciteiten - Lokaal governance - Openbare ruimte

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# Glossary

| | |
|---|---|
| **Climate adaptation** | Response to the changing climate and aims to reduce climate risks and vulnerability predominantly through adjustment of existing systems |
| **Governance** | The complex processes through which multiple stakeholders of the state, market and civil society collaborate and (ideally) interact on equal terms to conceive and achieve common goals |
| **Transformative governance** | The interactions and decision-making processes through which many stakeholders aim to address climate mitigation and adaptation while guiding societies toward low-carbon, resource-efficient, and long-term goals |
| **Stewarding capacity** | Anticipating and responding to uncertainty and risk while capitalizing on opportunities that are advantageous to sustainability. Stewarding capacity is manifested in actions that allow for learning and adaptability in the face of (uncertain) change and disturbance. |
| **Unlocking capacity** | Recognition and dismantling of unsustainable path- dependencies. It is manifested in actions that break open resistance and create opportunities and awareness for sustainable alternatives. |
| **Transformative capacity** | Creation, visibility and embedding of novelties that contribute to resilience and sustainability |
| **Orchestrating capacity** | Connectivity and coordination of multi-actor processes. It manifests in stakeholders' abilities for synergies and minimization of trade-offs and conflicts across scales, sectors, and time. |

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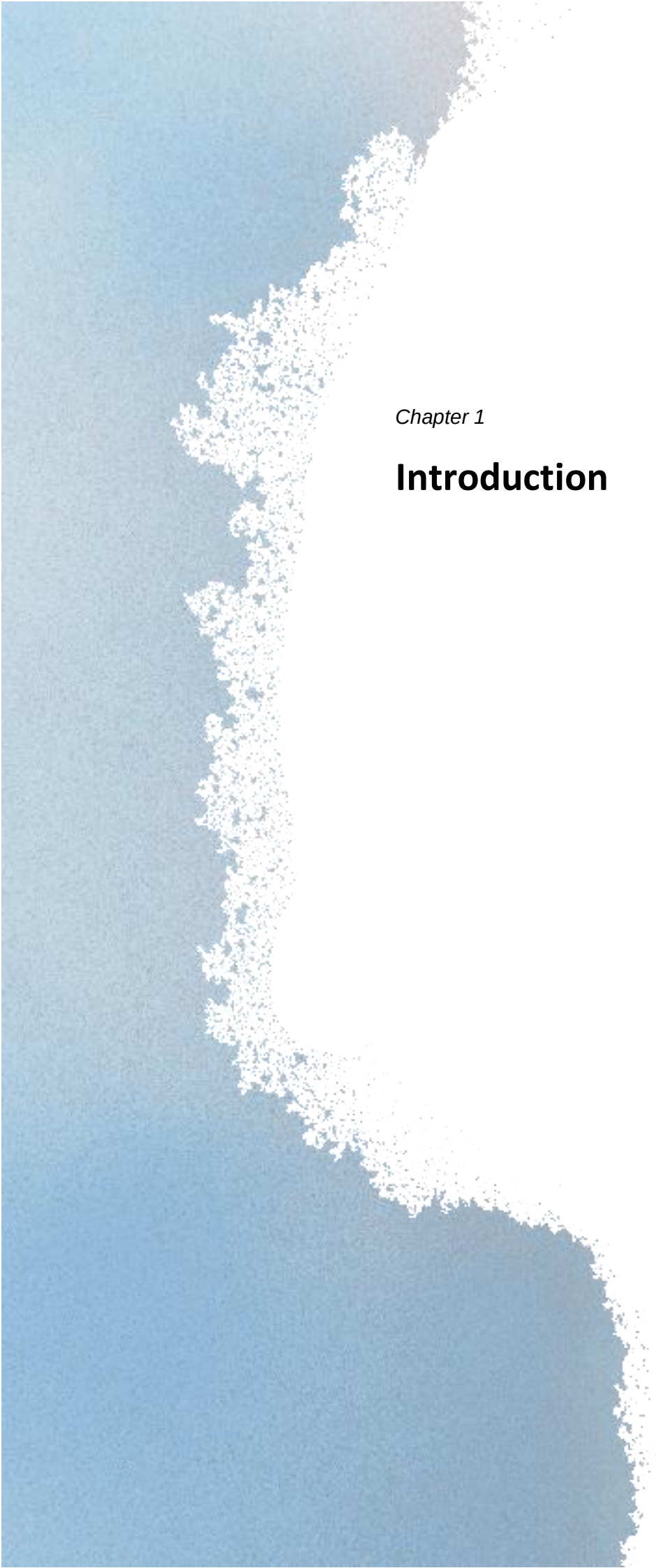


*Chapter 1*

# Introduction

Cities are acknowledged to play a major role in fighting climate change, particularly in terms of climate adaptation (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Rosenzweig et al., 2018). According to Wolfram et al. (2019) cities account for two-third of total global energy consumption and greenhouse gas emissions. At the same time, the most severe damages due to climate change are expected to take place within cities, such as sea-level rise, heatwaves, flooding, and heavy rains. Many municipalities have taken adaptation measures, because they recognise the major importance of adaptation for cities (Cloutier et al., 2015). Adaptation measures amongst which, but not limited to; policies that improve greenery in cities, construction of façade gardens, installing water-permeable tiles and building blue-green infrastructures for desired insects or animals (Gemeente Amsterdam, 2020). However, climate adaptation is not only technical, but also a matter of governing actions and interventions. Governance is even recognised to be of great influence in realising climate adaptation, its performance and overcoming limitations is therefore of importance to the execution of climate adaptation (Koop et al., 2017). This thesis focusses on the governance of climate adaptation at local urban level, to understand existing governance structures and discovering where improvements can be made.

## 1.1 Urban climate adaptation governance

To be able to understand and discover improvements, the meaning of governance and climate adaptation governance should be clear. Governance refers to the complex processes through which multiple stakeholders of the state, market and civil society collaborate and (ideally) interact on equal terms to conceive and achieve common goals (Torfing et al., 2012). Local governance stakeholders are defined in this study as individuals, groups or organisation, who influence and/or are influenced by a climate change adaptation decisions (Ahmadi et al., 2019; Williams et al., 2020), hereafter referred to as stakeholders. Climate adaptation activities and strategies are utilized to help manage expected climate change impacts, however, their implementation is dependent on the governance capacity and effectiveness and execution of activities (Pörtner et al., 2022). Climate resilient development can be aided by these activities and strategies. Governance capacity and its efficacy will be further explained within *Theory*.

Although many municipalities have taken adaptation measures (Cloutier et al., 2015), local governments cannot fight against climate change only by themselves (Anguelovski et al., 2014). Higher levels of government and groups of whom their power and/or influence exceeds national boundaries and governments are responsible for the planning and funding of climate adaptation. Citizens, local communities, and representatives of groups are recognised for their local ability for change, and are considered to be to be most responsible and best able to take local climate adaptive action (Cloutier et al., 2018). Furthermore, companies' responsibilities can be on local and larger scales, mostly depending on their scope. Multi-level governance presents an opportunity for effective adaptation action (Birchall et al., 2021), as different levels have their area of influence and combined can reach a wider audience. Thus, many stakeholders are involved and are needed to address the issue of climate adaptation.

The climate will continue to change, therefore, it is important to consider the flexibility of urban climate adaptation governance in changes and transformations towards sustainability and resilience. Within this research the concept of *transformative climate governance* according to Hölscher, Frantzeskaki, McPhearson, et al. (2019, p. 844) is used, implying: *"a fundamental change of urban governance systems to take more seriously the complex, uncertain and contested dynamics of urban transformations under climate change that unfold across scales and sectors"*. Thus, organising lasting adaptive capacity. To understand existing transformative climate governance, Hölscher, Frantzeskaki, McPhearson, et al. (2019) developed a climate governance capacity framework. The governance capacity refers to stakeholders' ability to constantly identify and act on collective concerns. By analysing different climate adaptation governance capacities, the level of (in)adaptability within an area and its stakeholders can be identified. These concepts and theory are further explained in *Theory*.

## 1.2 Problem statement

Cities, amongst which Amsterdam, experience difficulties to adapt to the changing climate and to related effects (Gemeente Amsterdam, 2022d; Koop et al., 2017; Wolfram, van der Heijden, et al., 2019). It is difficult to adapt as the impact of climate change is often highly uncertain, and can vary within a few kilometres and affect different levels of organisations (Clar & Steurer, 2019). Literature reveals that when an adaptation agenda does exist, it is frequently neglected and marginalised, putting it in competition with other economic, political, and social activities (Birchall et al., 2021; Carter et al., 2015). Although there is an increasing number of adaptation measures for urban systems, their feasibility and effectiveness are often limited by constraints on access and competence in institutions, finances, and knowledge (Pörtner et al., 2022). For example, many prioritise immediate and short-term climate risk constraints, thereby reducing the opportunity for transformational adaptation (Pörtner et al., 2022). Furthermore, stakeholders rely on coordinated and contextually appropriate responses across physical, natural, and social infrastructure. The coordination and appropriate responses related to climate adaptation can be explained through governance of climate adaptation (Pörtner et al., 2022). The question is raised whether the current urban climate adaptation governance is sufficient, and if stakeholders are encouraging or hindering each other.

Birchal et al. (2021) suggests a need for new approaches to adaptation governance as the impact of climate change worsens, emphasising a needed balance between economic and political interest with adaptation actions. This balance could increase the potential for long-term successful adaptation actions (Clar & Steurer, 2019). Furthermore, actions that meet both adaptation and community requirements are more efficient, and they can help to increase the long-term viability and scalability of adaptation operations (Birchall et al., 2021). A new approach to climate adaptation governance could improve urban sustainability and resilience. Leaving the challenge of identifying local climate adaptation governance gaps and finding ways to bridge and/or limit these gaps.

Within Amsterdam many forms of climate adaptation take place, for example: aiming to retain rainwater to decrease water nuisance and droughts (Gemeente Amsterdam, 2020). However, there continues to be many places that are not adequately adapted to local changing climates. Citizens, businesses and visitors suffer from the consequences of previously mentioned climate change effects, of which heat stress, drought and water nuisance are most pressing climate challenges (Gemeente Amsterdam, 2022d). The combination of different levels of governance in climate adaptation and the efficacy of their interaction are not known for the city of Amsterdam.

Local context heavily influences which climate issues are faced, along with hurdles to adaptation fitting solutions (Cloutier et al., 2015). Hence, considering a smaller scope within cities to discover the ability of governance can provide a more precise and adequate outcome. Therefore, this research project analyses the capacities of climate adaptation governance and aims to discover how existing gaps can be bridged within the local context. The area Amsterdam Oud-Noord is chosen because of its unknown climate adaptation governance structure and capacity, the need for climate adaptation and because the area is subject to rapid social and special development enabling systemic adaptation possibilities (Gemeente Amsterdam, n.d.; van de Kamp & Welschen, 2019; van Zelm et al., 2022; J. Schaap, personal communication, April 14, 2022). The case study is introduced and explained within *Methodology*.

## 1.3 Research aims and questions

While many researchers focus on constrains of local adaption and governance, it is less common to see how different stakeholders enable or counterwork each other (Hölscher, Frantzeskaki, & Loorbach, 2019; Trell & van Geet, 2019). This thesis seeks to add to the discussion by investigating the governance of climate adaptation in Amsterdam Oud-Noord, and how the current governance affects the ability to effectively adapt to a changing climate.

The aim of the research project is to understand the current governance capacity of Amsterdam Oud-Noord and discover how this area with its stakeholders combined, can improve its

climate resilience through climate adaptation governance. This could provide many benefits for both the environment and the society, both long- and short-term impact. On the short-term this could identify which new collaborations and relationships between present climate adaptation initiatives would benefit adaptation and connect these parties. Ultimately, in the long run, this research hopes to contribute to help towards effective institutional arrangement of climate adaptation through identification of possible improvements. This would make the city more resilient to changes and (continue to) enable a high quality of life, as is the aim of the municipality of Amsterdam (hereafter the municipality) and metropolitan area of Amsterdam (Gemeente Amsterdam, 2022d; Metropoolregio Amsterdam, 2022). Furthermore, the research specifically aims to understand which capacities for transformative climate governance can be improved, thus setting a research goal. As continued transitions are expected to be needed in the (near) future (Hölscher, Frantzeskaki, & Loorbach, 2019) and governance capacity is recognised as a precondition or enabler for effective change (Koop et al., 2017).

Through this research the capacity of current climate adaptation governance is researched to identify if and how transformative climate adaptive governance can be used to make both short- and long-term improvements. The analysis will be done by the guidance of the climate adaptation governance capacity framework, which will be further introduced in *Theory*. The analysis uses an agency-centred perspective that enables recognising and understanding how and by whom, governance capacities are produced; what types of conditions indicate the governance and if they are able to participate climate adaptation governance.

This research aims to both understand the climate adaptation governance capacities within Amsterdam Oud-Noord and discover ways to bridge the existing gaps. The research results in recommendations to bridge the discovered gaps. Thereby contributing to improving the liveability of Amsterdam and increasing the quality of life. The following research questions will be answered:

*How is climate adaptation governed at local urban level and where are improvements possible?*

The main research question is answered through the following research questions:

1. *How is climate adaptation governance currently shaped at area level?*
2. *What is the current capacity of climate adaptation governance?*
3. *What are current governance capacity gaps?*
4. *How can the governance capacity be improved?*

## 1.4 Report outline

This report is constructed as follows. In *chapter 2*, a theoretical framework is explained around the concepts and theories of transformative climate adaptation governance and its capacities. Thereafter, in *chapter 3*, the research strategy is given, explaining the research septs and methodologies used throughout this research. *Chapter 4* provides insights into the research area Amsterdam Oud-Noord and its climate adaptation stakeholders. In *chapter 5* an analysis is conducted for the governance capacities in Amsterdam Oud-Noord, providing insight in the level of performance for each capacity. *Chapter 6* identifies governance capacity gaps and provides recommendations on how the gaps in governance capacities could be bridged. *Chapter 7* reflects on the framework, methods and analysis. The final chapter, *chapter 8* draws conclusions and provides recommendations for future research. The appendixes provide background information of this research, as indicated in the table of content.

*Chapter 2*

# Theory

This chapter elaborates on the theoretical background and framework guiding this research. First, key concepts and theories are explained, this helps the understanding of urban climate adaptation and urban climate adaptation governance. Thereafter, the conceptual framework of climate adaptation governance and the need for analysis through this framework are elaborated on.

## 2.1 Understanding urban climate adaptation

*Climate change adaptation*, hereafter referred to as *climate adaptation*, is a response to the changing climate and aims to reduce climate risks and vulnerability predominantly through adjustment of existing systems (Pörtner et al., 2022). Climate adaptation has been explained as a continuum of resilience, transition and transformation (Colloff et al., 2017). Performing climate adaptation activities aims to improve an area's resilience and enable liveability. Climate adaptation involves a change in the way things are done and a transition from traditional problem-solving intervention approaches (Cloutier et al., 2015), towards recognising and considering climate change challenges and their adaptations as wicked problems (Rittel & Webber, 1973; Termeer et al., 2013; Termeer et al., 2015). Climate adaptation is recognized as a wicked problem due its complexity of origin and practicality, and the involvement of multiple actors. Taking into account the evolving nature of climates and the impact on living environments requires a transformative approach, which can evolve alongside the problem (Cloutier et al., 2015).

Climate adaptation actions vary, on the one hand there are incremental responses to proximate causes of vulnerability, and at the other are transformative responses (Colloff et al., 2017; Fedele et al., 2019). *Transformative adaptation* is a long-term method for reducing the core causes of climate change vulnerability by redirecting systems away from unsustainable or undesired paths (Fedele et al., 2019). It is related to profound systemic changes in social-ecological systems that result in new states and interactions. It can be induced either directly by radical changes in ecosystems or societies as a result of actual or predicted climate change, or indirectly by a cascade of gradual adaptations or modifications (Fedele et al., 2019).

To understand different adaptation activities, the types of adaptation according to Tompkins et al. (2010) are explained. They identify eight adaptation outputs (*Table 1*), of which six are related to building adaptive capacity (research, planning, networking, awareness raising, training and advocacy), one is concerned with establishing an appropriate institutional environment (legislation), and one is concerned with implementing adaptation (implemented change). Adaptive capacity refers to the ability to mobilise and combine multiple capacities within a system to predict or respond to economic, environmental and social stressors and thereby achieve transformative adaptation (Bettini et al., 2015), meaning that all activity types are of importance to transformative adaptation. Capacity building adaptation outputs are often most grounded and frequently the first step of an adaptation process (Biagini et al., 2014), and could therefore be recognised as incremental adaptations. Hence, a higher proportion of capacity building activities may represent the early stages of general adaption or the predominance of barriers that must be overcome before transformative adaptation can take place. Transformative adaptation is thus recognised within legislation and implementation of change. Nonetheless, all types of adaptation outputs can and most likely will continuously be used and are important to continuously adapt the existing climate adaptation to new insights on climate change.

As more adaptation projects are implemented it is likely new adaptation activities and actions come in place, thus, new activities or even outputs could evolve (Biagini et al., 2014). The classification in *Table 1* is therefore not definite, but a suggestion for climate adaptation activities for all possible stakeholders.

**Table 1.** *Types of adaption and example adaptation activities*

| Adaptation outputs | Examples of activities |
|---|---|
| Research | Gathering information, reports, maps, models |
| Plan | Strategy, policy, making plans |
| Networks | Creating committees, forum, network |
| Awareness raising | Information campaigns, education |
| Training | Tools to cope/adapt |
| Advocacy | Lobbying for change of practice or behaviour |
| Legislation | Sustainability initiatives, regulations, laws |
| Implemented change | Infrastructure design, building practice |

*Note.* based upon Tompkins et al. (2010)

## 2.2 Understanding urban climate governance and its capacities

### 2.2.1 Governance and transformative governance

Governance plays a critical role in determining a system's ability to adapt (Pörtner et al., 2022), therefore, it is important to understand the governance of climate adaption. *Governance*, shortly explained in the *Introduction*, is about the action and interaction of a combination of different stakeholders who interact and/or collaborate to conceive and achieve a common goal (Torfing et al., 2012). Existing governance regimes, also within the climate change domain, are characterised by incremental decision-making, short-term policy cycles, and significant interests that favour short-term optimisation, preventing more disruptive long-term changes and sustaining dangerous maladaptation (Hölscher, Frantzeskaki, & Loorbach, 2019). This relates to a limited degree of transformative adaption, as long-term methods are often not adhered to, and thus likely limits the ability to shift away from unsustainable or undesired paths.

Climate adaptation drives deep changes in urban governance towards more integrated, inclusive and experimental approaches (Hölscher, Frantzeskaki, & Loorbach, 2019). Local governments often take leading roles in urban climate governance, and many other stakeholders from local communities, regional and national governments, businesses and research institutes are contributing as well (Hölscher, Frantzeskaki, McPhearson, et al., 2019a). Scientific and policy attention is drawn to bottom-up and decentralised urban climate governance by increasing self-organising ways of delivering societal functions. Agency of climate adaptation is about the processes and dynamics by which stakeholders mobilise, construct, and transform societal institutions in order to "achieve" transformative adaptation (Hölscher, Frantzeskaki, & Loorbach, 2019). Scholars stress the importance of coordinating different stakeholders and across governance scales (Hölscher, Frantzeskaki, McPhearson, et al., 2019a), that is necessary for transformative adaptation. Literature refers to the importance of a division of roles and responsibilities and agreement on this division, as it influences behaviour of stakeholders in climate adaptation (Trell & van Geet, 2019). Governance becomes less about controlling and more about influencing these processes; such as by disturbing unsustainable regimes, promoting innovation, and dealing with surprise and upheaval (Hölscher, Frantzeskaki, & Loorbach, 2019; Loorbach, 2014). In order to improve governance of climate adaptation it is essential to identify interdependencies between stakeholders (Termeer et al., 2011; Trell & van Geet, 2019).

To facilitate transformative change in the decision context for adaptation, transformative change in governance will be required (Colloff et al., 2017). *Transformative governance* is an approach that can respond to, manage, and initiate regime transformations at many scales in linked social-ecological systems (Chaffin et al., 2016). Transformative climate governance is defined as the interactions and decision-making processes through which many stakeholders aim to address climate

mitigation and adaptation while guiding societies toward low-carbon, resource-efficient, and long-term goals (Hölscher, Frantzeskaki, & Loorbach, 2019). It empowers problem-based and systemic climate mitigation and adaptation policies and interventions that help he preservation of environmental integrity, social equity and well-being, and economic viability (sustainability) in the face of complex, contested, and uncertain transformation dynamics (resilience) (Hölscher, Frantzeskaki, McPhearson, et al., 2019a).

### 2.2.2 Governance capacity

The perspective of governance capacities aids in understanding how and by whom (local) urban climate governance is carried out, what conditions emerge as a result. Along with if these conditions indicate a shift towards transformative climate governance, and what capacity gaps exist (Hölscher, Frantzeskaki, & Loorbach, 2019; Hölscher, Frantzeskaki, McPhearson, et al., 2019a). Governance capacity and its efficacy are recognised to be possibly context-dependent (Koop et al., 2017), therefore, the context of a research are and stakeholders should be considered . Nonetheless, Koop et al. (2017) identified three communalities. First, governance capacity refers to stakeholders' ability to constantly identify and act on collective concerns. Second, the capacity is determined by the interactions of stakeholders, that are shaped by social-institutional settings and resource distribution. Third, it is about stakeholders' frame of reference, which include their values, interests, and culture, shaping interactions and influence collective problem-solving.

As stated before, governance capacity by itself does not lead to effective change, but is rather considered as a precondition or enabler for efficacious change, meaning enabler for transformative adaptation (Koop et al., 2017). Governance capacities are constantly evolving and adapting as a result of the actions of diverse governance stakeholders (Hölscher, Frantzeskaki, McPhearson, et al., 2019a). An assessment of governance capacity could help understand (local) challenges and underlying processes, shape co-learning between cities or areas, and lead to recommendations for stakeholders (Koop et al., 2017).

One specific way to analyse governance capacities regarding climate adaption is the framework developed by Hölscher, Frantzeskaki, & Loorbach (2019), who explain *transformative climate governance capacity* through four types of capacities:

- *Steward capacity* is about anticipating and responding to uncertainty and risk while capitalizing on opportunities that are advantageous to sustainability. Stewarding capacity is manifested in actions that allow for learning and adaptability in the face of (uncertain) change and disturbance.
- *Unlocking capacity* regards recognition and dismantling of unsustainable path- dependencies. It is manifested in actions that break open resistance and create opportunities and awareness for sustainable alternatives.
- *Transformative capacity* is about enabling creation, visibility and embedding novelties that contribute to resilience and sustainability.
- *Orchestrating capacity* regards the connectivity and coordination of multi-actor processes. It manifests in stakeholders' abilities for synergies and minimization of trade-offs and conflicts across scales, sectors, and time.

Together the capacities enable transformative climate governance, enabling mobilisation of urban transformation dynamics and developing integrated and systemic climate mitigation and adaptation measures that contribute to sustainability and resilience. The different capacities are applicable to all climate adaptation outputs since various indicators are alliable for the different climate adaptation outputs (*Table 2*).

**Table 2.** *Types of adaption and possible relations to type of governance capacity*

| Adaptation output | Possible related governance capacity type |
|---|---|
| Research | Stewarding, unlocking, transformative |
| Plan | Stewarding, transformative, orchestrating |
| Networks | Stewarding, unlocking, transformative, orchestrating |
| Awareness raising | Unlocking |
| Training | Transformative |
| Advocacy | Transformative |
| Legislation | Stewarding Unlocking, Transformative, Orchestrating |
| Implemented change | Stewarding, unlocking, transformative, orchestrating |

## 2.3 Conceptual framework

A framework is built to guide this research on how to gain insight in ways adaptation is governed. As a basis, the conceptual framework for transformative climate governance is used (*Figure 1*) (Hölscher, Frantzeskaki, & Loorbach, 2019; Hölscher, Frantzeskaki, McPhearson, et al., 2019a). It addresses the four types of governance capacities, to enable transformative climate adaptation governance. Each of the governance capacities consists of three conditions, explained further on. The framework is adapted by adding indicators to the capacities conditions to provide an indication to what extent different governance capacities are present (*Table 3*). The framework adjustments are made to enable research on a local area level and consider recent literature. The output for each capacity provides an inside on which climate adaptation governance could improve its performance. Hence, providing insight into possible improvements.

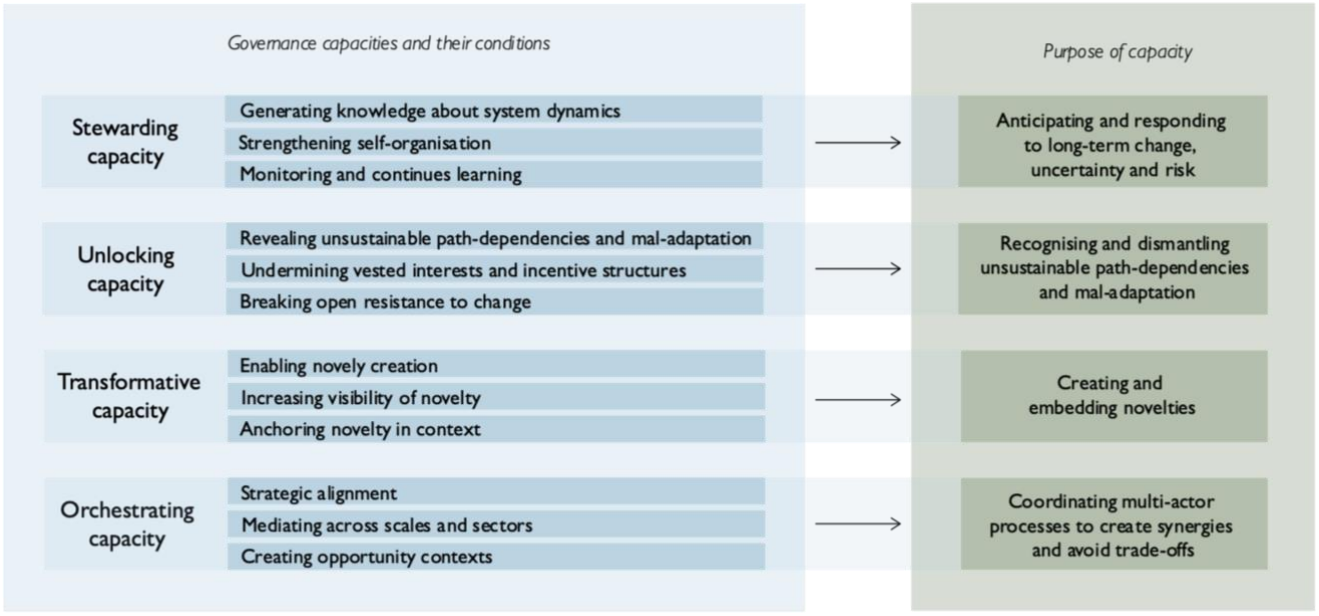



**Figure 1.** Conceptual framework: Transformative Climate Adaptation Governance Capacity Framework (Hölscher, Frantzeskaki, & Loorbach, 2019; Hölscher, Frantzeskaki, McPhearson, et al., 2019a)

The indicators are based on and inspired by the rich knowledge base of climate adaptation, climate governance, transformative climate governance, and capacities, as previously discussed. Along with existing frameworks: the capacities framework for transformative climate governance (Hölscher, Frantzeskaki, & Loorbach, 2019), water governance capacity framework (Koop et al., 2017), operationalising adaptive capacity (Trell & van Geet, 2019), and the integrated modelling approach for assessing adaptive capacity (Williams et al., 2020). By reformulating them into a well-balanced framework (*Table 3*). Underneath *Table 3*, the conditions and their indicators are explained with the use of recent literature.

**Table 3.** The Transformative Climate Adaptation Governance Capacities Framework

| **Governance capacities** | **Conditions** | **Indicators** |
|---|---|---|
| Stewarding capacity | 1.1 Generating knowledge about system dynamics | a. Knowledge availability |
| | | b. Cross-stakeholder learning |
| | 1.2 Strengthening self-organisation | a. Collaboration in knowledge and projects |
| | 1.3 Monitoring and continuous learning | a. Institutional and social memory |
| | | b. Smart monitoring |
| Unlocking capacity | 2.1 Revealing unsustainable path dependency and maladaptation | a. Identifying and exploring systemic drivers |
| | 2.2 Undermining vested interests and incentive structures | a. Support for sustainable business |
| | | b. Room to manoeuvre |
| | 2.3 Breaking open resistance to change | a. Fostering willingness and awareness |
| Transformative capacity | 3.1 Enabling novelty creation | a. Leadership of opportunities for change |
| | | b. Multi-actor innovation networks |
| | | c. Space for innovation |
| | 3.2 Increasing visibility of novelty | a. Local support |
| | | b. Advocacy coalitions |
| | 3.3 Anchoring novelty in context | a. Learning for replication and upscaling |
| | | b. Institutional space and compliance |
| | | c. Affordability |
| Orchestrating capacity | 4.1 Strategic alignment | a. Long-term and integrated goals |
| | | b. Involvement for strategy/vision |
| | | c. Division of responsibilities |
| | 4.2 Mediating across scales and sectors | a. Connection nodes for climate action |
| | | b. Space for knowledge sharing |
| | | c. Knowledge cohesion |
| | 4.3 Creating opportunity contexts | a. Long-term co-benefits |

*Note.* Adapted from Hölscher, Frantzeskaki, & Loorbach (2019) and Hölscher, Frantzeskaki, McPhearson, et al. (2019)

## Stewarding capacity

Steward capacity is about anticipating and responding to uncertainty and risk while capitalizing on opportunities that are advantageous to sustainability. It is manifested in actions that allow for learning and adaptability in the face of (uncertain) change and disturbance.

### 1.1 Generating knowledge about system dynamics

Knowledge concerns all knowledge related to climate adaptation, knowledge and learning enable anticipating emergent disturbances and uncertainties and identifying available options in light of these (Chapin et al., 2010; Hölscher, Frantzeskaki, & Loorbach, 2019).

a. *Knowledge availability* is about to what extent different stakeholders have access to information and context specific knowledge about the challenges, the availability of knowledge and contribution to generating knowledge (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Pörtner et al., 2022; Williams et al., 2020).
b. *Cross-stakeholder learning* refers to the interaction among stakeholders and their understanding of perspective of different stakeholders, that contributes to a more thorough, though not unanimous, review (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).

### 1.2 Strengthening self-organisation

Stakeholders' self-organisation supports independent and flexible response to changes and disturbances (Garmestani & Benson, 2013; Hölscher, Frantzeskaki, & Loorbach, 2019). The self-organisation can be in collaboration and networks of climate adaptation or activities related to climate adaptation.

*a.* *Collaboration in knowledge and projects* regard communication, sharing and/or co-creation of knowledge with all interested stakeholders; multi-level and cross-sectoral. For example, in joint visioning, planning and implementation (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Pörtner et al., 2022).

### 1.3 Monitoring and continuous learning

Indicating learning from previous social and institutional events related to climate adaptation and smart monitoring of current climate adaptations. For facilitating a collective memory of climate adaption options and for climate adaptive management rules, monitoring and continuous learning are essential indicators (Chapin et al., 2010; Gupta et al., 2010; Hölscher, Frantzeskaki, & Loorbach, 2019). Thereby creating a response to learning what works and what does not (anymore).

*a.* *Institutional and social memory* regards drawing lessons from past experiences, identifying needed changes, and continuously adapting plans, resilience and sustainability indicators. Institutional memory refers to the institutional provision of monitoring and evaluation processes of policy experience, and social memory refers to the experience for dealing with changes (Folke et al., 2005; Gupta et al., 2010; Hölscher, Frantzeskaki, McPhearson, et al., 2019a).
*b.* *Smart monitoring* explains a prerequisite for learning and may be used to identify threatening circumstances, elucidate underlying processes, and forecast future developments. It enhances (together with institutional and social memory) continuous learning (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Williams et al., 2020). It is analysed through extensive monitoring of progress towards goals, clear documenting and sharing of progress and outcomes.

## Unlocking capacity

Unlocking capacity regards recognition and dismantling of unsustainable path-dependencies. It is manifested in actions that break open resistance and create opportunities and awareness for sustainable alternatives.

### 2.1 Revealing drivers of unsustainable path-dependencies and mal-adaptation

Providing insights in the conditions for revealing institutions, technologies and behaviours that need to be phased-out strategically (Hölscher, Frantzeskaki, & Loorbach, 2019; Meadowcroft, 2009).

*a.* *Identify and explore systemic drivers* is about to what extent stakeholders are aware of what drivers are of unsustainability and where climate adaptation is needed. It is argued that this is strongly influenced by the ability of stakeholders sharing their knowledge and its repletion by others (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Trell & van Geet, 2019; Williams et al., 2020). Systemic drivers of unsustainability refer to factors which causes a particular unsustainable phenomenon to happen or develop.

### 2.2 Undermining vested interests and incentive structures

Enabling reduction of the comparative advantage of doing business as usual in favour of new or emerging alternatives (Hölscher, Frantzeskaki, & Loorbach, 2019; Kivimaa & Kern, 2016; Koop et al., 2017).

a. *Support for sustainable business* is about providing incentives or standards for sustainable investment and/or implementing regulation to control unsustainable practices (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).
b. *Room to manoeuvre* regards the opportunity of stakeholders to explore different pathways. This is explained through the means and skills to seek opportunities, gain access to resources and manage risks for stakeholders (Koop et al., 2017). For instance, to what extent a stakeholder can explore different adaptation options and their access to skills and resources for this exploration.

### 2.3 Breaking open resistance to change

Breaking open resistance to change reduces support for business as usual, while increasing opportunities and awareness for alternatives (Hölscher, Frantzeskaki, & Loorbach, 2019; Koop et al., 2017).

*a.* *Fostering willingness and awareness* is about raising awareness on climate challenges and possible climate adaptation; and/or assisting in behaviour change (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Trell & van Geet, 2019). Increasing awareness is acknowledged as stimuli for climate adaptation (Runhaar et al., 2012).

## Transformative capacity

Transformative capacity is about enabling creation innovation of climate adaptation, visibility of adaptations and embedding novelties in existing structures, contributing to resilience and sustainability.

### 3.1 Enabling novelty creation

Novelty creation ensures space, resources and networks for developing and testing innovations (Frantzeskaki et al., 2012; Hölscher, Frantzeskaki, & Loorbach, 2019). The capacity of stakeholders to create is what allows for creation.

a. *Leadership of opportunities for change* is about visionary agents, who create and use opportunities for climate adaptive change. Making use of momentum and opportunities and put ambitious goals on the agenda (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Williams et al., 2020). The visionary agents mostly refer to individuals but can also refer to a group, both within and outside stakeholder groups and/or organisations.

b. *Multi-actor innovation networks* is about networks and stakeholders who enable collaboration for strategic and/or operational innovations and by involving communities (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Trell & van Geet, 2019; Williams et al., 2020). The presence of networks stimulates colaboration and sharing of innovations (Runhaar et al., 2012).
c. *Space for innovation* regards regulatory and financial lifting or avoiding enabling climate adaptation (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017). Space for innovation can be experienced regarding time, regulations, financials and other needed space.

### 3.2 Increasing visibility of novelty

Increasing innovation visibility enables challenging dominant regimes and motivating wider acceptance, uptake and replication (Frantzeskaki et al., 2012; Hölscher, Frantzeskaki, & Loorbach, 2019). Visibility is improved by the presence of local support advocacy coalitions.

a. *Local support* regards support of local climate adaptation. Which can be analysed through acceptance and appreciation of a climate adaptation action at local level. Along with creation and advocacy of climate adaptation at a local level. Support increases the implementation ability and potential support base of stakeholders (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Trell & van Geet, 2019).
b. *Advocacy coalitions* refers to networking and collaboration of stakeholders to share novelties and innovations. Along with participation in networking and collaborations for visibility of the novelties (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Trell & van Geet, 2019).

### 3.3 Anchoring novelty in context

By anchoring innovations in existing or new structures, cultures and practices, implications and lessons are made generalisable (den Exter et al., 2015; Hölscher, Frantzeskaki, & Loorbach, 2019).

*a.* *Learning for replication and upscaling* concerns identifying opportunities for upscaling and mainstreaming it into urban practises (Hölscher, Frantzeskaki, McPhearson, et al., 2019a). Learning for replication and upscaling enables mainstreaming of urban practises in the future.
*b.* *Institutional space and compliance* is about institutional space for embedding strategic and operational innovations in mainstream practice and ensuring that stakeholders respect and understand agreements, objectives, and legislation (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Williams et al., 2020).
*c.* *Affordability* concerns whether climate adaptation actions are accessible for stakeholders and to what extent they are willing to pay for such actions. Measures regarding time and finances are mostly used to express affordability (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017). Typical examples are subsidies and innovative networks created by for instance EU projects (Runhaar et al., 2012).

## Orchestrating capacity

Orchestrating capacity concerns the connectivity and coordination of multi-actor processes. It manifests itself in stakeholders' abilities to create synergies and minimise trade-offs and conflicts across scales, sectors, and time.

### 4.1. Strategic alignment

Strategic alignment supports the formulation of shared and long-term goals towards which actions are oriented (Abbott, 2017; Hölscher, Frantzeskaki, & Loorbach, 2019; Koop et al., 2017).

a. *Long-term and integrated goals* regard long-term and integrated climate adaptation goals which are supported and/or developed by various stakeholders. These should be embedded in discourse, as that increases the support base. Similarly increases in support base are found when there is more cohesion between stakeholders (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).
b. *Involvement for strategy/vision* concerns involvement of multiple stakeholders in shared strategy formulation and visioning. Next to that, it concerns to what extent representatives can speak and decide in clear and transparent engagement processes (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).
c. *Division of responsibilities* concerns whether stakeholders can be held accountable and whether stakeholders have an understanding what to expect from other stakeholders (Koop et al., 2017; Trell & van Geet, 2019).

