Navigating Climate Adaptation Through Cities in Transition

A Case Study of the Municipalities Almere, Lelystad, and Urk

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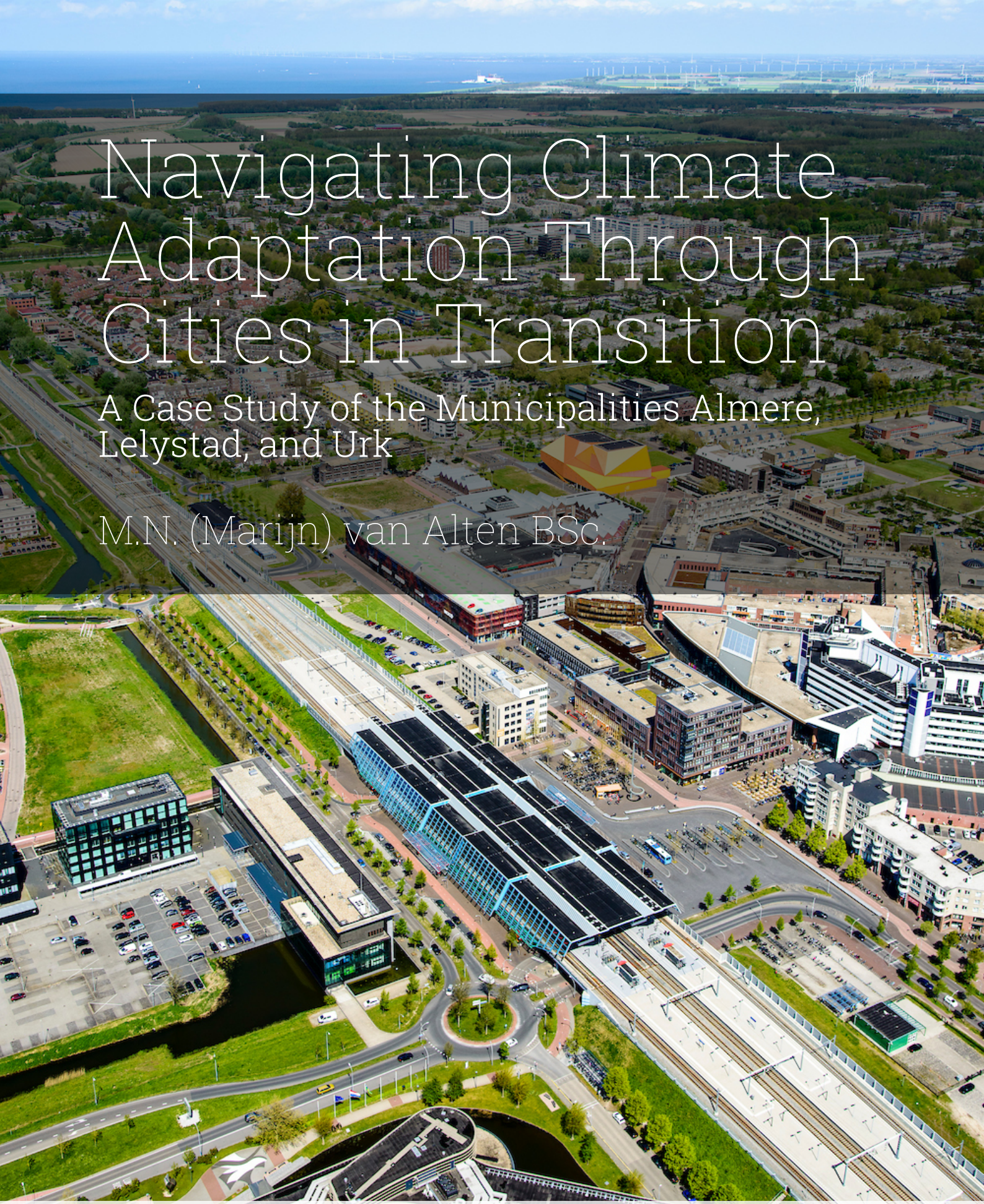

TU Delft

Gemeente Almere

gemeente Lelystad

gemeente Urk

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by

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to obtain the degree of Master of Science
at the Delft University of Technology,
to be defended publicly on Thursday April 17, 2025 at 11:00 AM.

Student number:	4608666	
Project duration:	8 January, 2024 – 17 Apil, 2025	
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Keywords: Climate adaptation, water management, sustainability transitions, urban planning, integration, urban greening

Cover: Aerial photo of railway station Lelystad Centrum and surroundings, by Siebe Swart Photography. Used with permission.

Preface

This thesis is the result of my research conducted to complete the MSc Water Management program at the Faculty of Civil Engineering, Technological University of Delft, in collaboration with the municipalities of Almere, Lelystad, and Urk. It signifies the culmination of my time at TU Delft, where I also completed my bachelor's degree in Civil Engineering.

I was introduced to Jeroen Langeveld, chair of my graduation committee, through a project at The Green Village, which focused on a climate adaptation measure for a company. However, this endeavor was not fruitful. Jeroen encouraged me to broaden my perspective by viewing climate adaptation not as isolated measures, but as a fundamental shift in city design, exploring its connections with other urban transitions. This idea resonated with me, and soon after, Almere, Lelystad, and Urk each independently agreed to be part of my research.

I set out with this ambitious project, but researching such a broad topic turned out to be a valuable lesson in how easily I can overestimate what can be achieved within a limited timeframe. Fortunately, the timeline remained flexible, and I ended up doing more than initially planned. I do not regret this, as I gained a deeper understanding of urban planning and related social and technical aspects, all tied back to water management and climate change. This aligned well with my broad interests, and I have been fascinated by viewing things from a larger perspective.

While my intention was to embed my research within a municipality, in practice, it became a largely self-driven desk study—on my own, focusing on document analysis rather than being integrated into municipal operations and employees. This was partly due to the multi-municipal setup and my document-based research approach, which naturally lent itself to an independent working style.

By the time the document study was completed and interviews were set to begin, I was already well over time, and enough data had been collected. Still, I chose to proceed with the planned interviews, and I'm glad I did—even if there were only three. Interviewing the kind and passionate people behind the papers I had been studying was both interesting and inspirational. Hearing firsthand about the practical complications that arise in reality, often hidden in documents, was invaluable. I do regret not being able to explore these complexities further due to my extensive document study, but I am confident that I will encounter and understand them more deeply as I start my career in water management.

I would like to express my gratitude to my supervisors at the university for their guidance throughout this process. First, I want to thank Jeroen for providing the opportunity to research this fascinating topic and for granting me the trust and freedom to carve my own path while offering guidance and support whenever I needed it. I also want to thank Maurits for joining the committee, helping me shape my research design, and overseeing the research method as I progressed. Additionally, I want to thank Ekaterina for her kindness, valuable feedback on my report, and advice for my final presentation.

I would like to thank all my contacts at the municipalities, particularly Anne, for not only being my main contact at the municipality but also taking a place in my thesis committee and providing invaluable feedback on my progress and reports. I also want to thank Dick and Sjef for their warm welcome from the start and for assisting me with my thesis, providing documents and connections within the municipalities that allowed me to conduct the interviews.

A special thanks goes to Timo, whom I met at the start of my bachelor at TU Delft, and who has been my closest study companion throughout the last year, regularly offering me a place to study, coffee, valuable advice, and friendship.

I would also like to thank my family for their continuous love and support, especially my father for his advice on my final presentation. Lastly, I want to thank Josine for always being there for me, providing a listening ear during highs, and offering support during lows. I look forward to the adventures we will have together.

Marijn van Alten
Delft, April 2025

Summary

Climate change is already a reality, and its impacts—extreme precipitation, heat stress, and drought—present substantial threats to society. Adapting to these climatological changes requires fundamental shifts in how society and its environment are organized. At the same time, critical challenges such as mitigating further climate change, improving mental and physical health, and halting the decline of ecosystems and biodiversity demand urgent attention. Governments at international, national, regional, and local levels have implemented a range of agreements, strategies, and plans to confront these issues. Achieving these objectives necessitates structural changes across society, a process commonly referred to as transitions.

This thesis places climate adaptation at the center of a range of urban transitions and investigates its relation with a number of sustainability transitions, spanning a variety of sectors. The study examines how these transitions interact within the built environment—a context particularly vulnerable to climate change in which diverse interests compete for limited space—with a strong focus on the spatial-technical aspects.

This research is carried out through a literature study and an exploratory multiple case study conducted in three municipalities within the Dutch polder province of Flevoland: Almere, Lelystad, and Urk. The research addresses the central question: **What is the relation between climate adaptation and other urban transitions in Almere, Lelystad, and Urk?**

To address this complex and multidimensional question, a grounded theory approach was employed, involving the iterative collection and analysis of four types of data: literature, policy documents, project documents, and interviews.

The first phase involved a literature study that identified five key transitions related to climate adaptation: energy, mobility, circular economy, environmental health, and nature inclusiveness. It explored the motivations, urban implications, and connections between each transition and climate adaptation.

Following the literature review, the exploratory multiple case study of Almere, Lelystad, and Urk was conducted. The case study had three components:

1. **Policy Study**: This component analyzed how climate adaptation and other transitions were represented in municipal policy documents, employing both quantitative and qualitative methods to assess their interrelationships.
2. **Project Study**: Building on the policy study, this component explored how climate adaptation intersects with other transitions in ongoing or recently completed spatial projects. A systematic analysis of project documents qualitatively examined transitions and relations in spatial municipal projects, using the policy study as a framework for interpretation.
3. **Interviews**: The final component involved interviews with municipal professionals, capturing their experiences and perspectives on the studied transitions and relationships, and providing further validation of the findings from earlier stages.

The policy study revealed that the climate adaptation strategies of the municipalities share a focus on three key themes: (1) integrating climate adaptation into spatial planning as a new approach, rather than treating it as a separate sector; (2) advocating for a preferential order in stormwater management, with local retention and infiltration prioritized over rapid discharge; and (3) emphasizing blue-green solutions for climate adaptation due to their cost-effectiveness and multidimensional benefits.

Although the climate adaptation policies are more recently developed than the studied projects—this being the case for most policies and projects examined—these strategies are largely recognized in the projects.

The following sections present the key findings on the relations between climate adaptation and other transitions, categorized into geographical, physical, and project-based relations.

Geographical Relations: Providing Space for Climate Adaptation

The mobility and energy transitions play key roles in the allocation of space for climate adaptation in Almere, Lelystad, and Urk. While the mobility transition can create space for climate adaptation, the energy transition primarily competes for it.

Municipal policies in all three municipalities indicate a clear effort to increase the share of active mobility and reduce car use. They are thus actively pursuing a mobility transition, though they adopt a careful, enticing approach rather than one of enforcement. This reduction in car dependence can be leveraged to free up space for urban greening, supporting climate adaptation. While this connection was rarely highlighted in the policy documents, the project study—particularly the redevelopment projects—demonstrated how the reduction of car infrastructure, through incremental changes in design and functionality, can effectively create space for green areas and facilitate climate adaptation.

The energy transition, which requires space for infrastructure such as heating networks and cables, competes with climate adaptation needs. Policy documents emphasize the importance of spatially integrating both transitions. In two of the new development projects, both transitions are spatially integrated, but even then, the spatial impact of the energy transition is substantial, reducing space available for climate adaptation measures. In the new development project in Urk, challenges in integrating a heat network undermined climate adaptation efforts by reducing green space. No large-scale energy transition measures were included in the redevelopment projects, so the integration of climate adaptation in these contexts was not evaluated. Given the large-scale implications of these projects, further research on their integration is highly recommended.

Physical Relations: Shared Infrastructure

Some urban transitions show strong synergies in shared infrastructure, particularly through green and blue-green infrastructure. Climate adaptation closely aligns with the environmental health transition, as both aim for a healthy living environment and rely on urban greening as a key part of their strategy. Policy documents revealed extensive connections between these transitions, often overlapping with nature inclusiveness, especially in Almere and Lelystad. For the environmental health transition, a key term is *beleefbaarheid* (experiential quality) of blue and green spaces. This was reflected in the project studies: water bodies for stormwater storage are designed to also serve recreational purposes, while green spaces include amenities for play and exercise, alongside wadis and trees. Closely related to urban greening for environmental health is the alignment of active mobility infrastructure with blue-green structures, providing aesthetics and pleasant microclimates that stimulate active transport. Although the link between health and climate adaptation is strong and emphasized in interviews, challenges such as allergens, pests, maintenance, and social security must be managed, as highlighted in the policy documents.

Nature inclusiveness and climate adaptation are closely aligned, as both aim to expand blue-green infrastructure to support ecosystems and mitigate climate change impacts on these ecosystems. Projects integrate green spaces into broader blue-green networks, as seen in the overhauled Prismapark in the Regenboogbuurt in Almere. In new development projects, green and blue structures within the neighborhood fabric are connected to larger green spaces surrounding it. Besides providing cooling, this creates a continuous ecosystem. Clean stormwater also plays a crucial role in ecological health, as demonstrated in Warande in Lelystad, where a newly created water body, primarily fed by local stormwater, improves water quality and resilience to extreme weather.

The circular economy and energy transitions present integration opportunities through sustainable water management and energy-efficient infrastructure. While strategies such as rainwater reuse are mentioned in policy, their practical application in the studied projects has been modest. The energy transition can integrate with climate adaptation through green roofs and walls, which contribute to cooling and insulation, potentially reducing energy demand.

Project-based Relations: Aligning Stakeholder Agendas

Successful geographical and infrastructural integration of climate adaptation with other transitions requires project-based collaboration to align stakeholder agendas. Policy documents emphasize the importance of integrated projects to reduce costs and disruption, but interviews revealed challenges in practice. Limited time, expertise, and prioritization often hinder integration, with climate adaptation and urban greening sometimes treated as secondary concerns. The energy transition, in particular, poses challenges due to its complexity, novelty, and scale. However, given the small sample size of interviews, further research is needed to fully understand these challenges and potential solutions.

This study found that integrating climate adaptation practices with various urban transitions plays an important role in addressing diverse municipal challenges and ambitions. The ongoing mobility transition is key in creating space within the limited urban environment, while improper integration with the energy transition can dilute climate adaptation measures and hinder their effectiveness. There is considerable potential for synergy between transitions related to health and ecology, as their objectives align closely with climate adaptation strategies. Together, they can collectively advocate for increased attention to blue and green infrastructure. The capture and reuse of water presents a promising link between climate adaptation and the circular economy, but practical implementation was not observed in the studied projects.

This research explored the spatial-technical relations between the transitions broadly, focusing primarily on policy and project documents. This can serve as a starting point for further research delving deeper into the specifics of these relations or particular aspects of them. Such research is necessary to provide actionable insights for municipalities. Improving integration with the energy transition is especially critical due to its large-scale and unavoidable implications. Additionally, project managers and their teams need additional capacity, tools, and training to successfully integrate all municipal transitions into practice.

Contents

List of Figures

List of Tables

Nomenclature

Glossary

Term	Applied definition
Transition	Gradual, continuous process of change where the structural character of a society, or a complex sub-system, transforms. This research only deals with transitions in the urban spatial environment (Rotmans et al., 2001).
Climate adaptation	The transition towards an urban environment that aims to negate the negative impact of climate change in the form of water nuisance through pluvial flooding, heat stress and drought (IPCC (2007) and *Delta Plan on Spatial Adaptation* (2018)).
Energy transition	Actions aimed at replacing fossil fuels with renewable energy sources, generating renewable energy, and reducing overall energy demand (*Dutch Climate Agrement*, 2019).
Mobility transition	Actions related to promoting active mobility and public transport, reducing car use, and limiting car ownership (Loorbach et al., 2021).
Circular economy transition	Actions related to circular economy practices, including material reuse, reducing consumption (such as through local supply chains and rainwater capture and reuse), circular construction, and waste prevention (*Circular Netherlands in 2050*, 2016).
Environmental health	Actions to enhance the living environment for improved mental and physical health, such as encouraging physical activity, relaxation and socializing, trough urban greening and provision of health promoting amenities such as play areas, bike and walking paths and seating areas (de Vries et al. (2022) and *National Environmental Vision*, (2020)).
Nature inclusiveness transition	Actions aimed at improving biodiversity and nature values such as urban greening, providing habitats for wildlife, and enhancing nature experience and appreciation actions (*Agenda Nature Inclusive*, 2022).

Note: These definitions were partially formulated by the author to align with the specific context of this research project. Sources referenced at the end of certain definitions indicate materials that informed the formulation of those terms, even if the wording differs from the original source.

Part I.

Introduction and Research Framework

The Haagwinde, a new residential tower and the tallest landmark of the Warande neighborhood in Lelystad. This neighborhood is part of the project study analysis.
Source: ZAAK VAN NN Architects, retrieved from https://zaakvannn.nl/lelystad-warande/.

1 Introduction

Climate change poses significant threats to the Netherlands, increasing the risks of extreme rainfall, droughts, and heatwaves. Despite global mitigation efforts, the Netherlands has already experienced a 2°C rise in temperature since 1900. Projections suggest an additional 1°C of warming by 2050, with potential increases of up to 4°C by 2100, relative to the current climate, according to the Royal Netherlands Meteorological Institute (*Koninklijk Nederlands Meteorologisch Instituut*) (KNMI, 2023).