### 4.2 Mediating across scales and sectors

The mediating across scales and sectors optimises interaction processes, and thereby improves climate adaptation (Abbott, 2017; Hölscher, Frantzeskaki, & Loorbach, 2019).

a. *Connection nodes for climate action* is about the connection of stakeholders that are, or want to be, active in climate adaptation. Connection can be between and across levels and organisations, thereby limiting fragmentation (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).
b. *Space for knowledge sharing* is about availability of neutral spaces for knowledge sharing and trust building. Neutral spaces refer to spaces where stakeholders can speak freely with each other. Next to that, whether stakeholders co-produce and can select from a variety of options to ensure learning and authoritative decision making (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).
c. *Knowledge cohesion* refers to integrating and merging knowledge and resources across scales and sectors. This could be done through identifying opportunities, synergies and trade-offs between different goals (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Trell & van Geet, 2019; Williams et al., 2020).

### 4.3 Creating opportunity contexts

The creation of opportunity contexts ensures the existence of overarching frameworks and conditions that encourage and facilitate actions toward common and long-term goals (Abbott, 2017; Hölscher, Frantzeskaki, & Loorbach, 2019).

a. *Long-term co-benefits* refers to stakeholders creating conditions and financing mechanisms for long-term co-benefits; on innovative, long-term and co-beneficial solutions. For instance, redefining responsibilities for carrying costs (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017).

*Chapter 3*

# Methodology

This chapter elaborates on the methods used to answer the research questions. First the research strategy is set out. Thereafter, for each step in the research approach it is explained what methods are used, the reasons for using these methods are discussed, and treatment of the data is elaborated.

## 3.1 Research strategy

The research method of Yin (2009) was used to illustrate current climate adaptation governance at a local scale through a qualitative analysis of the case of Amsterdam Oud-Noord. When researching a specific area, a better understanding of specific local conditions and stakeholders helps to identify the local situation and local needs. This provided both in-depth insights for this specific environment, but also provided relevant insights for other (comparable) areas. Yin (2009) describes case studies to be a linear albeit iterative process, as is shown in *Figure 2*. Alterations within this research were done on the areas of 'preparations' and 'collection', after discovering it was not suiting of the analysis or understanding. Prior to this, the planning of the research was started by identifying selection criteria and finding a relevant research area for a case study.

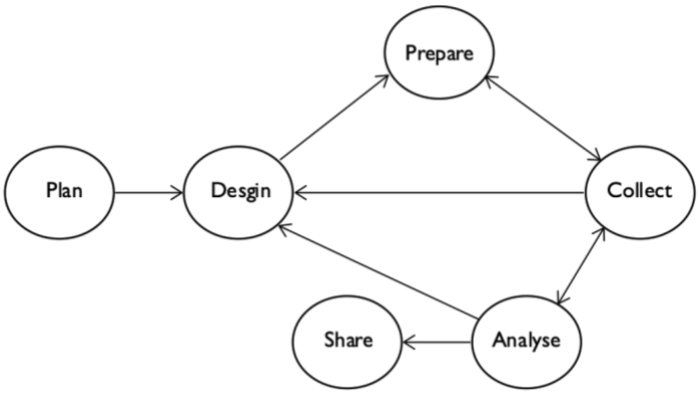



**Figure 2.** Iterative research process, altered from Yin (2009)

This research was conducted in five steps (*Figure 3*) to answer the sub-research questions and assure required information to be present in later steps of the research. The research started by a literature review of the system, discovering and understanding the research area and identifying possible and involved stakeholders. Thereafter, the governance capacities were analysed for the identified stakeholders. This analysis provided insights into possible gaps and led to the discovery and identification for ways in which these gaps can be closed. These are aimed at improving the governance capacity, thereby aiming to improve the climate adaptivity of the research area. Each step of the research methods is explained in the following sub-chapters.

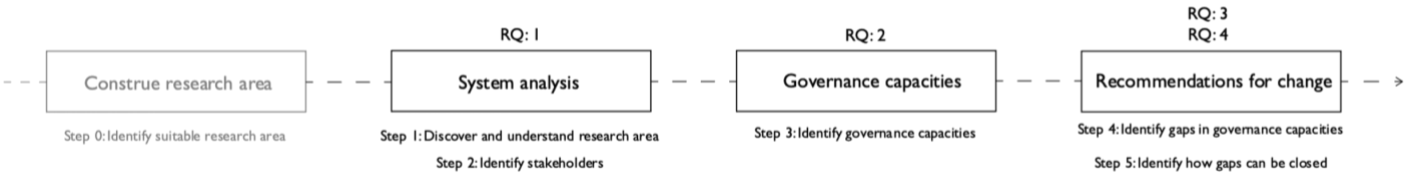



**Figure 3.** Research approach and steps

## 3.2 Data gathering and analysis

### 3.2.1 Construe research area

#### Step 0. Identifying suitable research area

To research local transformative climate adaptation governance capacities, a local research area should be chosen. Considering the researcher's location and existing connections related to the field of urban climate adaptation, the city of Amsterdam was chosen as the city of research. Thereafter, a smaller research area was needed to be defined, this discovery was done through literature and document review and conversations with experts on knowledge of climate adaptation of the city of Amsterdam (J. Schaap, personal communication, April 14, 2022).

##### Research area selection criteria

To select an area for the desired research, the scope should adhere to a set of requirements. The scope is of great importance; it should be large enough to observe how different stakeholders act in climate adaptation governance, there should be policies, approaches and/or legislation on climate adaptation at regarding this area, and citizens should be able to grasp the area (J. Schaap, personal communication, April 14, 2022). The latter refers to the ability of stakeholders to understand the scope, and whether stakeholders see themselves contributing to this research area. Furthermore, different types of stakeholders should have the opportunities to participate or organise, during the period of research, climate adaptive activities. Net to that, it should be possible to get in contact with (some of) these stakeholders. It is also important that the research area is facing one or more climate change effects and requires climate adaptation. Lastly, the area should be (mostly) urbanised, to assure an analysis of local urban climate adaptation can be performed.

##### Motivation of case study area Amsterdam Oud-Noord

The research area chosen is Amsterdam Oud-Noord, see *Figure 4* and *Figure 5*. Amsterdam Oud-Noord municipal area borders were renewed in 2019; the most recent borders are used as the boundary of the research area (Gemeente Amsterdam, 2022c). The scope of the research is determined to be an 'area', as the municipality has an area-oriented approach with specific goals for each area. The municipality has governmental bodies focussed on this scope and has particular action plans concerning this area (Gemeente Amsterdam, 2019b; van Zelm et al., 2022). The area is relatable for stakeholders, as stakeholders most likely have visited most of the neighbourhoods within Amsterdam Oud-Noord, can envision the area and share many facilities such as markets, parks and access roads and ferries. The scope of an 'area' is also big enough to have a wide variety of stakeholders present; many different types of companies and organisations, different type of residents and various bodies of the municipality are considering (parts of) this area. A variety of these stakeholders are acting in climate adaptation, for example via the neighbourhood greening organisation Buurtgroen 020, tile removal actions, including water infiltration and greenery in new building plans, and governing current parks and (new) green areas (J. Schaap, personal communication, April 14, 2022; I. Brekelmans, personal communication, May 11, 2022). The analysis of stakeholders will be elaborated upon in *Chapter 4*.

In Oud-Noord action in climate adaptation is deemed necessary to sustain liveability on the long-term and in some cases even in the short-term. Climate adaption is required within the area Amsterdam Oud-Noord, as it is facing various climate change effects, that are also expected to worsen in time due to both the changing climate as well as the increased urbanisation of the area (Gemeente Amsterdam, 2022d; van Zelm et al., 2022). The climate change challenge and understanding of the research area Amsterdam Oud-Noord will be further described in *Chapter 4*.

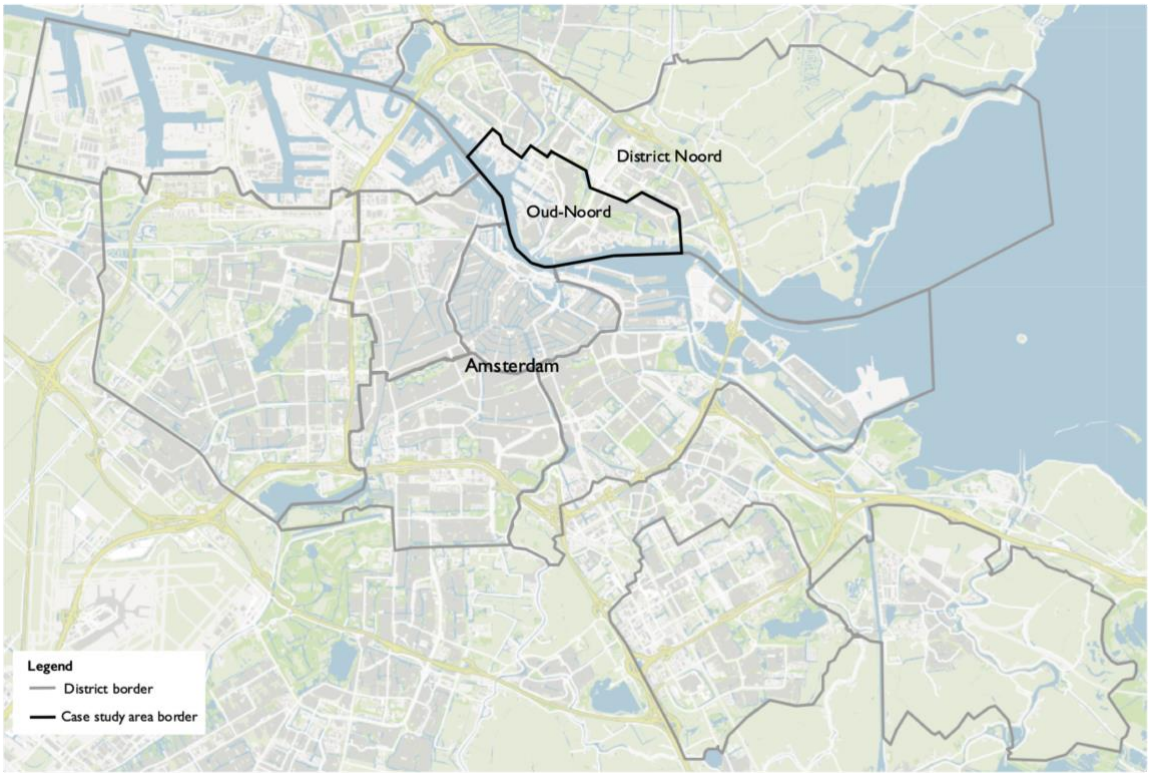



**Figure 4.** Amsterdam Oud-Noord in perspective of the city of Amsterdam (Gemeente Amsterdam, 2022c)


**Figure 5.** Case study area: Amsterdam Oud-Noord (Gemeente Amsterdam, 2022c)

### 3.2.2 System analysis

The analysis of the research area's system aimed to answer the first research question, identifying how the climate adaptation is currently shaped at area level. This is done by considering the physical and social aspects of the research area, as well as its stakeholders.

#### Step 1: Discover and understand climate adaptation in the research area

Discovery and analysis of the research area provided understanding of the research context. This helps in understanding the climate adaptation present and needed within the areas, and social context of stakeholders and their perspectives. Moreover, it helps to place the outcomes of the research within perspective, and possibly comparable to other areas or circumstances (Dilling et al., 2019; Williams et al., 2020). The discovery concerned visiting the research area, to get a better visual understanding of the special context, atmosphere and visible climate adaptations. Furthermore, the research area was analysed through desk research: analysing literature, documents and information shared by interviewees (explained in *Step 2*), and policy documents. The research and analysis focussed on understanding local politics, demographics, and expected and planned changes. Moreover, the presence of challenges due to climate change were researched, such as heat stress, water nuisance and drought. The challenges of heat stress and water nuisance and its related risks were mapped, using the geospatial programme ArcGIS by using existing databases from acknowledged organisations, to visualise the locations and abundance of these challenges. Supported through previously mentioned desk research. The maps were afterwards edited using Adobe software to increase visual understandability.

#### Step 2: Identify stakeholders

A stakeholder analysis was done to obtain an overview of the most relevant stakeholder related to the research area and identify stakeholders types and characteristics (Ahmadi et al., 2019; Reed et al., 2009). The identification of stakeholders is important in understanding which individuals, groups, initiatives and organisations are active in climate adaptation within and related to the research area. These different stakeholders represent the governance stakeholders in climate adaptation. Simultaneously, existing climate adaptation within the area were identified through literature research, information shared by interviewees, which will be explained shortly, and documents of other stakeholders. The identification of stakeholders was consequently done using the snowball technique, inspired by Reed et al. (2009) and Mees et al. (2013); these consisted of a first connection to Amsterdam Rainproof, followed by various employees of the municipality, local organisations, companies, initiatives and citizens. Supported by findings of literature and documentation. Furthermore, the researcher talked with citizens on site visits; at community centre (Van der Pekbuurthuis) on June 8 and 10 in 2022, and the local market (Van der Pek market) which is central and visited by various inhabitants for Oud-Noord on June 15, 2022 (Interviewee MN4). The researcher also attended an event for local initiators who wanted to claim neighbourhood budgets, on June 30, 2022, where I discovered more local initiators. All interviewed stakeholders were asked about others who participate in climate adaptation and relevant contacts for a similar interview.

The stakeholders were analysed according to their locality, type of stakeholder, the climate challenge they were adapting to, and their climate adaptation outputs. Locality: when focussed on the Amsterdam Oud-Noord or district Noord this is perceived as local, as municipal documents refer according to this wording (Gemeente Amsterdam, 2019b; van Zelm et al., 2022). Type of stakeholder: to which stakeholder group an interviewee and other stakeholders belong, groups are based upon identity of stakeholders combined with motive based classification (Rowley & Moldoveanu, 2003). This led to the following stakeholder groups: municipal, private sector/NGO, cultural organisation/institution, action group, and citizen. Climate adaptation output refers to the climate adaptation output stakeholders are active in as explained in *Table 1* (Tompkins et al., 2010). Lastly,

addressed climate challenge refers to the climate challenge a stakeholder is adapting to, drought, water nuisance and/or heat stress.

A selection of the identified stakeholders was contacted via the previous explained snowball effect to participate in this research, nonetheless, not all were able or willing to participate in this research within the time frame. The selection is based on involvement in local climate adaptation, a variety stakeholder types, and the availability of contact details via previous interviewed stakeholders. The list of interviewees is presented in *Table* 4.

**Table 4.** List of interviewees

| Stakeholder group | Interviewees | | Date |
|---|---|---|---|
| Municipality – District Noord | *Interviewee MN1* | Sustainability coordinator Noord | 11-05-2022 |
| | *Interviewee MN2* | Green coach Oud-Noord | 31-05-2022 |
| | *Interviewee MN3* | Green coordinator Noord | 01-06-2022 |
| | *Interviewee MN4* | Neighbourhood broker Volewijck | 08-06-2022 |
| | *Interviewee MN5* | Area coordinator Oud-Noord | 10-06-2022 |
| | *Interviewee MN6* | Strategy advisor Noord | 14-06-2022 |
| | *Interviewee MN7* | Coordinator project green Noord/ Noordmaker | 15-06-2022 |
| | *Interviewee MN8* | Coordinator Neighbourhood Budgets Noord | 24-06-2022 |
| Municipality (not district specific) | *Interviewee M1* | Project and process specialist – Urban works | 09-06-2022 |
| | *Interviewee M2* | Urban landscape designer (public space) – Space and sustainability | 20-06-2022 |
| | *Interviewee M3* | Community manager Amsterdam Rainproof – Rainproof & Engineering Bureau Municipality of Amsterdam | 23-06-2022 |
| | *Interviewee M4* | Communication advisor – Programme Climate Adaptation | 24-06-2022 |
| Citizens | *Interviewee C1* | Citizen Volewijck – initiator green in front of building and initiator public aquaponic systems | 24-06-2022 |
| | *Interviewee C2* | Citizen IJplein – Initiator Oud-Noord tile removal | 01-07-2022 |
| Local private sector/NGO | *Interviewee PN1* | Owner local company – initiator green in front of building | 14-06-2022 |
| | *Interviewee PN2* | Board member Vliegenbos | 16-06-2022 |
| | *Interviewee PN3* | Programme and project manager - Waternet | 21-07-2022 |
| Local cultural organisation/ institution | *Interviewee LC1* | Citizen Tuindorp Buiksloot – Initiator Beeldenbos | 01-07-2022 |
| | *Interviewee LC2* | Programme manager – Tolhuistuin | 21-07-2022 |

*Note.* Interviewees are numbered according to their stakeholder group. MN = municipality district Noord, M = municipality, C = citizen, PN = local private sector/NGO, LC = local cultural organisation/institution. Dutch translations of position of interviewees in brackets to clarify positions. Translation of original Dutch (job)titles of interviewees is provided in *Appendix A*.

The interviewees were asked to participate in an interview ranging from 30-60 minutes. Semi-structured interviews were held to obtain insight into motivation and awareness of an interviewee, as well as information related to the indicators of the governance capacity framework. Semi-structured interviews are characterised by their flexibility, which allows more personal conversations and the exploration of ideas and responses in greater depth (Gill et al., 2008). To ensure desired information was also obtained, a semi-structured interview guide was used (*Appendix B*). The interviews were mostly conducted face-to-face, except for four interviews by Zoom and two by telephone. Offline interviewing was done to improve the understanding of the interviewee and when applicable to view climate adaptations. The interviews were recorded, transcribed and coded in Atlas.ti. The coding was done according to the governance capacity framework (*Theory)*, substituted by codes outside the framework to grasp unexpected discoveries. The indicators from the framework are coded as main-codes, as well as a code 'outside-framework but interesting' where interesting quotes were coded who did fall under one of the indicators. Moreover, during the coding of the interviews, the codes 'personal motivation/awareness' and 'missing stakeholders' were created as these seemed to be topics of interest where multiple interviewees talked about but was not incorporated in the existing codes. The data collection was conducted in spring and summer of 2022, the results are based on the perceptions and answers of the interviewees during that time period.

### 3.2.3 Governance capacities

The governance capacities analyses aimed to answer sub-research questions two and three. It discovered the current climate adaptation governance capacities.

#### Step 3: Identify governance capacities

To gain inside in the governance capacity, the competence of the different governance capacities was researched, which was done through an analysis of the coded interviews. Each of the twenty-four indicators were scored by answering one or more predefined questions (*Appendix C)*. For the understanding of governance capacity and to be able to provide a clear overview, levels of performance were created for each indicator. A five-scale Likert-type scoring was developed, which ranges from very encouraging (++) to very limiting (––) to the governance capacity, inspired by Koop et al. (2017). An example of indicator 1.1.a is provided in *Table* 5, scoring overviews for all indicators are defined in *Appendix D*. For each indicator a score was given, based on the gained insights of the answers of all interviewees. For instance, when all interviewees mention to have access to knowledge and information relating to their climate adaptation, ability to use this knowledge. Along with some interviewees mention to contribute or generate knowledge themselves but not the majority, an encouraging (+) score could be fitting the overall knowledge availability.

In addition, the variations of the answers were categorised as wide or small, to provide an insight on the distribution of the answers of the interviewees. Based on consolidated interpretations, I deduced the dominant considerations from the interviewees' responses.

Furthermore, an overview was provided for each capacity and each condition, to understand more generally where governance capacities performance is encouraging or limiting for climate adaptation. The indicator scores and conditions analysis are deepened, to discover communalities and differences, and striking outcomes are highlighted. The interviewees contribution to indicators is analysed, to discover whether they have unifying or contradicting voices, ways of intervention and responsibility, between and among stakeholder groups. Literature and (policy) document review was used to validate and strengthen the findings of the interviews: particularly for the identified gaps, specific conditions for interviewees and existing knowledge of local governance.

**Table 5.** Likert-type indicator levels for indicator 1.1.a knowledge availability

| Level | Description |
|---|---|
| Very encouraging (++) | Access to and availability of desired information and context specific knowledge, and contributing to generating knowledge. |
| Encouraging (+) | Access to and availability of desired information and context specific knowledge |
| Indifferent (0) | Access to and availability of information and context related knowledge |
| Limiting (-) | Access to or availability of information and context related knowledge |
| Very limiting (--) | No access to and availability of desired information and context specific knowledge, and not contributing to generating knowledge. |

### 3.2.4 Recommendations for change

Recommendations for change aimed to identify the current governance capacities gaps. The most urgent gaps were discovered and identified how these can gaps can be closed, or at least be limited.

#### Step 4: Identify gaps in governance capacities

By analysing the governance capacities performance, both the overview as well as the detailed outcomes of the conditions and indicators, gaps were identified. By comparing the performance of the capacities and deepening the analyses by researching the possible origins of these gaps, reasons for these gaps became evident. This was done through both desk research of literature and documents, and possible reasons given by interviewees. Linkages between interviewees, stakeholder types and adaptation outputs with identified gaps were examined to discover these gaps.

#### Step 5: Identify how gaps can be closed

To improve the governance capacities the identified gaps within climate adaptation governance capacities should be bridged. Gaps were selected on their scoring within the framework as well as underlying limitations for lower scores, identified by creating an overview of the indicator score. Suggestions to bridge the identified gaps were done by combining, researching and considering suggestions and information provided by interviewees, insights during the research by the researcher, and available literature of similar research and areas. Suggestions were given on how to close or at least decrease the gaps in the different governance capacities.

## 3.3 Ethics

During the interviews and processing of the data, names of participants were removed, and referencing is done to interviewees function, to avoid privacy violation. Moreover, respecting the wishes of the interviewee was central during the interviews. The interviewee was able to stop the interview at any moment and was able to retract their participation at any moment during as well as after the interview. In addition, interviewees signed a statement of consent to assure their rights are valued during and after the interview had taken place (*Appendix E*). When the interviewee did not want certain answers or information to be considered, there was an opportunity to adjust their statement.

Throughout the research the aim was to be inclusive and not exclude stakeholders based on any other requirements than previously mentioned. Furthermore, this research aimed to minimise the risk of harm, for both interviewees as well as other mentioned stakeholders.

*Chapter 4*

# System analysis

This chapter provides a discovery and analysis of the research area and its climate adaptation stakeholders, which present the shape of governance of the research area. Providing understanding of the research area and context for further analysis. It thereby answers the first research question.

*RQ 1: How is climate adaptation governance currently shaped at area level?*

## 4.1 Understanding Amsterdam Oud-Noord

Amsterdam Oud-Noord is a diverse area, it has many new constructions, transition projects and redeveloping neighbourhoods. The understanding of the area starts by an explanation of the geography, demographics and non-climate change challenges. Followed by the climate change challenges, and related risks and problems, as shortly touched upon in paragraph *3.2.1*.

The area Oud-Noord is divided into several neighbourhoods, which are mostly separated by roads, green or watercourses (*Figure 6*). There are five old neighbourhoods: Volewijck, IJplein/ Vogelbuurt, Tuindorp Nieuwendam, Tuindorp Buiksloot and Nieuwendammerdijk/Buiksloterdijk. As well as two new neighbourhoods Noordelijke IJ-oevers West and Noordelijke IJ-oevers Oost. The new neighbourhoods on the banks of the IJ-river are former industrial areas and have recently been build or transformed, or will be in the coming years, to metropolitan living and working environments (Gemeente Amsterdam, 2019b). Most neighbourhoods are divided into smaller section by the municipality to understand and govern the areas is greater detail. Each section has its own identity, which is valued by most of its citizens (Interviewee MN7). Oud-Noord is subject to rapid change spatially and socially, in both old and new neighbourhoods. There are currently almost 32.000 citizens in Oud-Noord, which is expected to increase to 40.000 by 2030 and 60.000 citizens by 2050 (Gemeente Amsterdam, n.d.). This indicates a significant increase of the population density, and thereby possible increases of social and environmental challenges (Interviewee M2). Most of these new citizens will live within the new neighbourhoods, where many high rises are being built and planned, but also within the older neighbourhoods (Interviewee M3).


**Figure 6.** Neighbourhoods of Amsterdam Oud-Noord (Klimaateffectenatlas, 2022a)

As the neighbourhoods were built in different time periods, diverse neighbourhood typologies apply. The neighbourhood Volewijck is mostly identified as a pre-war building block- and working-class neighbourhood, IJplein/Vogelbuurt are partly pre-war building blocks and 70s buildings. These neighbourhoods are also characterised by two large green area's; the Noorderpark (park) and Vliegenbos (forest). Tuindorp Buiksloot, Nieuwendammerdijk/Buiksloterdijk and Tuindorp Nieuwendam are mainly working-class neighbourhoods, and Noordelijke IJ-oevers West and Oost are identified as business area with an increasing share of high-rise buildings (Kleerekoper, 2016; Kleerekoper et al., 2018; Klimaateffectenatlas, 2022a). The pre-war building blocks are mostly

characterised by closed urban blocks, 3 or 4 floors, in some areas greenery (*Figure 7*) (Kleerekoper et al., 2018). 70s buildings are characterised by single-family homes, courtyards and wide public green strips around the neighbourhood (*Figure 8)*. Working-class neighbourhoods are characterised by 2 or 3 floors, single-family homes a limited public greenery (*Figure 9*). These neighbourhoods are also recognised for their cultural-historical value (Gemeente Amsterdam, 2016). The buildings in these neighbourhoods are mostly owned by housing associations (Gemeente Amsterdam, 2021b), however an increasing number of these houses are privately owned (Interviewee M3). Business areas are characterised by companies (*Figure 10*), and high-rise neighbourhoods are characterised by more than 10 floors and building in grids (*Figure 11*) (Kleerekoper et al., 2018). These homes are a combination of private and housing associations (Interviewee M3).

**Figure 7.** Pre-war building blocks in Volewijck (left), IJplein/Vogelbuurt (right)

**Figure 8.** 70s buildings IJplein/Vogelbuurt

**Figure 9.** Working-class neighbourhoods Nieuwendammerdijk/Buiksloterdijk (left), Tuindorp Buiksloot (right)



**Figure 10.** Company areas in Noordelijke IJ-oevers West (left), Noordelijke IJ-oevers East (right)

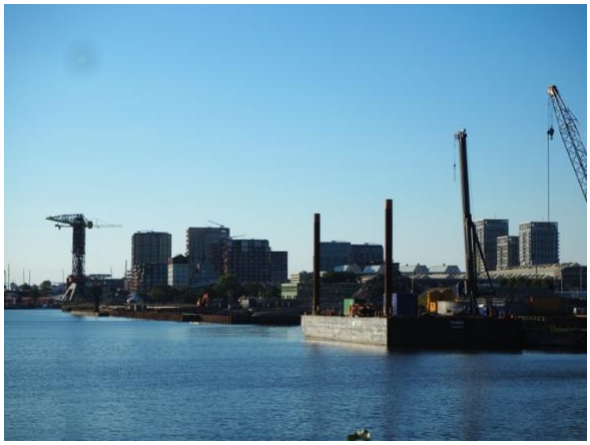



**Figure 11.** (Construction of) high-rise buildings in Noordelijke IJ-oevers West

Due to the development within new neighbourhoods, older neighbourhoods experience changes as well, as the population increases, currently relative quiet neighbourhoods will become more crowded, and character of the neighbourhoods change (Interviewee MN7, Interviewee M2). There is often a division recognised of citizens who have lived within the area for decades (old Noorderlingen) and relative new citizens (new Noorderlingen). These groups also have different characteristics, such as background and culture (van de Kamp, 2018; van de Kamp & Welschen, 2019). Old Noorderlingen are often recognised to be 'working-class', 'authentic', 'survivors' and to 'speak their minds', where new Noorderlingen are identified as 'pioneers', 'creative professionals', 'youngsters who buy houses' (van de Kamp & Welschen, 2019). The reasons why old Noorderlingen chose for the area are disappearing or at least less present, elements such as quietness, a lot of greenery and space (Interviewee MN6). The culture difference sometimes leads to challenges in collaboration (Interviewee C1), although many organisations, initiatives and companies try to create an atmosphere and conditions where the collaboration is enhanced (Gemeente Amsterdam, 2019b; Interviewee C2, Interviewee LC1, Interviewee LC2). The approach to enable local changes also often differs between the old and new Noorderlingen. Interviewee MN4 mentions that new Noorderlingen often offer help and as a result get more help from others, such as the municipality. The differences in approach could have various reasons, one of which is the social challenges faced mostly by old Noorderlingen (Interviewee MN1, Interviewee MN4).

Oud-Noord is facing various challenges, both social and environmental. The neighbourhoods Volewijck and IJplein/Vogelbuurt are recognised to be some of the most vulnerable neighbourhoods of Amsterdam, neighbourhoods Tuindorp Nieuwendam and Tuindorp Buiksloot are recognised to be vulnerable as well (Gemeente Amsterdam, 2019a; van Zelm et al., 2022). These neighbourhoods, especially the most vulnerable, face problems like poverty, health issues, unemployment, low literacy,

poor quality housing, lonely elderly and inequality of opportunity for youth (Gemeente Amsterdam, 2019a, 2019b; van Zelm et al., 2022). This results in a limited resilience of the citizens of the area (Gemeente Amsterdam, 2022b) and could potentially lead to limited participation in or focus on climate adaptation, as people have other things to worry about. Values, knowledge, risk and culture compose potential societal limits to adaptation (Adger et al., 2009). Furthermore, the maintenance and development has lagged in Amsterdam Noord for a relatively long time (van Zelm et al., 2022). As a result, there is a continuous under achievement compared the rest of the city in many domains, such as street and greenery maintenance (van Zelm et al., 2022; Interview F, Interview G). This relates to the available budgets for (maintenance of) greenery, which are relatively limited in Noord (Interview C), resulting in less greenery for climate adaptation.

Besides societal challenges, Oud-Noord has several climate challenges as shortly explained in *3.2.1*. The main identified climate challenges for Amsterdam and specifically Oud-Noord, are drought, heat stress and water nuisance (Amsterdam Rainproof, 2019; Gemeente Amsterdam, 2020). Flood risk is appearing to be very low for Amsterdam Oud-Noord although widely present in the Netherlands (Klimaateffectenatlas, 2021b; Trell & van Geet, 2019), it is therefore excluded from this analysis. A large part of Oud-Noord is coping with soil subsidence (*Figure 12*) because of drought (Klimaateffectenatlas, 2021a; van Leeuwen & Sowter, 2019). This can lead to rotten poles of houses and buildings. The risk is based on the percentage of wooden poles in a neighbourhood and drought (Klimaateffectenatlas, 2021c). The risk is moderately in the neighbourhoods Volewijck, IJplein/Vogelbuurt and Tuindorp Nieuwendam, low in Tuindorp Buiksloot, Nieuwendammerdijk/ Buiksloot and parts of Noordelijke IJ-oevers Oost. In the other neighbourhoods it is very low. In addition, Oud-Noord is coping with heat stress, which can have negative influence on human and animal health. It is mapped according to the experienced temperature, as this represents the exposure to heat (De Nijs et al., 2019). Experienced temperature is used as an indicator of the impact of heat on human health and is viewed as a good method to indicate heat stress. *Figure 13* shows there are multiple neighbourhoods and streets that experience high temperatures and therefore this is recognised to be a challenge in Oud-Noord. Another challenge is water nuisance, increasing extreme rainfall in combination with paved area makes cities vulnerable, leading for example to great run-off as water cannot drain directly (Amsterdam Rainproof, 2017; Koop et al., 2017). Pre-war building blocks are known to be vulnerable to water nuisance, working-class neighbourhoods and high-rise buildings are recognised to be a bit less vulnerable and company areas have usually limited vulnerability (Kleerekoper, 2016). *Figure 14* shows the bottlenecks and risk areas for damage caused by water nuisance; therefore, all neighbourhoods should pay attention to water nuisance limitation. These climate challenges show the need for climate adaptation in Amsterdam Oud-Noord, stakeholders who act upon these climate challenges in Oud-Noord are identified in the next sub-chapter.

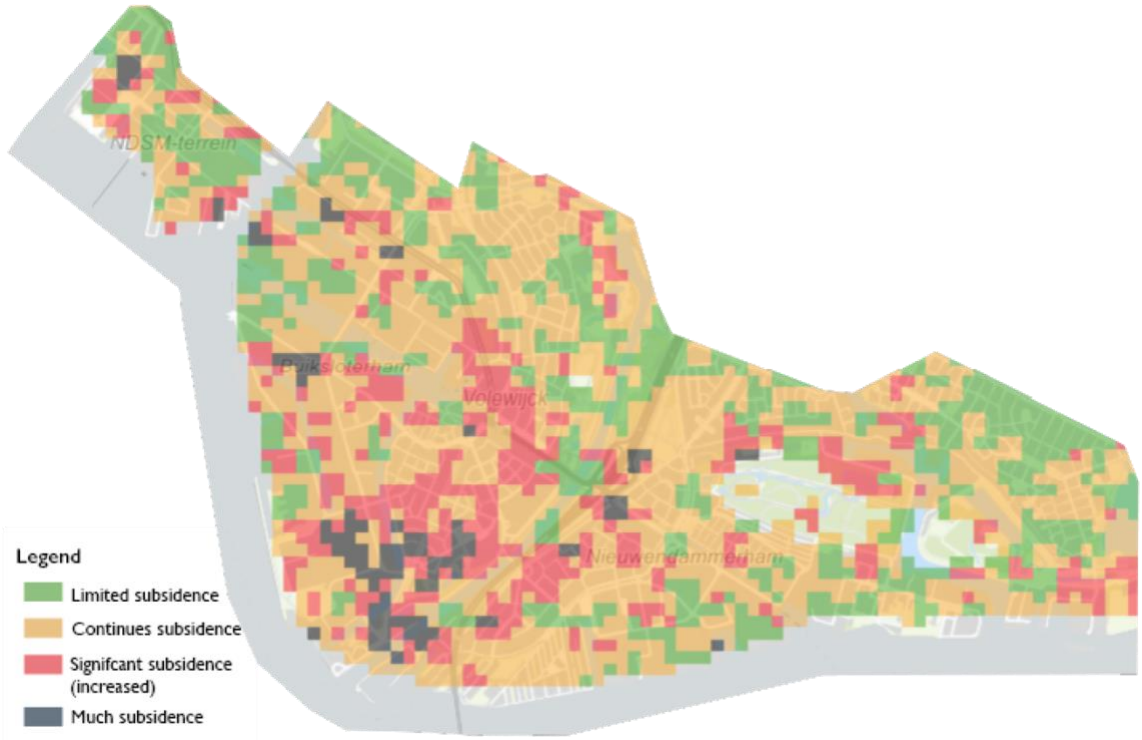



**Figure 12.** Soil subsidence Amsterdam Oud-Noord (Klimaateffectenatlas, 2021a)


**Figure 13.** Heat stress Amsterdam Oud-Noord (Klimaateffectenatlas, 2022b)

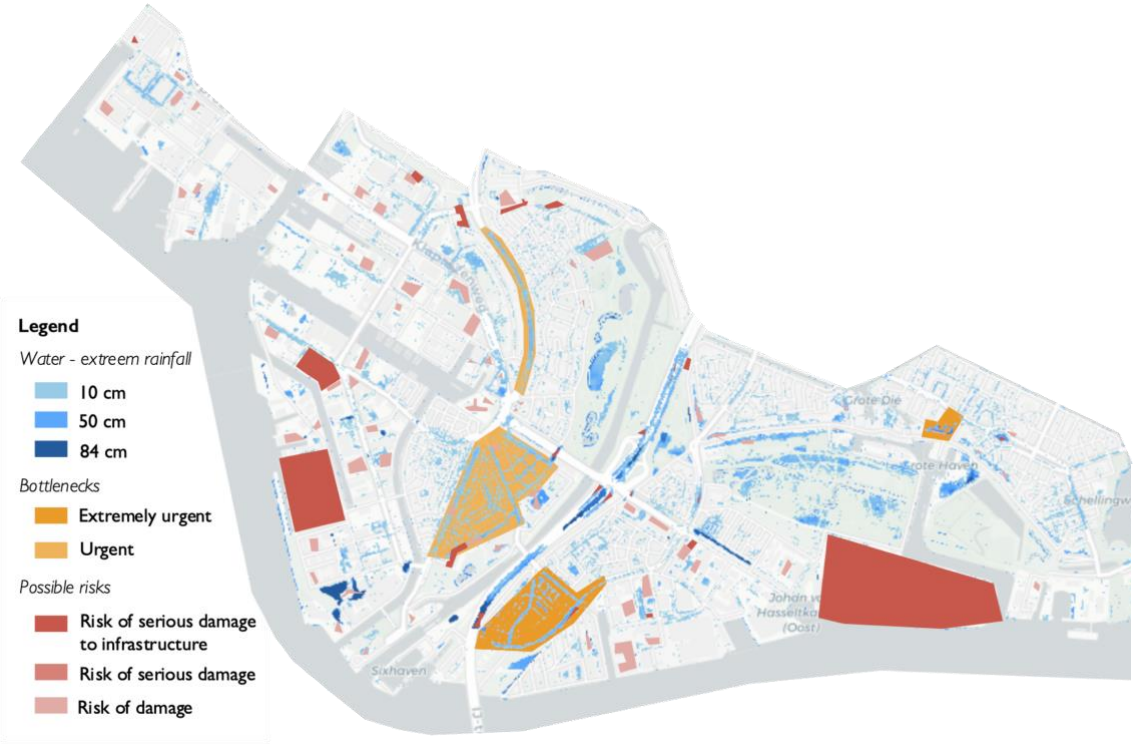



**Figure 14.** Water nuisance Amsterdam Oud-Noord (Amsterdam Rainproof, 2017, 2019)

## 4.2 Climate adaptation stakeholders

Different stakeholder groups are identified whom act upon the, previously explained, most pressing climate change challenges for Oud-Noord; drought, water nuisance and/or heat stress. Some stakeholders are focused on district Noord or Oud-Noord both perceived as local, and stakeholders who have a wider focus but also include (Oud-)Noord. The identified groups are the municipality, private sector and non-governmental organisations (NGOs), cultural organisations and institutions, action groups, and citizens (*Figure 15*). For each stakeholder group, an overview is provided of the active stakeholders, examples of their actions and adaptation output (as explained in *Table 1*). Before explaining the stakeholder groups, some context is provided on policy from the national government, which influences municipalities policies and actions.