Cities are particularly vulnerable to these climatic changes due to the prevalence of impervious surfaces and heat-retaining materials, limited adaptability, high population density, and the central role of the built environment in daily life. If no climate adaptation measures are taken, climate-related damage in the Netherlands is estimated to range from 77.5 to 173.6 billion euros by 2050, according to the *Klimaatschadeschatter* (Climate Adaptation Services, 2020).

The Dutch government and local authorities recognize these threats and have committed to creating a climate-resilient environment by 2050. This goal is outlined in the Delta Plan on Spatial Adaptation (*Deltaplan Ruimtelijke Adaptatie* [DPRA]) and the National Adaptation Strategy (*Nationale Adaptatie Strategie* [NAS]) of the Ministry of Infrastructure and Water Management (I&W, 2016, 2018).

The transition to a climate-adaptive environment is primarily driven at the local and regional levels. As key actors in spatial planning, municipalities and provinces bear much of the responsibility for implementing climate adaptation measures (I&W, 2023a).
Climate adaptation, however, is just one of several sustainability transitions shaping cities today. Long-standing environmental, health, and societal challenges have increasingly influenced policies, driving transitions in energy, economy, mobility, health, and ecology. These shifts have led to new political goals and agreements that cities must now navigate. Additionally, the housing crisis is causing cities to expand and densify, placing increased pressure on existing public spaces and infrastructure. Sustainability transitions not only require physical adaptations but also compete for limited urban space, leading to spatial conflicts between residents, municipalities, utility providers, and other stakeholders. This intensifies the complexity of urban planning (City Deal Openbare Ruimte, 2024).

To foster synergy rather than conflict between climate adaptation and these other transitions, it is crucial to integrate climate adaptation efforts across various spatial policy sectors. This process, known as *mainstreaming*, is recognized in the literature as essential for the successful implementation of climate adaptation (Kok & de Coninck, 2007). Integrating climate adaptation with other spatial tasks can create synergies, optimize the use of limited urban resources, foster innovation, and prevent conflicts that could lead to maladaptation (Grafakos et al., 2019; Uittenbroek et al., 2013). Accordingly, the DPRA emphasizes integration as a key component of its strategy (I&W, 2018).

Dutch municipalities and provinces have recently begun publishing climate adaptation policies or plan to do so in the near future. Additionally, with the recent implementation of the Environment and Planning Act (*Omgevingswet*), municipalities are developing Environmental Visions (*Omgevingsvisies*) that outline integrated, long-term ambitions and goals for the physical environment, in which climate adaptation is expected to be addressed. Despite the previous lack of adequate local policies on climate adaptation and its integration, many municipalities have already started implementing adaptation measures, as noted in a recent DPRA update (I&W, 2023a).

Amidst this turbulent policy landscape for urban planning and climate adaptation, this research aims to provide insight and oversight into how climate adaptation interacts with other urban transitions. This will be achieved through a literature study and an explorative multiple case study of three municipalities in the Dutch Flevopolder: Almere, Lelystad, and Urk. Data will be collected and analyzed from literature, policy documents, project plans, and interviews with involved civil servants.

1.1. Problem statement

The importance of linking climate adaptation to other urban transitions is emphasized in both gray and academic literature. However, translating theory into practice remains a challenge for civil servants and urban planners (I&W, 2023a), and the literature highlights a persistent "implementation gap" in climate adaptation efforts (Runhaar et al., 2018).

The identified research gap is threefold. First, while various studies have examined the integration of climate adaptation within specific policy sectors, a comprehensive exploration of its relation with other urban transitions is lacking. The connections between climate adaptation and some transitions—such as the energy transition or mobility—have been studied to some extent, but the interactions with others, like circular economy or nature inclusiveness, remain largely unexplored. An inclusive assessment of how these transitions influence and interact with one another is missing from existing research.
Second, climate adaptation policy is evolving rapidly in the real-world context of this case study. As mentioned in the introduction, relevant policy documents are being published and implemented in quick succession. Understanding how other urban transitions influence climate adaptation within this dynamic policy landscape provides valuable insights that contribute to the existing body of knowledge.
Third, the three municipalities in this study—Almere, Lelystad, and Urk—offer a unique perspective within the Dutch context. Almere and Lelystad are relatively young cities, developed in the reclaimed Flevoland region in the 1950s and 1960s. Urk, by contrast, was a former island that became part of the mainland following the drainage of the Noordoostpolder. Their distinct histories, spatial characteristics, and urban planning challenges provide a valuable opportunity to study how climate adaptation interacts with other sustainability transitions in newly developed and historically unique settlements.

1.2. Research aim

This study aims to comprehensively explore and map the potential synergies between climate adaptation and other urban transitions. Additionally, it seeks to identify tensions that may hinder successful integration, providing insights into both opportunities and challenges in aligning these transitions.

1.3. Research questions

Main-question

What is the relation between **climate adaptation** and other urban **transitions** in Almere, Lelystad, and Urk?

- **Climate adaptation**: The transition towards an urban environment that aims to negate the negative impact of climate change in the form of water nuisance through pluvial flooding, heat stress and drought (IPCC, 2007) and as outlined in the DPRA (I&W, 2018)).

- **Transition**: Gradual, continuous process of change where the structural character of a society, or a complex sub-system, transforms (Rotmans et al., 2001). This research focuses solely on transitions in the urban spatial environment. The specific transitions of interest will be identified in the first part of the literature review (sub-question 1).

Sub-questions

1. Which urban transitions are linked with climate adaptation according to the literature?
2. In what ways can climate adaptation interface with these urban transitions according to literature?

The following questions are answered in the context of the case study and apply specifically to Almere, Lelystad, and Urk:

3. Which municipal policy documents address the identified urban transitions?
4. What do these policy documents state about the interface between climate adaptation and other urban transitions?
5. Which recent urban planning projects have incorporated climate adaptation measures?
6. What are the outcomes of these projects in terms of climate adaptation and other transitions?
7. How does climate adaptation relate to other urban transitions within these projects?

1.4. Scope

To ensure the practicability of this research, clear boundaries are defined:

- The geographical scope is limited to the **built environment** of Almere, Lelystad, and Urk.
- Only **transitions affecting the physical urban environment** are considered. While the focus is on spatial and physical aspects, financial, institutional, and societal elements are not excluded due to their interconnections.
- The study addresses climate change impacts in the form of **pluvial flooding, heat stress, and drought**. While the DPRA acknowledges the increased flood risk from primary embankment failure, this aspect is excluded. In the Flevopolder (-5m NAP), spatial adaptation is not cost-effective. Instead, evacuation is prioritized, making its relation to other urban transitions negligible.
- The research focuses on the **current state of affairs**, analyzing the most recent projects and policy documents available.

1.5. Research design

This research began with an open-ended main question, allowing flexibility to refine the focus as data was collected. While a general structure was outlined early on, the study evolved iteratively, with insights from each phase shaping subsequent analyses. This data-driven approach enabled a broad yet structured exploration of theories and findings.

The methodology aligns with grounded theory, an inductive research approach introduced by Glaser and Strauss (1967). Grounded theory emphasizes theory development based on emerging patterns in data rather than predefined hypotheses, ensuring that findings remain closely tied to real-world observations.

To reflect the study's chronological progression, a decentralized approach to methodology was adopted. Each study component—literature review, policy analysis, project study, and interviews—has a dedicated methods section within its respective chapter, maintaining logical coherence throughout the thesis.

Literature study

The initial phase of this research involves identifying urban transitions that interface with climate adaptation through a literature study. After pinpointing these transitions and outlining their implications for the built environment, the relations between the transitions and climate adaptation, as discussed in the literature, will be analyzed. This process addresses the first two research questions and establishes a theoretical foundation to guide the subsequent stages of the research.

Case studies

Relations between climate adaptation and other urban transitions are explored through a multiple case study of three municipalities in the Dutch Flevopolder: Almere, Lelystad, and Urk. The case study has an exploratory nature, focusing on an inclusive exploration of the key interconnections. These relations will be examined through a policy study, project study, and interviews.

Policy study The second step of the research focuses on examining municipal policy documents to assess the extent to which municipalities engage with these transitions and envision their impact on the urban environment. This policy study, as the first part of the exploratory case study, will address research questions 3 and 4.