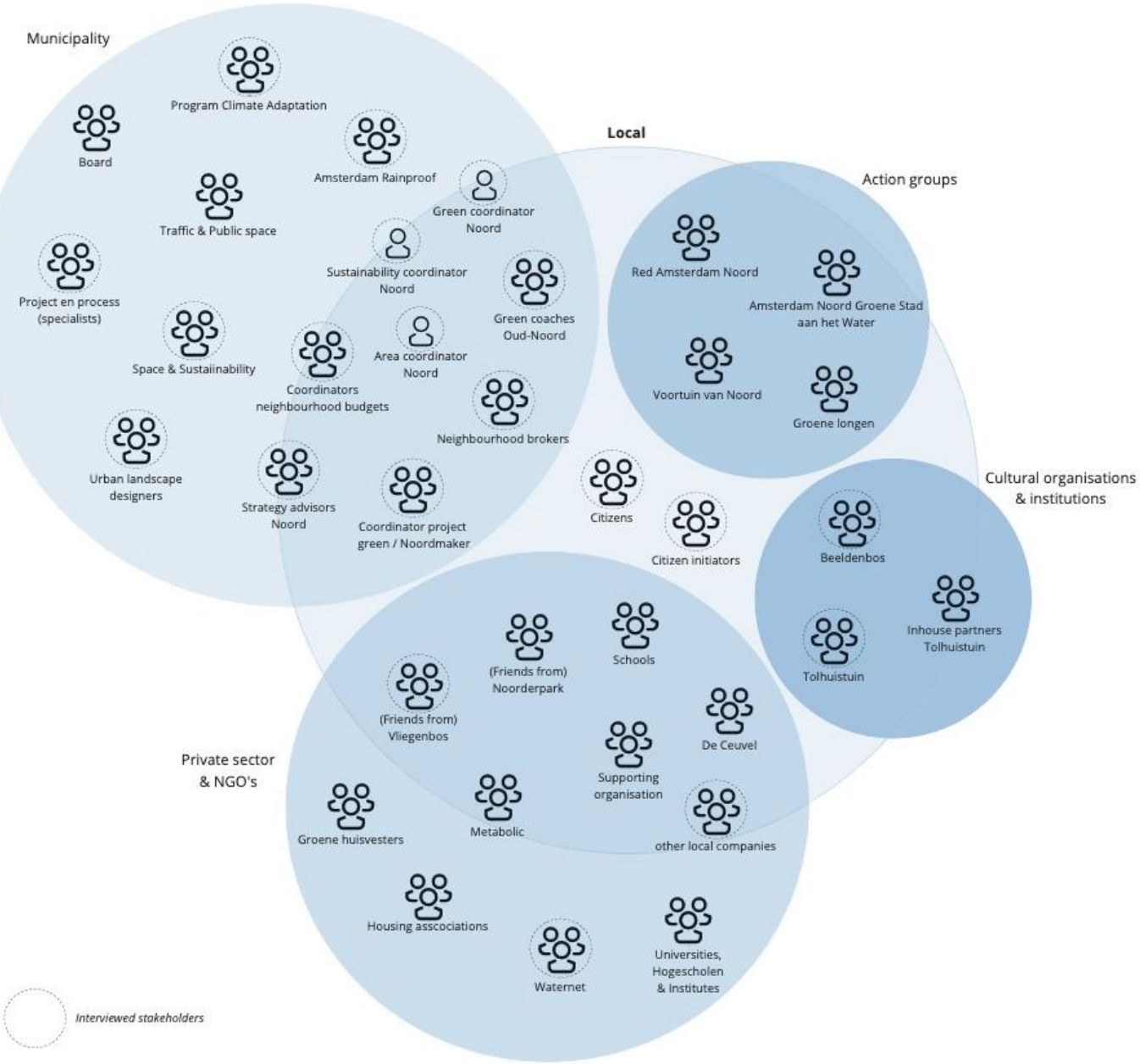



**Figure 15.** Identified and interviewed stakeholders in climate adaptation in Amsterdam Oud-Noord

## National government

The national government has created two main approaches to put climate adaptation on the agenda. Firstly, the 'Nationale Klimaatadaptatiestrategie' (NAS) (national climate adaptation strategy) was created in 2016 (Ministerie van Infrastructuur en Milieu, 2016). This is a national strategy for climate adaptation, providing insights into the most pressing climate change risks, impact analysis and objectives based on the most urgent climate challenges. It is accompanied by a perspective for the future of climate adaptation, 'Nationaal perspectief klimaatadaptatie', which elected three points of importance; 1) act upon urgent climate risks such as heat, drought, built environment and infrastructure, 2) connect to other transitions and societal challenges, and 3) invest in long-term knowledge and monitoring systems (Ministerie van Infrastructuur en Milieu, 2020).

Secondly, the national government created the 'Deltaprogramma' (delta programme), which is a nationwide strategy to protect the Netherlands against flooding and water nuisance and ensures a sufficient supply of freshwater. The national, provincial and municipal authorities and water boards have the joint ambition to make the Netherlands as climate-resistant and water-resistant as possible by 2050 (Ministerie van Infrastructuur en Waterstaat et al., 2021). This strategy must be part of local policies by 2020. Part of the Deltraprogramma is the 'Deltaplan Ruimtelijke Adaptatie' (delta plan spatial adaptation), aims to make the Netherlands resilient to extreme weather conditions (Waterstaat, 2020). Municipalities, water boards, provinces and the central government all stated they must work together to limit the consequences of climate change as much as possible. The government articulates they must work together with the private sector, as they deem everyone is needed for creating climate-proof cities. The Delta Plan includes an action plan with concrete actions and measures. The first step is to provide insight into the consequences of climate change, flooding, heat stress, drought and water nuisance through stress tests (Amsterdam Rainproof, 2022b; Waterstaat, 2020).

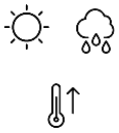
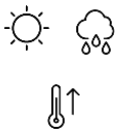
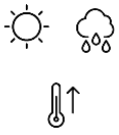
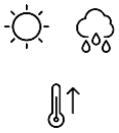
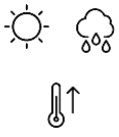
A related administrative agreement for climate adaptation was signed in 2018, which enabled budgets to act accordingly (VNG et al., 2018). Furthermore, discoveries are done on variations for national reporting on climate adaptation, which is line with and required by the European Climate Law and related policies (Ligtvoet, et al., 2021). These policies and legislation show mainly legislative adaptation outputs for the national government, they do act in other adaptation outputs, but these are not considered in this research. Within the national government, various actors are active, but will not be further included within this research as it exclusively focusses on local stakeholders. The national policies do however partly indicate the reason for local action of municipalities.

## Municipality

As a public entity, the municipality has set climate adaptation on their agenda, adhering to the national strategy. Multiple organisational instruments are used to enable climate adaptation, by a variety of municipal stakeholders, the most dominant ones are shortly explained. Amsterdam was part of the national 'City Deal Climate Adaption', a national aim to connect the government, municipalities, knowledge institutes and the private sector (City Deal Klimaatadaptatie, 2016). This deal puts climate adaptation to the attention of decision makers in Amsterdam. The municipality has created a strategy for climate adaptation, indicating what is currently done and where more adaptation is needed; which has led to the creation of an implementation agenda on climate adaptation (Gemeente Amsterdam, 2020, 2021a). The strategy and implementation agenda were both realised through the effort of, amongst others, Programma Klimaatadaptatie, department space and sustainability and collaboration with water boards related to Amsterdam. The strategy is aimed at 2050, but the implementation agenda is only till 2030. A more long-term strategy was formulated 'Structuurvisie Amsterdam 2040 – Economisch sterk en duurzaam', which touches upon climate adaptation related topics. Furthermore, in 2021 a rainwater collection rule (Hemelwaterverordening) was adopted (Hemelwaterverordening Amsterdam, 2021), which was realised through various stakeholders within the municipality, amongst which Rainproof and Waternet (Interviewee M3, Interviewee PN3). Additionally, there are agendas for green and sustainability, which both are formulated by the municipal board and oversees a period of

four years (Amsterdam Rainproof, n.d.). Furthermore, the municipality has a plan for sewage systems and their role in water regarding water drainage, which is on importance for climate adaptation with increasing intensity of rain showers. Different departments within the municipality involve in climate adaptation and are responsible for topics where climate adaptation relates to, such as the mentioned departments. In addition, through the Programme Climate Adaptation and Rainproof (hereafter referred to as Rainproof), both relatively young municipal bodies as they are less than 10 years old (Interviewee M3, Interviewee M4). Besides the already mentioned stakeholders within the municipality, more stakeholders within the municipality are involved. *Table 6* indicates the identified most relevant non-district specific municipal stakeholders for Oud-Noord and their actions and adaptation output. It also shows the adaptation outputs differ per municipal stakeholder and mostly address all climate challenges. The addressing of climate challenges is mostly done directly with a focus on climate adaptation, but also indirectly through for example the redevelopment of streets including more greenery.

**Table 6.** Municipal stakeholders – actions and adaptation output

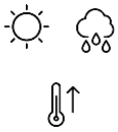
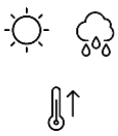
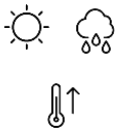
| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| Board | Set agenda for ruling period, create policies | Plan, legislation |  | (Gemeente Amsterdam, 2020, 2021a) Interviewee MN1, Interviewee MN6 |
| Programme Climate Adaptation | Enable pilot projects, educate and inform other departments, provide tools, stress outside municipality | Research, plan, training, advocacy |  | (Gemeente Amsterdam, 2020), Interviewee M3, Interviewee M4 |
| Rainproof | Activate, facilitate and create awareness, enable and participate in pilot projects, network creation | Research, network, awareness raising, training |  | (Gemeente Amsterdam, 2020, 2022d), Interviewee MN1, Interviewee M3 |
| Department traffic and public space | Decision making on public space | Plan, implemented change |  | Interviewee MN1, Interviewee MN6, Interviewee M1, Interviewee M2 |
| Department space and sustainability | Decision making on space and sustainability aspects | Plan, implemented change |  | Interviewee MN1, Interviewee M2 |
| Urban landscape designers | Designing of public space, sharing knowledge with colleagues | Implemented change, advocacy |  | Interviewee M1 Interviewee M2 |

*Note. Climate challenge meaning:*  *= drought,*  *= water nuisance, and*  *= heat stress*

Districts in Amsterdam have their own board, managing their own district and representing the district within the wider municipality. Within each district are areas with their own agenda,

focussed on challenges which are specific for this area. On the contrary to other areas in Amsterdam, the municipal area agenda for Oud-Noord does not directly mention priorities of climate adaptation or sustainability (Gemeente Amsterdam, 2019b). Interviewee MN6 mentions that climate adaptation might not be explicitly mentioned for the local municipal agenda but is embedded in connecting neighbourhoods and citizens. Moreover, there are multiple municipal-led greening projects taking place within the area, partly through the guidance of neighbourhood budgets, which are citizen initiatives financed by the municipality. Each year approximately €53.000 is used for sustainability and green initiatives and projects (+-20% of the neighbourhood projects) in Oud-Noord (Gemeente Amsterdam, 2022a, Interviewee MN4). Various employees of the local municipality work on climate adaptation, *Table 7* shows the most relevant identified stakeholders, and the variety of adaptation outputs. The local municipal stakeholders address different climate challenges, which is done mostly indirectly through for instance actions related to greenery.

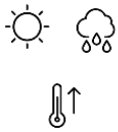
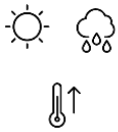
**Table 7.** Municipal district Noord and area Oud-Noord stakeholders – actions and adaptation output

| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| Sustainability coordinator Noord | Gathering information of various sustainability actors, connecting networks | Research, network |  | Interviewee MN1, Interviewee M2 |
| Strategy advisors Noord | Advice board on challenges, heat stress | Research, plan |  | Interviewee MN6 |
| Coordinator project green/ Noordmaker | Think along with citizens, help citizens with green projects | Legislation, network |  | Interviewee MN1, Interviewee MN7 |
| Area coordinator Noord | Advocating for green required by citizens within municipality | Research, plan |  | Interviewee MN5 |
| Neighbourhood brokers | Helping citizens to find information about tile removal, green, subsidies | Research, networks, advocacy |  | Interviewee MN5, Interviewee MN4 |
| Coordinators neighbourhood budget | Subsidising citizen led greenery projects | Training, networks |  | Interviewee MN8 |
| Green coordinator Noord | Realising and maintaining green, sharing gardening knowledge | Research, plan, networks, awareness raising, implemented change |  | Interviewee MN2 |
| Green coach Oud-Noord | Help citizens realising green, sharing knowledge of gardening | Training, implemented change |  | Interviewee MN1, Interviewee MN3 |

## Citizens

As briefly explained in *4.1* the citizens of Amsterdam Oud-Noord can be recognised as either old or new Noorderlingen. In this research the citizens of Oud-Noord are viewed to be one stakeholder group, as both appear to be active in climate adaptation (Interviewee MN4, Interviewee PN1, Interviewee LC2), and as this research strives for inclusion and not potentially create division among citizens. Nonetheless, it is important to consider the difference of needs and resources between citizens. The identified most relevant citizen stakeholders 'groups' are identified in *Table 8*; these are grouped as there are many individual and citizen parties active in climate adaptation but identifying them separately would not do justice to the representation. The adaptation outputs and addressed climate challenges differ per citizen stakeholder, mainly difference in individual action takers.

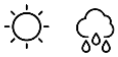
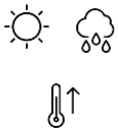
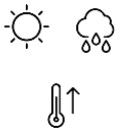
**Table 8.** Citizen stakeholders – actions and adaptation output

| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| Citizens | Maintenance flower beds/green in own street, tile removal, installing rain barrel, sharing ideas with neighbours | Awareness raising, implemented change |  | (Anonymous visitor community centre, personal communication, June 8, 2022; Anonymous visitor local market, personal communication, June 15, 2022), Interviewee MN1, Interviewee MN4, Interviewee MN7 |
| Citizen initiators | Initiating (innovative) ideas, developing plans, funding actions, idea sharing, initiating/ maintaining greenery, sharing knowledge, helping others realising projects | Research, plan, networks, awareness raising, training, advocacy, legislation implemented change |  | (Anonymous visitor community centre, personal communication, June 8, 2022), Interviewee MN1, Interviewee M2, Interviewee C1, Interviewee C2, Interviewee PN1 |

## Private sector and NGO's

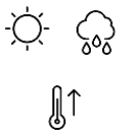
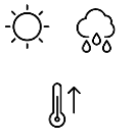
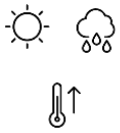
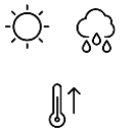
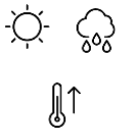
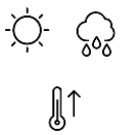
Various actors in the private sector and NGO's, in and outside Oud-Noord act in climate adaptation within Oud-Noord. First the non-local organisations and companies are discussed. Waternet is recognised as an important stakeholder in water related climate adaptation, both on regional, city- and local level. Since most housing in Oud-Noord is owned by housing associations (Gemeente Amsterdam, 2021b), housing associations are important stakeholder in enabling its residents to live in a climate adaptive environment. Groene Huisvesters is an organisation who helps to realise climate adaptation in and around houses, also for housing associations (Interviewee M3). Universities, Hogescholen and research institutes are monitoring pilots and researching climate adaptions (Interviewee M3, Interviewee M4), for example monitoring is taking place regarding water drainage in Noorderpark (Interviewee M2). *Table 9* shows the identified relevant stakeholders of non-local private sectors and NGO's, showing the adaptation outputs differ per stakeholder.

**Table 9.** Non-local private sector and NGO stakeholders – actions and adaptation output

| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| Waternet | Enable and participated in pilot projects | Research, plan, network, legislation, implemented change |  | (Gemeente Amsterdam, 2020), Interviewee M2, Interviewee M3, Interviewee PN3 |
| Housing associations | Renovating courtyard gardens with increasing number of trees | Implemented change |  | Interviewee M2 |
| Groene Huisvesters | Improve climate adaptivity of gardens and homes | Implemented change |  | Interviewee M3 |
| Universities, Hogescholen, research institutes | Research on climate adaptation and monitoring | Research |  | Interviewee M3, Interviewee M4 |

Within Amsterdam Oud-Noord, the following private sector and NGO stakeholders are identified; local organisations Vliegenbos and Noorderpark govern green areas, supporting organisations like Flora 4 Life who help citizens to realise climate adaptation around their home, and companies like De Ceuvel and Metabolic who work on sustainability and adaptive solutions. Local companies, such as BEE-agency, who do not work within climate adaption but make effort to make their environment more green by starting initiatives together with neighbours (Interviewee C1, Interviewee PN1). Various schools are including climate change and adaptation within their educational programme and make their playing areas more climate adaptive (de Voogt et al., 2021; Interviewee M3). Nonetheless, there remain schools who transform their playing areas but do not include green or other climate adaptation (Interviewee MN1, Interviewee LC1). In addition, local private sectors, NGO's, cultural organisations/institutions, and action groups together declared Natuurgebied Noord, a manifest that states that Amsterdam Noord is a nature reserve and people should treat it accordingly (Tolhuistuin, 2021). This declaration was signed by over 90 local parties to show they support the movement and approve and desire a more environmental and indirectly more climate adaptive environment (Interviewee LC2). *Table 10* shows the identified relevant stakeholders of local private sector and non-governmental organisations. The adaptation outputs of local organisations and companies differ strongly, however, they all implement change. Almost all stakeholders address all climate challenges, some do this directly through for instance the development of sustainable techniques and others indirectly by increasing greenery.

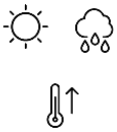
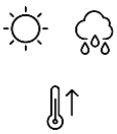
**Table 10.** Local private sector and NGO stakeholders – actions and adaptation output

| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| De Ceuvel | Sustainable techniques and experiments, sharing knowledge, creating climate adaptive terrain | Research, networks, awareness raising, training, legislation, implemented change |  | (Grayson, 2018; Ortner, 2020; J. Schaap, personal communication, April 14, 2022) |
| Metabolic | Developing and researching with local companies such as De Ceuvel | Research, training, implemented change |  | (Metabolic, 2013; J. Schaap, personal communication, April 14, 2022) |
| Vliegenbos | Maintain public green, increase qualitative green | Plan, networks, awareness raising, advocacy, implemented change |  | Interviewee MN7, Interviewee PN2 |
| Noorderpark | Maintain public green, increase qualitative green | Advocacy, implemented change |  | Interviewee MN1, Interviewee M2 |
| Supporting organisations | Enable citizens and organisations to take action | Training, implemented change |  | (Anonymous visitor community centre, personal communication, June 10, 2022; Anonymous visitor local market, personal communication, June 15, 2022), Interviewee C2 |
| Schools | Removing riles, greening schoolyards, educating | Awareness raising, implemented change |  | (de Voogt et al., 2021), Interviewee MN8, Interviewee LC1 |
| Local non-climate related private sector/NGO | Initiate and/or act in local greening | Plan, implemented change |  | Interviewee MN4, Interviewee C1, Interviewee PN1 |

## Cultural organisations and institutions

Amsterdam Oud-Noord has a wide cultural scene and many creative hubs (van Zelm et al., 2022). A selection of these organisations and institutions focusses on or pay attention to the changing climate and climate adaptation. Beeldenbos and Tolhuistuin are local cultural organisations who are active in climate adaptation. Additionally, inhouse partners from Tolhuistuin are mentioned in local climate adaptation as well, for example Impact Makers, Climate Cleanup and Stichting Wijsneus (Interviewee S). The Impact Makers created, together with other cultural stakeholders such as Tolhuistuin, Warming Up a statement from the cultural sector about the climate crisis and a Warming Up festival (Impact Makers, n.d.), to stress the importance of a liveable environment, containing elements of climate adaptation. Climate Cleanup pioneers in sustainable scalable climate solutions (Climate Cleanup, n.d.), and Wijsneus organised activities for children where they learn about acting in a more sustainable manner (Interviewee LC2). *Table 11* indicates the identified local cultural organisations and institutions related to climate adaptation. It shows cultural organisations/institutions' adaptation outputs are awareness raising, possibly combined with other outputs. The climate challenges addressed are mostly heat stress and water nuisance, both directly and indirectly, and drought is mostly addressed indirectly by for instance raising awareness on water collection.

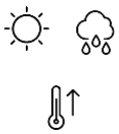
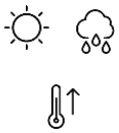
**Table 11.** Cultural organisation/institute stakeholders – actions and adaptation output

| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| Beeldenbos | Maintaining and planting greenery, education children about nature and art, information centre, green roof | Networks, awareness raising, implemented change |  | (B. van der Kamp, personal communication, June 30, 2022), Interviewee LC1 |
| Tolhuistuin | Developing cultural programmes related to climate, lobbying for Natuurgebied Noord, maintain own green area, educate visitors, connect artists and variety of visitors | Research, plan, networks, awareness raising, advocacy, implemented change |  | Interviewee MN1, Interviewee LC2 |
| Inhouse partners Tolhuistuin | Developing cultural programmes related to climate, educate children | Awareness raising |  | (Climate Cleanup, n.d.; Impact Makers, n.d.) Interviewee LC2 |

## Local action groups

Various local action groups are active in Amsterdam Noord, mostly focussing on the district and not only the area of Oud-Noord. The action groups were created out of dissatisfaction with, in the first place, the large and rapid developments in Noord (Amsterdam Noord Groene Stad aan het Water, n.d.; Red Amsterdam Noord, n.d.; Voortuin van Noord, 2019). The rapid changes influence the liveability of the citizens and the greenery strongly, these are therefore climate adaptation related topics they enable networks for to lobby for change. *Table 12* indicates the most relevant local action group stakeholders. These indicated local action groups are mainly acting in network and advocacy outputs and addressing various climate challenges indirectly through their advocacy and lobbying regarding, for instance, greenery.

**Table 12.** Local action group stakeholders – actions and adaptation output

| Stakeholder(s) | Examples of actions | Adaptation output(s) | Addressed climate challenge | Source |
|---|---|---|---|---|
| Red Amsterdam Noord | Lobby for inclusion (in sustainability), improved public space | Network, advocacy |  | (Red Amsterdam Noord, n.d.), Interviewee MN1, Interviewee MN6, Interviewee M2, Interviewee LC2 |
| Groene Longen | Lobby for protection of green areas | Network, advocacy |  | Interviewee MN5, Interviewee LC2 |
| Amsterdam Noord Groene Stad aan het Water | Lobby for liveability, green and water | Network, advocacy |  | (Amsterdam Noord Groene Stad aan het Water, n.d.), Interviewee C2, Interviewee LC2 |
| Voortuin van Amsterdam | Advocation for blue-green area instead of high-rises | Network, advocacy |  | (Voortuin van Noord, 2019), Interviewee C2 |

## Missing stakeholders

During the interviews, interviewees were asked if and whom they experience to be missing, hereby an overview of perceived missing stakeholders is given. This does not necessarily mean these stakeholders are missing in climate adaptation, but they are not (always) visible for other stakeholders. The perceived missing stakeholders are presented in *Table 13*. For some stakeholders a small explanation is given, as interviewees provided more context to their perception of missing. The housing associations are recognised for doing some climate adaptation, but interviewees mention they should do much more (Interviewee M2, Interviewee M3). Some citizens are missed, as they are not able to find their ways to the municipality, or do not have the means to participate (Interviewee MN2, Interviewee MN7, Interviewee M2, Interviewee C1). Interviewee MN1 mentions these citizens should be included, however, the expectation of what they are able to do considering their circumstances should be considered. Interviewee M4, contrasts this by stressing that for various climate adaptations early adaptors are present but cannot be expected to participate if the adaptations are not mainstreamed. Furthermore, Interviewee MN1 and Interviewee MN4 mention that everybody who is not mentioned as a stakeholder is missing, as everybody can contribute to climate adaptation either big or small.

**Table 13.** Perceived missing stakeholders

| Missed stakeholder(s) | By whom |
|---|---|
| Housing associations | Interviewee M2, Interviewee M3, Interviewee C2 |
| Real estate owners | Interviewee M3 |
| Architects and designers | Interviewee M2, Interviewee M3 |
| Companies | Interviewee MN5 |
| Citizens | Interviewee MN2, Interviewee MN7, Interviewee M2, Interviewee C1 |
| Neighbours | Interviewee C1, Interviewee PN1, Interviewee LC1 |

*Chapter 5*

# Governance capacities

This chapter entails the analysis of the climate adaptation governance capacities. First the governance capacities are identified per indicator, and simultaneously for each capacity an overview of its performance is given. Thereafter the governance capacities are evaluated and analysed to provide an overview of the governance capacities. This chapter aims to answers research question two.

*RQ 2: What is the current capacity of climate adaptation governance?*

## 5.1 Identifying governance capacities

The governance capacities are identified in the literature review and examined in the empirical study through interviews, as indicated in *Methodology*, through the analysis of the conducted interviews. The answers related to the capacities are scored according to the predefined levels of performance, as is presented in *Appendix C*. Each capacity, its conditions and their indicators are analysed, and outcomes are explained. Tables 14, 16, 17 and 18 provide overviews for the scores of indicators for each of the four governance capacities. The scores indicate an average for all stakeholders. The variation indicates the difference between stakeholders. The four sub-chapters entail the analysis of each indicator and provide an overview of the capacity's conditions.

### 5.1.1 Stewarding capacity

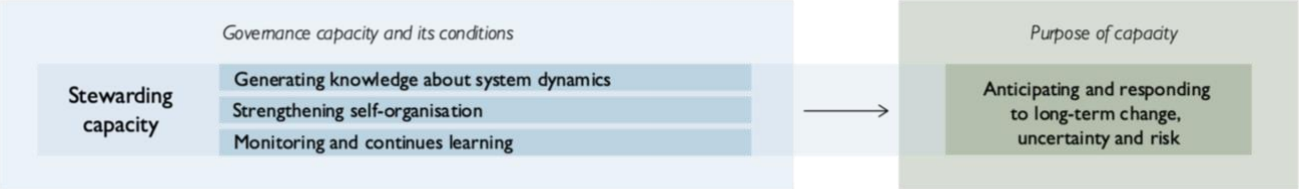



**Figure 16.** Stewarding capacity

#### Condition 1.1 Generating knowledge about system dynamics

Generating knowledge about system dynamics concerns *knowledge availability* of climate adaptation knowledge and *cross-stakeholder learning*. Climate adaptation knowledge concerns all knowledge related to climate adaptation, which enables anticipating emergent disturbances and uncertainties and identifying available options in light of these (Chapin et al., 2010; Hölscher, Frantzeskaki, & Loorbach, 2019).

##### a. Knowledge availability

*Knowledge availability* was analysed according to the access to and availability of desired information of a stakeholder and context specific knowledge, and contribution to knowledge generation (*Appendix D, Table 5)*. The interviews show that municipality of Amsterdam has many experts on a great range of topics related to climate change, from practical to theoretical experts, therefore they have substantial knowledge present within the organisation; *"Inhouse there are many ecologists and biologists, whom I contact for information. And I recently started a collaboration with a designer"* (Interviewee MN7), *"We have a lot of designers and other professions [within the municipality]"* (Interviewee MN3). Many of the interviewees who work at the municipality mention that knowledge is available knowledge and address that they can ask experts for advice. However, interviewee MN8 mentions not being able to find inhouse experts if connections are absent; *"Intranet does not have a proper colleague search function. For example, if you type in 'project leader', you do not get any results. While there are hundreds of them"* (Interviewee MN8). Even though the substantial knowledge is present, interviewees mention connections are predominantly made via their (colleagues) network. This indicates that the knowledge availability is encouraging but could be significantly improved.

Besides internal knowledge, interviewees working at the municipality gather knowledge and information from other stakeholders through collaborations in projects, networking events, training and social (media) platforms. Interviewees mentioned various methods and stakeholders: *"We have continuous conversations with the KNMI [weather institute] (…) and have networking sessions*

*with housing associations"* (Interviewee M3), *"Buurtgroen 020 is a platform of almost 100.000 people, where you can find connections and information"* (Interviewee MN2).

Local organisations and citizens acting in climate adaptation often have a background related to greenery, water or sustainability and/or great personal interest (Interviewee C1, Interviewee C2, Interviewee LC2); and experience to have knowledge and/or access to networks with related knowledge. This could suggest that taking leading action in climate adaptation is not accessible for all if not having a background or personal interest related to the previously mentioned topics. Nonetheless, not all local organisations have the desired knowledge themselves, but have access to news items, public research about climate adaptation topics and knowledge from neighbours (Interviewee C2). Some organisations, like Vliegenbos also conduct their own research, sometimes in combination with knowledge institutes. All interviewees mention they have affinity with the topic and therefore read and hear about climate adaptation regularly.

The access to the right channel of information can differ per person, depending on many factors like education, access to internet, being familiar with knowledge routes and prior knowledge (Schneider, 2008). It shows the importance to consider these factors when sharing information, as it has extensive influence on the knowledge availability. All interviewees mention they have access to relevant knowledge and mention they are familiar with how to access to this information. A selection of the citizens of Oud-Noord are recognised to be a vulnerable group regarding knowledge availability (Interviewee MN4, Interviewee MN5, Interviewee MN6), due to illiteracy, limited knowledge of Dutch language, health complication and/or other social challenges (van Zelm et al., 2022). Interviewee M3 mentions the importance of disseminating knowledge by making it easy to access and understand, to be able to reach all. Interviewee M3 illustrated how to learn from mistakes and improve knowledge availability: *"I had my flyers with my story ready, but citizens pointed out to me that I forgot that half of them are to some extent illiterate. Our flyer had too much text and did not speak to them at all. This was an important lesson for us. In Noord we must use more imagery to bring across information to citizens"*.

In short, all interviewees experience availability of knowledge and information about climate adaptation, and mention they can find and generate it themselves when deemed necessary. Nonetheless, interviewees also mentioned that others might not be able to find the same information. Prevented knowledge change or knowledge dissemination is the result of insufficient connections with stakeholders who possess relevant knowledge. Stakeholders could potentially act in a way that is better for climate adaptation if they had better access to information. Furthermore, it is noteworthy to address that most interviewees seem to have a personal interest or background in topics related to climate adaptation, as it appears to influence their ability to act in climate adaptation. Considering the perception of knowledge availability, an encouraging score (+) is granted, with a small variation.

### b. Cross-stakeholder learning

*Cross-stakeholder learning* was analysed according to the continuous learning among stakeholders, active exchange of knowledge others benefit from, and understanding of different perspectives (*Appendix D, Table 25)*. Cross-stakeholder learning takes place in many forms, between a wide variety of stakeholders. All interviewees mention learning from others and sharing (some of) their knowledge which they deem relevant for others, both on process and content, as can be illustrated by the following quotes: *"We learn from each other (…) so we share knowledge [between people who are active in gardening])"* (Interviewee MN2), *"We make use of each other knowledge and abilities. We are not the holy grail, so we share knowledge with each other"* (Interviewee M4.

Interviewees from the municipality state they learn from citizens through resident evenings, where they educate citizens on specific topics or show different possibilities for planned changes (Interviewee M1). During some resident evenings only insights are collected from citizens, and cross-stakeholder learning does not take place. Members from the municipality also mention that they rarely share knowledge with citizens specifically about climate adaptation during these evenings (Interviewee

MN4). Interviewee M2 clearly explained when actions are taken, particularly about greenery, citizens are easily convinced. Additionally, through networking events connections with other stakeholders are made, due to the exchange of knowledge and ideas and the opportunity to generate new ideas; *"Citizens and colleagues come to networking events, to see what is already taking place"* (Interviewee MN7) and *"We try to connect stakeholders who have expertise or ideas and create new ideas together"* (Interviewee MN8).

Despite recognising the importance of cross-sector learning, interviewees do recognise the barriers that limit knowledge exchange. Learning often occurs when individual connections are in place. Showing that cross-stakeholder learning between different disciplines can be improved; *"Sometimes cross-fertilisation could be a bit better"* (Interviewee M2) and *"That is an inconvenience, it [cross-stakeholder learning] is not well organised"* (Interviewee PN3).

Stakeholders who are one of a kind, such as Beeldenbos and Vliegenbos, find it more difficult to have cross-stakeholder learning with comparable organisations as they are one of the few city forests in the Netherlands: *"Not really [cross-stakeholder learning with similar projects], as others are sculpture gardens [not forests] and want to limit nature. They have other purposes and methods"* (Interviewee LC1).

Considering that all stakeholders experience cross-stakeholder learning to some extent, but leave room for improvements, it scores encouraging (+). The variation differs slightly per stakeholder, as some only learn within their discipline and others miss comparable stakeholders. Furthermore, not all stakeholders are continuously learning from others.

## Condition 1.2 Strengthening self-organisation

Strengthening self-organisation concerns *collaboration in knowledge and projects*. Stakeholders' self-organisation supports independent and flexible response to changes and disturbances (Garmestani & Benson, 2013; Hölscher, Frantzeskaki, & Loorbach, 2019). The self-organisation can be in collaboration and networks of climate adaptation or activities related to climate adaptation.

### a. Collaboration in knowledge and projects

*Collaboration in knowledge and projects* was analysed by considering communicating, sharing and co-creating knowledge with interested stakeholders, across multi-levels and sectors (*Appendix D, Table 26*). All interviewees mention to collaborate with multiple stakeholders, and mentioned collaborations are presented in *Figure 17*. *Figure 17* shows the mentioned collaborations between identified stakeholders, it indicates some stakeholders have more collaborations than others and collaborations exist both within and across stakeholder groups. There might be more collaborations between stakeholders that are not mentioned in the interviews, the figure is therefore not definite.

The municipality aims to collaborate across levels within its own organisation (Interviewee M1, Interviewee M2 Interviewee M3). Since the municipality consists of many departments all with their own knowledge, there are many internal stakeholders with possible different opinions and interests (Interviewee M1). To realise climate adaptation, collaboration within the municipality is of great importance. As previously mentioned in *Knowledge availability*, knowledge is shared between municipal stakeholders, as well as with other stakeholders. It shows collaboration of knowledge sharing. At different levels within the municipality, interviewees mention that they collaborate with other sectors. The collaborations can be in place to realise projects, co-create knowledge and/or projects, and/or improve the mutual understanding by sharing knowledge. For example, the interaction of the neighbourhood broker regarding climate adaptation, on the one hand with citizens and citizen/local initiators, and on the other hand with municipal bodies. This indicates collaboration across sectors and scales.

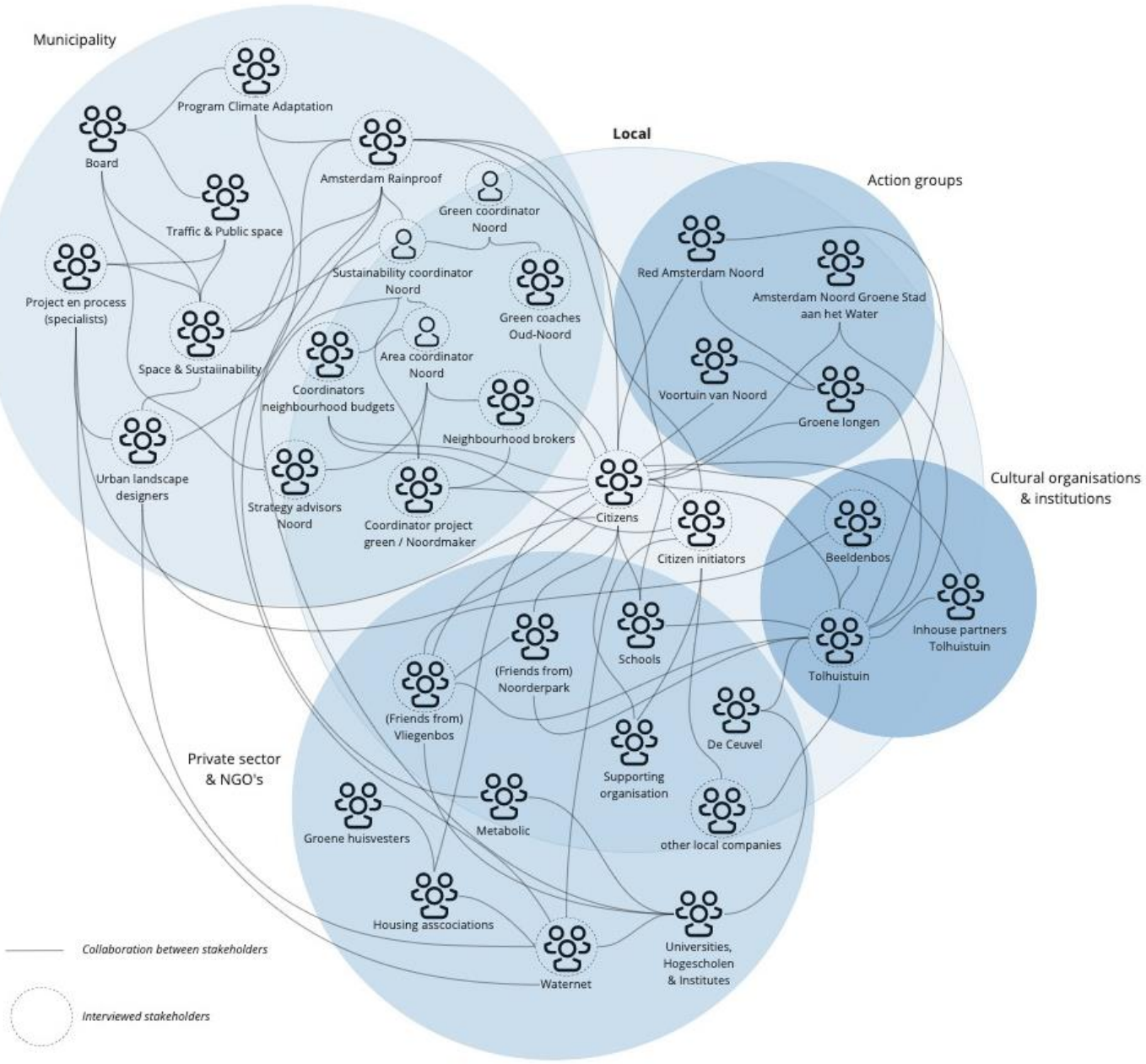



**Figure 17.** Identified collaborations between stakeholders

Non-municipal stakeholders collaborate both with municipal and non-municipal stakeholders (*Figure 17*). Collaborations are mentioned for sharing and co-creating knowledge and realising projects, often done through events, courses, expeditions, and activities. The declaration of Natuurgebied Noord is an example of collaboration of non-municipal stakeholders.

Collaborations can sometimes be challenging as multiple stakeholders are involved, with different opinions and interests, as discussed by several interviewees; *"Sometimes there are so many opinions that we still have not realised anything"* (Interviewee MN7) and *"Timelines can also differ strongly between stakeholders, which influences the collaboration"* (Interviewee C1). The perception and practise of long- and short-term goals and possible actions differ per stakeholder (Interviewee MN8), especially across multi-levels and scales. For example, goals from the municipality are often hard to align with individual goals from citizens or local organisations. Non-municipal organisations prefer to make rapid adaptations within their street or neighbourhood (Interviewee M3, Interviewee MN1), while municipal bodies aim to choose locations on a basis of greatest need and

efficiency in combination with other projects within an area (Interviewee M3). This sometimes leads to challenges in collaboration, as expectations differ.

The importance of communication, collaboration and co-creation is often mentioned by the interviewees; *"Many opinions slow the process down, as it is often complex and messy. But it is also of greater value and fits our modern way of governing better"* (Interviewee MN7) and *"[organising public green] you have to do it together"* (Interviewee PN1) are among answers given. Interviewees mention to do their best in collaboration and aim to find communalities instead of differences.

Besides mentioned collaboration, there is also disconnection as a result of poor collaboration. Several interviewees mention there is a disconnection between people from the municipality who maintain greenery (in the field) and citizens who planted greenery and/or want to maintain it themselves. This group green maintainers are characterised by their supervisors as often not having enough knowledge at hand to maintain greenery properly. Although this is recognised, supervisors mention the problem of understaffing and insufficient knowledge of the young people who join their teams, this problem originates in deferred maintenance as explained in *Chapter 4.1* (Chapin et al., 2010; Hölscher et al., 2019). In addition, between the old- and new Noorderlingen there seems to be a lack of collaboration (Interviewee M1). This is however not only in relation to climate adaptation (Interviewee C1), but climate adaptation might be a fruitful domain for collaboration as interviewees mention that new Noorderlingen often have more knowledge in finding support from the municipality and subsidies. Whereas as old Noorderlingen are recognised for their enthusiasm about greenery and some elderly for their knowledge about plants (Interviewee MN4, Interviewee MN7). Moreover, analysing *figure 17*, connections between municipal bodies and action groups appear to be missing.

Furthermore, the coordination and specific agreements in collaboration can be made clearer and more flexible within the municipality (Interviewee M2, Interviewee PN3). For instance, to make planting trees easier but also their removal when after 30 year the planned maintenance needs to be performed. Furthermore, interviewees mentioned some stakeholders should and/or could be more involved in climate adaptation, these are mentioned in *Missing stakeholders*.

*Collaboration in knowledge and projects* is scoring encouraging (+), with a small variation between the interviewees. All interviewees are collaborating with multiple other stakeholders. Some collaborate more on multi-level, others more cross-sectoral, and many aim to do both. Co-creation of knowledge is often taking place. There is however room for new and more elaborate collaboration, as some collaboration seem to be lacking or limited. The communication when collaborating is difficult to evaluate, but interviewees mention that projects can sometimes not be realised due to difficulty in collaboration. If the communication improves, this could potentially improve the collaboration as people develop greater understanding of other stakeholders.

## Condition 1.3 Monitoring and continuous learning

Monitoring and continuous learning concerns *institutional and social memory* and *smart monitoring*. Indicating learning from previous social and institutional events related to climate adaptation and smart monitoring of current climate adaptations. For facilitating a collective memory of climate adaption options and for climate adaptive management rules, monitoring and continuous learning are essential indicators (Chapin et al., 2010; Gupta et al., 2010; Hölscher, Frantzeskaki, & Loorbach, 2019). Thereby creating a response to learning what works and what does not (anymore).

### a. Institutional and social memory

*Institutional and social memory* was analysed by lessons drawn from past experiences, and continuously adapting plans, resilience and sustainability indicators (*Appendix D, Table 27)*. The interviews indicate interviewees to partly draw lessons from past experiences and adapting their plans.

An example of learning from social memory is given by many municipal interviewees from different departments, they mentioned that they look for referential projects and guidelines to learn from other projects and aim to find applicable solutions to include in their current activities and projects: *"We are developing 'Approach Noord', which is a masterplan with goals, similar to what is done in district South-East"* (Interviewee MN6) and *"Mostly look for comparable material, for example Rainproof street arrangements"* (Interviewee M2). Another example of learning from social memory is the carefulness of sharing new plans regarding greenery Noord, as this has proven to be a delicate subject for citizens within the area; *"Greenery is a delicate topic in Noord, if greenery decreases you can expect Noorderlingen to protest. We therefore consider this in the development of the main green structure"* (Interviewee MN6). Nonetheless, some people mentioned there is room to improve learning from existing projects and activities; *"We should be looking at other places within the city or the Netherlands. Look guys, this is a good example! And do it like them"* (Interviewee MN5) and *"Elderly know a lot about greenery and gardening, this is often not taught to younger generations. Where we lose knowledge and ability to maintain greenery – possible climate adaptive - areas"* (Interviewee MN2)

Particularly more executive departments within the municipality work according to manuals, which indicate steps to be taken and stakeholders to involve but also leaves room to check whether this is applicable (Interviewee M1, Interviewee MN3). This is not specific for climate adaptation measures, but for many greenery and water related practical procedures, and therefore indirectly applicable to climate adaptation actions. These manuals are made and adjusted in line with lessons learned within the department, showing there is room for institutional memory.

Municipal interviewees who work closer together with citizens mention they receive signals from citizens of things that have gone wrong in public spaces. They try to discuss and understand what should be improved, to incorporate this in future developments and performance. *"Buiksloterham for example, is a new neighbourhood with limited public greenery. Citizens complain about this and request a greenery budget"* (Interviewee MN7), this an example of a lack of memory. Public greenery is known to have positive influence on citizens and is important to include in neighbourhoods (Interviewee M2), this was hover not included in the original design of the neighbourhood Buiksloterham. At the same time, it leads to new institutional and social memory as this is now receives more attention within other new developing neighbourhoods (Interviewee MN3, Interviewee M2).

Neighbourhood-budgeting is also an example of institutional learning. There used to be incidental budgets for neighbourhood initiatives, which became a structural yearly budget as a result of great interest and citizen led solutions (Interviewee MN4, Interview MN6). A set budget is currently addressed for sustainability and greenery (Gemeente Amsterdam, 2022a), showing institutional learning.

Non-municipal interviewees aim learning from other projects and activities, for example through platforms like Buurtgroen 020 and connecting with stakeholders (Interviewee C1, Interviewee PN2, Interviewee LC2). Nonetheless, the social memory could be improved as interviewees experience, they are re-inventing the wheel, as similar situations might have taken place elsewhere (Interviewee LC1, Interviewee C2).

Even though many interviewees mentioned examples of institutional and social memory, there are also examples given where this could be improved. What indicates a variety between stakeholders. Regarding the alteration of plans according to the lessons learned, it is happening for some of the interviewees but not for all and not in all projects and activities. Therefore, the indicator scores encouraging (+). Since there is a variety to what degree stakeholders learn lessons and adapt their own plans, the variation between interviewees is wide.

b. Smart monitoring

Extensive monitoring of progress (towards goals), clear documenting and sharing of progress and outcomes were used to analyse *smart monitoring* (*Appendix D, Table 28)*. Only few interviewees are active in monitoring their climate adaptation and sharing of outcomes.

The interviewees suggested monitoring of projects is mainly done for pilot projects performed by (a collaboration of) the municipality, often Programme climate adaptation and Rainproof, research organisations and innovators (interviewee M2, Interviewee M3). Monitoring these pilots is mainly done on the effectiveness, replicability and needed conditions of the adaptations (Interviewee PN3, Interviewee M3). The effects of the pilots are aimed to be documented and shared with a greater public after completion. As availability of resources such as money and political momentum change over time, the feasibility and upscaling are often limited at the end of a pilot project (Interviewee PN3). These type of pilot projects related to climate adaptation often are not placed within Oud-Noord, as there is limited public space (Interviewee PN3). The advised changes and innovations of pilot projects are implemented in Oud-Noord (Interviewee M2) and thus indirectly affect Oud-Noord.

There are many pilot projects or pioneering projects taking place within Amsterdam Oud-Noord initiated by organisations, citizens, and companies (Interviewee C2, Interviewee LC1, Interviewee LC2). These projects are however not always monitored on their effects; *"We should start documenting. We are doing are best and working very hard. But we don't really have the time to start everything properly"* (Interviewee LC1), the effects of these adaptations are therefore more difficult to measure, document and share. Monitoring within the cultural sector seems to be complicated in general, thus also in relation to awareness goals in climate adaption; *"Accountability for subsidies or impact are difficult to measure. We try to make a difference, otherwise we don't experience it to be interesting at all"* (Interviewee LC2).

Climate adaptation activities, which are often related to the municipal department of traffic and safety, must adhere to certain estimates and are to that extent monitored (Interviewee M1). However, when alternations are placed, for example to reduce the nuisance of water in the Vogelbuurt, this is not monitored and no feedback is given to take into account elsewhere when making adjustments in the neighbourhood (Interviewee M2). This might be known to some departments, but is not well documented and/or shared with others.

There is discussion when monitoring should take place, as employees feel distrusted; *"There are discussions about monitoring. To be honest, why should my work be monitored, it feels like distrust. They should trust that I do my job properly"* (Interviewee MN2). Giving confidence to employees instead of officially monitoring is often more fitting, as the added value is expected to be less valuable than the discomfort experienced by employees (Mathew et al., 2016).

Considering the different climate adaptation actions, *smart monitoring* scores limiting (-). There is some monitoring of progress (towards goals), mainly in pilot projects and annual reports. However, limited documenting and sharing of progress and/or outcomes. The variation between actions is relatively wide, as some pilot projects are performing smart monitoring extensively, while other projects and actions lack monitoring completely. It could be noted that monitoring is more sufficient in some cases than in others, which will be elaborated on within the discussion.

## Overview stewarding capacity

This paragraph provides an overview of the scoring of stewarding capacity. The stewarding capacity scores mostly encouraging, except from smart monitoring (*Table 14*). Considering the indicator scores for stewarding capacity, anticipation and response to long-term change, uncertainty and risk is enabled to a certain extent.

The encouraging scores for condition *1.1 generation of knowledge about system dynamics*, indicate ability to anticipate to emergent disturbances and uncertainties, and availability of options to adapt. The ability to anticipate could be improved by enabling stakeholders who are less familiar or have trouble with finding knowledge. By enabling a wider variety of stakeholders and including more diverse backgrounds, more stakeholders would be enabled to act in climate adaptation (Chapin et al., 2010; Hölscher, Frantzeskaki, & Loorbach, 2019). Enabling continuous learning between stakeholders could be improved, as well as learning from new stakeholders. The current situation leaves the possibility for limited scopes and path-dependencies (Koop et al., 2017; Termeer et al., 2015), and room for more comprehensive evaluation (Brown & Farrelly, 2009; Koop et al., 2017).

Condition *1.2 strengthening self-organisation*, with encouraging *collaboration in knowledge and projects*, indicates independent and flexible response to changes and disturbances of climate adaptation. However, multiple new collaborations could be set up, and current collaboration could be improved. The communication within the collaborations could also be enhanced, although the current status should be further researched to understand what the challenges are.

Condition *1.3 monitoring and continuous learning* is split in encouraging *social and institutional memory* and limited *smart monitoring*. Results indicate learning from previous actions and projects, however in multiple cases lessons are not drawn hampering climate adaptation as improvements cannot be made (Hölscher, Frantzeskaki, & Loorbach, 2019; Runhaar et al., 2012). Limited *smart monitoring* makes it more difficult to identify threatening circumstances and underlying processes and forecast future developments. Clar & Steurer (2019) and den Exter et al., (2015) confirm the challenge of the realisation of monitoring. This will be further discussed in chapter *5.2.3 Overview of indicators*.

**Table 14.** Stewarding capacity scores

| Condition | Indicator | Score | Variation |
|---|---|---|---|
| 1.1 Generating knowledge about system dynamics | Knowledge availability | + | Small |
| | Cross-stakeholder learning | + | Small |
| 1.2 Strengthening self-organisation | Collaboration in knowledge and projects | + | Small |
| 1.3 Monitoring and continuous learning | Institutional and social memory | + | Wide |
| | Smart monitoring | - | Wide |

### 5.1.2 Unlocking capacity

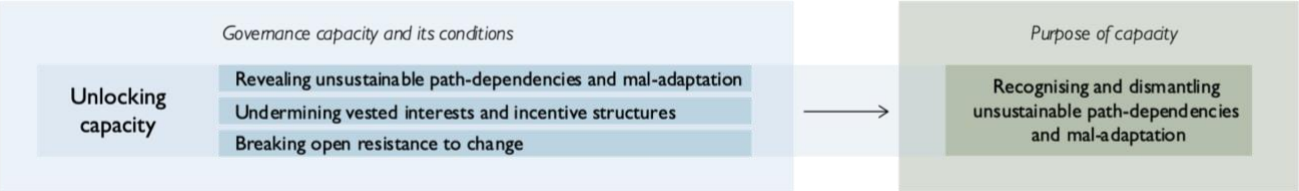



**Figure 18.** Unlocking capacity

## Condition 2.1 Revealing unsustainable path-dependency and maladaptation

Revealing unsustainable path-dependencies and maladaptation concerns the *identification and exploration of systemic drivers*. This proves insights in the conditions for revealing institutions, technologies and behaviours that need to be phased-out strategically (Hölscher, Frantzeskaki, & Loorbach, 2019; Meadowcroft, 2009).

### a. Identifying and exploring systemic drivers

*Identifying and exploring systemic drivers* was analysed by stakeholders' awareness of what drivers are for unsustainability, finding where climate adaptation is needed and if stakeholders experience they are able help others respond to these findings (*Appendix D, Table 29*). Many of the interviewees were able to discover at least some systemic drivers which are known nowadays. *Table 15* provides an overview of the shared identification and/or exploration of systemic drivers mentioned by interviewees. The task of identifying and exploring systemic drivers is taken seriously particularly by Programme Climate Adaptation and Rainproof, they view this as one of their priorities. These two municipal groups mention they aim to find the systemic drivers within the power of the municipality and make the stakeholders related to these systemic drivers aware so they can enable other stakeholders to respond to these findings.

Many stakeholders in climate adaptation act according to the known systemic drivers, which are mostly identified not identified by themselves. The acknowledgement of drivers for unsustainable practises within one's own environment, can be seen as recognition or discovery of systemic drivers within a specific environment. All who act in climate adaptation, for adaptation reasons, could therefore be recognised as being able to identify unsustainable systemic drivers. However, 'new' unsustainable systemic drivers are often discovered by researchers and/or in collaboration with researchers (Wolfram & Frantzeskaki, 2016), so discovery of drivers is mostly not done by interviewees but the identification and exploration in their own environments is done by all stakeholders.

Many interviewees are aware of systemic drives and are looking for unsustainable systematic drivers within their environment, acting accordingly. Nonetheless, many act in climate adaptation according to the identification and/or discovery done by others. Therefore, an encouraging (+) score is fitting for *identifying and exploring systemic drivers*. The way of identifying and exploring differs per interviewee and project, holding a wide variety.

**Table 15.** Identification and/or exploration of systemic drivers by interviewees

| Stakeholder(s) | Identification/exploration of systemic drivers | Source |
|---|---|---|
| Rainproof | Performing research to identify systemic drivers, such as solely paved areas or missing water catchment, and sharing outcomes with parties in- and out-side the municipality | Interviewee M3 |
| Programme Climate Adaptation | Performing research to identify systemic drivers and sharing outcomes with parties inside the municipality | Interviewee M3, Interviewee M4 |
| Urban landscape designer | Urban landscape architects recognised environmental and social challenges in existing neighbourhoods and identify the reasons for great heat and water stress. They try to enable changes such as more trees, and water storage and disposal options within their design. | Interviewee M2 |
| Citizens | Initiate self-maintenance of green areas, as they identify their street or neighbourhoods need to be greener, healthier and more climate adaptive | Interviewee C1, Interviewee C2 |
| Organisations | Initiate self-maintenance of green areas, as they identify their street or neighbourhoods need to be greener, healthier and more climate adaptive | Interviewee C1, Interviewee PN1 |
| Green coordinator Noord | *"It concerns nutrient richness, drought, moisture, sun and shade, wind or no wind, much or little tread. Those are all things you need to consider"* – recognising which elements are changing significantly due to climate change, and adjusting plant choices in line with | Interviewee MN3 |
| Strategy advisor Noord | The team of advisors provided the district with unsolicited advice about need for an integral approach for heat stress in Noord. As the advisory team received many signals leading to the discovery of heat stress as driver of many problems within Noord. Even though there are many systemic drivers behind this problem, it can also be seen a systemic driver for problems like illness and increase of electricity and water use. | Interviewee MN6 |

## Condition 2.2 Undermining vested interests and incentive structures

Undermining vested interests and incentive structures concerns the *support for sustainable business* and *room to manoeuvre*. It enables reducing the comparative advantage of doing business as usual in favour of new or emerging alternatives (Hölscher, Frantzeskaki, & Loorbach, 2019; Kivimaa & Kern, 2016; Koop et al., 2017).

### a. Support for sustainable business

*Support for sustainable business* was analysed by the availability of incentives and standards for sustainable investment and regulations to control unsustainable practices (*Appendix D, Table 30*). Many interviewees mention options for subsidies or incentives on climate adaptive activities, for many different types of climate adaptation; *"We make use of incentives, such as subsidies"* (Interviewee MN2), *"I want to discover to possibilities of subsidies, this would help my initiative to get off the ground"* (Interviewee C2) and *"Smart usage of collaboration and subsidies"* (Interviewee M4).

Interviewees mention different subsidies for organisations, companies, initiatives and/or citizens to enable their actions.

Furthermore, multiple interviewees from the municipality point at budgets with specific goals they can add to their original budget (Interviewee M2, Interviewee M3). Budgets for planting trees and green areas are mentioned as examples by the urban landscape designer. They also mention they are able to make use of these budgets as they are familiar with the routes and paperwork related to subsidies and requesting budgets. The familiarity to subsidy or budgeting routes appears to be of importance for all stakeholders who require budgeting (Interviewee LC2).

However, these subsidy pots are empty quite quickly, and therefore not incentivising or helping all who want to act in climate adaptation (Interviewee MN1, Interviewee MN5). The number of subsidies related to climate adaptation seems to be increasing according to the interviewees.

Moreover, interviewees do not point out regulations of control of unsustainable practices. Rainproof mentions they hope this will take place in the future. Regarding regulations for climate adaptation, many are in development. The rainwater regulation, which was recently implemented, shows multiple parties are discovering and using this method to incentivise stakeholders to act in climate adaptation.

Considering the often-mentioned subsidies but its limited access, budgeting for climate adaptive measures but is often not included in standard planning and upcoming development of regulations. S*upport for sustainable business* scores indifferent (0), with a wide variety. Since regulations come in place and some interviewees mention to have access to incentives for sustainable investment.

### b. Room to manoeuvre

*Room to manoeuvre* was analysed by the space for manoeuvring in different pathways, and access to skills, resources and means, and ability to manage risks (*Appendix D, Table 31*). The room to manoeuvre differs per stakeholder, to the extent that they desire different ways to manoeuvre and to what degree they can manoeuvre. Departments of the municipality with an executive role, and organisations who must adhere to specific standards experience relatively less room to manoeuvre in different pathways as they must adhere to standards from other parties (Interviewee M1, Interviewee MN3, Interviewee PN3). They do experience that they have the ability to place accents on some elements, but do not discover completely new pathways; *"There are a lot of possibilities within the set boundaries"* (Interviewee MN8). The green coordinator Noord and the urban landscape designer mention there is room to manoeuvre within their budget, but also, they should oblige to social and practical constraints such as not placing fruit trees (as it attracts rats and other vermin), safety measures, and plants that fit the environment. The sustainability coordinator Noord points out that extensive bureaucracy and complexity of the municipality reduces the room to manoeuvre. Noordmaker interviewee mentions she is sometimes limited in her room to manoeuvre as she does not have access to the desired advice, which indicates not having access to skills, resources and knowledge.

Citizens such as the ones who initiate greenery in front of their building, mention to experience great room to manoeuvre. They created two phases within the project to be able to adapt their plans, include opinions from neighbours and improve the plan. They found access to the neighbourhood broker and via him support from the municipality, they have a broad skillset themselves and experience ability to find different resources and pathways (Interviewee PN1, interviewee C1). Although, citizens are often restricted through restrictions made by others. As it is often the case with rental homes or office spaces, people are not allowed to make a façade garden, as owners are afraid it will reduce the value or quality of the building, and/or it will not be maintained long-term (Interviewee PN1, Interviewee C2). This decreases the room to manoeuvre for climate adaptive solutions for renters.

Cultural sectors mention they experience great room to manoeuvre as they feel not limited to many boundaries, they are able to organise a wide variety of activities and have a large network which then can use (Interviewee LC1, Interviewee LC2). Beeldenbos mentioned being bound to their official

purpose for the area, which has not led to limitation for climate adaptation thus far. The most dominant factors they experience to be missing are time and money, as further discussed in *Affordability*.

Public space is mentioned to be quite full, both above and beneath the surface, reducing the room to manoeuvre for many climate adaptive measures particularly in existing neighbourhoods (Interviewee M1, Interviewee M2, Interviewee MN4). An illustration, there are many limitations for placing trees due to underground construction and aboveground desires as parking space, roads and wide pavements.

Considering the difference in room to manoeuvre for interviewees, it can be stated that the variation is wide. Interviewees experience room to manoeuvre but are often limited in access to skills and resources, leading to an indifferent (0) score.

## Condition 2.3 Breaking open resistance to change

Breaking open resistance to change concerns *fostering willingness and awareness*. Breaking open resistance to change reduces support for business as usual, while increasing opportunities and awareness for alternatives (Hölscher, Frantzeskaki, & Loorbach, 2019; Koop et al., 2017).

### a. Fostering willingness and awareness

The present and perceived awareness raising, behaviour change enabling and assisting in behaviour change were used to analyse *fostering willingness and awareness* (*Appendix D, Table 32*). Municipal departments, except from Programme Climate Adaptation and Rainproof, are mostly focussed on executing climate adaption instead of raising awareness (Interviewee M1, Interviewee M3). Municipal employees not raising awareness refer to the municipal employees who are in contact with organisations and citizens to raise awareness, which is happening oftentimes. To illustrate, neighbourhood brokers mention they are not the ones who should be raising awareness as they operate demand-driven by requests from citizens. They believe community centres should pay more attention to climate change and climate adaptation related topics, as they are closer to the local citizens (Interviewee MN4). However, the community centre mentioned climate challenges are not the most pressing currently taking place within the neighbourhood (Anonymous volunteer community centre, personal communication, June 8, 2022). Even though many departments do not actively raise awareness, their alteration of public space could raise awareness as trespasser wonder why the area has changed (Interviewee M3, Interviewee MN3). The level of raising awareness is however not monitored and expected to be limited if there is no information given on site of the changed area (Koop et al., 2017). The interviewees mention they do raise awareness among their colleagues and collaborative partners (Interviewee M2, Interviewee MN7, Interviewee M4, Interviewee M3). For instance, the urban landscape designer tries to make his fellow landscape designers aware of their professional responsibility during meetings, focus groups and in casual conversations. The latter is mentioned by many interviewees, not only from the municipality, as they are passionate about the topic of climate adaptation or related topics, they discuss about this with people they encounter both within the personal and professional spheres. Through these discussions they experience raising awareness.

Furthermore, community manager Rainproof points out *"Urgency [of climate change and need for adaptation] must be experienced from time to time, I believe this contributes to people's awareness"*. She deems it necessary to share her knowledge, thereby first raising awareness before being able to adapt. Programme Climate Adaptation, Rainproof and sustainability coordinator Noord try to raise awareness among both municipal employees and citizens. They operate this through networking events, information markets, direct support and interaction with departments who could play a role in climate adaptation, share information with citizens in letters and/or pamphlets,

presenting information in areas that are made climate adaptive and trying to connect various stakeholders for collaboration (Interviewee M3, Interviewee M4, Interviewee MN1). In addition, their internal lobbying and information sharing enables behavioural change within the municipality, as they look for opportunities to incorporate climate adaptation within existing departments (Interviewee M3, Interviewee M4). Regarding citizens, they for example made it possible to remove tiles in front of a home and provide services to make façade gardens more accessible. This shows they are enabling behavioural change and trying to assist this change both internally and externally. Furthermore, the municipality tries to involve sceptics of climate change, to at least show them effects like heat stress, droughts, and nuisance, to show this group the necessity for adaptation independently of 'whatever the reason for this may be'; *"We do experience that the climate is changing – whatever the reason may be – and try to make citizens aware of this"* (Interviewee M4).

The cultural sector related interviewees explain they are mainly focussed on raising awareness, through various creative methods (Interviewee LC1, Interviewee LC2); *"For us it's very much about finding some kind of playfulness, to make people aware"* (Interviewee LC2). Tolhuistuin mentions they are to some extent disappointed that the cultural scene has not been able to teach society about the changing climate and its effects in the past. They do feel that their current attempts are effective, as artists speak up about climate change and visitors continue to react and interact with their climate related programmes. Thereby they are able to raise awareness with a wider public.

Initiatives, citizens and local organisations are active in raising awareness, through their collaboration and making visible what they have done; *"We made signs with QR-codes, to inform visitors"* (Interviewee PN2) and *"Talking about climate change and the effect of the adaptation raises awareness by neighbours"* (Interviewee C1) are among the statements given. Even though many citizens are not aware of the actions they can take, like tile removal actions, once people get in contact with neighbours who are aware they often get enthusiastic and (try to) realise it themselves as well (Interviewee C2, Interviewee M3).

Many interviewees mention to be active in raising awareness, and few interviewees enable behaviour change and even assist in this change. This leads to an encouraging score (+), with a small variation, as all interviewees are experiencing to raise awareness even though the extent and methods differ strongly.

## Overview unlocking capacity

This paragraph provides an overview of the scoring of unlocking capacity. The unlocking capacity indicators score indifferent/encouraging (*Table 16*). Considering the overall unlocking capacity, recognition and dismantling of unsustainable path-dependencies is not always present. Some actions to break open resistance, create opportunities and raise awareness for sustainable alternatives is present, however these could significantly increase.

The encouraging score of condition *2.1 revealing unsustainable path dependency and maladaptation*, indicates that some conditions are created for revealing intuitions, technologies and behaviour that need to be strategically phased-out. However, it is mainly done for widely recognised unsustainable pathways (cf. Hegger et al., 2017; Runhaar et al., 2012).

Condition *2.2 undermining vested interests and incentive structures*, scores indifferent. Thereby not fully enabling, but also not directly limiting reduction of comparative advantage of doing business as usual in favour of new or emerging alternatives. The limited subsidies schemes and budget constraints are recognised to be a challenge for enabling climate adaptation (den Exter et al., 2015). Regarding *room to manoeuvre*, some stakeholders mention being able to make small adjustments, but they do not discover new pathways. It does not necessarily have to be limiting, as long as adaptation is included within standard decision making (Colloff et al., 2017).

*Condition 2.3 breaking open resistance to change* scores encouraging. Suggesting some reducing support for business as usual and increasing opportunities and awareness for alternatives. It should be noted that not all interviewees are raising awareness and behavioural change or assistance in change is not present oftentimes (cf. Tompkins et al., 2010).

**Table 16.** Unlocking capacity scores

| Condition | Indicator | Score | Variation |
|---|---|---|---|
| 2.1 Revealing unsustainable path dependency and maladaptation | Identifying and exploring systemic drivers | + | Wide |
| 2.2 Undermining vested interests and incentive structures | Support for sustainable business | 0 | Wide |
| | Room to manoeuvre | 0 | Wide |
| 2.3 Breaking open resistance to change | Fostering willingness and awareness | + | Small |

### 5.1.3 Transformative capacity


**Figure 19.** Transformative capacity

## Condition 3.1 Enabling novelty creation

Enabling novelty creation concerns *leadership of opportunities for change*, *multi-actor innovation networks*, and *space for innovation*. The creation ensures space, resources and networks for developing and testing innovations (Frantzeskaki et al., 2012; Hölscher, Frantzeskaki, & Loorbach, 2019).

### a. Leadership of opportunities for change

*Leadership of opportunities for change* was analysed according to the ability to create and use opportunities, the presence of visionary agents, and setting goals and putting these on the agenda (*Appendix D, Table 33*). Interviewees who initiate climate adaptation actions all show certain leadership for change through their pioneering and innovative effort to realise change, regardless the size and effect of their effort. Their search and ability to create and use opportunities to organise collaboration and discover methods to operationalise their idea appear to be present or in development. Along with their ability to use opportunities and set goals have for many of these interviewees been successful to a certain extent or are still in progress. Examples are the declaration of Natuurgebied Noord, organisation of tile removal services, realisation and plans of greenery in streets, provision of unsolicited advice about heat stress, and putting climate adaptation on (municipal) agendas (Interviewee MN1, Interviewee MN3, Interviewee MN6, Interviewee M3, Interviewee M4, Interviewee C2, Interviewee LC2). The interviewee from Programme Climate Adaptation mentions to continuously revise their goals according to new findings within the field of climate adaptation and experiences within her work. She is one of the few interviewees who mention to have goals directly related to climate adaptation put on their agenda. Other interviewees mention climate adaptation is often related to their goals, if they have set goals at all (Interviewee PN2, Interviewee LC2, Interviewee MN7).

Interviewees who are not visionary agents themselves, or do not work within environments where these people are present, seem to experience less leadership of opportunities of change (Interviewee M1, Interviewee MN5). The interviewees are often more constrained by guidelines. However, they do mention they look for possibilities within their circle of influence and try to create opportunities in for example starting discussions.

Additionally, various interviewees mentioned differences for old and new Noorderlingen in their opportunities for change (Interviewee MN1, Interviewee C1). New Noorderlingen are recognised to be relatively able to find different and new pathways, create and use opportunities, and find ways to mobilise the municipality, companies and related to this enable resources (Interviewee MN4, Interviewee MN8, Interviewee C1). On the contrary old Noorderlingen are mostly mentioned in relation to being occupied with personal challenges and not having the ability to have concerns about public space and climate adaptation (Interviewee MN1, Interviewee MN4). This indicates a variation among citizens in leadership of opportunities for change.

Considering the interviewees aim to find and create opportunities for change, some mention to look for new opportunities showing presence of visionary agents, some are able to set goals and put these on the agendas, indicating an encouraging (+) score. There is strong difference among stakeholders, and therefore the score has a wide variation.

b. Multi-actor innovation networks

*Multi-actor innovation networks* was evaluated based on its presence and ability to facilitate collaboration for strategic and operational innovations, as well as involvement in communities (*Appendix D, Table 34*). Three main networks related to climate adaptation and connected to Oud-Noord are identified, network of Rainproof, network related to Natuurgebied Noord and the network via platform Buurtgroen 020. The networks include more stakeholders who are not presented as they are not part of this research. *Figure* 20 shows the identified networks and their involved stakeholders, some stakeholders are involved in one or more networks, while others are not part of any of the identified networks. The figure shows not all networks include the same stakeholders, and do not include several local stakeholders from the municipality, schools, and Beeldenbos.

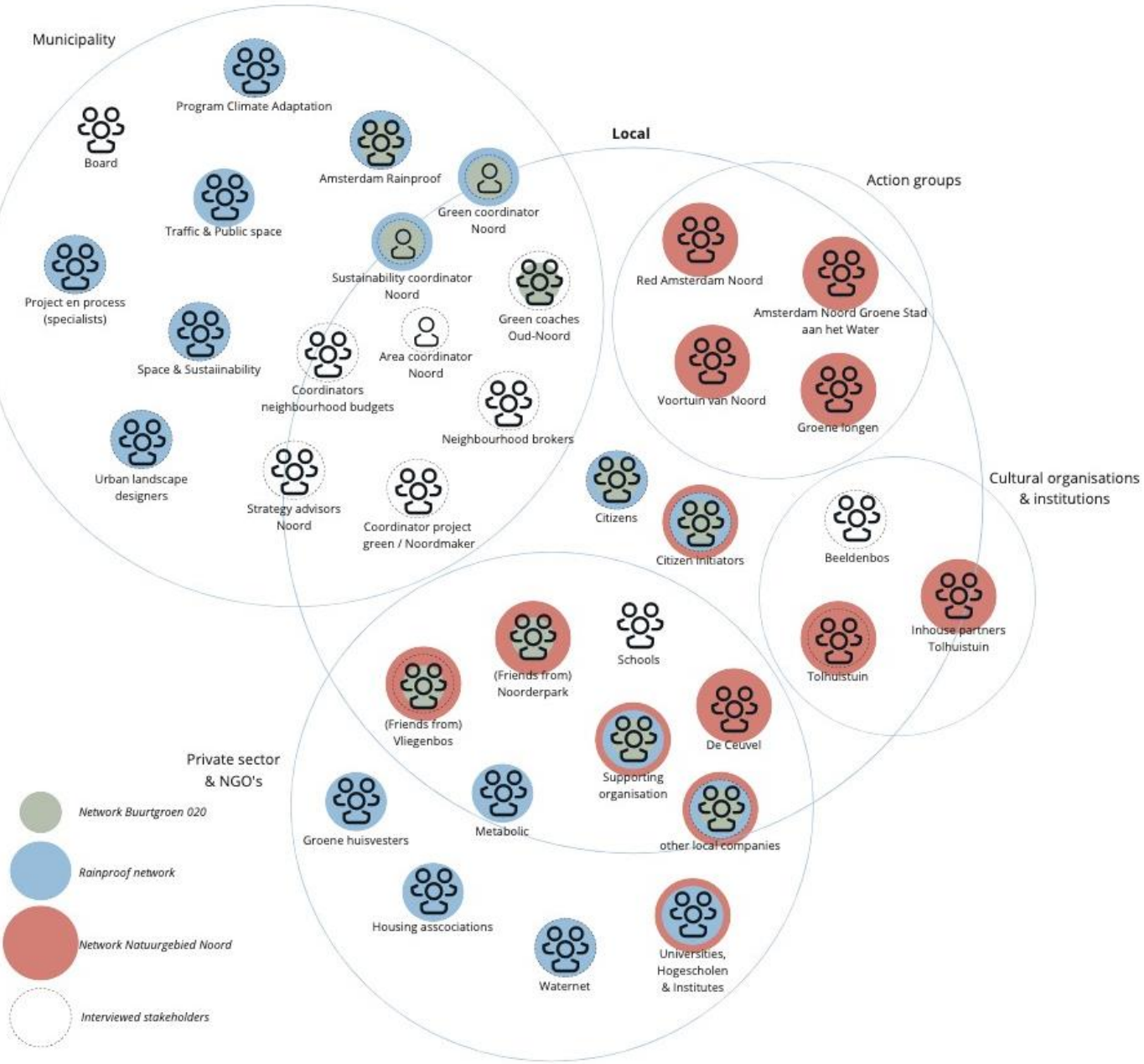



**Figure 20.** Identified parties of identified networks, based on interviews and (Amsterdam Rainproof, 2022a; Buurtgroen 020, 2022; Tolhuistuin, 2021)

Within the municipality the network approach by Rainproof can be seen as a multi-actor innovation network, as it aims to enable collaboration of a wide variety of stakeholders to realise and develop strategies for climate adaptation related topics (Interviewee M3). This network involves various professional communities as well as trying to engage and involve citizens (Interviewee M3, Interviewee M4, Interviewee PN3). Engaging communities is mostly established by including citizens in local projects and collaborating with local organisations and individuals (Interviewee M3, Interviewee C2). Interviewees of other departments and organisations confirm their collaboration with Rainproof; *"We collaborate a lot with our partner Rainproof"* (Interviewee M4) and *"With Rainproof, we make the water related climate challenges visible"* (Interviewee PN3). Nonetheless, not all departments or interviewees are linked to this network. Interviewees such as the manager of neighbourhood budgets and neighbourhood brokers do not have relations with this municipal body. This is due to the difference of focus, as they do collaborate with many others who are connected to Rainproof. However, it does not imply their involvement would not lead to strategic or practical innovations.