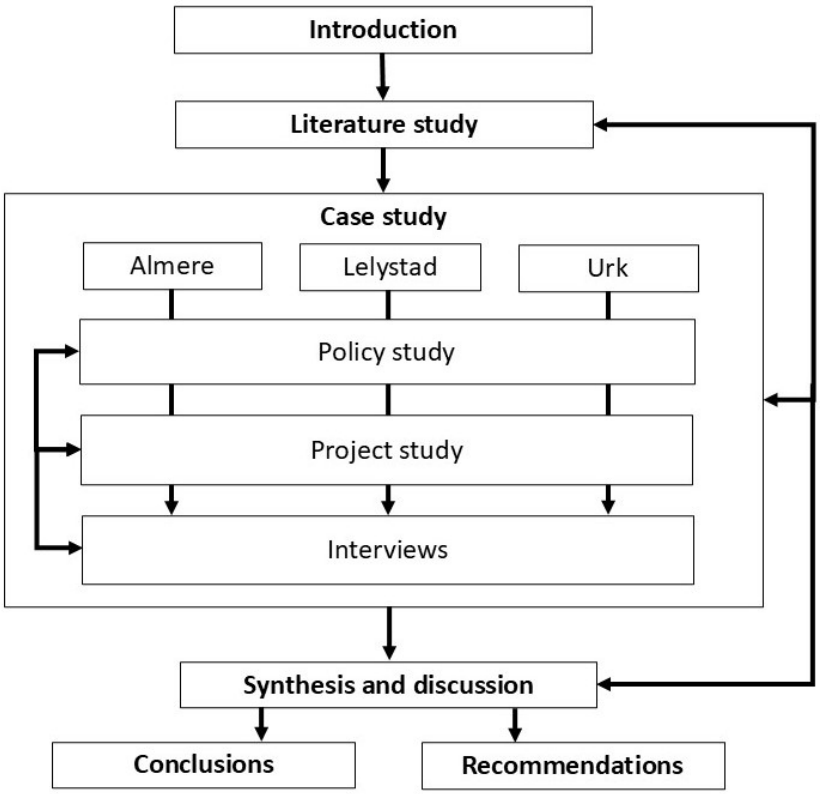

Figure 1.1: Research design diagram

Project study To go beyond the policy documents and assess the practical outcomes, a project study will be conducted. This involves identifying projects in the three municipalities that have integrated climate adaptation measures and analyzing how these measures relate to the other urban transitions. It will address research questions 4 and 5.

Interviews Interviews will be conducted to provide context to the project findings, reflect on the results of the project study, and gather insights from practitioners in the field.

Synthesis and discussion

The synthesis will integrate the findings from the case studies and provide a cohesive interpretation of the results. The discussion will address the theoretical implications of the findings and reflect on the study's limitations.

Conclusion and recommendations

The conclusion will answer the main research question. The final chapter will offer policy recommendations and suggestions for future research.

Part II.

Literature Study

A renovated park in Urk, featuring the restored Palenscherm (timber revetment), which signifies the old outline of the island. The photo was taken at the Schelpenhoek-Holkenkamp crossing, on the border of the Top neighborhood. In this neighborhood, the Molenkamp renewal project, analyzed in the project study, is also located.

Source: NRC, retrieved from https://www.nrc.nl/nieuws/2021/10/28/lopen-langs-de-palissade-a4063310.

2 Literature study

This chapter provides the theoretical foundation for the research and addresses research questions 1 and 2. The chapter is structured as follows: first, the method for the literature study will be introduced in section 2.1. Following that, the results of the literature study will be presented, beginning with the negative consequences of climate change for the urban environment, which underscore the need for climate adaptation, discussed in detail in section 2.3. The focus will then shift to other urban transitions. A brief discussion of the transition phenomenon will precede concise descriptions of the transitions relevant to climate adaptation, as covered in 2.5 through 2.9.

2.1. Method

This section outlines how the literature study was conducted, focusing on the general approach taken, as well as the methods used for literature collection and analysis.

Narrative review

Among several available approaches for conducting a literature study, the decision was made to conduct a narrative review. The narrative review is the "traditional" way of reviewing the extant literature and is skewed towards a qualitative interpretation of prior knowledge (Sylvester et al., 2011). A narrative review differs from a systematic research approach, and in comparison, it has its pros and cons. In general, narrative reviews are less transparent, do not provide an exhaustive, comprehensive review of existing literature, are not easily reproducible, and are subject to the researcher's interpretation (Lau & Kuziemsky, 2017; Sukhera, 2022). Nonetheless, the narrative review was selected as its advantages outweigh its drawbacks in the context of this research:

1. Given the broad and diverse nature of the studied topics, opting for a narrative review allows for a cohesive synthesis of literature that remains accessible and relevant to readers (Sukhera, 2022).
2. By offering a comprehensive overview, a narrative review serves as an educational tool, benefiting both the reader and the researcher.
3. The flexibility inherent in a narrative review aligns with the current study's needs, particularly as the topic is relatively underexplored and the encountered literature is expected to be varied and unpredictable.
4. Utilizing a narrative review method effectively sets the groundwork for the current research, offering an interpretative lens through which to contextualize the existing literature.

Literature search and selection

The literature study examined the implications of climate change for urban environments and the processes involved in adapting these environments to a changing climate. Additionally, it explored the effects of other urban transitions on the built environment and discussed their relation with climate adaptation.

First, to study the general implications and meaning of these topics in the Dutch context, leading institutions and their publications were consulted. Examples include executive authorities such as the

European Commission and Dutch Ministries, sub-governments and their affiliated knowledge institutes (e.g., KNMI, KiM, RIONED, STOWA), as well as international bodies like the IPCC and IPBES. Documents were selected based on relevance. These publications form the basis for local and regional policy documents and their implementation by municipalities, making them crucial for contextualizing later findings.

Secondly, to complement this primarily gray literature, academic literature was assessed. Relevant academic literature was gathered using two methods: snowballing—starting from the aforementioned publications and those from researchers within my network and research field—and database searches in Scopus, Web of Science, and Google Scholar.

The database search was conducted using queries with terms representing the transitions themselves, such as ”climate adaptation”, ”energy transition”, ”mobility transition”, etc., combined with Boolean operators (OR and AND) to assess relations. Additionally, terms related to the further implications of climate change and urban transitions, such as “blue-green infrastructure,” “sustainable urban drainage systems,” “green roofs,” “green space,” “urban heat island,” “heat transition,” “Mobility-as-a-Service,” “smart mobility,” “active mobility,” and “urban biodiversity”, were included.

The selection process was as follows: when the title of a piece of literature suggested it contained relevant information for answering the research questions, the abstract was read. Relevant articles were then fully scanned or read. The literature found led to new insights, synonyms, or phrases that in turn resulted in new search queries, and snowballing was applied.

2.2. Urban vulnerability to climate change

There is no doubt that human activities have caused global warming through the emissions of greenhouse gases. Global average surface temperatures observed between 2011 and 2020 increased by 1.1°C compared to the levels recorded during 1850–1900, as stipulated in the report of the International Panel on Climate Change (IPCC, 2023). The 1.5°C threshold is expected to be reached in the first half of the 2030s. Depending on global mitigation efforts and the sensitivity of the climate system, temperatures could either decrease slightly to around 1.4°C or rise as much as 4.4°C by the end of the 21st century. Human-induced climate change is, however, not limited to a temperature increase; it has likely led to an increase in heatwaves, heavy precipitation, droughts, and tropical cyclones (IPCC, 2023).

In the Dutch context, the impacts of climate change are particularly pronounced. Since measurements began in 1901, the observed annual average temperature in the Netherlands has already risen by 2.3°C. Additionally, the risk of extreme weather events has increased and is expected to continue rising in the future (KNMI, 2023). Figure 2.1 summarizes the projections of these extreme weather events for 2100 compared to the climate of past decades. The following four sections will briefly discuss the changing weather patterns and their impact on the urban environment: increased precipitation, extreme precipitation, drought, and heat.