The declaration of Natuurgebied Noord shows another multi-actor network that enables an innovative strategy to show, communicate and raise awareness of the importance of nature within the area. *"We appointed Noord as a nature reserve in October last year, independently. It's a kind of manifesto that we set up with 90 different parties from Noord"* (Interviewee LC2). Through this declaration they hoped and enabled practical innovations, by activating people to act in line with behaviour appropriate to a nature reserve (Interviewee LC2). They want to make the area more climate adaptive by reducing paved areas, increasing greenery and handle water differently. This network shows involvement of many different types of local stakeholders including (resident) associations, companies, organisations, foundations, action groups, cultural institutions, and parks. Thus, involving communities within innovations. This network, however, seems to be missing a connection with governmental or municipal organisations. The collaboration of the network with governmental or municipal organisations could lead to greater innovation, as this would enable a legal, legislative and/or policy implementation of the desires of the network.

Another multi-actor network is Buurtgroen 020, which is not directly oriented on innovations but enables collaboration for (mostly greenery) operations within the area (Interviewee MN2, Interviewee C2, Interviewee PN2). If this network also enables innovations cannot be concluded from this research, this should be further researched to make such a claim. Buurtgroen 020 is also connected to the Rainproof network.

Considering the mentioned multi-actor networks and considering that many interviewees are connected to one or more of these networks, there is encouraging ability for enabling collaboration for innovation both strategically and operationally. These networks also actively involve communities, nonetheless, the effectiveness of the involvement cannot be concluded as result of this research. The score is therefore encouraging (+), with a small variation as the networks have different focusses but are similarly performing.

### c. Space for innovation

*Space for innovation* was analysed by space for innovation regarding time, regulations, financial and other needed space (*Appendix D, Table 35*). Innovation refers to discovery of new (or new to stakeholder) elements or ways of climate adaptation. Interviewees related to previous mentioned pilot projects, as they experience space for innovation regarding time, regulations and finances (Interviewee M3, Interviewee M4, Interviewee PN3). They also amplified on the importance of available knowledge of climate adaptation, which is considered in *Knowledge availability*. During the pilot projects these resources were not infinite but provided some room to explore with and within pilot projects. Nonetheless, if these resources would be in greater abundance, there would potentially be more pilot projects. The interviewee from Waternet also comments, that in the previous year's finances had been available, as municipalities did not want to economize during the past covid years. It will most likely

decrease in coming years, as sustainability budgeting is expected to decrease and there is the possibility of an economic recession. The affordability of the projects itself will be discussed in *Affordability*. The space for innovation related to pilot projects is not specific for Amsterdam Oud-Noord but for Amsterdam in general.

Regarding non-pilot projects, the space for innovation varies among interviewees of the municipality. Some interviewees mention to experience great space for innovation; *"In our work we are very open for innovation, most important is to get other stakeholders aboard"* (Interviewee M4), *"A lot [of space for innovation], to discover what would fit different organisations and stakeholders"* (Interviewee M3). While other interviewees mention to experience limited space for innovation; *"I expect them [project leaders and designers] to be innovative, it is not related to my task, I think it is their responsibility"* (Interviewee MN5) and *"I do not really experience space to experiment or innovate"* (Interviewee MN4). Interviewee MN3, green coordinator Noord, also mentions that for an innovative project in assisting citizens, time is limited. When he wants to proceed, he must do this in the weekend. In addition, the rainwater regulation shows space for innovation through the design of new regulations.

The Beeldenbos and Tolhuistuin experience to have great opportunity for innovation, which they believe is mostly generated by their creative ability. Beeldenbos mentions; if their innovations are within the regulatory boundaries of their area, they are able to innovate. Untill now they did not feel limited by this restriction. Innovation and space to innovate is present by the private sector, NGO's and citizens in Oud-Noord. Examples are circular and adaptive environment of De Ceuvel, innovation discovery and support of Metabolic, discovery of most adaptive forestry methods for Vliegenbos, and an individual who enabled placing water-permeable tiles (Interviewee PN2, Interviewee M3, Interviewee LC1). Furthermore, the area is perceived as an incubator for innovation due its available places and opportunities related to the area status of 'in-development' (Grayson, 2018). Space and opportunities are therefore relatively great compared to other areas within Amsterdam, this is not limited to Oud-Noord but refers to the entire district. Nonetheless, all interviewees mention if resources such as finances and time would be present in greater abundance, even more innovation would be possible.

The interviewees experience multiple options in space for innovation. Where pilot projects seem to be very encouraging, interviewees also mention limitations in time, finances and/or regulations. They do however experience some space for innovation within these restrictions. Therefore, an encouraging (+) score is granted, with a small variety.

## Condition 3.2 Increasing visibility of novelty

Increasing the local visibility of novelty concerns *local support* and *advocacy coalitions*. Increasing innovation visibility enables challenging dominant regimes and motivating wider acceptance uptake and replication (Frantzeskaki et al., 2012; Hölscher, Frantzeskaki, & Loorbach, 2019).

### a. Local support

*Local support* was analysed by the acceptance and appreciation of climate adaptation actions and the innovation stories at local level, and by the local support in creation and advocacy of climate adaptation (*Appendix D, Table 36*). The municipality tries to discover if projects are supported through citizen evenings, as previously mentioned in *Cross-stakeholder learning*, citizens could otherwise object and hinder planned changes (Interviewee M1, Interviewee MN4). Citizen initiatives are often initiated by few; therefore, it is important to check whether this is carried and accepted throughout the community (Interviewee MN4, Interviewee MN5).

Improvements and increase of greenery in the public space are mostly supported locally, as previously mentioned greenery is of great importance for citizens of Oud-Noord; *"Reactions are*

*really warming. And a lot of help was offered"* (Interviewee C2), *"Natuurgebied Noord is supported by over 90 local stakeholders"* (Interviewee LC2) and *"Yes absolutely! [experience local support]"* (Interviewee MN2). There are however exceptions, such as unwanted trees in areas where this limits citizens water view (Interviewee M1), and resistance to change of neighbourhoods mostly by people who have lived there for a long period (Interviewee PN1, Interviewee MN4). There are also citizens afraid of changes, which can limit or prevent changes, this is experienced by the initiator green in front of building and Vliegenbos. They mention, by including individuals and groups who were resistant they were able to include their views. This resulted in increased local acceptance and even appreciation and involvement in the execution of climate adaptive changes.

The action groups within Noord are seen as the spokespersons for the area, as argued by the interviewee from Tolhuistuin, other parties therefore expect they have great local support. Considering that involvement and worries regarding climate change and related actions are seen as a luxury (Interviewee MN4, Interviewee LC2), the positive alterations are supported by locals but whether it addresses climate adaptation might be of less concern.

In addition, multiple citizens experience cultural organizations to be elitist and feel distance from their actions (Interviewee LC2; Anonymous visitor local market, personal communication, June 15, 2022). This could potentially indicate that climate adaptation action organised or facilitated by organisations like Tolhuistuin and Beeldenbos are not always supported locally. Tolhuistuin, like other local organisations, tries to improve local support by involving local citizens in activities – thereby also achieving the goal to let people interact with the natural environment of (Oud-)Noord (and not leaving trash behind). Furthermore, interviewees mention clear communication is of great importance to improve local support. For example, Beeldenbos experiences difficulty as neighbours have different expectations due to incomplete communication. It could be of influence who presents the message and what status this person has within the local environment.

Considering the different experiences from interviewees, all changes experience some challenge in local support, but are mostly perceived positively with acceptance and often appreciation. Support in creation and advocacy is less evident but still present in several climate adaptation actions. *Local support* therefore is scored encouraging (+), as many initiatives and actions are initiated and acknowledged locally. Some local citizens do not feel connected to challenges related to climate change, however, when they experience it improves their environment, they are enthusiastic. The variation between interviewees experienced local support is wide.

### b. Advocacy coalitions

*Advocacy coalitions* was analysed through existing networking and collaboration to share novelties with multiple others (*Appendix D, Table 37*). The collaboration and networking to share novelties differs between the interviewees (see also *Figure 20*). The collaboration for Natuurgebied Noord shows strong networking and collaboration in sharing the new idea of a city area as a nature reserve and treating it accordingly. Furthermore, there seems to be a strong network with different greenery initiatives within Oud-Noord and near to Oud-Noord, greenery coach Oud-Noord mentions to also use this network in lobbying for certain innovative climate adaptive activities; *"Always lobby. With everyone together!"* (Interviewee MN2). The interviewee from Vliegenbos mentions to collaborate with parks in Amsterdam, she mainly acts within this collaboration to share novelties when one is stumbling upon problems. Although Vliegenbos is being part of multiple networks, she also mentions the sharing of novelties could be done more often.

The interviewee from Rainproof mentions to collaborate and join network events to increase visibility and enable future collaborations and novelties or practicalities in climate adaptation. But also mentions they would like to do these more often, since the covid-19 pandemic the networking events have been limited. Programme Climate Adaptation is very active in sharing novelties with different type of stakeholders, but not specifically in Oud-Noord. These and other interviewees mention collaboration with companies could be improved, as they could play an important role in climate

adaptation and collaborations for novelty sharing are limited. Considering *Collaboration in knowledge and projects* and *Cross-stakeholder learning*, there is a lot of potential for sharing novelties through networking and collaborating.

Considering the present networks and collaborations, but limited use to share novelties, *advocacy coalitions* scores indifferent (0), with a wide variaty between interviewees. As some interviewees mention to have great sharing of novelties and others experience this too be limited.

## Condition 3.3 Anchoring novelty in context

Anchoring novelty in context concerns *learning for replication and upscaling*, *institutional space and compliance*, and *affordability*. By anchoring innovations in existing or new (local) structure, cultures and practices, implications and lessons are made generalisable (den Exter et al., 2015; Hölscher, Frantzeskaki, & Loorbach, 2019).

### a. Learning for replication and upscaling

Identifying opportunities for upscaling and replicating climate adaptive activities, and mainstreaming it into urban practises, were used to analyse *learning for replication and upscaling* (*Appendix D, Table 38*). Many interviewees from various stakeholder groups often look for upscaling or replication; *"Our aim is to expand [the forest] as much as possible"* (Interviewee PN2), and *"Thinking small. Repeating these actions many times."* (Interviewee MN2) are among the statements made. The interviewee from Rainproof state replication and upscaling can be challenging, as they want the market to participate in providing the discovered adaptations, so they compete and make the innovation affordable. This often takes time, while innovations are preferably deployed faster to improve public space as quickly as possible.

Several interviewees mention they learn from projects, as knowledge gained in previous projects is applied in similar projects which could be seen as replication; *"I experience it all to be separate projects. As each public area has its own context, history and resistance from citizens. But I do think we take our internal [municipal] knowledge with us to future projects"* (Interviewee MN8) and *"It is mostly custom work, which makes replication difficult. But we learn lessons from previous projects"* (Interviewee M2) were statements made. Through knowledge sharing similar projects are organised elsewhere, using the input of existing initiatives and actions. This could also be recognised as replication by others and when this is done extensively it could even become a mainstreamed urban practise. An example of this is the tile removal actions, these have taking place in many areas in the Netherlands and are also getting local attention among citizens in Oud-Noord. Another example is a pilot by citizens to create public aquaponic systems, they are working on a plan how to replicate and upscale and hope to become a mainstream adaptation (Interviewee C1). This is however not realised, but the learning for replication does take place.

Only few interviewees mention they do not look for opportunities for upscaling or replicating, as they do not deem it feasible; *"I am not looking for that at the moment, I'll just see what happens"* (Interviewee C2), *"Upscaling is not needed, I think. This is a size we can handle"* (Interviewee LC1). Furthermore, stakeholders mention to learn from replication and/or upscaling, however, actually doing so is experienced to be difficult.

Many interviewees identify and explore opportunities for replicating and/or upscaling, for many interviewees this also takes place. However, the mainstreaming of the adaptations into urban practices is limited and is only mentioned by some interviewees. The indicator scores therefore encouraging (+), with a wide variation.

### b. Institutional space and compliance

*Institutional space and compliance* was analysed by the space for embedding strategic and operational innovations in mainstream practice, and respect and understand of agreements, objectives, and legislation by stakeholders (*Appendix D, Table 39*). The creation of Programme Climate Adaptation and Rainproof (both relatively young municipal bodies) show institutional space for mainstreaming climate adaptive innovations. Their actions aim for stakeholder discovery and inclusion, enabling respect and understanding of agreements, objectives and legislations (Interviewee M3, Interviewee M4). The rainwater regulation is an example of institutional space, as it mainstreamed the climate adaptive practise of rainwater collection. Another example of mainstreaming innovations through institutional services, acceptance and adjustment of regulations, is the tile removal and greening façade practise and related services.

According to the interviewee from Programme Climate Adaptation, an increasing number of departments and managements are incorporating climate adaptive measures within their standard procedures. Both within the municipality, but also through their collaborations with housing associations, business parks, initiatives and larger organisations. This is confirmed by various stakeholders within different departments and organisations (Interviewee MN1, Interviewee M1, Interviewee M2, Interviewee M3, Interviewee C1).

Furthermore, it is mentioned more often that politics play an important role in the institutional space and compliance, as each coalition decides what topics have priority for their term of office (Interviewee MN7, Interviewee M3, Interviewee PN3, Interviewee LC2). In the past four years, climate and sustainability were seen to be of importance and budgets were reserved (Interviewee M3). Starting July 2022, a new coalition started and their focus points and budgeting for climate adaptation will therefore be of importance for the level of space for embedding innovations (Interviewee PN3). When looking at local area plans, sustainability and climate adaptation are limitedly mentioned (Gemeente Amsterdam, 2019b). Although, this does not mean these are not included, the plans are often presented in relation to other challenges and plans of the neighbourhoods (Interviewee MN5).

Additionally, when climate change challenges are not greatly recognised within an area, for example when heat stress or water nuisance are not drawn as major challenges in an area, it is often difficult to enable institutions, but especially the municipality, to enable action (Interviewee MN1). Both strategic and operational innovations are in those cases difficult to realise. However, the areas that are recognised to have climate related challenges do experience extra attention. When these areas are redesigned climate challenges are considered. For example, a square in Volewijck had great difficulty with flooding and heat stress, this was included in the design by making the area greener (Interviewee M2).

Moreover, other organisations mention to experience space to embed their innovations and mostly feel other stakeholders at least respect their agreements and objectives. Stakeholders who act within climate adaptation themselves indicate to also understand most of these, for other stakeholders this is hard to identify. Although, the interviewee from Vliegenbos mentions to have founded a pedestrian association, through which she could reach out to council members to improve the respect of other stakeholders and embed strategic and operational opportunities in agreements and legislation. As an individual or via other routes she experienced less respect and understanding with municipal stakeholders for mainstreaming her activities.

Taking into the account the different perspectives and actions and their room for embedding of innovations both strategical and operational, and considering the respect and often understanding of agreements, objective, and legislation, *institutional space and compliance* scores encouraging (+). With a wide variation, as some adaptation activities experience great space, where other experience this to be indifferent or even limiting.

c. Affordability

*Affordability* is analysed through the accessibility of climate adaptation actions and stakeholders' willingness to pay (*Appendix D, Table 40*). The affordability is perceived differently by the interviewees, as all have different frames of reference. The willingness to pay also differs, depending on personal interest in the adaptation, availability of resources and perception. Time and money are often mentioned and seem to be limiting in all attempts for innovation, discovery and performance. Tolhuistuin mentions they always struggle with time, referring to limited staffing, but mention they resolve this problem by collaborating and therefore do not view it as limiting in affordability of their climate adaptation activities. Other interviewees also mention the understaffing as a limiting factor, especially within the municipality, which is partly related to the tight labour market (Interviewee MN3, Interviewee MN7, Interviewee MN8, Interviewee M1, Interviewee PN3, Interviewee LC1, Interviewee LC2).

Affordability through finances is perceived differently, action takers who can easily find subsidies experience the actions as more affordable (Interviewee LC2, Interviewee C1, Interviewee M2). Where actions, such as tile removal and replacement of plants for façade greening, are relatively cheap this can still be perceived as not affordable for all if citizens do not have this money to spend (Interviewee C2, Interviewee MN2). This is the case for a significant group within Oud-Noord. A resident explained that she guards a budget for her street, and sometimes provides neighbours with plants if they need it, when they have done something for their community. Through these local streams affordability is improved (Anonymous visitor community centre, personal communication, June 8, 2022).

Regarding other climate adaptation actions, many mention that if there would be more money available, they could reach out to a larger group regarding both awareness and practical climate actions. This suggests that affordability could be improved. Some interviewees referred to the influence of money; *"Big money always wins"* (Interviewee MN7) and *"Large sums of municipal money go to other districts like Centre and South"* (Interviewee M2). Suggesting their actions or non-money driven solutions are often a gesture or will not have the wanted effect. Nonetheless, interviewees acknowledge that the costs hamper, but will not stop them.

*Affordability* is encouraging (+) as many different stakeholders seem to have access to climate adaptation actions, although their size and effect might differ. Furthermore, the interviewees show they are willing to pay with their time or sometimes money. The variation among stakeholders is wide, as some interviewees experience great affordability whereas for few for few interviewees this seems to be indifferent.

## Overview transformative capacity

This paragraph provides an overview of the scoring of transformative capacity. The transformative capacity scores mostly encouraging, except from advocacy coalitions (*Table 17*). Looking at the overall transformative capacity, creation, visibility and embedding of innovations is enabled, to a significant extent. Hence contributing to climate adaptivity of Oud-Noord. It should be noted that the variation in transformative capacity among stakeholders is mostly wide.

Results show that the encouraging scores within condition *3.1 enabling novelty creation* indicates space, resources and networks for developing and testing innovations. Although, goals could be put more (directly) on agendas of stakeholders, and effectiveness of present networks remains to be unclear (cf. Birchall et al., 2021; Carter et al., 2015). Existing networks do not include all stakeholder types which could be improved, and even if interviewees are part of networks they do not always mention to collaborate. Furthermore, time and finances could be present in greater abundance to enable more space for innovations. These challenges are in line with previous findings (Runhaar et al., 2012; Trell & van Geet, 2019).

Condition *3.2 increasing visibility of novelty* is split in encouraging *local support* and indifferent *advocacy coalitions*. *Local support* is encouraging suggesting acceptance and appreciation of climate adaption action, and creation and advocacy at local level. Although, some citizens and organisations do not feel connected to climate adaptation and not directly supporting climate adaptations. Previous research recognises early adaptors to be active in and supportive of climate adaptation, while for other stakeholders embedding in structures is needed (Colloff et al., 2017; Koop et al., 2017). Moreover, indifferent score for *advocacy coalitions* shows networking and collaborations to share novelties is not present for all stakeholders. Many interviewees suggest this should be improved, recognising the importance of sharing novelties (Trell & van Geet, 2019).

Condition *3.3 anchoring novelty in context* scores encouraging, suggesting implications and lessons are made generalisable and better accessible for other stakeholders. However, mainstreaming of climate adaptation in urban practises is limited, understanding of agreements, objectives and legislation is not present with all interviewees or their stakeholders, these could be improved. In addition, interviewees affordability of climate adaptations is hampered by costs, some interviewees experience their actions are not affordable to the extent they desire. Interviewees are influenced by and dependent on organisations who provide money, influencing their perceived affordability. These limitations confirm previous findings (den Exter et al., 2015; Runhaar et al., 2018).

**Table 17.** Transformative capacity scores

| Condition | Indicator | Score | Variation |
|---|---|---|---|
| 3.1 Enabling novelty creation | Leadership of opportunities for change | + | Wide |
| | Multi-actor innovation networks | + | Small |
| | Space for innovation | + | Small |
| 3.2 Increasing visibility of novelty | Local support | + | Wide |
| | Advocacy coalitions | 0 | Wide |
| 3.3 Anchoring novelty in context | Learning for replication and upscaling | + | Wide |
| | Institutional space and compliance | + | Wide |
| | Affordability | + | Wide |

### 5.1.4 Orchestrating capacity

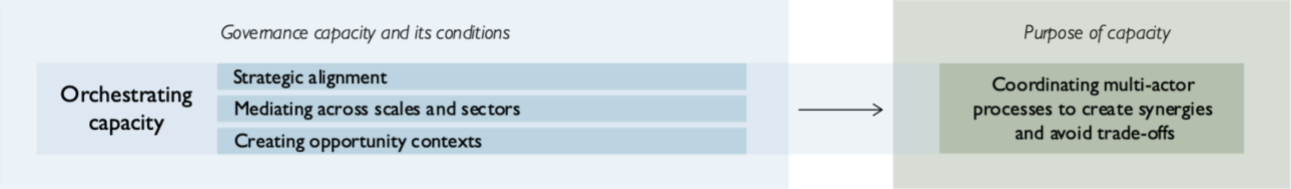



**Figure 21.** Orchestrating capacity

## Condition 4.1 Strategic alignment

Strategic alignment concerns *long-term and integrated goals*, *involvement for strategy/vision*, and *division of responsibilities*. Strategic alignment supports the formulation of shared and long-term goals towards which actions are oriented (Abbott, 2017; Hölscher, Frantzeskaki, & Loorbach, 2019; Koop et al., 2017).

### a. Long-term and integrated goals

*Long-term and integrated goals* were analysed through the presence of long-term integrated goals related to climate adaptation with various stakeholders. Along with embedded goals in discourse, meaning continues conversation with stakeholders to reach the goals (*Appendix D, Table 41*). Long-term goals have been set by the municipality in relation to climate change and needed transitions, as explained in chapter 4.2 paragraph *Municipality*. The Strategy Climate Adaptation Amsterdam refers to conversation with and within the city and aims for structural integration in operations and management (Gemeente Amsterdam, 2020). This indicates presence of integrated goals with various stakeholders and discourse embedding in these goals. As mentioned in *Institutional space and compliance*, these goals within the municipality are related to coalition periods of 4 years. The realisation of this goal through both short- and long-term projects, is therefore dependent on the performance of coming coalitions.

Some interviewed private sector/NGOs and cultural organisations have long-term goals, mostly focused on their own activities. Similar to the municipality, their goals are partly dependent on governing boards, which also fluctuates (Interviewee PN2, Interviewee PN3). Even when these organisations or the municipality do have goals, not all their employees might be aware of these and thus will not actively act upon them (Interviewee M2, Interviewee PN3).

Climate initiatives coupled to neighbourhood budgeting, mostly do not have long-term goals (Interviewee MN8). Which is recognised to be challenging for the initiators, as they prefer to see their effort is also worth in the long-term (Interviewee MN8). Financial and structural support is missing for these projects, nonetheless, as the initiatives differ strongly not all of them require this (Interviewee MN8, Interviewee C2, Interviewee LC1). However, other climate initiatives often do not have long-term goals, even though they work towards improving the environment, their focus is mostly short-term Interviewee C1). Which does not directly mean they do not work on long-term goals but is recognised to be easier compromised.

Many interviewees do not have long-term goals related to climate adaptation, or mostly focused on their own activities, with few exceptions. The goals which are present are mostly abstract on making areas more climate adaptive, without specifying how to do so. This shows there is wide variation between long-term goals and shows the integration of goals is often quite limited. Some goals are embedded in discourse; however, most interviewees did not indicate the origin of their goal (when existing). Therefore, *long term and integrated goals* scores indifferent (0).

### b. Involvement for strategy/vision

Involvement of multiple stakeholders in strategy/vision and the ability for stakeholders to speak and decide in clear and transparent engagement processes, were used to analyse the *involvement for strategy/vision* (*Appendix D, Table 42*). Interviewees from the municipality mention they receive input from citizens through various engagement methods to identify challenges which need to be tackled (Interviewee MN4, Interviewee MN5, Interviewee MN6). These are considered when designing areas, districts and city strategies and vision, for instance in placement of new greenery. Municipal interviewees mention they experience integration; *"How we deal with things internally, or what we consider to be important, is quite similar to residents. In terms of the needs, we have for a city and the future, we aren't that different."* (Interviewee MN8) and *"A big common denominator is making the city of Amsterdam and its surrounding area (…) safe and liveable in a financial bearable manner"* (Interviewee M4) are among the statements made.

Moreover, the interviewee from Rainproof mentioned to have had many conversations and meetings with multiple stakeholders, within the municipality, with companies, organisations and citizens, to understand their needs and gain knowledge, which led to inclusion in actions and strategies. Rainproof has done this mainly for rainwater thus far, but are developing this for other topics related to climate change as well (Interviewee M3, Interviewee PN3).

However, these methods of stakeholder involvement have their limitations. All citizens were allowed to participate within the aforementioned citizen engagement sessions, but often limited number of people show up (Interviewee MN4, Interviewee M2). Even though municipal interviewees experience inclusion, citizens often feel they are not heard, as they did not participate in the democratic process due to ignorance or as they were not able to participate (Interviewee MN7). People who did participate sometimes also do not feel heard, the interviewed Noordmaker explains this is often because these people do not understand the complete process, and do not feel they are heard when their opinion is not executed, while it is considered. This process is not specific for climate adaptation visions and strategies but do apply to projects related to climate challenges. The sustainability coordinator Noord points out that the municipality is not always clear during these meetings, it seems the participation checklists and policies are not always effectively used. This could be a reason for miscommunication with citizens.

Interviewees outside the municipality do not mention to involve other stakeholders actively in the creation of their strategy or vision. Most organisations however do mention to involve multiple and diverse people from their own organisation and often get inspired by goals from others, such as the municipality.

Considering the different interviewees and their involvement of multiple stakeholders in strategy and/or visions, an indifferent (0) score is given. Due to the encouraging involvement regarding municipal strategies/visions, but limiting involvement with most non-governmental parties, this also shows a wide variety.

### c. Division of responsibilities

*Division of responsibilities* were analysed by whether responsibilities are divided, understanding of responsibilities and expectations by stakeholders is present, and if there is communication of responsibilities (*Appendix D, Table 43*). The view on the division of responsibility differs. Some citizens, organisations and departments (within the municipality) believe the municipality and/or the government have the responsibility to handle climate adaptation and execute this (Interviewee MN1, Interviewee MN8, Interviewee M1, Interviewee PN3). Most interviewees mention the societal responsibility of each societal force; *"You have your responsibility. We have our responsibility. That is what we should execute"* (Interviewee PN3). The difference in the agreement is they feel responsibility to act in relation to the changing climate and/or improvement of the area, but not necessarily in climate adaptation. What the responsibility entails is not clearly defined, or not defined at all for most interviewees. Who (should) determine(s) responsibilities is not clear.

*"I do get the impression that this (climate adaptation) is a hot potato, which no one has really taken ownership of yet. The fear is that it will cost a lot. (..) the municipality has looked in a different direction for a long time or perhaps has not done the right things, so that it will now cost a lot of effort and resources. For the time being, no one wants to take that risk."* (Interviewee MN6)

Some agreements are made, for example, the municipality is held responsible for maintaining public space, and is held accountable. Nonetheless, they are not sued when not realising reduced heat stress, drought or flooding in the past. Waternet points out that they are responsible for drainage of 20mm rainwater, but if rainfalls are heavier, they point to the municipality who is responsible to make sure streets are not flooding through design of public space.

Regarding legislative responsibility for climate adaptation steps are being taken. The responsibility for collecting rainwater is also put with building owners, through the rainwater regulation which obliges owners of new buildings to collect and possibly hold a certain amount of rainwater (Interviewee M3, Interviewee PN3; Hemelwaterverordening Amsterdam, 2021). New buildings also must adhere to an increasing number of rules and regulations to build more climate adaptive, which relates to incorporate climate adaptation in new neighbourhoods (Interviewee M2; Ministerie van Infrastructuur en Milieu, 2016) and which is more and more considered in redevelopment of existing neighbourhoods.

Programme Climate Adaptation mentions to aim to enable and point companies to their responsibility in governing the area and circle of influence. Companies and business areas react differently to this, as there is no obligatory responsibility, but rather a personal responsibility (Interviewee M1, Interviewee PN1).

Recognition of responsibilities is visible in the maintenance of climate adaptions. The division in maintenance of green areas, either citizens, greenery maintenance service from the municipality or contractors is mostly clear (Interviewee MN3). There is however the relative short-term responsibility of contractors and citizens could stop their maintenance quite quickly, which could lead to degradation of the green spaces (Interviewee M2). This provides challenges for the municipal maintainers, as they are often the ones who should take over this responsibility (Interviewee MN3). Furthermore, not all citizens maintainers are aware of the intensity of their responsibility, including challenges of dry summers, gone for holidays or personal circumstances, which could lead degradation as well (Interviewee MN2, Interviewee MN3). Nonetheless, citizens who were interviewed and maintained green areas showed great responsibility and awareness of these challenges (Interviewee C2; Anonymous visitor community centre, personal communication, June 8, 2022).

Cultural organisations mention to feel the responsibility to educate the wider public about climate change and how to act adaptively through creative manners (Interviewee LC1, Interviewee LC2). Tolhuistuin makes this visible through their programmes, such as the Warming Up festival, and on their terrain (Interviewee LC2; Impact Makers, n.d.). Interviewees related to greenery specifically mention their personal affection with this and how they believe this improved the area (Interviewee MN2, Interviewee C1, Interviewee C2, Interviewee PN2, Interviewee LC1).

Responsibilities of oneself, others and of their profession are perceived different among interviewees and responsibilities are not always clearly divided. Nonetheless, interviewees seemed to be aware of and understand their own responsibilities. Interviewees showed that they knew what was expected from them, although other stakeholders might disagree with them, for example with the municipality or companies. Communications of responsibility are not always identified, as interviewees often mentioned to not state is as responsibility but more in relation to goals or aims. Therefore, *division of responsibilities* has an indifferent (0) score, with a wide variation.

## Condition 4.2 Mediating across scales and sectors

Mediating across scales and sectors concerns the presence of *connection nodes for climate action*, *space for sharing knowledge sharing*, and *knowledge cohesion*. The mediating across scales and sectors optimises interaction processes, and thereby improves climate adaptation (Abbott, 2017; Hölscher, Frantzeskaki, & Loorbach, 2019).

### a. Connection nodes for climate action

*Connection nodes for climate adaptation* were analysed by the connections of stakeholders between and across levels, organisations, and to the effort to limit fragmentation (*Appendix D, Table 44*). Considering the previously discussed collaborations in paragraph *Collaboration in knowledge and projects* and networks discussed in paragraph *Multi-actor innovation networks*, but focussing on the connection of stakeholders between and across levels, organisations, connection nodes for climate adaptation are identified. All interviewees mention to have connections with other parties, and at least one other stakeholder in climate adaptation and many are part of a network (*Figure 22*). The integration between levels differs between organisations. *Figure 22* shows the connections and networks of stakeholders, showing some stakeholders have more connections than others. Three stakeholders with many connections and being part of one or more networks are identified as connection nodes for climate adaptation: Amsterdam Rainproof, Citizens and Tolhuistuin. Rainproof and Tolhuistuin explicitly aim to take this connecting position (Interviewee M3, Interviewee LC2; Amsterdam Rainproof, 2022), and appear to act successfully as connection nodes. Other stakeholders might also be important nodes but not directly for climate adaptation.

The interviewee from Rainproof mentions they started with connections who seemed to have 'energy', as there are many opportunities in climate adaptation but limited support from groups such as Rainproof, as they are not able to connect with all possible stakeholders. Rainproof does connect across levels and organisations; they connect within the municipality with different levels and departments but also outside the municipality with citizens, private sector/NGOs and research organisations. They often do this in collaboration with Programme Climate Adaptation, hence they are closely connected.

Within the municipality many connections between levels are present (*Figure 23*), though one might be more connected to more climate adaptation stakeholders than the other. Many of these stakeholders are connected to other departments and individuals within the municipality. Sustainability coordinator Noord states the complexity, of great number of employees and departments, of the municipality is sometimes challenging as the connections between municipal stakeholders are not always present or actively used. Interviewees also mention that connections, especially through the network approach of Rainproof are limiting fragmentation of municipal climate adaptation (Interviewee M3, Interviewee M4). Rainproof is however not specifically active in Amsterdam Oud-Noord, and for example mentions not to be aware of green coaches in Amsterdam Noord, since each district organises this differently, they have to discover this in each district.

The interviewee from Tolhuistuin mentions their critical role in organising the network related to Natuurgebied Noord. This explains the connections between them and many local initiatives, private sector/NGOs and citizens. These connections are across sectors, and to some extent across scale as citizens could be seen as a different scale. Not all parties are probably connected with each other, but this action and related actions connect stakeholders. These stakeholders often have connections to municipal bodies. *Figure X* indicates the stakeholders connected to Tolhuistuin and Rainproof often do not connect with each other.

Citizens as a stakeholder group appear to be connected to almost all stakeholders and show many connections across scales and sectors. Citizens are less clearly organised, and the indicated connections are not present with most citizens (Interviewee MN1). Connections for individual citizens are often not with multiple stakeholders of multiple scales and sectors, which makes limiting fragmentation more difficult. As a group, citizens are a connection node, in practise they appear not

be a (successful) connection node. Since many stakeholders are connected to (a selection of) citizens and most citizens are not connected to many other stakeholders.
Connections can also change over time, and as stated before, can be dependent on the individual or group involved. For example, the connection between the two parties in Vliegenbos seem be less than before, after change of boards (Interviewee LC1). Similar situations are mentioned by other interviewees. At the same time, new connections are created. As the municipality and other organisations enable connections through the organisation of networking events. For example, neighbourhood budgeting provided an event where different local initiatives got to know each other, many focused on local challenges, amongst which initiatives related to greenery. Through this event people got to know more initiators and able to connect with like-minded people.

Considering the different connections, and the variety of closeness and types of connections, *connection nodes of climate change* score encouraging (+), with a wide variety. This suggests there is some limitation of fragmentation of climate adaptation, but this could be improved significantly.

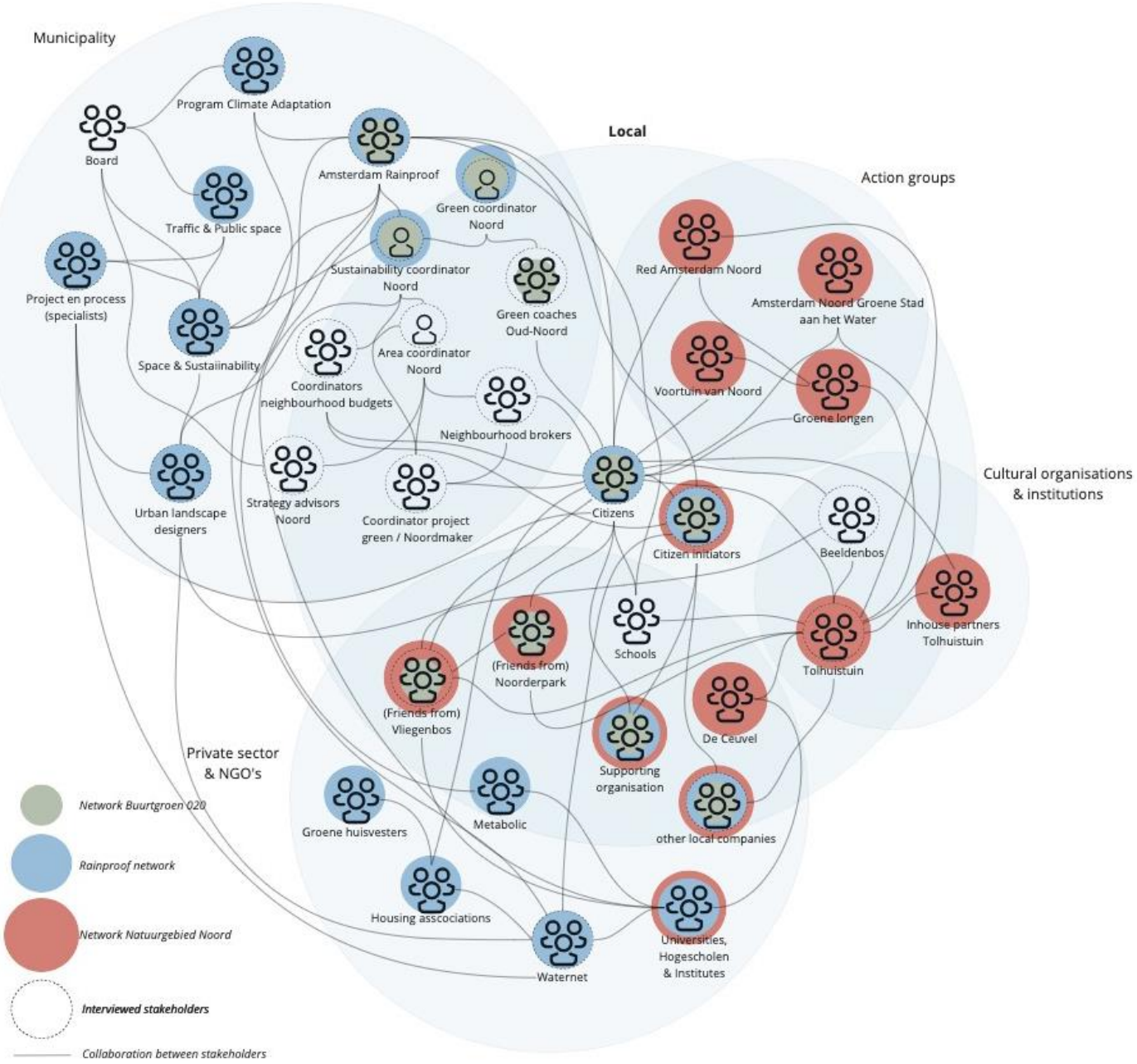



**Figure 22.** Identified networks and collaborations

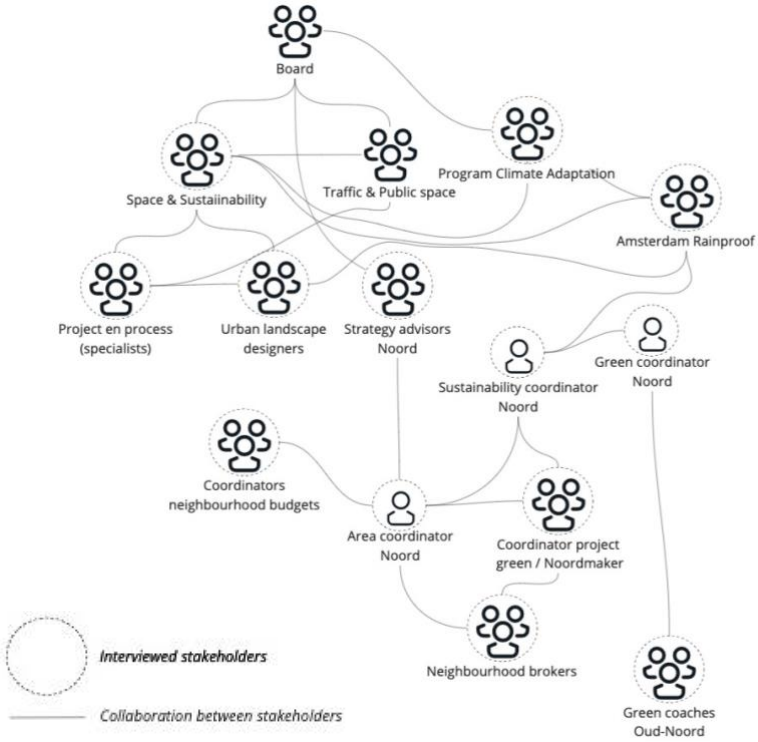



**Figure 23.** Indication of hierarchy for identified stakeholders of the municipality

### b. Space for knowledge sharing

*Space for knowledge sharing* was analysed by availability of intermediary space for knowledge sharing and trust building, referring to unbiased space for stakeholders. Along with analysis on the sharing, co-production of climate adaptations and selection from a variety of options to ensure learning and authoritative decisions (*Appendix D, Table 45X*). Knowledge sharing is present among all interviewees, although the frequency, intensity and extension differs. The experienced space for knowledge sharing and trust building, also differs, but is mainly experienced to be present.

All municipal interviewees mention to organise or be part of meetings where knowledge is shared, within their teams and departments, across multi-levels and outside parties; *"The department space and sustainability, often organizes meetings and webinars to share knowledge with each other"* (Interviewee M2), *"During networking events of when someone gives a presentation"* (Interviewee MN7) are among the answers given. However, it is mentioned by multiple interviewees that employees (of the municipality) often do not adopt lessons from colleagues, and sometimes are not aware of these lessons (Interviewee M2, Interviewee MN3, Interviewee MN7, Interviewee PN3). This indicates there is not sufficient space or trust to learn from each other. It is mentioned that transfers of knowledge and course of business could be improved (Interviewee MN7, Interviewee PN3). Sustainability coordinator of Noord states; *"Knowledge sharing is difficult, not only for climate adaptation but for many processes. People have to experience certain process themselves, as they think the situation is unique even though similar situations take place where they can learn from".* This raises the question whether this is related to the individual aspect, as is often mentioned by interviewees or if there are other reasons for the limited space for sharing.

Space for knowledge sharing is often aimed to be created in comfortable places of stakeholders. For example, Rainproof joins meetings or events from real estate owners to share knowledge about climate change and adaptation which possibly affect the real estate owners. Together they can discuss possibilities and search for collaborations and solutions. Another example is from the initiators of public greenery in front of their building. They organised meetings where neighbours could share their opinion, and ideas, thereby educating each other about needs and knowledge about climate adaptive and social elements topics. They combined these ideas into new designs where they aimed to include new knowledge.

Moreover, some interviewees try to create knowledge sharing outside of the stakeholder's comfortable area. Beeldenbos, for instance, aims to include and share knowledge about art and nature with a group of youngsters who normally do need feel welcome in the neighbouring area of the Beeldenbos, due to their background. Beeldenbos and Vliegenbos want to educate all type of stakeholders within the natural environment, to show its value.

Sharing knowledge is also often done online, via WhatsApp groups, internal information network websites (e.g. intranet), platforms (e.g. Buurtgroen020) and social media platforms (e.g. Facebook). The interviewees mention when they connect with others, both online and offline, and mutual understanding is realised or improved, there is simultaneously the process of trust building. Whether the spaces of sharing knowledge are intermediate is difficult to assess, as the interviewees mostly feel free to share their knowledge, but others who might not, potentially would not share this or do not participate at all.

Considering the different interviewees perspectives, *space for knowledge sharing* scores encouraging (+) with a wide variation, because of the recognised spaces for knowledge sharing and additional trust of the interviewees, but not always intermediary space to do so and considering the variation of co-production and ensured learning.

### c. Knowledge cohesion

*Knowledge cohesion* was analysed by the integration and merging of knowledge and resources across scales and sectors. In addition,it is analysed by to what extent stakeholders identified opportunities, synergies and trade-offs between different goals (*Appendix D, Table 46*). Integrating knowledge across scales and sectors is an aim of Rainproof and Programme Climate Adaptation. Both hope to realise knowledge cohesion through their network approach and sharing of knowledge (Interviewee M3, Interviewee M4). Considering that they have interactions and integrate topics of climate adaption with multiple departments and organisations, they are doing well in integrating their pilots and obtaining knowledge (Interviewee PN3, Interviewee M3, Interviewee M4). In addition, Programme Climate Adaptation's communication manager mentions to alter goals when they appear not to be realistic or when the goals grind with changing conditions or new obtained knowledge.

As stated earlier in *Involvement for vision/strategy*, some stakeholders appear to set goals in line with the goals of the municipality, or the national government. Showing integration of knowledge, they obtained from others and deemed important. It is expected to be most present with organisations or companies that are relatively less pioneering (Interviewee M3, Interviewee MN1). Non-municipal interviewees do not mention to set their goals in line with municipal goals, and indicate they are more progressive than the municipality. Besides the municipality, citizen interviewees mention the importance of inspiring and helping each other, through which cohesion of knowledge comes in place; *"We incorporate what we learn from others and share our resources where needed"* (Interviewee C1).

At the same time, multiple interviewees state that other stakeholders do not have the same knowledge or understanding of urgency (Interviewee M2). Understanding knowledge from specific disciplines and integrating this with knowledge from other scales and sectors seems to be challenging. For instance, multiple people from the municipality mention that designers often are not aware of specific knowledge about climate adaptive plants (Interviewee MN1, Interviewee M2). Next to that, stakeholders are often not aware of present and upcoming climate challenges, which shows limiting cohesion of knowledge (Interviewee M3). It is mentioned by interviewees that the integration of knowledge and resources could be improved, as currently people often are only knowledgeable within their own discipline. Interviewees mention the same challenges for neighbourhoods, streets and individuals.

The score for knowledge cohesion is experienced different by stakeholders, although it seems that knowledge is integrated, and the integration improves. Challenges remain and integration mainly takes

place across interviewees own scale and/or sector. Hence an indifferent (0) score seems fitting with a wide variation.

## Condition 4.3 Creating opportunity contexts

Creating opportunity contexts concerns *long-term co-benefits*. The establishment of opportunity contexts provides the existence of overarching framework circumstances that encourage and facilitate actions toward common and long-term goals (Abbott, 2017; Hölscher, Frantzeskaki, & Loorbach, 2019).

### a. Long-term co-benefits

*Long-term co-benefits* were analysed through the framing of conditions and financing mechanisms for long-term co-benefits for innovative, long-term and co-beneficial solutions (*Appendix D, Table 47*). Co-benefits refer to both benefits for multiple stakeholders, climate and social challenges and sustainable transitions. Long-term climate adaptation goals are dependent on the climate adaptation implementation agenda, which is administratively regulated (Interviewee M4). The conditions that are set are focused on climate adaptation, and often multiple climate challenges are addressed. These adaptations often provide co-benefits (Interviewee M3; Abbott, 2017). Climate adaptation can also be an additional benefit of other changes in public space, which did not have climate adaptation as point of interest such as a friendlier environment (Anonymous visitor community centre, personal communication, June 8, 2022; Anonymous visitor local market, personal communication, June 15, 2022). The Programme Climate Adaptation and Rainproof strive to incorporate climate adaptation within departments and organisations, conditions and financial mechanisms could thereby be framed for longer-terms (Interviewee M3, Interviewee M4).

Framing conditions for long-term co-benefits is mostly recognised in adaptation actions related to greening. Many interviewees recognise the co-benefits for greenery and therefore mention, if their action relate to greenery, to frame conditions for this. Interviewees recognise greenery to be beneficial for climate adaptivity, as well as increasing social cohesion, and creating a friendlier and healthier environment (Interviewee MN1, Interviewee MN2, Interviewee MN3, Interviewee M2, Interviewee C2, Interviewee LC1). These benefits are visible and effective when it is long-term. These interviewees mention that many different stakeholders benefit from these effects: citizens, local organisations and companies, visitors, commuters and the municipality. It is also mentioned by Beeldenbos that greenery, within but also outside their area could potentially re-connect old and new Noorderlingen, as many value it greatly.

Furthermore, long-term co-benefits between municipal departments could be improved, for example the discussion on the placement of trees (Interviewee MN3, Interviewee M1, Interviewee M2, Interviewee PN3). All recognise that trees can play an important role in climate adaptation and plea for an increasing number. Simultaneously, the interviewees recognise the challenge with underground infrastructure in combination with trees. They mention the tuning for maintenance of underground infrastructure, placement and removal of trees should be a more open conversation where they look for conditions that can benefit all parties involved and the environment.

Conditions of long-term co-benefits are less clearly framed by cultural organisations, due to a greater focus on the short-term as it is more in line with subsidy cycles which are used oftentimes, and citizens, as these have other perspectives and time frames (Interviewee LC2, Interviewee C2). Nonetheless, they might create circumstances where co-benefits are realised long-term. For instance, through the realisation of greener neighbourhoods, raised awareness of stakeholders who act accordingly (Interviewee LC1, Interviewee C2).

*Long-term co-benefits* scores encouraging (+) with a wide variety, because some interviewees are framing condition and financial mechanisms for long-term co-benefits, where others' conditions for long-term are discussed but not really enabled or realised.

## Overview orchestrating capacity

This paragraph provides an overview of the scoring of orchestrating capacity. The orchestrating capacity scores mostly indifferent or encouraging (*Table 18*). Considering the overall orchestrating capacity, the connectivity and coordination of multi-actor processes is not well established. Stakeholders do not seem to have sufficient abilities for synergies and minimisation of trade-offs and conflicts across scales, sectors and time. The synergies that appear to be most lacking are between stakeholders and regarding time.

The indifferent scores for *4.1 strategic alignment* indicate indifferent support in formulation of shared and long-term goals toward which climate adaptation actions are oriented. Many interviewees seem to lack long-term goals or are mostly focused on their own activities and more goals could be embedded in discourse, (cf. Clar & Steurer,2019). Results indicate a limited involvement of non-governmental stakeholders in strategy/vision development, although they should be involved to incorporate their view (Hegger et al., 2017; Planas-Carbonell et al., 2022). Additionally, responsibilities of climate adaptation could be clearer defined, shared and understood by stakeholders. The challenge of dividing climate adaptation responsibility at local level and presence of recognised responsibility by municipal bodies, is confirmed by previous research (Bergsma et al., 2012; Hölscher, Frantzeskaki, McPhearson, et al., 2019b; Knaggård et al., 2020; H. L. P. Mees et al., 2012; Trell & van Geet, 2019).

Condition *4.2 mediation across scales and sectors* scores both encouraging and indifferent, indicating improving interaction processes and thereby improving climate adaptation to some extent. *Connection nodes for climate action* and *space for sharing knowledge* appear to be encouraging, although not all stakeholders are connected to each other, and networks are often not including all stakeholder types. Also, there is not always ability to share knowledge in intermediate spaces. Knowledge is to some extent coherent, but cohesion is mainly present across interviewees own scale and/or sector. The existence of the indicators as well as their limitations are substantiated by literature (den Exter et al., 2015; Koop et al., 2017).

Condition *4.3 creating opportunity context* scores encouraging, suggesting enhancing existence of overarching frameworks which encourage and facilitate actions towards common and long-term goals. Interviewees acknowledge co-benefits, although these are often not clearly defined by the interviewees. This is in line with literature, as it is stated difficult to quantify many co-benefits (Koop et al., 2017; Runhaar et al., 2012).

**Table 18.** Orchestrating capacity scores

| Condition | Indicator | Score | Variation |
|---|---|---|---|
| 4.1 Strategic alignment | Long-term and integrated goals | 0 | Wide |
| | Involvement for strategy/vision | 0 | Wide |
| | Division of responsibilities | 0 | Small |
| 4.2 Mediating across scales and sectors | Connection nodes for climate action | + | Wide |
| | Space for knowledge sharing | + | Wide |
| | Knowledge cohesion | 0 | Wide |
| 4.3 Creating opportunity contexts | Long-term co-benefits | + | Wide |

## 5.2 Analysis of governance capacities

This subchapter describes the overview of the governance capacity indicators, conditions, capacities and the overall governance capacity, based on the results presented *in Chapter 5.1.* The aim of this section is to provide insights in the meaning of the capacities, and to validate and strengthen these insights. This enabled insight in their performance and enabled discovery of underlying and important drivers for climate adaptation governance. Along with the discovery of possible drivers hampering current capacities.

### 5.2.1 Overview of capacities

A more comprehensive picture of Oud-Noord's climate adaptation governance capacity is produced by integrating the results of the indicators for each capacity. Considering the potential of each capacity, *Figure 24* shows the capacities have more potential than is currently reached. Indicating that climate adaptation is to some extent happening and thereby directing societies toward resilient, and sustainable goals (Hölscher, Frantzeskaki, & Loorbach, 2019).

Transformative capacity is doing relatively well, indicating stakeholders have a certain ability to create novelties and embed them in structures, practices and discourses (Hölscher, Frantzeskaki, & Loorbach, 2019). The scoring of the other capacities indicate presence, but not abundance, of anticipation and response to long-term change, uncertainty and risks, recognition and dismantling of unsustainable path-dependencies and mal-adaptation, and coordination of multi-actor process creating synergies and avoiding trade-offs.

The four governance capacities contribute positively to climate adaptation governance, showing interaction and decision-making by which stakeholders aim to address climate adaptation while steering society towards climate resilience. Results show that the climate adaptation governance capacity is perceived as promising, but that there is also need for improvement. To discover the desired improvements, to identify requirements, design policies and devise purposive interventions as suggested by Hölscher et al. (2019), a closer analysis is done of the condition and indicator scores.

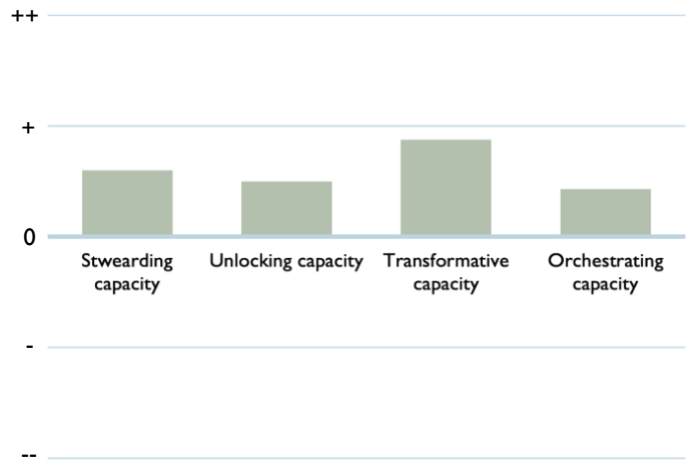



**Figure 24.** Overview average climate adaptation governance capacities scores, ranging from very encouraging (++) to very limiting (--)

### 5.2.2 Overview of conditions

Averaging the scores of the indicators for each condition yields a more detailed, yet general overview of Oud-Noord's governance capacity (*Figure 25*). It suggests that seven out of the twelve indicators are performing encouraging, suggesting many conditions enable local climate adaptation governance. All

capacities have one or more conditions which are not scoring encouraging on average, indicating all capacities have positive influence as well as shortcomings.

The steward capacity is mainly hampered by limiting *smart monitoring*, and the orchestrating capacity is mainly limited due to absence of synergies between stakeholders. Moreover, condition 2.2 *Undermining vested interests and incentive structures* appears to be restricted by insufficient resources for innovative alternatives, and condition 3.2 *Increasing visibility of novelty* is hampered as collaborations for novelties are limited.

By comparing the conditions scoring lower than encouraging, the commonality is a need for a long-term approach. Long-term approaches are recognised to take time to be established and be challenging because a wide variety of stakeholders need to be included (Hölscher, Frantzeskaki, & Loorbach, 2019; Koop et al., 2017; Runhaar et al., 2012). The absence or limited presence of long-term collaboration is recognised to have a hampering effect on climate adaptation and would therefore be of importance to improve. This challenges is a component of the challenge of required initiation effort and insufficient synergies, on which will be elaborated in the next paragraph.

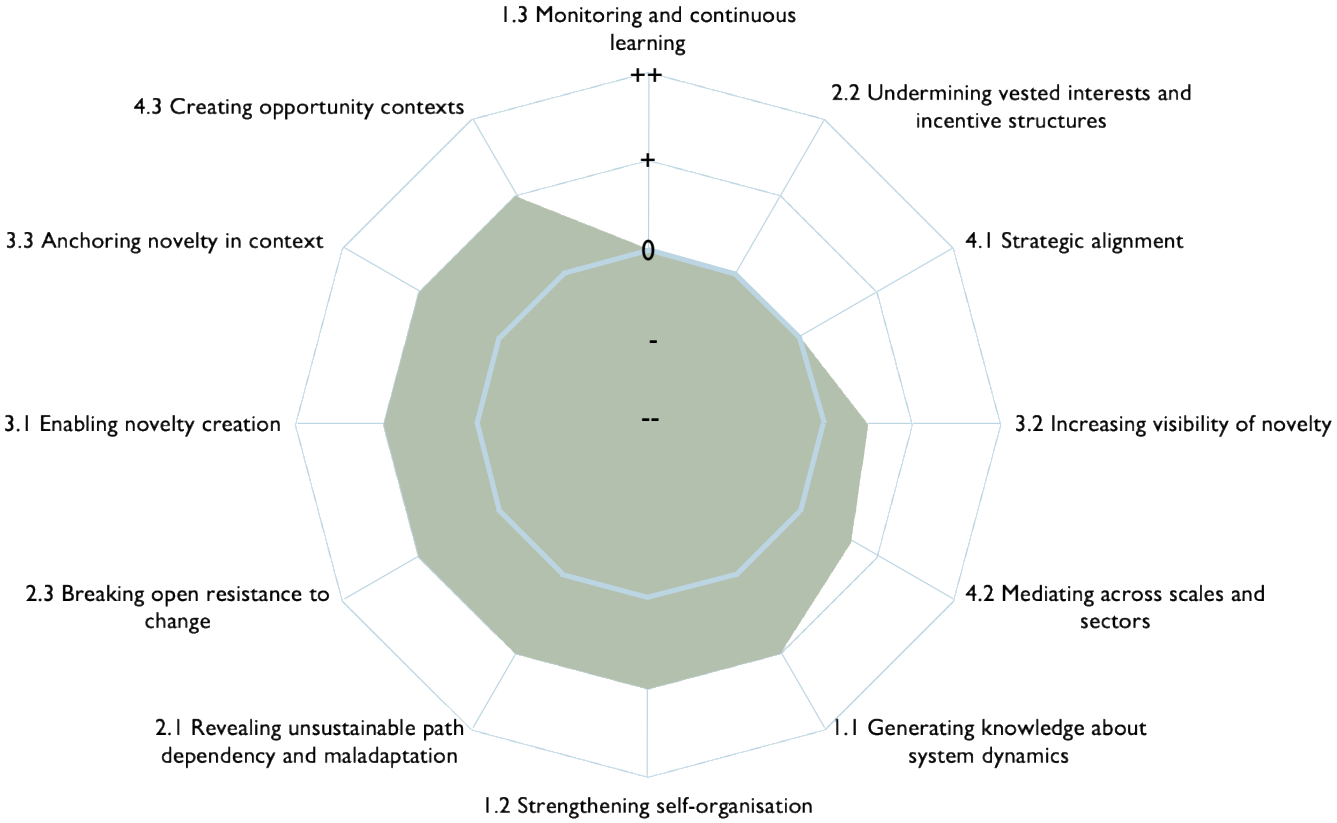



**Figure 25.** Overview climate adaptation governance capacity and average conditions scores. The governance capacity conditions average scores are ranked clockwise from very limiting (--) to very encouraging (++)

### 5.2.3 Overview of indicators

The scoring of all individual indicators was compared, and communalities and differences were identified. *Table 19* provides an overview of the scores of all indicators, which shows most scores are encouraging, followed by a few indifferent scores and one limiting score. The different indicator scores are analysed.

**Table 19.** Overview climate adaptation governance capacity per indicator for Amsterdam Oud-Noord

| Indicator | Score |
|---|---|
| 1.1.a Cross-stakeholder learning | + |
| 1.1.b Knowledge availability | + |
| 1.2.a Collaboration in knowledge and projects | + |
| 1.3.a Institutional and social memory | + |
| 2.1a Identifying and exploring systemic drivers | + |
| 2.3.c Fostering willingness and awareness | + |
| 3.1.a Leadership of opportunities for change | + |
| 3.1.b Multi-actor innovation networks | + |
| 3.1.c Space for innovation | + |
| 3.2.a Local support | + |
| 3.3.a Learning for replication and upscaling | + |
| 3.3.b Institutional space and compliance | + |
| 3.3.c Affordability | + |
| 4.2.a Connection nodes for climate action | + |
| 4.2.b Space for knowledge sharing | + |
| 4.3.a Long-term co-benefits | + |
| 2.2.a Support for sustainable business | 0 |
| 2.2.b Room to manoeuvre | 0 |
| 3.2.b Advocacy coalitions | 0 |
| 4.1.a Long-term and integrated goals | 0 |
| 4.1.b Involvement for strategy/vision | 0 |
| 4.1.c Division of responsibilities | 0 |
| 4.2.c Knowledge cohesion | 0 |
| 1.3.b Smart monitoring | - |

*Note.* Ordered by score from very encouraging (++) to very limiting (--)

## Non-existing and abundant scores

*Table 19* shows none of the indicators score very encouraging (++) suggesting no indicator is performing optimally, thus one or more stakeholders are not optimally being part of/contributing to an indicator. Considering Amsterdam, among other cities, is not sufficiently adapted to climate change (Gemeente Amsterdam, 2022d; Koop et al., 2017; Wolfram, van der Heijden, et al., 2019), it seems logical that not all indicators would score very encouraging. Furthermore, literature states various barriers in climate adaptation governance, which also apply to the case of Amsterdam Oud-Noord as discussed in the overviews of each capacity. The barriers recognised to be embedded in limited access and competence of institutions, financials and knowledge (Pörtner et al., 2022) are also experienced to be obstacles for the governance capacity of Oud-Noord. These barriers are, amongst others, mentioned in indicators *institutional and social memory*, *room to manoeuvre* and *affordability*.

In addition, none of the indicators score very limiting (--), this indicates within the governance of climate adaptation in Oud-Noord for all indicators one or more stakeholders are taking action in or experiencing the ability to act. Considering the literature used to develop these indicators, it is not surprising that indicators are not scoring very limiting, as the indicators evolved from existing circumstances were recognised to support climate adaptation. The indicators are developed based on condition of present activities discovered in other cities (Hölscher, Frantzeskaki, McPhearson, et al., 2019a), indicators for Water governance in Amsterdam which also do not score very limiting (Koop et

al., 2017), and other discoveries from literature that indicate the improvement of governance when these are present. The presence of all indicators provides opportunity for climate adaptation governance and shows efforts have been made. Furthermore, Amsterdam is recognised to perform action on climate adaptation including a combination of stakeholders (Gemeente Amsterdam, 2020), it would therefore not be very likely for all stakeholders to score very limiting.

*Table 19* shows most indicators score encouraging, indicating most conditions enable climate adaptation governance in Oud-Noord. Knowledge, resources and collaborations, amongst other necessities for climate adaptation, appear to be present. The presence of climate adaptation governance in Amsterdam is confirmed by literature (den Exter et al., 2015; Hegger et al., 2017; Koop et al., 2017; Planas-Carbonell et al., 2022; Runhaar et al., 2012). The meaning of this for conditions and scores will be elaborated in later paragraphs.

### Indifferent indicator scores

The difference between indicators scoring encouraging and indifferent (and limiting), could be explained through the difference in explicit initiation effort. Indicators which score indifferent, require more effort of stakeholders than indicators with an encouraging score. When more effort is needed for an indicator to score encouraging, often a larger time span, clear collaboration and mutual understanding is needed as well. The analysis indicates all stakeholders can improve on these indicators. The municipality, but mainly Rainproof and Programme Climate Adaptation, are contributing relatively much to these indicators compared to other stakeholders. These stakeholders seem to have greater ability of means and appear to be front-runners. Through sharing and elaborating their collaborations, connections and resources, the indicators might be able improve (Hölscher, Frantzeskaki, McPhearson, et al., 2019a). In the same line of reasoning, collaborations in knowledge and projects and space for knowledge sharing, would improve if stakeholders would put greater effort in collaboration and making time and space for knowledge sharing.

The indifferent scoring indicators, except from *room to manoeuvre*, seem to require explicit effort from stakeholders, active coordination and tuning regarding processes and content between and among stakeholders. Especially indicators part of orchestrating capacity, where stakeholders' abilities for synergies play an important role. Synergies between the municipality and action groups appear to require relatively more effort to be realised, as well as synergies between multiple stakeholder types (Runhaar et al., 2012). The deficiency of synergy between stakeholders is important to be improved (Runhaar et al., 2012; Trell & van Geet, 2019) and is further discussed in *Chapter 6.1*.

Furthermore, there appears to be a factor that is mentioned by many interviewees: the individual. This strongly affects the relations for, knowledge availability and sharing, cross-stakeholder learning, collaboration in knowledge and projects, and sometimes even for social and institutional learning. It is often mentioned that the individual can strengthen or weaken these indicators by the personal motivation and/or connections: *"Again, that depends on the person"* (Interviewee M1). Bergsma et al. (2012) confirm this dependency on individuals for collaborative approaches, the challenge and origin of this factor is further discussed in *Governance capacity gaps.*

### Limiting indicator score

Indicator *smart monitoring* attracts attention as it is the only condition to score limiting. The limiting score suggests obstruction of learning, as smart monitoring is identified to be a prerequisite for learning (Williams et al., 2020). Learning does take place from pilot projects outside Oud-Noord, and this learning does enable identification of threatening circumstances, elucidates underlying processes and provides forecasting of future developments in Oud-Noord, as is desired through smart monitoring (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017; Williams et al., 2020). The obstruction for learning is taking place in climate adaptations as lessons cannot, or only limitedly, be drawn from data. The learning that is currently taking place is mostly intuitive, which is more prone to subjectivity (Mathew et al., 2016). The absence of this learning results most likely in not identifying local vulnerabilities (Williams et al., 2020) and no adaptation of management objectives and practices

to changing situations in line with new information (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Koop et al., 2017). Limited smart monitoring is further discussed in *Chapter 6.1*.

*Chapter 6*

# Recommendations for change

The understanding of the capacities enabled identification and understanding of transformative climate adaptation governance. This chapter entails the identification and explanation of governance capacity gaps. Followed by the discovery of and suggestions how existing pressing governance capacity gaps could be bridged or at least be diminished. Thereby answering research questions three and four.

*RQ 3: What are current governance capacity gaps?*
*RQ 4: How can the governance capacity be improved?*

## 6.1 Governance capacity gaps

This subchapter takes a closer look at the governance capacities gaps and discusses where these gaps originate from and the importance of bridging them. This leaded to a selection of governance capacity gaps and recommendations on how they could be bridged, discussed in *chapter 6.2.*

The previous analysis of the governance capacities is used to identify the governance capacity gaps; where there appears to be great room for improvement and where connections between stakeholders or indicators are missing. Considering the previous analysis, all indicators show room for improvement but some indicators and fundamentals behind indicators appear to have greater influence. Hence, the following four gaps are identified: threshold of required effort, insufficient smart monitoring, insufficient synergies, and dependency on 'individual'. Each gap will shortly recap on its challenge, mention importance for improvement and identified causes.

### Threshold of required effort

As explained in *5.2.3 Overview of indicators*, indifferent scoring indicators are subject to greater required effort than higher scoring indicators. The required effort creates a threshold for stakeholders to act. When stakeholders would be able to act (to a greater extent) in these indicators, realisation of climate adaptation would be enhanced. Required effort for certain activities is by itself not a problem, as this enables a higher quality of activities (Folke et al., 2005; Williams et al., 2020). When stakeholders dedicate effort, they are often more engaged and experience responsibility (Runhaar et al., 2016; Trell & van Geet, 2019). Stakeholders who experience greater responsibility, by themselves and by others, also act more in indicators with greater required effort.

Lowering the thresholds, and thereby improving various indicators, is needed as these indicators currently hamper dismantling of unsustainable practises and creation of synergies, thus restricting the climate adaptation governance in Oud-Noord. When thresholds are lowered, more stakeholders will be able to act and connect within climate adaptation. Improving stakeholders' recognition of responsibility could improve the sense of urgency to act and thereby indirectly lower the threshold for stakeholders to perform well in those indicators (Rosenzweig et al., 2018; Runhaar et al., 2016).

The required effort might not directly improve the indifferent scoring indicators, as dedication and effort of stakeholders appear to be needed to realise various elements of climate adaptation, predominantly their time and effort in mediation. However, lowering the threshold to participate in these efforts, would create opportunities.

### Insufficient smart monitoring

Smart monitoring appears to be insufficient. It is recognised to be a challenge for municipalities and mostly not done by other stakeholders, leaving a gap in smart monitoring. Limited smart monitoring is confirmed by Clar & Steurer (2019) who state systemic monitoring is missing in climate adaptation, and den Exter et al. (2015) who state many municipalities struggle with monitoring. Limiting smart monitoring also has the implication that the 'effectiveness' of present climate adaptations is not known, which makes it more difficult to improve (Nevig et al., 2013).

There is thus a need for improvement of smart monitoring, since smart monitoring enables continuous improvement and learning based on data. According to Colloff et al. (2017) the development of governance systems that allow for (climate) adaptation is embedded in monitoring, among other things. They stress the importance of adaptive monitoring and the need for institutions to include lessons learned in institutional environments. This shows an interrelation between *smart monitoring* and *Institutional space and compliance*, as the efficacy of smart monitoring is dependant of the space to learn and integrate these lessons. Improving the monitoring could therefore indirectly improve climate adaptation actions through i*nstitutional space and compliance*. Moreover, literature states the importance for monitoring knowledge for governmental organisations, non-governmental organisations (including private sector) and citizens (Nevig et al., 2013), suggesting various stakeholders types should be involved.

Findings showed that reasons for this shortcoming are suggested to be multi-fold; interviewees mention reasons for not monitoring are lack of time and resources, and often not being aware of its effectiveness. The following three reasons suggested by literature and confirmed by this study are recognised to be of importance for Oud-Noord; 1) a lack of a clear definition of an adaptation measure; 2) a lack of adequate methods to monitor the implementation of adaptation measures; 3) no clear indicators to assess climate adaptation (den Exter et al., 2015; Mathew et al., 2016; Nevig et al., 2013; Ryan & Bustos, 2019). By addressing these challenges, smart monitoring could be improved.

### Insufficient stakeholder synergies

Synergies between networks, stakeholders and stakeholder groups appear to be insufficient (see also in *5.2.3*). This often leads to misunderstanding of others' perspectives, simultaneously but separately working on similar projects where collaboration would enhance the performance, and limits the collaboration and division of long-term tasks and actions.

The presence and creation of synergies is of importance as it stimulates climate adaptation (Runhaar et al., 2012; Trell & van Geet, 2019), and could potentially improve the performance of indicators *long-term and integrated goals*, *involvement for strategy/vision*, *division of responsibilities*, and *knowledge cohesion*. Thus, predominantly improving the orchestrating capacity, and thereby minimizing trade-offs and conflicts and improving the collective climate adaptation.

The restricted synergy between stakeholders, stakeholder groups and networks can have various origins. The findings show unawareness of other stakeholders, stakeholder groups and/or networks, and/or their activities. Furthermore the requirement of mediation and time can be limiting (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Trell & van Geet, 2019). By addressing these challenges, stakeholder synergies could be improved.

### Dependency on individual

As stated in *Overview of stewarding capacity*, the presence of specific knowledge, connections with other stakeholders and focus on climate adaptation is often dependent on individuals' motivation and connections. The dependency on the individual appears to lead to inconsistencies of stakeholder roles, execution of (climate adaption) activities and presence of specific knowledge. Consistency is however important to guarantee collaborations, to share knowledge and create trust (Folke et al., 2005; Hölscher, Frantzeskaki, & Loorbach, 2019). Bergsma et al. (2012) state dependency on individuals' enthusiasm and commitment is inherent to an open and collaborative approaches, which is often used in climate adaptation. It is therefore the question whether this gap can be bridged. It is however of importance to limit the dependency by improving transfer of knowledge and incorporating climate adaptation in in systems and regulations, as considered in indicator *institutional space and compliance*. Meanwhile acknowledging the role of individuals to be important, as visionary and entrepreneurial stakeholders enable climate adaptation where it was not embedded before (Trell & van Geet, 2019).

## 6.2 Addressing governance capacity gaps

Considering the identified gaps, their origin or relation to other challenges and the need for solving this gap, two gaps are identified to be of greatest urgency to be improved. First gap, insufficient smart monitoring, as this can improve the learning based on data and can improve future and existing climate adaptations. Second gap, insufficient stakeholder synergies, due to its influence on multiple indicators and importance of including and aligning stakeholders. Suggestions are done on how these gaps can be limited or solved.

### Improving smart monitoring

The limiting smart monitoring is recognised to have three possible origins for Oud-Noord, as previously discussed, which are taken as point of departure for suggesting changes.

### 1) Lack of clear definition of an adaptation measure

By sharing the value and importance of monitoring climate adaptation via networks and platforms, more stakeholders become aware of the value of monitoring their own climate adaptation actions. By referring to the impact and physical changes of climate adaptation, but not directly climate adaptation, more stakeholders will be able to understand the elements which needs to be measured. Simultaneously, stakeholders could become more aware of their (possible) impact. Furthermore, monitoring should not be 'one-way traffic', a monitor should be a platform for citizens to share their own projects and get in touch with local initiatives (Roest & Boogaard, 2020). The monitoring by citizens and organisations can be shared on their own webpages, as well as within established networks as for example Buurtgroen 020. This form of monitoring is recognised as 'community based monitoring' and aims for participation of stakeholders throughout the monitoring (Mathew et al., 2016).

### 2) Lack of adequate methods to monitor the implementation of adaptation measures

Monitoring methods should be researched and developed to provide measures which are easy to use and require only limited time, as this is recognised to be scarce. Within this methodology clear indicators for monitoring should be identified.

### 3) No clear indicators to assess climate adaptation

Clear indicators should be set, to provide insights in possible elements to measure. Clearly defining the indicators is of importance to avoid misunderstanding and incomparable monitoring. The indicators should be specified for different activities, linked to climate adaptation for all climate challenges. The indicators would be even more useful if they are linked to other sustainability challenges, as many challenges are interlinked (Frantzeskaki et al., 2012; Hölscher, Frantzeskaki, & Loorbach, 2019). This could for example be done through a collaboration of local climate adaptation stakeholders and the municipality, so it can be shared within both their networks, and mutual understanding is in place.

## Improving stakeholder synergies

Limiting stakeholder synergies could be present because of unawareness of other stakeholders or because of the required mediation and time. For both causes recommendations for change are given.

### 1) Unawareness of other stakeholders

Stakeholders should become better aware of other local climate adaptation stakeholders. When stakeholders are more aware who are working on same and similar actions, collaboration becomes easier to initiate (Wolfram, van der Heijden, et al., 2019). The visibility of stakeholders could be enabled by a platform where both citizens, initiators and professionals can share their activity. By means of using keywords, the visibility could be improved. Establishing a more permanent platform for climate adaptation-related interactions, where affected parties can voice their concerns, and where adaptation efforts can be coordinated (Trell & van Geet, 2019). This platform should be linked to existing networks, to include and expand them instead of competing.

### 2) Required mediation and time

To lower the threshold of effort regarding mediation and time for synergies between stakeholders, could be done by a combination of various attempts. Structural collaboration and presence of mutual understanding and respect of stakeholders' could decrease the effort of mediation and time needed for this mediation (Hölscher, Frantzeskaki, McPhearson, et al., 2019a; Pörtner et al., 2022). Furthermore, the municipality and local municipal employees could aim for a reduction of needed time for synergies by creating easily accessible formats to share plans and goals, whereafter meetings could be planned more efficiently. This improvement could also lower the threshold of required effort.