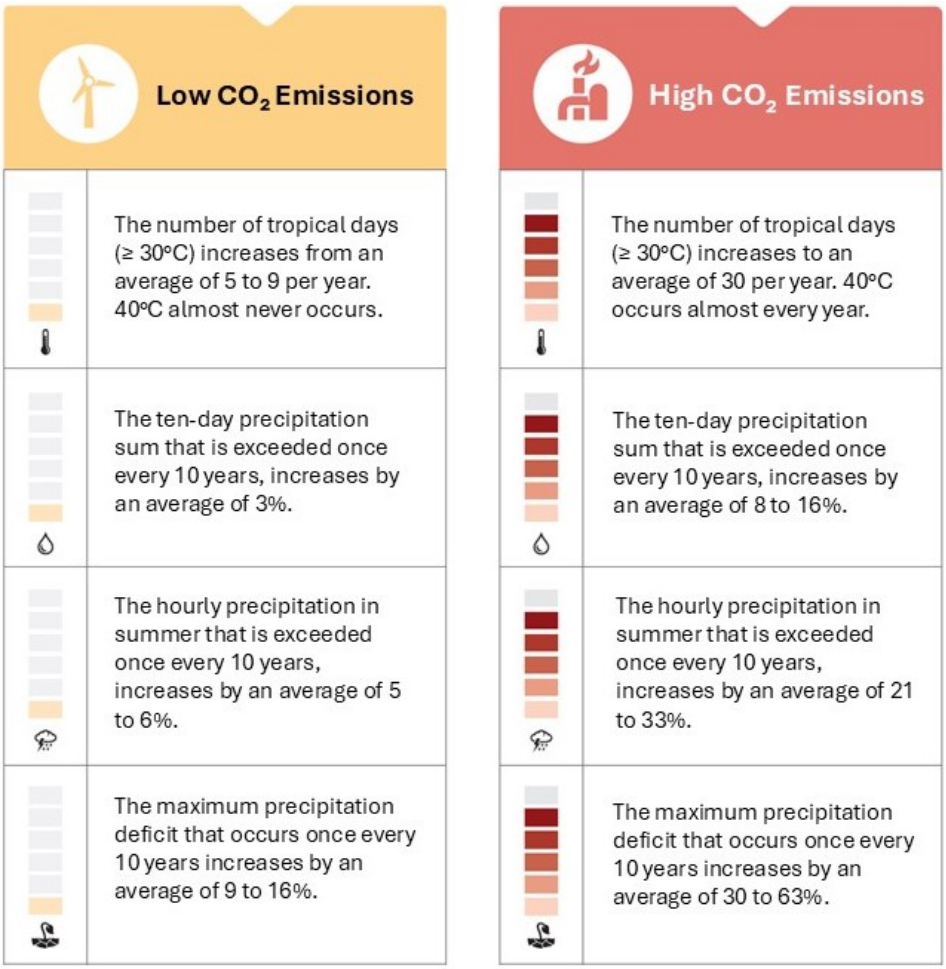

Figure 2.1: Increase in climate extremes (from top to bottom: extreme heat, persistent precipitation, extreme precipitation, and droughts) in the Netherlands around 2100 compared to 1991-2020 (KNMI, 2023).

2.2.1. Increased precipitation

Compared to 1906, there has been a 20% increase in average annual precipitation (KNMI, 2023). Projections indicate further changes ranging from a 3% decrease to an 8% increase between 1991 and 2100, depending on the scenario. The anticipated increase is primarily forecast for winter, with

projected increases ranging from 4% to 24%. Autumn and spring are also expected to experience increased precipitation, while summers are predicted to become drier.

The urban environment's vulnerability to persistent winter precipitation is generally limited, provided that individual precipitation events do not exceed the sewer system's drainage capacity. However, in certain circumstances, persistent precipitation can pose a threat. This is particularly evident when the regional water system of a polder is unable to discharge excess water quickly enough, for instance due to limited pumping capacity, which can lead to inundation. In areas with poorly permeable soils, rising groundwater levels may result in damage and inconvenience (Climate Adaptation Services, n.d.-a).

2.2.2. Extreme precipitation

In the latest KNMI report, fine-grained models that simulate individual precipitation events were combined with coarse-grained climate models to forecast extreme precipitation occurrences under high-emission scenarios. The findings reveal significant increases in hourly and daily precipitation values across various return periods (T=1, T=10, T=100). Projections for longer return periods are particularly notable, indicating increases ranging from 10% to nearly 50% in both hourly and daily rainfall. A previous analysis by KNMI (2015) reported a 12% intensification in extreme precipitation intensity per degree of warming.

Many existing sewer systems lack the capacity to manage more extreme precipitation events, heightening the risk of pluvial flooding and leading to greater damage and inconvenience (this will be further explored in Subsection 2.3.2).

An assessment by SWECO (2018) estimates that pluvial flooding could result in total damages ranging from 36 to 73 billion euros between 2018 and 2050, depending on the climate scenario. Notably, 25 billion euros of this estimate is attributed to current climate conditions, independent of additional climate change.

2.2.3. Drought

A drought is characterized by an extended period of below-normal precipitation levels, combined with significant evaporation. As droughts persist, they can lead to water scarcity and have serious ecological, social, and economic impacts. In three of the four climate scenarios of KNMI (2023), summers are projected to become drier, with droughts expected to occur more frequently and intensely (Machairas & van de Ven, 2023).

Extended periods of drought pose multiple threats to Dutch cities. Droughts can lower groundwater levels, leading to subsidence in soft soil lowland areas, which can cause damage to subsurface infrastructure, flood protection systems, and the foundations of buildings and roads. Particularly, the rotting of wooden pile foundations is a considerable risk. It is estimated that between 750,000 and 1,000,000 buildings are vulnerable to damage from drought.

Damage to buildings and infrastructure due to groundwater level subsidence constitutes a significant portion of the total drought-induced damage. Estimated damages for 2018-2050 vary between 5 and 39 billion euros for an unchanged climate, with this figure potentially increasing by 3 to 15 billion euros due to climate change (Deltares, 2020).

Another negative consequence of drought is the wilting of vegetation in urban parks due to low soil moisture, which can, in turn, damage urban ecosystems (Vicente-Serrano et al., 2020). Moreover, this decrease in evaporation exacerbates the urban heat island effect, leading to higher temperatures.

2.2.4. Heat

Temperatures in the Netherlands have risen by more than 2.3°C and are projected to increase further, potentially reaching 4.4°C under a high-emission climate scenario. In the summer, this would result in an average temperature of 22°C.

Cities are particularly vulnerable to increasing temperatures, as they are already relatively warm due to the urban heat island (UHI) effect. During the summer, urban areas are on average 1°C warmer than surrounding rural areas (I&W, 2018), with the average daily maximum difference reaching 2.3°C (Steeneveld et al., 2011). At night, the UHI effect can be as high as 7°C. The UHI is driven by various factors, including the absorption of solar radiation by heat-retaining materials, which warm up, and

the reduced evaporation due to sparse greenery and water, leading to a greater conversion of solar radiation into sensible heat.

High temperatures can have a wide range of adverse effects on urban society, including health problems for vulnerable population groups, decreased well-being, and reduced labor productivity. Additionally, higher temperatures can lead to a decrease in water quality and an increase in drinking water consumption (Kluck et al., 2020).

Assessed damages based on loss of labor productivity, increased hospitalizations, and fatalities range from 5 to 11 billion euros for the period 2018-2050, depending on the climate scenario (SWECO, 2018).

2.3. Climate adaptation

Climate change adaptation (or simply climate adaptation) is, in the context of this research, defined as the transition toward an urban environment that aims to mitigate the negative impacts of climate change, specifically water nuisance from pluvial flooding, heat stress, and drought, as described by the IPCC (2007) and DPRA (I&W, 2018).

The Dutch government has set a target to achieve a water-robust and climate-resilient built environment by 2050. This objective specifically aims to minimize the adverse effects of climate change on human health, reduce inconvenience for people, and mitigate damage to buildings and the surrounding environment. The initiative seeks to progress towards a more pleasant, environmentally friendly, and healthier living environment both now and in the future.

Climate adaptation is addressed in several national policy documents, one of which is the National Environmental Vision (or *Nationale Omgevingsvisie [NOVI]*) (BZK, 2020), the first comprehensive national policy vision aimed at addressing significant societal challenges. Urban sustainable transitions, as discussed in the current research, are among the central themes of the NOVI.

The Dutch government has introduced two specific policy lines on climate adaptation. In 2016, the National Climate Adaptation Strategy (NAS) was introduced (I&W, 2016), followed by the Delta Plan on Spatial Adaptation (DPRA) (I&W, 2018). The DPRA is a collaborative initiative involving the central government and decentral governments across 45 regions. Under the DPRA framework, these regions are conducting stress tests, engaging in risk discussions, and currently formulating policies and implementation plans. To support the implementation efforts, the central government has made funds available through a temporary stimulus program (*impulsregeling*). The program allocated 300 million euros, with requests, including implementation plans, accepted until 2024. Implementation is expected to be completed by 2027 (BZK et al., 2021; Climate Adaptation Services, n.d.-b). This is currently the only funding provided by the central government for climate adaptation in the spatial urban environment, as no structural budget exists. Further financing must be secured by decentral governments themselves.

In the context of the DPRA, stress tests have been conducted to identify local vulnerabilities in the existing built environment, with a particular focus on water management and sewer systems. These tests often center on public spaces, but the integration with other domains, such as energy, mobility, and nature inclusiveness, remains underdeveloped (BZK et al., 2021).

Central to the DPRA policy is the concept of integrating climate adaptation with other municipal spatial tasks, such as the energy transition, public health, and biodiversity. Numerous tools, examples, and resources on how to effectively link these areas are available on the website *www.Klimaatadaptatienederland.nl* Climate Adaptation Services (n.d.-c).

2.3.1. Blue-Green Infrastructure for Climate Adaptation

Policy frameworks and guidelines from the national government and the European Union, such as the EU Strategy on Adaptation to Climate Change (European Commission, 2021a) and the DPRA (I&W, 2018), emphasize the pivotal role of nature-based solutions (NBS) in adapting cities to a changing climate. NBS serve as a multidisciplinary umbrella concept that integrates social benefits with the notion of ”nature” (Sowinska-Swierkosz et al., 2021).