*Chapter 7*

# Discussion

This chapter reflects on the used framework, methodology and main findings. First, the development of the framework is discussed, together with its effectiveness. Secondly, limitations on the methodology are elaborated. Lastly, the general findings are related to existing literature.

## 7.1 Reflection on climate adaptation governance capacity framework

### Framework development

This research adds to existing literature on (transformative) climate governance by extending the existing and specific transformative climate governance capacity framework by Hölscher, Frantzeskaki, & Loorbach (2019) towards climate adaptation governance capacity. Indicators were developed to assess local climate adaptation, by combining existing literature on climate adaptation, climate governance, climate governance capacities and local climate governance. Next to that, this research relates the framework to the identification of gaps and provides possible solutions to identified gaps.

In the transformative climate governance capacity framework by Hölscher, Frantzeskaki, & Loorbach (2019), two main limitations were identified: missing tangible methods to assess the capacities, thus missing indicators, and solely focussing on governmental stakeholders, thereby excluding non-governmental stakeholders in climate governance. This research aimed to overcome these limitations by the development of the climate adaptation governance capacity framework. While doing so, the framework was also made more specific towards climate adaptation, as this is perceived to be of great importance to make (urban)areas climate resilient (Birchall et al., 2021; Cloutier et al., 2015).

This research thus adapted the framework towards climate adaptation and identified relevant indicators to measure the performance of each capacity, following the suggestion put forward by Hölscher, Frantzeskaki, & Loorbach (2019) to research the efficacy of governance capacities in accomplishing transformative climate governance. Moreover, the development indicators and standardised rating of the analyses of capacities, tried to make the usage of the framework less subjective. Through this improvement, research applying the framework became easier to replicate and easier to compare to similar research in other areas.

Lastly, this research aimed to identify all local stakeholders in climate adaptation, thereby providing a comprehensive representation of the existing climate adaptation governance (Trell & van Geet, 2019; Williams et al., 2020). It enabled the recognition and possibility to improve the sharing of responsibilities in climate adaptation, which enables additional and more effective climate adaptation (Knaggård et al., 2020; Mees, 2017; Mees et al., 2012). The framework provides an entry point for engaging and empowering stakeholders by explicitly incorporating non-municipal actors in all phases of climate adaptation governance (Glaas et al., 2019; Hölscher, Frantzeskaki, & Loorbach, 2019; Wolfram, 2016).

The developed transformative climate adaptation capacities framework is strongly dependent on two sources who developed and put forward the original framework; Hölscher, Frantzeskaki, & Loorbach (2019) and Hölscher, Frantzeskaki, McPhearson, et al. (2019). This dependency is decreased by using a variety of cited sources stressing the same and/or similar conditions, and governance elements of importance for enabling climate adaptation. I created the framework by combining the findings of literature.

### Framework limitations and desired improvements

Nonetheless, the new developed climate adaptation governance capacity framework experiences several challenges, which should be taken into account when using the framework in future research. Four suggestions of alterations are given based on the experience of this study.

Firstly, due to the development of twenty-four indicators the framework has become extensive and detailed. This could lead to difficulty in grasping the meaning and analyse the abundance of work for those who want to navigate upon the outcomes. To be able to navigate on the outcomes, one could use the more generalised results of the capacities and/or conditions and use the detailed information of the indicators to clarify specifics of interest to the user, similar to Koop et al. (2017). To make the framework more accessible for case managers, for whom doing this analysis is part of their daily work, their focus should be on using the 'conditions' level of the framework.

Secondly, the scoring of indicators could be subject to subjectivity of the researcher analysing the results, despite the effort to limit this in predefining indicator levels. To limit this bias, throughout this research independent outsiders were asked to give their score based on the arguments given by interviewees in combination with the predefined meaning of scores when I, the researcher was not completely sure of the score. For future research the limitation of this bias should be organised more structurally, to strengthen the validity of the scores. The scores should be given, independently, by two researchers and when in disagreement of a score, a third reader should provide a decisive opinion.

Thirdly, including multiple stakeholder types is experienced to be challenging, as not all stakeholder (types) are connected to identified stakeholders (Giordano et al., 2017; Williams et al., 2020). Next to that, high stakeholder diversity always entails a risk of hierarchy, authority, and language to have an impact on the results of deliberations (Williams et al., 2020; UNDP, 2010). This research aimed to reduce these limitations by continuously improving the stakeholder analysis, by interviewing and thereby using stakeholders' own perceptions, and by interviewing all stakeholders according to the same questions. This possible challenge should continuously be considered by researchers conducting similar research in the future.

Lastly, considering the outcomes of the conditions, conditions with only one indicator appear to score encouraging. It could be argued to be less evident to single out these conditions. Although supported by literature, some of these conditions could be made stronger using additional indicators. For future research, these conditions could be strengthened by adding coherent indicators. For example, condition 4.*3 creating opportunity contexts* could be strengthened by an additional indicator providing opportunity context, for example specifying contexts for co-benefits and separating these contexts for the creation of financial contexts (Runhaar et al., 2012).

## Communalities and differences between indicators

Since governance processes are frequently interconnected (Koop et al., 2017), several of the conditions and indicators of the framework are inextricably interrelated. Although each indicator is intended to offer a separate score, scores are affecting one another. When considering the need for improvement of one or more indicators, it is important to take into account conditions that are interlinked as this could enhance to general governance capacity. Next, the identified important interconnections between indicators are explained.

Important interrelations are present between *room to manoeuvre*, *space for innovation* and *affordability*. *Affordability* influences the perception of interviewees to be able to innovate and explore different pathways, as seen by the answers given in the interviews, even though indicator aimed to exclude the focus on finances. Furthermore, indicators *space for innovation* and *room to manoeuvre* are reinforcing, and their scoring is interrelated. The main difference represents the degree of freedom and existing opportunities that actors can use, opposite to focus on actors' ability and skills to create and seize opportunities (Koop et al., 2017). *Space for innovation* is to some extent also in contrast with *smart monitoring*, as *space for innovation* stresses the availability of neutral spaces for knowledge sharing and trust building, while monitoring could be experienced as a lack of trust. However, the need for rules and procedures, of which monitoring is one, is recognised to also ensure a sound environment to build trust (Koop et al., 2017; Mathew et al., 2016).

Other important relations are with the indicator *division of responsibilities*. D*ivision of responsibilities* is dependent on the indicator *collaboration in knowledge and projects*, *multi-actor innovation networks* and *knowledge cohesion*. To be able to divide and recognise one's own and others' responsibilities, stakeholders must be aware of other stakeholders, their activities, how they (can) collaborate and are connected to other stakeholders (Knaggård et al., 2020; Mees, 2017). Additionally, this is primarily realised through being aware of one another's viewpoints and behaving accordingly. Furthermore, d*ivision of responsibilities* could be enhanced by an increasing score of *fostering willingness and awareness*, when stakeholders become more aware of the need for climate adaptation and possible actions they are more likely to act (Trell & van Geet, 2019). Willingness to act in climate

adaptation and realisation of responsibilities are also recognised for their influence on collaborations (Pelling & High, 2005; Trell & van Geet, 2019), indicating the indicators are interconnected.

In addition, *knowledge cohesion* is influenced by the indicators related to connections (*collaborations in knowledge and projects*, multi-actor innovation networks, and l*ong-term and integrated goals*) and *space for knowledge sharing*. These indicators need to be present for knowledge cohesion to take place. Moreover, these indicators enable limiting of fragmentation and creation of cohesion of knowledge, and thereby cohesion and cooperation of stakeholders (Williams et al., 2020).

## 7.2 Reflection on methodology

It is important to take into account that the research is conducted at one moment in time for an area with specific conditions, hence results can be different within a short period of time. The momentum of adapting to climate change changes as well as the environment of the area, especially since Oud-Noord is rapidly developing (Gemeente Amsterdam, 2019b; Planas-Carbonell et al., 2022). To validate the robustness of this research, it could be repeated at a later moment in time and/or the study could be improved when compared to another area. This would show better how the area is relatively doing and could potentially demonstrate more ways to bridge gaps. Furthermore, the methodology could potentially be improved by including more quantitative analysis, for instance by means of surveys. When doing so, it is important to consider the knowledge (gaps) of participants and provide needed context.

Besides varying the research method, one could also improve the current (interview) methodology. Among other things, the following actions could be taken to decrease research limitations.

First of all, stakeholders who are solely affected by climate adaptation could also be included in the research. The interviewees are all stakeholders who participating in climate adaptation. This research did not involve those stakeholders who are solely affected by climate adaptation and therefore could give a limited view on the governance capacity of Oud-Noord. The stakeholders who are included all participate in climate adaptation, which could provide a biased picture of the governance, as not all individuals and parties within Oud-Noord participate. The governance capacity therefore only represents the existing climate adaptation governance. This research only concerns what does take place and does not show where other stakeholders might have lacked certain resources as they are not included within this research.

Secondly, more stakeholders active in climate adaptation in Oud-Noord could be included in the research. This research contained a selection of stakeholders to be interviewed aiming for a representation of stakeholder groups. Nonetheless, action groups appear to be missing partly due to a participation fatigue (Helleman et al., 2021; Tshishonga, 2020), referring to stakeholders' unwillingness to participate as they participate in much research and/or projects. Some interviewees mentioned not to be willing to connect me with those stakeholders as they experienced those stakeholders would not appreciate it. Hence, the representation of all stakeholder groups could be improved. By including documents and information shared by interviewees, the view from these missing stakeholders was aimed to be included. To assure no disinformation was created, no claims are made on the behalf of action groups.

Thirdly, most interviewees were found according to the snowball method, potentially showing a biased representation of the governance since these stakeholders are already connected (Reed et al., 2009). This is attempted to be limited by researching identified networks, site visits and visiting the neighbourhood budget event.

Lastly, the research area boundaries, borders of Oud-Noord, were often not the same as the area of influence of interviewees, for instance Rainproof and Programme Climate Adaptation. Some indicators would therefore be also applicable to other areas or are in collaboration more focused on

other areas. Performing this research in another area of Amsterdam could therefore lead to similar results regarding stakeholders with a wider perspective (Hölscher, Frantzeskaki, & Loorbach, 2019).

Chapter 6 provided a discussion on the capacity gaps and proposed improvements to bridge the most urgent gaps. It could be argued that other gaps, or existing limitations for indicators are also urgent and are needed to be bridged. This research does not deny this need; however, it focusses on the gaps with the expected greatest effect. The choice not to elaborate on 'dependency on the individual', was because it is recognised to be challenging to solve this institutionally and should therefore be researched further to be able to provide recommendations (Bergsma et al., 2012). The limiting of the 'threshold of effort' is partly addressed in the second recommendation for improving 'stakeholder synergies'. Furthermore, what the exact thresholds are that stakeholder experience could be researched further.

The recommendations to bridge the gaps are based on literature, suggestions of interviewees and considerations of the researcher based on both of these. To validate these recommendations a focus group of stakeholders could be organised to test the local support and create a starting point to realise the recommendations.

The recommendations are focussed on improvement of indicators which are scoring limiting and indifferent, as these appear to hamper the climate adaptation governance capacity most. It could be considered to start improving the indicators that are already performing quite well, as these already appear to have momentum. Nonetheless, it appears to be of greater effect to enable all indicators to score encouraging as this can show stakeholders who are not yet actively part of limiting indicators the possibilities for involvement. Furthermore, since the indicators are often interlinked, improving the lagging indicators indirectly improves other indicators simultaneously.

## 7.3 Reflection on results

Besides the addition to existing literature, this research provides insight in the local climate adaptation governance of Amsterdam Oud-Noord. The results indicate that the four governance capacities make good contributions to the governance of climate adaptation in Oud-Noord, but also leave considerable gaps. As a result, the governance capacity for climate adaptation is seen as promising, albeit (urgently) in need of strengthening. Strengthening is especially desired in smart monitoring of climate adaptation to improve the data-based learning, and creation of synergies between stakeholders to enable collaborations in long-term coordination. As stated in each capacity overview in *chapter 5.1*, most findings in this regard are in line with literature.

It is found that the scoring of the capacities is also in line with previous literature, along with the challenge of mainstreaming and prioritising of climate adaptation actions (Hölscher, Frantzeskaki, McPhearson, et al., 2019a). The relative better performance of the stewarding and transformative capacities, and the greater challenges in unlocking and orchestrating capacities confirm existing literature regarding climate governance (Hölscher, Frantzeskaki, & Loorbach, 2019; Pedde et al., 2019; Wolfram, Borgström, et al., 2019). Moreover, it confirms the similar challenges in climate adaptation (cf. Birchall et al., 2021; Cloutier et al., 2015; Runhaar et al., 2012; Ryan & Bustos, 2019). The greatest differences with existing literatrue are regarding the perception of coherent goals and long-term strategic direction, which are valued higher in papers with a focus on municipal stakeholders.

Furthermore, suggestions for improvement were provided according to the identified gaps. These improvements are desired to be performed by the climate adaptation stakeholders, elaborated upon in *chapter 6.2*. The improvements of climate adaptation governance are desired, as governance is recognised to be hampering climate adaptation, whilst adaptation to climate challenges is needed to keep cities liveable within the changing climate (Birchall et al., 2021; Clar & Steurer, 2019; Koop et al., 2017). Considering the suggestions of improvements, multiple ways can be used to do so. The suggestions done are confirmed by literature but could be extended by further research on fitting solutions.

*Chapter 8*

# Conclusion

This chapter provides a concluding remark of this research, regarding research questions, research aims and results. Ending with recommendations for practise and future research.

## 8.1 Concluding remarks

This research has explored the climate adaptation governance capacities and possible improvements for the area Amsterdam Oud-Noord, by researching the following research question: *How is climate adaptation governed at local urban level and where are improvements possible?* This research has done so by answering the sub-research questions which focus on understanding the research area and its climate adaptation stakeholders, the climate adaptation governance capacities, and defining capacity gaps and suggestions how to limit these gaps.

First of all, an understanding of the environment of the research area and identification of key stakeholders of climate adaptation in Amsterdam Oud-Noord was created. Amsterdam Oud-Noord is a diverse area coping with various climate challenges that required adaptation action. The key stakeholders in climate adaptation appeared to be various stakeholders from the municipality, amongst which but not limited to Rainproof, urban landscape designers and local officials related to greenery. Next to various municipal stakeholders, stakeholders from the local private sector, NGOs, cultural organisations, action groups and citizens were identified. Together they make up the identified local climate adaptation governance, acting related to the climate challenges of drought, heat stress and/or water nuisance.

Secondly, the current climate adaptation governance capacity for Oud-Noord was analysed. The climate adaptation governance capacity consists of four capacities, which are subdivided into conditions and indicators to enable investigation of the capacities. The performance of the four capacities were identified:

- *Stewarding capacity* showed anticipation and response to long-term change, uncertainty and risk is enabled to a certain extent. Although having limited smart monitoring.
- *Unlocking capacity* indicated recognition and dismantling of unsustainable path-dependencies is not always present. Some actions to break open resistance and creating opportunities and awareness for sustainable alternatives are present, however these could be significantly increased.
- *Transformative capacity* showed creation, visibility and embedding of innovations is enabled, to a significant extent. Hence contributing to climate adaptivity of Oud-Noord. It should be noted that the variation in transformative capacity among stakeholders is mostly wide.
- *Orchestrating capacity* indicated connectivity and coordination of multi-actor processes is not well established. Insufficient abilities for synergies between stakeholders appeared to be present, and minimisation of trade-offs and conflicts across scales, sectors and time should be further enhanced.

The four governance capacities positively contribute to climate adaptation governance, by demonstrating interaction and decision-making by stakeholders who aim to address climate adaptation. All of this, with the goal to steer society towards climate resilience. The findings indicate that climate adaptation governance capacity is perceived as promising, but that there is an urgent need for improvement.

Throughout the analysis various improvements for the governance capacities were discovered. Important identified gaps are threshold of required effort, insufficient smart monitoring, insufficient stakeholder synergies, and dependencies on the 'individual'. Out of these four main gaps, the gaps of insufficient smart monitoring and insufficient synergies are recognised to be of the greatest influence. Consequently, the gaps are most important to be bridged, as these have effect on many indicators. The recommendations for bridging the gaps are mentioned in chapter *8.2 Recommendations.*

To answer the main research question, local urban climate adaptation is governed by a wide variety of stakeholders, enhancing transformative governance whilst leaving great room for improvement on all capacities but predominantly improvements are possible for monitoring and creating synergies between climate adaptation stakeholders.

The aim of this research was twofold, short- and long-term impact goals and a research goal. Firstly, having impact on society by contributing to local climate adaptation on the short- and long-term. In the short-term this means identifying possible new collaborations and relationships between stakeholders. In the long term this means contributing towards effective institutional arrangement of climate adaptation. This is done through identification of possible improvements, thereby improving Amsterdam's resilience and enabling a good quality of life. The second aim of this research was to contribute to literature by creating understanding of what capacities for transformative climate adaptation governance can be improved, and how this can be done. This indicates both the (short-term) impact goal and research goal are reached.

The short-term goal is addressed through the discovery of the existing stakeholders and their connections and collaborations. This aim is therefore reached if these recommendations are put into practise. The long-term goal can be enhanced when the recommendations of this research, both for practise and future research are exploited. This aim is addressed though the identification of governance capacities, their gaps and related improvements. The research related goal is reached, as an understanding and possible improvements of the climate adaptation capacities is created through the analysis and recommendations for closing identified gaps.

This research contributes to the body of knowledge on climate adaptation governance and its capacities. It adds to literature by extending and specifying an existing climate governance framework for local climate adaptation governance capacity and connecting this to identification of governance capacity gaps and points of improvement. Furthermore, this research provided insight in the local climate adaptation governance of Amsterdam Oud-Noord, what its capacities are and how these can be improved.

By considering the outcomes of this research, it is important to take into account that not all stakeholder groups participated in the research and the view of, mainly action groups, is not included in this research. Their viewpoints are however aimed to be considered and no claims are made on their behalf.

## 8.2 Recommendations

### 8.2.1 Recommendations for practise

Throughout the research, I discovered people often are confused by using the terms 'climate adaption' and 'governance'. Therefore, I recommend stakeholders acting in climate adaptation to be clear in their communication what they refer to. Rainproof recognises this problem for 'climate adaptation' and suggest referring to adapting the (urban) environment to changing and/or extreme weather events. Regarding 'governance' it is of importance to give a clear definition and what is meant, as many are familiar with the word but have a different understanding (G. Mol, personal communication, April 14, 2022; J. Schaap, personal communication, April 14, 2022). I encourage to use the definition used by this thesis; *The complex processes through which multiple stakeholders of the state, market and civil society collaborate and (ideally) interact on equal terms to conceive and achieve common goals* (Torfing et al., 2012).

Furthermore, a selection of practical recommendations is given to improve the local climate adaptation governance in Amsterdam Oud-Noord. The recommendations proposed in chapter *6.2 Addressing governance capacity gaps* to bridge the gaps of insufficient smart monitoring and insufficient stakeholder synergies:

- Improving the awareness and recognition of the value of monitoring climate adaptation activities, developing a general method for a wide variety of stakeholders to monitor their climate adaptation, and create a set of clear indicators to measure climate adaptation activities.
- Stakeholders should be made more aware of one another. This could be done by the creation of a platform, for instance by municipal departments related to climate adaption, where stakeholders can share their activities, voice concerns and from which different climate adaptation actions can be coordinated. Along with lowering the threshold of mediation and time for synergies, becomes of structural collaboration and improvement of mutual understanding, which could be enhanced by the established platform.

Secondly, practical recommendations are done to improve the governance capacities based on identified limitations.
Related to stewarding capacity:

- The municipality of Amsterdam could improve the possibility to find colleagues via its intranet. This could be done by improving the online search tool within its intranet, by adding key words and job description for each employee. This could improve the knowledge availability and access to inhouse experts within the municipality. Hence improving indicator *knowledge availability*. Additionally, regarding creation of connections, Rainproof could connect with local green coaches to exchange knowledge on local climate adaptation. Green coaches could for instance also include coping with drought and water nuisance to a greater extent in the advice and help they provide to local citizens. This would improve local climate adaption.

In relation to unlocking capacity:

- Support for sustainable business could be improved by the (local) municipality through enabling more subsidies, funds and/or financial incentives for climate adaptations. For instance, subsidise plants or seeds when citizens remove tiles, fund part of rainwater collection systems and/or rewards for participating in climate adaption actions.

With respect to transformative capacity:

- More climate adaptations could be mainstreamed. By including climate adaptation in more standards of sectors, for instance in construction of building and public space, climate adaptation becomes less dependent on stakeholders actively aware of climate adaptation and adaptations can be more easily be repeated and upscaled.

Related to orchestrating capacity:

- Considering the often-unclear division of responsibility in climate adaption, creation of climate adaptations rules and regulations can enhance climate adaptation and improve its governance. By embedding climate adaption standards in rules and regulations, the responsibility of climate adaptation becomes more clear ensuring stakeholders who are less active in climate adaptation also participate.
- Climate adaptation policies and goals should increasingly be created that transcend the four-year governing cycles. This would make climate adaptation less prone to political preference and enable long-term commitment and planning. Furthermore, this could enable the long-term collaboration with non-municipal stakeholders in setting and achieving the goals.

### 8.2.2 Recommendations for future research

This research has found five topics that desire future research. First, the dependency on the individual is recognised to create a governance capacity gap. However, the concept of dependency on the individual is ill-defined in scientific literature. Therefore, future research should further define the meaning of this concept, its conditions and implications. By a better understanding of this concept, possible improvements to bridge this gap could be identified and thereby potentially improved climate adaptation governance capacities.

Second, as suggested in chapter 7.1 *Reflection on climate adaptation governance capacity framework*, further development of the climate adaptation governance capacity framework could be done by adding indicators for conditions who currently consist of only one indicator. This would improve the validation of those indicators.

Third, to better understand the implications of the results and possible improvement and gaps of climate adaptation governance, future research could address a comparison of research areas. By comparing areas, in for example different areas within Amsterdam, insights could be gained on different ways of local climate adaptation governance and their efficacy. As well as on discovery of common capacity gaps and gaps which might be more related to local context.

Fourth, research could be performed on perceived and actual missing stakeholders within local climate adaptation. By discovering which stakeholders are missing in climate adaptation, inclusion of these stakeholders can be improved. Furthermore, by discovering which stakeholders are perceived to be missing but are taking action, their visibility and/or connection with other stakeholders could be enhanced.

# References

Abbott, K. W. (2017). *Orchestration: Strategic Ordering in Polycentric Climate Governance*. https://doi.org/10.13140/RG.2.2.10435.60962

Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., Naess, L. O., Wolf, J., & Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic Change*, *93*(3–4), 335–354. https://doi.org/10.1007/s10584-008-9520-z

Ahmadi, A., Kerachian, R., Rahimi, R., & Emami Skardi, M. J. (2019). Comparing and combining Social Network Analysis and Stakeholder Analysis for natural resource governance. *Environmental Development*, *32*, 100451. https://doi.org/10.1016/j.envdev.2019.07.001

Amsterdam Noord Groene Stad aan het Water. (n.d.). *Missie | ANGSAW*. Retrieved 31 August 2022, from http://angsaw.nl/over-angsaw/missie/

Amsterdam Rainproof. (n.d.). *Beleid gemeente Amsterdam*. Retrieved 29 August 2022, from https://www.rainproof.nl/beleid-gemeente-amsterdam

Amsterdam Rainproof. (2017). *Toelichting regenwaterknelpunten:* 2.

Amsterdam Rainproof. (2019). *Rainproof Knelpunten*. https://maps.amsterdam.nl/open_geodata/?k=288

Amsterdam Rainproof. (2022a). *Het rainproof netwerk*. https://www.rainproof.nl/netwerk

Amsterdam Rainproof. (2022b). *Nationaal beleid*. https://www.rainproof.nl/nationaal-beleid

Anguelovski, I., Chu, E., & Carmin, J. (2014). Variations in approaches to urban climate adaptation: Experiences and experimentation from the global South. *Global Environmental Change*, *27*, 156–167. https://doi.org/10.1016/j.gloenvcha.2014.05.010

Bergsma, E., Gupta, J., & Jong, P. (2012). Does individual responsibility increase the adaptive capacity of society? The case of local water management in the Netherlands. *Resources, Conservation and Recycling*, *64*, 13–22. https://doi.org/10.1016/j.resconrec.2012.03.006

Bettini, Y., Brown, R. R., & de Haan, F. J. (2015). Exploring institutional adaptive capacity in practice: Examining water governance adaptation in Australia. *Ecology and Society*, *20*(1). https://www.jstor.org/stable/26269741

Biagini, B., Bierbaum, R., Stults, M., Dobardzic, S., & McNeeley, S. M. (2014). A typology of adaptation actions: A global look at climate adaptation actions financed through the Global Environment Facility. *Global Environmental Change*, *25*, 97–108. https://doi.org/10.1016/j.gloenvcha.2014.01.003

Birchall, S. J., MacDonald, S., & Slater, T. (2021). Anticipatory planning: Finding balance in climate change adaptation governance. *Urban Climate*, *37*, 100859. https://doi.org/10.1016/j.uclim.2021.100859

Buurtgroen 020. (2022). *Netwerk*. buurtgroen020.nl. https://buurtgroen020.nl/organisaties

Carter, J. G., Cavan, G., Connelly, A., Guy, S., Handley, J., & Kazmierczak, A. (2015). Climate change and the city: Building capacity for urban adaptation. *Progress in Planning*, *95*, 1–66. https://doi.org/10.1016/j.progress.2013.08.001

Chaffin, B. C., Garmestani, A. S., Gunderson, L. H., Benson, M. H., Angeler, D. G., Arnold, C. A. (Tony), Cosens, B., Craig, R. K., Ruhl, J. B., & Allen, C. R. (2016). Transformative Environmental Governance. *Annual Review of Environment and Resources*, *41*(1), 399–423. https://doi.org/10.1146/annurev-environ-110615-085817

Chapin, F. S., Carpenter, S. R., Kofinas, G. P., Folke, C., Abel, N., Clark, W. C., Olsson, P., Smith, D. M. S., Walker, B., Young, O. R., Berkes, F., Biggs, R., Grove, J. M., Naylor, R. L., Pinkerton, E., Steffen, W., & Swanson, F. J. (2010). Ecosystem stewardship: Sustainability strategies for a rapidly changing planet. *Trends in Ecology & Evolution*, *25*(4), 241–249. https://doi.org/10.1016/j.tree.2009.10.008

City Deal Klimaatadaptatie. (2016). *City Deal Klimaatadaptatie*.

Clar, C., & Steurer, R. (2019). Climate change adaptation at different levels of government: Characteristics and conditions of policy change. *Natural Resources Forum*, *43*(2), 121–131. https://doi.org/10.1111/1477-8947.12168

Climate Cleanup. (n.d.). *What we do | Climate Cleanup*. Retrieved 31 August 2022, from https://climatecleanup.org/whatwedo/

Cloutier, G., Joerin, F., Dubois, C., Labarthe, M., Legay, C., & Viens, D. (2015). Planning adaptation based on local actors' knowledge and participation: A climate governance experiment. *Climate Policy*, *15*(4), 458–474. https://doi.org/10.1080/14693062.2014.937388

Cloutier, G., Papin, M., & Bizier, C. (2018). Do-it-yourself (DIY) adaptation: Civic initiatives as drivers to address climate change at the urban scale. *Cities*, *74*, 284–291. https://doi.org/10.1016/j.cities.2017.12.018

Colloff, M. J., Martín-López, B., Lavorel, S., Locatelli, B., Gorddard, R., Longaretti, P.-Y., Walters, G., van Kerkhoff, L., Wyborn, C., Coreau, A., Wise, R. M., Dunlop, M., Degeorges, P., Grantham, H., Overton, I. C., Williams, R. D., Doherty, M. D., Capon, T., Sanderson, T., & Murphy, H. T. (2017). An integrative research framework for enabling transformative adaptation. *Environmental Science & Policy*, *68*, 87–96.

https://doi.org/10.1016/j.envsci.2016.11.007
De Nijs, T., Bosch, P., Brand, E., Heusinkveld, B., Van Der Hoeven, F., Jacobs, C., Klok, L., Kluck, J., Koekoek, A., Koopmans, S., Van Nieuwaal, K., Ronda, R., & Steeneveld, G. (2019). *Ontwikkeling Standaard Stresstest Hitte*. https://doi.org/10.21945/RIVM-2019-0008
de Voogt, D., Smolenaars, D., Francissen, E., Vreeken, J., van de Veer, M., Schuurman, M., Berkenveld, H., Haanstra, W., & Marinussen, S. (2021). *Amsterdamse Impuls Schoolpleinen—Kennisdocument*. Gemeente Amsterdam. https://www.rainproof.nl/sites/default/files/210924_kennisdoc_ais_versie_extern.pdf
den Exter, R., Lenhart, J., & Kern, K. (2015). Governing climate change in Dutch cities: Anchoring local climate strategies in organisation, policy and practical implementation. *Local Environment*, *20*(9), 1062–1080. https://doi.org/10.1080/13549839.2014.892919
Dilling, L., Prakash, A., Zommers, Z., Ahmad, F., Singh, N., de Wit, S., Nalau, J., Daly, M., & Bowman, K. (2019). Is adaptation success a flawed concept? *Nature Climate Change*, *9*(8), 572–574. https://doi.org/10.1038/s41558-019-0539-0
Fedele, G., Donatti, C. I., Harvey, C. A., Hannah, L., & Hole, D. G. (2019). Transformative adaptation to climate change for sustainable social-ecological systems. *Environmental Science & Policy*, *101*, 116–125. h ttps://doi.org/10.1016/j.envsci.2019.07.001
Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*, *30*(1), 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511
Frantzeskaki, N., Loorbach, D., & Meadowcroft, J. (2012). Governing societal transitions to sustainability. *International Journal of Sustainable Development*, *15*(1/2), 19. https://doi.org/10.1504/IJSD.2012.044032
Garmestani, A. S., & Benson, M. H. (2013). A Framework for Resilience-based Governance of Social-Ecological Systems. *Ecology and Society*, *18*(1), art9. https://doi.org/10.5751/ES-05180-180109
Gemeente Amsterdam. (n.d.). *Kerncijfers gebieden | Website Onderzoek en Statistiek*. Retrieved 24 August 2022, from https://onderzoek.amsterdam.nl/interactief/dashboard-kerncijfers
Gemeente Amsterdam. (2016). *Stad om het IJ*. Gemeente Amsterdam. https://www.amsterdam.nl/kunst-cultuur/monumenten/publicaties/rapporten/stad-om-het-ij/
Gemeente Amsterdam. (2019a). *Actualisatie Bestuursopdracht Ontwikkelbuurten 2019 – 2022*. https://www.amsterdam.nl/bestuur-organisatie/volg-beleid/coalitieakkoord-uitvoeringsagenda/fijne-buurten/ontwikkelbuurten/
Gemeente Amsterdam. (2019b). *Gebiedsagenda's Noord 2019-2022*. Gemeente Amsterdam.
Gemeente Amsterdam. (2020). *Strategie Klimaatadaptatie Amsterdam*. https://www.omgevingsweb.nl/wp-content/uploads/po-assets/301953.pdf
Hemelwaterverordening Amsterdam, 5 (2021). https://www.rainproof.nl/sites/default/files/hemelwaterverordening_gemeenteblad.pdf
Gemeente Amsterdam. (2021a). *Uitvoeringsagenda Klimaat adaptie*.
Gemeente Amsterdam. (2021b). *Woningcorporatiebezit 2021 Metropoolregio Amsterdam* [Map]. https://maps.amsterdam.nl/afwc_2021/?LANG=nl
Gemeente Amsterdam. (2022a). *Buurtbudget Bloemenbuurt*. https://www.amsterdam.nl/stadsdelen/noord/buurtbudget-bloemenbuurt/
Gemeente Amsterdam. (2022b). *Factsheet Welke Buurten, Welke Opgaven? - Stadsdeel Noord*. https://openresearch.amsterdam/image/2022/5/19/factsheet_welke_buurten_welke_opgaven_stadsdeel_noord.pdf
Gemeente Amsterdam. (2022c). *Indeling gebied*. https://maps.amsterdam.nl/open_geodata/?k=204
Gemeente Amsterdam. (2022d). *Uitvoeringsagenda: Gezonde en duurzame stad* [Webpagina]. Amsterdam.nl; Gemeente Amsterdam. https://www.amsterdam.nl/bestuur-organisatie/volg-beleid/coalitieakkoord-uitvoeringsagenda/gezonde-duurzame-stad/
Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: Interviews and focus groups. *British Dental Journal*, *204*(6), 291–295. https://doi.org/10.1038/bdj.2008.192
Giordano, R., Brugnach, M., & Pluchinotta, I. (2017). Ambiguity in Problem Framing as a Barrier to Collective Actions: Some Hints from Groundwater Protection Policy in the Apulia Region. *Group Decision and Negotiation*, *26*(5), 911–932. https://doi.org/10.1007/s10726-016-9519-1
Glaas, E., Hjerpe, M., Storbjörk, S., Neset, T.-S., Bohman, A., Muthumanickam, P., & Johansson, J. (2019). Developing transformative capacity through systematic assessments and visualization of urban climate

transitions. *Ambio*, *48*(5), 515–528. https://doi.org/10.1007/s13280-018-1109-9
Grayson, E. L. (2018). *The Future of sustainable communities: A comparative study between Lancaster CoHousing and Amsterdam De Ceuvel*. 19.
Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., van den Brink, M., Jong, P., Nooteboom, S., & Bergsma, E. (2010). The Adaptive Capacity Wheel: A method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy*, *13*(6), 459–471. https://doi.org/10.1016/j.envsci.2010.05.006
Hegger, D. L. T., Mees, H. L. P., Driessen, P. P. J., & Runhaar, H. A. C. (2017). The Roles of Residents in Climate Adaptation: A systematic review in the case of the Netherlands: The Roles of Residents in Climate Adaptation. *Environmental Policy and Governance*, *27*(4), 336–350. https://doi.org/10.1002/eet.1766
Helleman, G., Majoor, S., Peek, G. J., & van der Veen, H. (2021). *Participatiemoe(d)*. Platform Stad en Wijk. https://sway.office.com/smyJ8icyfLfDmoNa
Hölscher, K., Frantzeskaki, N., & Loorbach, D. (2019). Steering transformations under climate change: Capacities for transformative climate governance and the case of Rotterdam, the Netherlands. *Regional Environmental Change*, *19*(3), 791–805. https://doi.org/10.1007/s10113-018-1329-3
Hölscher, K., Frantzeskaki, N., McPhearson, T., & Loorbach, D. (2019a). Tales of transforming cities: Transformative climate governance capacities in New York City, U.S. and Rotterdam, Netherlands. *Journal of Environmental Management*, *231*, 843–857. https://doi.org/10.1016/j.jenvman.2018.10.043
Hölscher, K., Frantzeskaki, N., McPhearson, T., & Loorbach, D. (2019b). Capacities for urban transformations governance and the case of New York City. *Cities*, *94*, 186–199. https://doi.org/10.1016/j.cities.2019.05.037
Impact Makers. (n.d.). *Warming Up*. Retrieved 31 August 2022, from https://impactmakers.nl/warmingup
Kivimaa, P., & Kern, F. (2016). Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. *Research Policy*, *45*(1), 205–217. https://doi.org/10.1016/j.respol.2015.09.008
Kleerekoper, L. (2016). Urban Climate Design: Improving thermal comfort in Dutch neighbourhoods. *A+BE | Architecture and the Built Environment*, *11*, 1–424. https://doi.org/10.7480/abe.2016.11.1359
Kleerekoper, L., Koekoek, A., & Kluck, J. (2018). Een wijk- typologie voor klimaat- adaptatie. *Stadwerk magazine*, *01/2018*, 3.
Klimaateffectenatlas. (2021a). *Droogte*. Climate Adaptation Services. STOWA / SAT-WATER / GVL
Klimaateffectenatlas. (2021b). *Overstroming*. Climate Adaptation Services. LIWO - Rijkswaterstaat
Klimaateffectenatlas. (2021c). *Paalrot*. Climate Adaptation Services. Deltaris
Klimaateffectenatlas. (2022a). *Basiskaarten—Wijktypologie*. Climate Adaptation Services. Tauw, Hogeschool van Amsterdam, and Climate Adaptation Services
Klimaateffectenatlas. (2022b). *Hittestress*. Climate Adaptation Centre. Witteveen+Bos
Knaggård, Å., Persson, E., & Eriksson, K. (2020). Sustainable Distribution of Responsibility for Climate Change Adaptation. *Challenges*, *11*(1), 11. https://doi.org/10.3390/challe11010011
Koop, S. H. A., Koetsier, L., Doornhof, A., Reinstra, O., Van Leeuwen, C. J., Brouwer, S., Dieperink, C., & Driessen, P. P. J. (2017). Assessing the Governance Capacity of Cities to Address Challenges of Water, Waste, and Climate Change. *Water Resources Management*, *31*(11), 3427–3443. https://doi.org/10.1007/s11269-017-1677-7
Ligtvoet, L., Franken, R., Minnen, J., Witmer, M., van Nieuwaal, K., Goosen, H., & Heinen, M. (2021). *Navigeren naar een klimaatbestendig Nederland. Drie varianten om de uitvoering van het klimaatadaptatiebeleid op kortere en langere termijn te sturen en te monitoren*. Planbureau voor de Leefomgeving, Climate Adaptation Services. https://www.pbl.nl/sites/default/files/downloads/pbl-2021-navigeren-naar-een-klimaatbestendig-nederland-4619.pdf
Loorbach, D. (2014). *To transition! Governance panarchy in the new trans- formation.* Inaugural Lecture, Erasmus University Rotterdam, Rotterdam. https://drift.eur.nl/wp-content/uploads/2016/12/To_ Transition-Loorbach-2014.pdf
Mathew, S. M., Trueck, S., Truong, C. H., & Davies, P. (2016). *Monitoring and evaluation in adaptation*. National Climate Change Adaption Research Facility. https://coastadapt.com.au/sites/default/files/factsheets/RR2_Monitoring_and_Evaluation_in_adaptation.pdf
Meadowcroft, J. (2009). *Climate Change Governance* (SSRN Scholarly Paper No. 1407959). https://papers.ssrn.com/abstract=1407959
Mees, H. (2017). Local governments in the driving seat? A comparative analysis of public and private responsibilities for adaptation to climate change in European and North-American cities. *Journal of Environmental Policy & Planning*, *19*(4), 374–390. https://doi.org/10.1080/1523908X.2016.1223540

Mees, H. L. P., Driessen, P. P. J., & Runhaar, H. A. C. (2012). Exploring the Scope of Public and Private Responsibilities for Climate Adaptation. *Journal of Environmental Policy & Planning*, *14*(3), 305–330. https://doi.org/10.1080/1523908X.2012.707407

Mees, H. L. P., Driessen, P. P. J., Runhaar, H. A. C., & Stamatelos, J. (2013). Who governs climate adaptation? Getting green roofs for stormwater retention off the ground. *Journal of Environmental Planning and Management*, *56*(6), 802–825. https://doi.org/10.1080/09640568.2012.706600

Metabolic. (2013). *Cleantech Playground*. https://www.metabolic.nl/publications/cleantech-playground/

Metropoolregio Amsterdam. (2022). *MRA Agenda*. metropoolregioamsterdam. https://www.metropoolregioamsterdam.nl/agenda/

Ministerie van Infrastructuur en Milieu. (2016). *Nationale klimaatadaptatiestrategie 2016 (NAS)*. Rijksoverheid.

Ministerie van Infrastructuur en Milieu. (2020). *Nationaal perspectief klimaatadaptatie*. Rijksoverheid.

Ministerie van Infrastructuur en Waterstaat, Ministerie van Landbouw, Natuur en Voedselkwaliteit, & Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. (2021). *Nationaal Deltaprogramma 2022*. https://open.overheid.nl/repository/ronl-b05f63ab-f2d5-4fba-8aca-1c7e2ef0ce57/1/pdf/bijlage-2-deltaprogramma-2022.pdf

Nevig, J., Voß, J.-P., & Monstadt, J. (2013). *Governance for sustainable development: Coping with ambivalence, uncertainty and distributed power* (3rd ed.). Taylor and Francis.

Ortner, F. P. (2020). Micro-infrastructures: Architecture In Data-driven Amsterdam. *Contour Journal*, *6*, Article 6. https://contourjournal.org

Pedde, S., Kok, K., Hölscher, K., Frantzeskaki, N., Holman, I., Dunford, R., Smith, A., & Jäger, J. (2019). Advancing the use of scenarios to understand society's capacity to achieve the 1.5 degree target. *Global Environmental Change*, *56*, 75–85. https://doi.org/10.1016/j.gloenvcha.2019.03.010

Pelling, M., & High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change*, *15*(4), 308–319. https://doi.org/10.1016/j.gloenvcha.2005.02.001

Planas-Carbonell, A., Anguelovski, I., Oscilowicz, E., Perez de Pulgar, C., & Shokry, G. (2022). From Greening the Climate-Adaptive City to Green Gentrification? Short-Lived Benefits and Mixed Social Effects in Boston, Philadelphia, Amsterdam and Barcelona. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4053652

Pörtner, H., Roberts, D. C., Poloczanska, K., Mintenbeck, K., Tignor, A., Alegría, M., Craig, M., Langsdorf, S., Löschke, S., Möller, V., & Okem, A. (2022). *IPCC, 2022: Summary for Policymakers*. In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

Red Amsterdam Noord. (n.d.). *Actiegroe Red Amsterdam Noord*. Retrieved 31 August 2022, from https://www.redamsterdamnoord.nl

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C. H., & Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management*, *90*(5), 1933–1949. https://doi.org/10.1016/j.jenvman.2009.01.001

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169. https://doi.org/10.1007/BF01405730

Roest, A., & Boogaard, F. (2020). *Spatial transformations 2020. Chapter 6 Climate Adaptation: about monitoring, citizens and cafes*, 172.

Rosenzweig, C., Solecki, W. D., Romero-Lankao, P., Mehrotra, S., Dhakal, S., & Ibrahim, S. A. (2018). *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press.

Rowley, T. J., & Moldoveanu, M. (2003). When Will Stakeholder Groups Act? - An Interest- and Identity-Based Model of Stakeholder Group Mobilization. *The Academy of Management Review*, *28*(2), 204. https://doi.org/10.2307/30040709

Runhaar, H. A. C., Uittenbroek, C. J., van Rijswick, H. F. M. W., Mees, H. L. P., Driessen, P. P. J., & Gilissen, H. K. (2016). Prepared for climate change? A method for the ex-ante assessment of formal responsibilities for climate adaptation in specific sectors. *Regional Environmental Change*, *16*(5), 1389–1400. https://doi.org/10.1007/s10113-015-0866-2

Runhaar, H., Mees, H., Wardekker, A., van der Sluijs, J., & Driessen, P. P. J. (2012). Adaptation to climate change-related risks in Dutch urban areas: Stimuli and barriers. *Regional Environmental Change*, *12*(4), 777–790. https://doi.org/10.1007/s10113-012-0292-7

Runhaar, H., Wilk, B., Persson, Å., Uittenbroek, C., & Wamsler, C. (2018). Mainstreaming climate adaptation: Taking stock about "what works" from empirical research worldwide. *Regional Environmental Change*, *18*(4), 1201–1210. https://doi.org/10.1007/s10113-017-1259-5

Ryan, D., & Bustos, E. (2019). Knowledge gaps and climate adaptation policy: A comparative analysis of six Latin American countries. *Climate Policy*, *19*(10), 1297–1309. https://doi.org/10.1080/14693062.2019.1661819

Schneider, W. (2008). The Development of Metacognitive Knowledge in Children and Adolescents: Major Trends and Implications for Education. *Mind, Brain, and Education*, *2*(3), 114–121. https://doi.org/10.1111/j.1751-228X.2008.00041.x

Termeer, C., Dewulf, A., & Breeman, G. (2013). Governance of Wicked Climate Adaptation Problems. In J. Knieling & W. Leal Filho (Eds.), *Climate Change Governance* (pp. 27–39). Springer. https://doi.org/10.1007/978-3-642-29831-8_3

Termeer, C., Dewulf, A., Rijswick, H. van, Buuren, A. van, Huitema, D., Meijerink, S., Rayner, T., & Wiering, M. (2011). The regional governance of climate adaptation: A framework for developing legitimate, effective, and resilient governance arrangements. *Climate Law*, *2*(2), 159–179. https://doi.org/10.1163/CL-2011-032

Termeer, C. J. A. M., Dewulf, A., Breeman, G., & Stiller, S. J. (2015). Governance Capabilities for Dealing Wisely With Wicked Problems. *Administration & Society*, *47*(6), 680–710. https://doi.org/10.1177/0095399712469195

Tolhuistuin. (2021). *Natuurgebied Noord*. https://tolhuistuin.nl/nieuws/opening-natuurgebied-noord-manifest-verlanglijst

Tompkins, E. L., Adger, W. N., Boyd, E., Nicholson-Cole, S., Weatherhead, K., & Arnell, N. (2010). Observed adaptation to climate change: UK evidence of transition to a well-adapting society. *Global Environmental Change*, *20*(4), 627–635. https://doi.org/10.1016/j.gloenvcha.2010.05.001

Torfing, J., Peters, B. G., Pierre, J., & Sørensen, E. (2012). *Interactive Governance: Advancing the Paradigm*. OUP Oxford.

Trell, E.-M., & van Geet, M. T. (2019). The Governance of Local Urban Climate Adaptation: Towards Participation, Collaboration and Shared Responsibilities. *Planning Theory & Practice*, *20*(3), 376–394. https://doi.org/10.1080/14649357.2019.1629573

Tshishonga, N. S. (2020). Forging Civic and Democratic Governance From Below Through Virtual State and Communities: Case Studies of Communities of Practice. In S. Chhabra & M. Kumar (Eds.), *Advances in Human and Social Aspects of Technology* (pp. 67–95). IGI Global. https://doi.org/10.4018/978-1-7998-2372-8.ch004

United Nations Development Programme. (2010). Designing climate change adaptation initiatives. http://www. adaptationlearning.net/sites/default/files/17750_CC_un_toolbox.pdf.

van de Kamp, L. (2018). *Stedelijke regeneratie in Amsterdam-Noord: Over de politiek van erfgoed en creativiteit (Urban Regeneration in Amsterdam North: the politics of heritage and creativity)*. *39*, 263–286.

van de Kamp, L., & Welschen, S. (2019). Sociale cohesie in gentrificerende arbeiderswijken van Amsterdam-Noord. *Beleid en Maatschappij*, *46*(3), 366–389. https://doi.org/10.5553/BenM/138900692019046003004

van Leeuwen, H. J. C., & Sowter, A. (2019). *Validation Soil subsidence in the Netherlands*.

van Zelm, I., Diemel, S., & Witschge, J. (2022). *Oud-Noord—Gebiedsanalyse 2022*. Gemeente Amsterdam. https://openresearch.amsterdam/en/page/85616/oud-noord---gebiedsanalyse-2022

VNG, Unie van waterschappen, Interprovinciaal overleg, & Ministerie van Infrastructuur en Waterstaat. (2018). *Bestuursakkoord klimaatadaptatie*. https://klimaatadaptatienederland.nl/actueel/actueel/nieuws/2018/bestuursakkoord/

Voortuin van Noord. (2019). *Manifest Voortuin van Noord*. https://voortuinvannoord.wordpress.com/over/

Waterstaat, M. van I. en. (2020, August 28). *Deltaplan Ruimtelijke adaptatie* [Webpagina]. Ministerie van Infrastructuur en Waterstaat. https://www.deltaprogramma.nl/themas/ruimtelijke-adaptatie/deltaplan

Williams, D. S., Celliers, L., Unverzagt, K., Videira, N., Máñez Costa, M., & Giordano, R. (2020). A Method for Enhancing Capacity of Local Governance for Climate Change Adaptation. *Earth's Future*, *8*(7). https://doi.org/10.1029/2020EF001506

Wolfram, M. (2016). Conceptualizing urban transformative capacity: A framework for research and policy. *Cities*, *51*, 121–130. https://doi.org/10.1016/j.cities.2015.11.011

Wolfram, M., Borgström, S., & Farrelly, M. (2019). Urban transformative capacity: From concept to practice. *Ambio*, *48*(5), 437–448. https://doi.org/10.1007/s13280-019-01169-y

Wolfram, M., & Frantzeskaki, N. (2016). Cities and Systemic Change for Sustainability: Prevailing Epistemologies and an Emerging Research Agenda. *Sustainability*, *8*(2), 144. https://doi.org/10.3390/su8020144

Wolfram, M., van der Heijden, J., Juhola, S., & Patterson, J. (2019). Learning in urban climate governance: Concepts, key issues and challenges. *Journal of Environmental Policy & Planning*, *21*(1), 1–15. https://doi.org/10.1080/1523908X.2018.1558848

Yin, R. K. (2009). *Case Study Research: Design and Methods*. SAGE.

# Appendices

# Appendix A: Translation interviewee (job)titles

**Table 20.** List of interviewees

| Stakeholder group | Interviewees | Dutch translation |
|---|---|---|
| Municipality – District Noord | Sustainability coordinator Noord | Duurzaamheid coördinator Noord |
| | Green coach Oud-Noord | Groen coach Oud-Noord |
| | Green coordinator Noord | Groen coördinator Noord |
| | Neighbourhood broker Volewijck | Gebiedsmakelaar Volewijck |
| | Area coordinator Oud-Noord | Gebiedscoördinator Oud-Noord |
| | Strategy advisor Noord | Strategisch adviseur Noord |
| | Coordinator project green Noord/Noordmaker | Coördinator groen projecten /Noordmaker |
| | Coordinator Neighbourhood Budgets Noord | Coördinator buurtbudgetten Noord |
| Municipality (not district specific) | Project and process specialist – Urban works | Project en process specialist |
| | Urban landscape designer (public space) – Space and sustainability | Stedelijk landscapsarchitect (openbare ruimte) – Ruimte en duurzaamheid |
| | Community manager Amsterdam Rainproof – Rainproof & Engineering Bureau Municipality of Amsterdam | Community manager Amsterdam Rainproof – Rainproof & Inginieursbureau Gemeente Amstersdam |
| | Communication advisor – Programme Climate Adaptation | Communicatie adviseur – Programma klimaatadaptatie |
| Citizens | Citizen Volewijck – initiator green in front of building and initiator public aquaponic systems | Bewoner Volewijck – initiatiefnemer groen voor de deur en publieke aquaponic systemen |
| | Citizen IJplein – Initiator Oud-Noord tile removal | Bewoner IJplein – initiatiefnemer Oud-Noord tegelwippen |
| Local private sector/NGO | Owner local company – initiator green in front of building | Eigenaar lokaal bedrijf – initiatiefnemer groen voor de deur |
| | Board member Vliegenbos | Bestuurder Vliegenbos |
| | Program and project manager – Waternet | Programma en project manager – Waternet |
| Local cultural organisation/ institution | Citizen Tuindorp Buiksloot – Initiator Beeldenbos | Bewoner Tuindorp Buiksloot – initiatiefnemer Beeldenbos |
| | Programme manager – Tolhuistuin | Programma maker – Tolhuistuin |

# Appendix B: Interview guide

This is an example interview guide that will be used during the stakeholder interviews. These questions an answer is needed to provide insight in the governance capacity. As the interviews are semi-structured, questions might be answered without directly asking them. Some questions are formulated differently depending on the interviewee's knowledge on governance and climate jargon.

Interview NAME, DATE
Semi-structured interview
STAKEHOLDER TYPE & POSITION

***Pre-information***
Goal interview: understand stakeholders governance capacities by looking at its adaptation, collaboration, knowledge, and organisation.
Give in advance an idea about which topics I would like to interview.

***Introduction***
Summarize the research. Tell what is done with the results, how they are spread and how I report them back. Explain the extent of anonymity that I can guarantee. Ask for consent on recording the interview and use of data.

***Start***
- How are you working on climate adaptation?
- What does this look like in practise?
- Why do you participate/take this action?
    - What is the problem you are trying to solve?
    - What is the origin of this problem?
- With whom do you undertake this/these action(s)?

***Middle***
*Topic: Adapting*
- Do you experience difficulties in your climate adaptation activity?
    - If so, where and how do you experience difficulty?
    - How do you think this can be resolved?
- Do you feel responsible to take climate adaptation action?
- Do you have the idea that your effort is improving the area, the environment and/or people?
- Are you able to explore different manners to perform your adaptation? Do you have the means and skills to seek opportunities?
- (How) do you raise awareness? What awareness do you aim to raise? (How) do you assist in behavioural change?
- (How) is your adaptation locally supported?

*Topic: Collaboration*
- Do you know other stakeholders who are also taking action on the same topic as your climate adaptation activities?
    - Yes
        - Who do you know?
    - Do you have the idea stakeholder(groups) are missing in acting in climate adaptation?
- Are you collaborating with other (climate adaptation) stakeholders?
    - Yes
        - Why do you collaborate?

        - How do you collaborate?
        - Do you think the collaboration works well? / Has an added value?
        - Is the collaboration across different scales and/or sectors? Across which ones?
        - Which stakeholders do you think are missing?
    - No.
        - Why do you not collaborate?
- Do you have a shared value with other stakeholders?
- Do you share a strategy and/or vision with multiple stakeholders?
- Do you/are you part of making plans or directions for long-term co-benefits?

*Topic: Knowledge*

- Did you inform yourself about certain topics? Which? How? Or did you need information before you started/could start?
    - Do experience that you have access to knowledge and information about climate adaptation, and your specific change you want to enable?
- (How) did you look if there were other projects? (How) did draw lessons from it?
- (How) are you monitoring you progress towards your goal?
    - (How) are you sharing the results and outcome?
- Are you sharing information with others?
    - Yes
        - With whom do you share information?
        - How do you share information?
        - What type of information do you share? (Do you share novelties)
        - Do you learn from other stakeholders/actors?
        - Can this be improved?
    - No Why not?
- Are you using information/knowledge and/or resources with other stakeholders?
    - Do you integrate across scales and sectors? Amongst which ones?

*Topic: Organisation*

- Do you feel there is room to experiment? What space do you need? Is there financial or regulatory lifting possible?
- Are there people within your group who are able to create and use opportunities to discover alternatives and/or innovations? Do you have goals and are they put on into actions? Are there networks where diverse actors can share ideas and innovations?
- Do you want to scale up and replicate your climate adaptive activity? How?
- Do you have long-term goals? (How) are these integrated with other climate adaptation stakeholders?
- Do you experience that the actions you take are affordable? And the ones you would like to take? Are you willing to pay for these actions?
- Are there incentives or standards for sustainable investment? Is there regulation and control on your topic of climate adaptation (that you are aware of)?

***End***

- Are there (other) questions that I did not ask, but that you do want to answer?
- For my thesis, who else is interesting to interview about this topic? Do you know other actors who participate in climate adaptation?

Thank interviewee for time and input and, ask if asking additional via e-mail is allowed and again summarize the follow-up and data-handling.

# Appendix C: Predefined indicator questions

This appendix shows the predefined indicator questions for each indicator, organised by capacity.

**Table 21.** Stewarding capacity predefined indicator questions

| Condition | Indicator | Predefined questions |
|---|---|---|
| 1.1 Generating knowledge about system dynamics | a. Knowledge availability | (How) do you gain knowledge on the topic of your climate adaptation activity?<br>Do experience that you have access to knowledge and information about climate adaptation, and your specific change you want to enable? |
| | b. Cross-stakeholder learning | (How) do you learn from other stakeholders/actors? |
| 1.2 Strengthening self-organisation | a. Collaboration in knowledge and projects | (How) you sharing knowledge with others?<br>With whom do you share knowledge?<br>What type of knowledge do you share? |
| 1.3 Monitoring and continuous learning | a. Institutional and social memory | (How) did you look at other projects in the past?<br>(How) did you draw lessons from it? What did you (dis)like/what when okay/wrong? |
| | b. Smart monitoring | (How) are you monitoring you progress towards your goal?<br>(How) are you sharing the results and outcome? |

**Table 22.** Unlocking capacity predefined indicator questions

| Condition | Indicator | Predefined questions |
|---|---|---|
| 2.1 Revealing unsustainable path dependency and maladaptation | a. Identifying and exploring systemic drivers | What is reason for you to act in climate adaptation?<br>Are you able to discover what the problem is you are trying to solve? What is the origin? |
| 2.2 Undermining vested interests and incentive structures | a. Support for sustainable business | Are there incentives or standards for sustainable investment? Is there regulation and control on your topic of climate adaptation (that you are aware of)? |
| | b. Room to manoeuvre | Do you experience room to explore different pathways of performing your adaptation? (Opportunity to experiment with other methods?)<br>Do you have the means and skills to seek opportunities? |
| 2.3 Breaking open resistance to change | a. Fostering willingness and awareness | (How) do you raise awareness? What awareness do you aim to raise? (How) do you assist in behavioural change? |

**Table 23.** Transformative capacity predefined indicator questions

| Condition | Indicator | Predefined questions |
|---|---|---|
| 3.1 Enabling novelty creation | a. Leadership of opportunities for change | Do you have goals and are they put on your agenda?<br>Are there networks where diverse actors can share innovations? |
| | b. Space for innovation | Do experience space for innovation? |
| 3.2 Increasing visibility of novelty | a. Local support | Do you experience support from people or organisations in Oud-Noord? How? |
| | b. Multi-actor innovation networks | Do you have people within your group/organisation who are looking for collaborations with other stakeholders for innovations? |
| | c. Advocacy coalitions | (How) do you share novelties? |
| 3.3 Anchoring novelty in context | a. Learning for replication and upscaling | (How) do you consider the ability to scale up and replicate your climate adaptive activity? |
| | b. Institutional space and compliance | (To what extent) do you think there is space to embed your adaptation within an institution – such as agreements, objective and legislation? |
| | c. Affordability | Do you experience the measures you take and would like are affordable?<br>Are you willing to pay for these actions? |

**Table 24.** Orchestrating capacity predefined indicator questions

| Condition | Indicator | Predefined questions |
|---|---|---|
| 4.1 Strategic alignment | a. Long-term and integrated goals | Do you have long-term goals? (How) are these integrated with other climate adaptation stakeholders? |
| | b. Involvement for strategy/vision | Do you share a strategy and/or vision with multiple stakeholders?<br>To what extent are representatives are able to speak and decide in clear and transparent engagement processes? |
| | c. Division of responsibilities | Do you have (or believe to have) responsibilities? What are your responsibilities?<br>Do others also have responsibilities? What are who's responsibilities in your view? Are these responsibilities communicated |
| 4.2 Mediating across scales and sectors | a. Connection nodes for climate action | Are you connecting with other (climate adaptation) stakeholders? |
| | b. Space for knowledge sharing | Are you sharing information or knowledge with other (climate adaptation) stakeholders? |
| | c. Knowledge cohesion | Are you integrating knowledge and resources with other stakeholders? Do you integrate across scales and sectors? Across which ones? |
| 4.3 Creating opportunity contexts | a. Long-term co-benefits | Do you/are you part of framing conditions and financing mechanisms for long-term co-benefits? |

# Appendix D: Indicator levels

This appendix shows the description for each of five possible levels for each indicator, to enable the operationalisation of the conceptual framework and analyses of the interviews.

## 1. Stewarding capacity

**Table 5.** Likert-type indicator levels for indicator 1.1.a knowledge availability *(repeated)*

| Level | Description |
|---|---|
| Very encouraging (++) | Access to and availability of desired information and context specific knowledge, and contributing to generating knowledge. |
| Encouraging (+) | Access to and availability of desired information and context specific knowledge |
| Indifferent (0) | Access to and availability of information and context related knowledge |
| Limiting (-) | Access to or availability of information and context related knowledge |
| Very limiting (--) | No access to and availability of desired information and context specific knowledge, and not contributing to generating knowledge. |

**Table 25.** Likert-type indicator levels for indicator 1.1.b cross-stakeholder learning

| Level | Description |
|---|---|
| Very encouraging (++) | Stakeholders continuously learn from each other, and actively exchange knowledge they believe other stakeholders can benefit from. They understand different perspectives. |
| Encouraging (+) | Stakeholders learn from each other and understand several different perspectives. |
| Indifferent (0) | Stakeholders learn from each other. |
| Limiting (-) | Stakeholders have learned from each other, or at least one stakeholder has learnt from others. |
| Very limiting (--) | Stakeholders do not learn from other stakeholders. |

**Table 26.** Likert-type indicator levels for indicator 1.2.a collaboration in knowledge and projects

| Level | Description |
|---|---|
| Very encouraging (++) | Communicating, sharing, and co-creating knowledge with all interested stakeholders; multi-level and cross-sectoral |
| Encouraging (+) | Communicating, sharing, and/or co-creating knowledge with multiple interested stakeholders; multi-level and cross-sectoral |
| Indifferent (0) | Communicating and sharing knowledge within own environment |
| Limiting (-) | Communicating about knowledge within own environment |
| Very limiting (--) | Not communicating, sharing, and co-creating knowledge with interested stakeholders |

**Table 27.** Likert-type indicator levels for indicator 1.3.a institutional and social memory

| Level | Description |
|---|---|
| Very encouraging (++) | Learning many lessons from other (past) projects and adapting own plans accordingly. |
| Encouraging (+) | Learning some lessons from other (past) projects and some are adapting own plans accordingly. |
| Indifferent (0) | Learning from other (past) projects but not adapting own plans accordingly. |
| Limiting (-) | Looking at other (past) projects but learning from it. |
| Very limiting (--) | Not looking at other (past) projects. |

**Table 28.** Likert-type indicator levels for indicator 1.3.b smart monitoring

| Level | Description |
|---|---|
| Very encouraging (++) | Extensive monitoring of progress (toward goals), clear documenting and sharing of progress and outcomes |
| Encouraging (+) | Monitoring of progress (toward goals), documenting and sharing of progress and/or outcomes |
| Indifferent (0) | Some monitoring of progress (towards goals), some documenting and sharing of progress and/or outcomes |
| Limiting (-) | Some monitoring of progress (towards goals), no documenting and sharing of progress and/or outcomes |
| Very limiting (--) | No monitoring of progress (towards goals), no documenting and sharing of progress and/or outcomes |

## 2. Unlocking capacity

**Table 29.** Likert-type indicator levels for indicator 2.1.a identifying and exploring systemic drivers

| Level | Description |
|---|---|
| Very encouraging (++) | Aware of systemic drivers, finding unstainable systemic drivers and make other stakeholders respond to these findings |
| Encouraging (+) | Aware of systemic drivers, finding or looking for unstainable systemic drivers |
| Indifferent (0) | Aware of systemic drivers |
| Limiting (-) | Aware of some systemic drives and unaware of possible unsustainable drivers |
| Very limiting (--) | Not aware of systemic drivers |

**Table 30.** Likert-type indicator levels for indicator 2.2.a support for sustainable business

| Level | Description |
|---|---|
| Very encouraging (++) | Incentives and standards for sustainable investment and regulations to control unsustainable practices |
| Encouraging (+) | Incentives and standards for sustainable investment and regulations related to unsustainable practices |
| Indifferent (0) | Incentives and/or for some sustainable investments |
| Limiting (-) | Incentives are developing or sustainable process is encouraged but not with incentives or standards |
| Very limiting (--) | No incentives or standards for sustainable investment or implementation of regulation to control unsustainable practices |

**Table 31.** Likert-type indicator levels for indicator 2.2.b room to manoeuvre

| Level | Description |
|---|---|
| Very encouraging (++) | Room to manoeuvre in different pathways, access to skills, resources and means, and ability to manage risks |
| Encouraging (+) | Room to manoeuvre in different pathways, access to some skills, resources and means, and/or ability to manage risks |
| Indifferent (0) | Limited room to manoeuvre in different pathways, limited access to skills, resources and means, and/or limited ability to manage risks |
| Limiting (-) | Limited room to manoeuvre in different pathways, and not having access to skills, resources and/or means, and/or ability to manage risks |
| Very limiting (--) | No room to manoeuvre in different pathways, and not having access to skills, resources and means and ability to manage risks |

**Table 32.** Likert-type indicator levels for indicator 2.3.a fostering willingness and awareness

| Level | Description |
|---|---|
| Very encouraging (++) | Raising awareness, enabling behaviour change and assist in behaviour change |
| Encouraging (+) | Raising awareness, enabling behaviour change |
| Indifferent (0) | Raising awareness |
| Limiting (-) | Discussing climate adaptation topics but not being able to raise awareness |
| Very limiting (--) | Not raising awareness and not enable behaviour change |

3. Transformative capacity

**Table 33.** Likert-type indicator levels for indicator 3.1.a leadership of opportunities for change

| Level | Description |
|---|---|
| Very encouraging (++) | Ability to create and use opportunities, presence of visionary agents, and setting goals and putting these on the agenda |
| Encouraging (+) | Ability to create and use opportunities, presence of visionary agents, and/or setting goals and putting these on the agenda (two out of three) |
| Indifferent (0) | Ability to create and use opportunities, presence of visionary agents, and/or setting goals (one out of three) |
| Limiting (-) | Ability to create opportunities but not using these and no presence of visionary agents |
| Very limiting (--) | No ability to create and used opportunities and no presence of visionary agents |

**Table 34.** Likert-type indicator levels for indicator 3.1.b multi-actor innovation networks

| Level | Description |
|---|---|
| Very encouraging (++) | Enable collaboration for strategic and operational innovations, and involve communities |
| Encouraging (+) | Enable collaboration for strategic or operational innovations, and involve communities |
| Indifferent (0) | Enable collaboration for strategic or operational innovations, no involvement communities |
| Limiting (-) | Not hinder collaboration for either strategic or operational innovations, no involvement of communities |
| Very limiting (--) | No collaboration for innovations, no involvement of communities |

**Table 35.** Likert-type indicator levels for indicator 3.1.c space for innovation

| Level | Description |
|---|---|
| Very encouraging (++) | Space for innovation regarding time, regulations, financials and other needed space |
| Encouraging (+) | Within boundaries there is space for innovation regarding time, regulations and financials |
| Indifferent (0) | Within boundaries there is space little space for innovation regarding time, regulations and/or financials |
| Limiting (-) | There seemed to be space for innovation within boundaries regarding time, regulations and/or financials. But one that is missing is dominant and therefore making innovation not possible |
| Very limiting (--) | No space for innovation regarding time, regulations and financials |

**Table 36.** Likert-type indicator levels for indicator 3.2.a local support

| Level | Description |
|---|---|
| Very encouraging (++) | Acceptance and appreciation of a climate adaptation action at local level, and local support in creation and advocacy of climate adaptation |
| Encouraging (+) | Acceptance and/or appreciation of a climate adaptation action at local level, and local support in creation and/or advocacy of climate adaptation |
| Indifferent (0) | Acceptance and/or appreciation of a climate adaptation action at local level, and limited local support in creation and/or advocacy of climate adaptation |
| Limiting (-) | Acceptance or appreciation of a climate adaptation action at local level. Or local support in creation or advocacy of climate adaptation |
| Very limiting (--) | No acceptance and appreciation of a climate adaptation action at local level, and no local support in creation and advocacy of climate adaptation |

**Table 37.** Likert-type indicator levels for indicator 3.2.b advocacy coalitions

| Level | Description |
|---|---|
| Very encouraging (++) | Networking and collaboration to share novelties with multiple others |
| Encouraging (+) | Networking and collaboration to share novelties |
| Indifferent (0) | Networking or collaboration to share novelties |
| Limiting (-) | Sharing novelties but not within networks or collaborations |
| Very limiting (--) | Not sharing novelties |

**Table 38.** Likert-type indicator levels for indicator 3.3.a learning for replication and upscaling

| Level | Description |
|---|---|
| Very encouraging (++) | Identifying opportunities for upscaling and replicating climate adaptive activity, and mainstreaming it into urban practises |
| Encouraging (+) | Identifying opportunities for upscaling and/or replicating climate adaptive activity, and putting it into more urban practises |
| Indifferent (0) | Identifying opportunities for upscaling and/or replicating climate adaptive activity |
| Limiting (-) | Not looking for opportunities for upscaling or replicating climate adaptive activity |
| Very limiting (--) | Not looking for opportunities for upscaling or replicating climate adaptive activity and not repeating activities |

**Table 39.** Likert-type indicator levels for indicator 3.3.b institutional space and compliance

| Level | Description |
|---|---|
| Very encouraging (++) | Institutional space for embedding strategic and operational innovations in mainstream practice, and stakeholders respect and understand agreements, objective, and legislation |
| Encouraging (+) | Institutional space for embedding strategic and operational innovations, and stakeholders respect and/or understand agreements, objective, and legislation |
| Indifferent (0) | Institutional space for embedding strategic and operational innovations, or stakeholders respect and/or understand agreements, objective, and legislation |
| Limiting (-) | No institutional space for embedding strategic and operational innovations in mainstream practice, and stakeholders only respect or understand some agreements, objectives, and legislations |
| Very limiting (--) | No institutional space for embedding strategic and operational innovations in mainstream practice, and stakeholders do not respect and understand agreements, objective, and legislation |

**Table 40.** Likert-type indicator levels for indicator 3.3.c affordability

| Level | Description |
|---|---|
| Very encouraging (++) | Climate adaptation actions are accessible for all, and stakeholders are willing to pay |
| Encouraging (+) | Climate adaptation actions are accessible for many, and stakeholders are willing to pay |
| Indifferent (0) | Climate adaptation actions are accessible for some, and stakeholders are willing to pay |
| Limiting (-) | Climate adaptation actions are accessible for some, but stakeholders are not willing to pay |
| Very limiting (--) | Climate adaptation actions are not accessible, and stakeholders are not willing to pay |

## 4. Orchestrating capacity

**Table 41.** Likert-type indicator levels for indicator 4.1.a long-term and integrated goals

| Level | Description |
|---|---|
| Very encouraging (++) | Long-term integrated goals with various stakeholders and goals are embedded in discourse |
| Encouraging (+) | Long-term integrated goals with some stakeholders and/or goals are embedded in discourse |
| Indifferent (0) | Long-term goals and partly embedded in discourse |
| Limiting (-) | (Long-term) goals |
| Very limiting (--) | No goals |

**Table 42.** Likert-type indicator levels for indicator 4.1.b involvement for strategy/vision

| Level | Description |
|---|---|
| Very encouraging (++) | Involving multiple stakeholders in strategy/vision, and stakeholders can speak and decide in clear and transparent engagement processes |
| Encouraging (+) | Involving multiple stakeholders in strategy/vision, and stakeholders can speak in clear and transparent engagement processes |
| Indifferent (0) | Involving multiple stakeholders in strategy/vision |
| Limiting (-) | Using information from multiple stakeholders to create strategy/vision |
| Very limiting (--) | Not involving other stakeholders |

**Table 43.** Likert-type indicator levels for indicator 4.1.c division of responsibilities

| Level | Description |
|---|---|
| Very encouraging (++) | Responsibilities are divided, all stakeholders understand their responsibilities and what is expected from them. Communication of responsibilities |
| Encouraging (+) | Stakeholders understand their responsibilities and what is expected from them. Communication of responsibilities |
| Indifferent (0) | Stakeholders understand their responsibilities and what is expected from them |
| Limiting (-) | Stakeholders try to understand what their responsibilities are |
| Very limiting (--) | Stakeholders do not understand their responsibilities and what is expected from them |

**Table 44.** Likert-type indicator levels for indicator 4.2.a connection nodes for climate action

| Level | Description |
|---|---|
| Very encouraging (++) | Connection of stakeholders between and across levels, organisations and providing limited fragmentation |
| Encouraging (+) | Connection of stakeholders between and across levels, organisations |
| Indifferent (0) | Connection of stakeholders between or across levels, organisations |
| Limiting (-) | Some connection of stakeholders within levels and/or organisations |
| Very limiting (--) | No connection of stakeholders between and across levels or organisations |

**Table 45.** Likert-type indicator levels for indicator 4.2.b space for knowledge sharing

| Level | Description |
|---|---|
| Very encouraging (++) | Intermediary space for knowledge sharing and trust building. Stakeholders share and co-produce and select from a variety of options to ensure learning and authoritative decisions. |
| Encouraging (+) | Intermediary space for knowledge sharing and trust building. Stakeholders share and co-produce knowledge. |
| Indifferent (0) | Stakeholders share knowledge and have space to do this |
| Limiting (-) | Stakeholders share knowledge, but do not experience availability of neutral spaces |
| Very limiting (--) | Stakeholders do not share knowledge |

**Table 46.** Likert-type indicator levels for indicator 4.2.c knowledge cohesion

| Level | Description |
|---|---|
| Very encouraging (++) | Integrating and merging knowledge and resources across scales and sectors. Identifying opportunities, synergies and trade-offs between different goals |
| Encouraging (+) | Integrating knowledge and resources across scales and/or sectors |
| Indifferent (0) | Integrating knowledge and resources across own scale and/or sector |
| Limiting (-) | Integrating knowledge and/or resources only within own scale and sector |
| Very limiting (--) | Not integrating knowledge and resources with others |

**Table 47.** Likert-type indicator levels for indicator 4.3.a long-term co-benefits

| Level | Description |
|---|---|
| Very encouraging (++) | Framing conditions and financing mechanisms for long-term co-benefits; on innovative, long-term and co-beneficial solutions |
| Encouraging (+) | Framing conditions for long-term co-benefits; on innovative, long-term and/or co-beneficial solutions |
| Indifferent (0) | Conditions for long-term co-benefits are discussed |
| Limiting (-) | Aiming for long-term co-benefits, not clearly framing conditions |
| Very limiting (--) | Not framing conditions and mechanisms for long-term co-benefits |

# Appendix E: Declaration of consent

## Information and Purpose

The interview you have been asked to participate in is part of my Masters in Metropolitan Analysis, Design & Engineering at WUR and TU Delft. This research focuses on governance capacity of climate adaptation in the Amsterdam Oud-Noord. The aim of this study is to understand who is working on climate adaptation in this area, how they are doing this and with whom they are collaborating.

## Your participation

Your participation in this study consists of an interview of approximately one hour. You will be asked a series of questions about your experience and participation in climate adaptation. You are not obliged to answer the questions. You are free to leave any question unanswered you would rather not answer. At any time, you may indicate to the interviewer/researcher that you wish to stop the interview and/or your participation in the study.

## Contribution and Risks

With your participation you contribute to the information for the research on the governance capacity of climate adaptation. The expectation is that you will not experience any risks.

## Confidentiality

The interview will be recorded, via audio only. Your name will also not be recorded or linked to your answers during the interview. All information and answers will be treated confidentially. The interviewer/researcher will not share your confidential answers with anyone other than the study supervisors.

If you have any questions, please contact Marit Vuyk.

By signing this form, I understand and agree to what I have read. I am aware that I may discontinue my participation in this study at any time.

Signature _____ Date: _____