A key concept within this framework is blue-green infrastructure (BGI) (Woo, 2020), which is widely applied in the context of urban climate adaptation. BGI integrates blue infrastructure (BI) and green infrastructure (GI) elements. BI consists of systems that restore hydrological functions in urban environments, including flow control, detention, retention, filtration, and evaporation. GI comprises ecological

systems that deliver essential ecosystem services. The integration of BI and GI into BGI creates synergistic benefits, as vegetation depends on water availability, while hydrological processes are influenced by vegetation (Dreseitl & Wanschura, 2016). Due to its cost-effectiveness and multifunctionality, BGI is increasingly gaining attention from both scientists and stakeholders (Pochodyła et al., 2021).

The DPRA promotes climate-adaptive solutions at the plot, neighborhood, and regional scales, with a strong focus on BGI. Figure 2.2 presents the measures recommended at the neighborhood level.

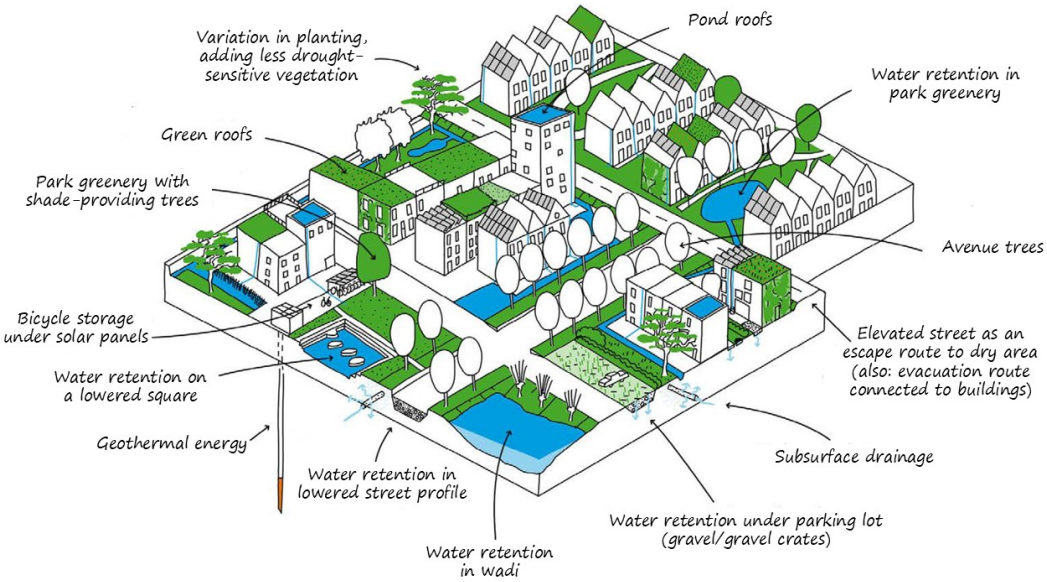

Figure 2.2: Possible design solutions at the neighborhood scale that can help mitigate the adverse effects of flooding, heat, and drought, as suggested in the DPRA.

BGI and stormwater management

Almaaitah et al. (2021) systematically reviewed academic literature evaluating the hydrological effectiveness of BGI, with the studies employing a range of different methodologies. They concluded that BGI can indeed control urban runoff and adapt the urban stormwater management to climate change. Although BGI can effectively complement gray infrastructure, the latter remains essential for the proper functioning of urban drainage systems. BGI effectiveness is highly dependent on local, geographic, and climatic conditions, and more research is required, especially at the local scale.

BGI is able to alleviate the load on gray infrastructure by reducing runoff and peak flows through hydrological functions such as detention and retention (forms of storage), infiltration, and evapotranspiration (Versini et al., 2018). Pochodyła et al. (2021) concluded from a literature review on the performance of different BGI elements that runoff and peak flow reductions varied widely: 2%-100% and 7%-70% respectively. Table 2.1 contains some common BGI elements and how they contribute to mitigating damage caused by stormwater, heat, and drought. The impact of these measures varies widely based on implementation and local conditions.

Policy documents align with these conclusions. The Urban Waste Water Treatment Directive (UWWTD) of the European Commission (2024) emphasizes that the collection of unpolluted rainwater by the sewer system should be restricted, taking local conditions into account. Additionally, investments in BGI are preferred over gray infrastructure, with the latter being considered only when absolutely necessary. Similarly, the Dutch government adheres to a 'green unless' policy in the context of climate adaptation (BZK et al., 2022).

BGI and drought

The risk of drought periods in summer increases as a result of climate change. In urban environments, these effects are further intensified by the urban heat island effect, as the evaporation processes from any unpaved areas or vegetation are increased. At the same time, non-permeable surfaces reduce infiltration and groundwater recharge.

Table 2.1: Climate adaptation measures and their functioning (RIONED, 2019).

Measures	Description	Stormwater	Heat	Drought
	Gray infrastructure			
Increasing capacity	Through expansion of the sewer network and/or overflows the discharge capacity can be increased.	Conveyance Storage		
Disconnecting stormwater	Stormwater is disconnected from the combined sewer. Old capacity of sewer is maintained.	Conveyance Storage		
Lowered roads	Roads are able to store water if the curbs are sufficiently high.	Storage		
	Blue-green infrastructure			
Disconnecting and infiltrating	Former combined sewers are separately discharged. Stormwater (partially) infiltrates into the soil.			Infiltration
Lowering road verges	If the roadside edge is lowered compared to the road, water can flow into the verge and infiltrate.	Storage		Infiltration
Pervious pavement	Replacing impervious pavement by pervious pavement allows for infiltration of stormwater			Infiltration
Removing paving	Pavement can be removed and replace by vegetation.		Transpiration	Infiltration
Trees	The effects depend on tree type and location.	Storage	Transpiration Shading	
Rainwater storage tank	Small or large rainwater storage tanks. Only effective if space is available during precipitation.	Storage		Water reuse
Rain garden	Vegetated depression with possible infiltration facilities.	Storage	Evaporation	Infiltration
Surface waters	Surface waters absorb warmth and retain coolness. Storage depends on the water level's ability to rise.	Storage	Evaporation	
Fountains			Evaporation	
Green roof	A roof with a layer of substrate and plants.	Storage	Transpiration Reflection	
Water roof	A roof with dosed drainage can store a limited amount of rainwater.	Storage	Evaporation Reflection	
Green walls	Vegetated walls prevent the absorption of sunlight and actively cool by transpiration.		Transpiration Reflection	
White roof or wall	Painting walls or roofs white reduces urban warming by absorbing less solar radiation.		Reflection	
Elevated construction	The street water level can rise higher before damage occurs.	Aversion		
Anti-flood bulkheads	Buildings can be sealed with incidentally installed barriers.	Aversion		

Through increased infiltration, BGI can enhance groundwater recharge, which can be used to bridge periods of drought. This approach can increase water availability for vegetation, help protect the urban ecosystem from damage, and reduce heat stress (I&W, 2018). However, an increase in vegetation also increases urban water demand due to higher evaporation rates (Back et al., 2021).

Additionally, the effects are highly dependent on local conditions. Vegetation in low-lying polders with poorly permeable soils is usually not dependent on rainwater, as the groundwater level is artificially maintained close to the surface, even during dry periods. For that same reason, increasing infiltration has a limited effect on water storage in these areas. A demand for water may still arise to combat soil subsidence and salinization, or for water quality replenishment (Kusters et al., 2023).

According to SWECO (2018), damage to infrastructure caused by soil subsidence can potentially be mitigated by using drainage-infiltration-transport (DIT) sewers. However, while DIT sewers can help raise the water table, their effectiveness is limited and depends on the proximity of the sewer and the permeability of the local soil.

BGI and heat stress

BGI can contribute to the mitigation of heat stress through evapotranspiration and shading. Removing pavement and planting trees and other vegetation are cost-effective measures to cool urban areas (SWECO, 2018).

This idea is widely supported in academic literature, particularly regarding the impact of trees. It is important to differentiate between areas directly adjacent to trees and those influenced by trees from a distance, as shading plays a major role in reducing heat.

A comprehensive survey of the urban heat island effect in the built environment found that, on average, a 10% increase in urban green space corresponds to a reduction of 0.6°C in the UHI phenomenon (Steeneveld et al., 2011). This finding is supported by an analysis of UHI levels in the city of Rotterdam, which revealed that each 1% increase in urban green space reduces the UHI effect by 0.058°C. Notably, differences of up to 4°C were observed between temperatures measured in a park area and those in the inner city (Heusinkveld et al., 2014).

However, Santamouris and Osmond (2020) found a weaker relation. According to their findings, with a 20% increase in tree canopy coverage, the temperature decreases by approximately 0.3°C during the day and around 0.5°C at night. A case study in Utrecht found that 10% tree canopy cover in a street canyon correlates with a decrease in the mean radiant temperature of 1°C. In contrast, grass and green roofs show less effectiveness in reducing temperature and enhancing thermal comfort (Klemm et al., 2015).

2.3.2. Climate-Responsive Urban Drainage Design

In the built environment, urban drainage systems play a crucial role in managing precipitation to mitigate potential nuisances or damages. Despite the increasing adoption of BGI, sewer systems typically form the backbone of this infrastructure. These systems are designed to efficiently drain most runoff; however, their capacity is increasingly challenged by changing climate conditions.

The hydraulic design of older Dutch sewer systems was originally based on continuous design loads ranging from 30 to 90 l/(s·ha), depending on local conditions. Later, this approach was replaced by the use of design storms (*standaardbuien*) with statistically determined recurrence intervals. A set of 10 design storms was introduced in a guideline published by STOWA (VROM, 1995). These storms were derived from extreme 15-minute precipitation events, using the highest total rainfall observed at the De Bilt measuring station between 1955 and 1979. They vary in terms of return period, rainfall intensity profile, total duration, and accumulated rainfall.

Among these, design storm 8 (*Bui08*) and, to a lesser extent, design storm 10 (*Bui10*) have been and continue to be used for the design and assessment of sewer system performance. These storms correspond to recurrence intervals of T = 2 years and T = 10 years, with accumulated rainfall amounts of 19.80 mm in 1 hour and 35.70 mm in 45 minutes, respectively.

Many existing sewer systems have been designed based on simulations using these design storms. However, this approach has certain limitations.

One key limitation is that the assessment criterion primarily focuses on the sewer system's ability to drain stormwater via stormwater overflows, without considering the urban environment's overall sensitivity to water nuisance. Traditional models often overlook the potential for water to safely accumulate

on streets and tend to overestimate the infiltration capacity of urban green spaces, as these areas are usually excluded from simulations.

Additionally, the design storms do not align well with recent intensity-duration-frequency (IDF) curves, particularly for short durations (STOWA et al., 2019). This discrepancy can partly be attributed to climate change (see Figure 2.3). To account for these effects, climate factors of 10%, 20%, or even 50% are sometimes applied to increase the intensity of design storms (RIONED, 2015).

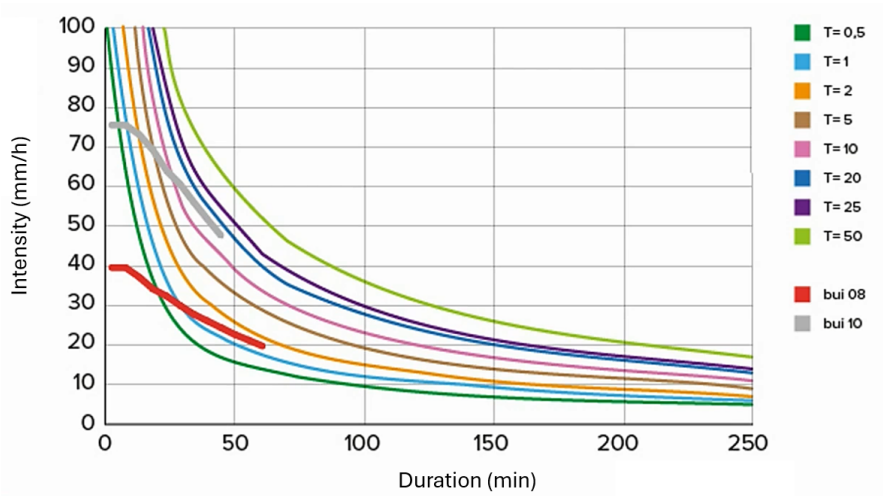

Figure 2.3: IDF curves and old design storms (RIONED, 2020; STOWA et al., 2019).

An alternative to the 10 traditional design storms is the use of composite rain events (*composietbuien*) (RIONED, 2020). Thirteen of these events, with return periods ranging from 0.5 to 1000 years, were developed based on the 2014 climate. Additionally, 91 more were created for various future climate scenarios (high or low emissions) for the years 2030, 2050, and 2085.

Composite rain events differ from traditional design storms by having a pronounced head and tail, resulting in significantly longer durations overall. In simulations, this produces a more realistic scenario where sewer systems are already partially filled, and infiltration facilities, which respond more slowly, are (partially) saturated before the peak of the rain event. Moreover, the short-duration peaks of these events align more closely with recent intensity-duration-frequency (IDF) curves.

Another alternative to conventional design storms consists of seven storm events developed for the Water Nuisance Stress Tests as part of the Delta Plan on Spatial Adaptation (I&W et al., 2020). These stress tests, conducted by local governments nationwide, aim to produce standardized and comparable outcomes. Rather than assessing or designing local stormwater drainage systems, they are intended to identify general vulnerabilities and critical locations within cities or neighborhoods.

The stress tests include short-duration precipitation events (1 and 2 hours), relevant for urban areas, as well as longer-duration events (48 hours), which are more applicable to regional water systems. This allows for a comprehensive evaluation of drainage system performance.

These storm events are characterized by block rain patterns, maintaining a consistent rainfall intensity throughout their duration. As a result, for events shorter than 1 hour, the stress tests tend to underestimate precipitation intensity. Additionally, projections for 2030, 2050, and 2085 incorporate the most severe climate change scenarios (RIONED, 2020).

Traditionally, sewer system capacity calculations have focused solely on hydraulics. However, advancements in computing power have made more sophisticated models feasible. These models can integrate the hydraulic performance of non-sewer infrastructure, such as BGI, allowing for a more accurate assessment of a city's vulnerability to extreme precipitation events. Rather than merely evaluating the presence of water on streets, municipalities can now use expected damage as the normative benchmark, defining acceptable recurrence intervals for such events.

With changing climatological conditions, stricter design principles are becoming more common. Many municipalities now apply the standard that rainfall intensities of 60 to 70 mm per hour (T=100) should not result in damage (SWECO, 2018).

However, expanding sections of existing sewer systems before their 60-year lifespan ends is often not cost-effective, as it typically requires enlarging substantial portions of the network (KNMI, 2023; Oosterom & Hermans, 2013; RIONED, 2007).

2.3.3. Responsibilities

Many stakeholders are impacted by the risks associated with climate change and the costs of climate adaptation. Table 2.2 provides an overview of the key responsibilities of the most relevant stakeholders in this research: private parcel owners, municipalities, and water boards. Notably, private parcel owners collectively own approximately 60% of the land in the average Dutch city (Klimaatbestendige Stad, 2020).

Table 2.2: Overview of responsibilities for private parcel owners, municipalities and water boards regarding urban water management and climate adaptation (Ambient, 2020).

	Private parcel owner	**Municipality**	**Water board**
Waste-water	Maintenance of the sewer facilities on the parcel up to and including the connection to the sewer.	Collection of urban wastewater and disposal towards treatment plant.	Treatment of wastewater and disposal
Rain-water	Processing rainwater on site as much as can reasonably be expected. The rest is discharged towards the municipal system.	Collection and processing of rainwater as well as urban planning such that design standards are met. The rainwater originates form public space. Only excess rainwater from private space.	Receiving and providing capacity for rainwater in canals, rivers and water bodies while preventing inundation. Binding standards re laid down by provinces.
Ground-water	In principle responsible for excess groundwater and and prevention of damages on site. Discharging on municipal sewer systems and waterproofing of the foundation are solutions. Responsibility for damage to own property as a result of drought-induced low groundwater levels.	Intervention on public property when the groundwater poses structural problems for the intended land-use. Usually through collection of excess water. Can cater to the needs of private owners in several ways. A DIT-sewer (drainage-infiltration-transport-sewer) is a physical measure that can be used to regulate groundwater levels to some extent.	Not responsible for an excess of groundwater as long as the water system functions in accordance with standards. an influence the groundwater levels through regulation of surface water levels. Water boards make an effort to maintain the surface water levels within target levels but they are not obliged to achieve these.
Heat stress	Reducing exposure to prevent damage. Behavior also plays a large role.	Urban planning aimed at reducing impact of extreme heat. Legally not responsible for damage.	Aim to reduce water quality issues that result from heat stress.

2.3.4. Costs and benefits

In the Subsection 2.2.2 through Subsection 2.2.4, the potential damages were provided per aspect of climate change. The total estimate ranges between 36-62 billion euros between 2018-2050 (SWECO, 2018). That same study estimated the costs of total prevention of these damages at 48-83 billion euros. The study found that adaptation to heat and drought could be done relatively cost-effectively. However, costs of adapting to the increased risk of pluvial flooding of (36-73 billion euros) while maintaining high safety standards (no damage during a T=100 year event) were estimated to exceed the potential damages (25-35 billion euros).

However, the relation between costs and benefits should not justify neglecting adaptation efforts

and merely accepting damages. Instead, it serves as a motivation to carefully evaluate the benefits and costs of adaptation on a case-by-case basis. While measures like substituting pavement with vegetation are typically cost-effective, enlarging the current drainage system may not consistently offer the same advantages. In certain scenarios, structural interventions in the built environment to mitigate exposure or vulnerability may not be cost-effective or feasible. In such instances, prioritizing emergency measures and initiatives to facilitate recovery might be the preferred course of action.

2.4. Transitions

”A transition can be defined as a gradual, continuous process of change where the structural character of a society, or a complex sub-system, transforms” (Rotmans et al., 2001). Transitions vary in scale and duration, unfolding in non-deterministic ways. This research focuses on transitions that directly reshape the spatial urban environment, where they most strongly intersect with climate adaptation.

Today's transitions in perspective

Cities have undergone major spatial transitions throughout history. Examples include the post-war rise of car-centric development, the shift from coal to gas heating, and the transition to centralized urban wastewater systems. All of which significantly altered the built environment.

Today’s transitions are largely driven by sustainability concerns, a trend dating back to the 1970s with growing awareness of resource depletion, environmental degradation, and population growth. This has led to global frameworks like the UN’s 17 Sustainable Development Goals of 2015.

With over half of the world’s population now living in cities, and nearly all future population growth expected to occur in urban areas, urban sustainability has become a central global challenge (Bugliarello, 2006; Vojnovic, 2014). Accordingly, this research examines urban sustainability transitions, which aim to address environmental, social, and economic challenges through systemic change. Climate adaptation is one such transition, alongside others discussed in the following sections.

2.4.1. Integration of transitions in the urban environment

The Dutch central government and parliament have set ambitious goals and frameworks for urban sustainability transitions, such as climate adaptation, energy transition, and circular economy. Municipalities must integrate these ambitions within an already crowded public space. An integral approach is crucial for aligning goals, minimizing costs, and reducing conflicts.

Integrating these transitions into the urban environment is part of the broader urban planning process, which can be defined as ”the best conceivable reciprocal adjustment of space and society, for the benefit of that society” (Cie Van Veen, Commissie Interdepartementale Taakverdeling en Coördinatie, 1971). This definition emphasizes the continuous adaptation between spatial planning and societal needs, with the goal of serving the long-term benefit of society. In this context, urban planning is not just about addressing individual transitions, but about creating a cohesive environment where these transitions can coexist and support each other.

The concept of ”integration” can be understood through three planning scales: strategic, tactical, and operational. Its meaning varies at each scale, as outlined by City Deal Openbare Ruimte (2024).

At the strategic level, integration involves aligning urban challenges and transitions across the entire city. This requires collaboration among politicians, policymakers, planners, designers, and residents to develop a long-term environmental vision that guides the city’s future development. The goal is to ensure the coordination of various objectives across both space and time. An environmental vision provides a framework that urban planners can apply at the tactical level.

The tactical level bridges the gap between long-term goals and concrete actions. Here, competing interests must be balanced, and resources (time, budget, space, labor) must be allocated wisely to address both shared and conflicting interests. While integrating all transitions and challenges at the project level may require additional investment, the societal value or long-term savings can offset these initial costs.

At the operational level, the focus shifts to the implementation of policies and designs at the street level. Integrated solutions should be considered early in the planning stages to avoid costly adjustments during the execution phase.

Integration typology

Nieuwenhuis (2023) examined the integration of the water management sector with other sectors and developed a typology to categorize and analyze various approaches to system integration. This typology serves as a practical tool for structuring, comparing, and understanding the complexities of integration across different sectors and transitions.

Table 2.3: Characteristics of the different Urban Water Systems Integration types (Nieuwenhuis, 2023).

Types of systems integration	Objects of integration	Description
Geographical	Space	Spatial alignment of systems in the same area
Pyhsical	Resources	Shared use of a resource for multiple functions
	Infrastructures	Shared use of an infrastructure system
Informational	Data	Use of data from different systems in operating those systems
Project-based	Planning	Alignment of rehabilitation and construction plans for multiple urban systems

2.5. Energy transition

The Netherlands is one of the 196 nations that signed the 2015 Paris Climate Agreement, which aims to limit the global temperature increase to well below 2°C and pursue efforts to restrict it to 1.5°C.

In line with the EU requirements, the Dutch government set up its own Climate Agreement with the goal of reducing greenhouse gas emissions by 45% compared to 1990 by 2030, and by 95% by 2050. The Netherlands also aims to be natural-gas free by 2050, shifting from fossil fuels like coal, oil, and gas to renewable energy sources such as wind, solar, and geothermal energy. To support these goals, €35 billion is allocated from the climate fund between 2021 and 2030 (EZK, 2024).

The built environment plays a significant role in the energy transition, accounting for 37% of the national final energy consumption (Rijksdienst voor Ondernemend Nederland, 2023). Of this, 67% is attributed to room heating, with 87% of buildings relying on natural gas. The transition to sustainable energy sources for heating, known as the heat transition, is central to urban energy transformation.

The provisions of the Climate Agreement are implemented through the Regional Energy Strategy (RES), where 30 regions work with local governments, businesses, grid operators, and residents to develop regionally supported plans for sustainable energy generation, heat transition, and infrastructure. These strategies must be incorporated into provincial and municipal spatial plans.

Municipalities are responsible for orchestrating the heat transition within the built environment. By the end of 2021, each municipality must create a Heat Transition Vision (*Warmte Transitie Visie* (WTV)) with proposals for sustainable, gas-free heating solutions, including Neighborhood Action Plans (*wijkuitvoeringsplannen* [WUP]). Between 2023 and 2025, municipalities can access €1 billion in funding for energy transition capacity (Vereneging van Nederlandse Gemeenten, 2023).

In this research, the energy transition is defined as the set of actions aimed at replacing fossil fuels with renewable energy sources, generating renewable energy, and reducing overall energy demand.

2.5.1. Relation with climate adaptation

Merkx (2020) explored the relationship between climate adaptation, specifically extreme precipitation, and the energy transition, focusing on the installation of a heat network in existing neighborhoods in Rotterdam. Key findings include:

- The energy transition demands space for infrastructure, limiting available space for climate adaptation measures.
- Rotterdam's goal of managing 70 mm of rainfall per hour may be unfeasible in some districts when combined with a heat network, necessitating further integration, alternative solutions, or acceptance of the risks, backed up on a case-specific basis by a cost-benefit analysis.

- Relaxing guidelines for adaptation measures on private property and addressing infrastructure congestion (especially subsurface) may be necessary.
- Integrating heat networks with sewer replacement offers benefits, though this integration is more effective for private land than public space.

Klimaatbestendige Stad (2020) provides a guide for municipalities to link climate adaptation with other tasks, including the energy transition. Key conclusions:

- Both transitions share similar timelines and processes, with goals set for 2050.
- Integration should be addressed early in the process, from regional inventories to neighborhood-level planning.

Some noteworthy connections can be drawn when considering climate control in the urban environment. Given the cooling effects of trees discussed in Table 2.3.1, it is not surprising that blue-green infrastructure, particularly trees, in public spaces or gardens can significantly reduce the need for active cooling when strategically placed (Akbari et al., 2001). This not only reduces energy consumption but also lessens the amount of warm air that these systems release into the urban environment.

Figure 2.4: The large-scale implications of the construction of a heat network (source: (NRC, 2022)).

The study also examined the potential downside of reduced shading during winter, which could increase energy consumption for heating. However, the effects were found to be minimal when deciduous trees were used, as they shed their leaves in winter. Additionally, in the Netherlands, the sun's role in warming buildings during winter is limited due to its lower angle, shorter daylight hours, and frequent cloud cover, further reducing the impact of this trade-off.

At the building level, addressing the energy transition and climate adaptation presents considerable opportunities for synergy, particularly through energy-saving measures for climate control. For example, improved insulation, possibly complemented by sunshades, contributes to reducing the need for active cooling and warming while providing a pleasant indoor climate (BZK et al., 2022). Application of green roofs and facades can significantly contribute to climate control of indoor but also outdoor climates (Besir & Cuce, 2018). This outdoor cooling effect, especially on roofs, can lower surface temperatures by several degrees, potentially increasing photovoltaic efficiency by reducing thermal losses, as PV cells lose approximately 0.3–0.5% efficiency per degree Celsius above 25°C (M Hui & C Chan, 2011).

Table 2.4 showcases integrated climate adaptation and energy transition measures, following the typology developed by Nieuwenhuis (2023) and drawing inspiration from Merkx (2020).

Table 2.4: Examples of climate adaptation and energy transition integration within the system integration framework (Nieuwenhuis, 2023).

Type of system integration	Object of integration	Examples of adaptation and energy transition
Geographical	Space	Integrated street-level design combines adaptation measures (e.g., trees, sewers, infiltration facilities) and energy transition measures (e.g., heat networks) (Merkx, 2020).
Physical	Resources	Thermal energy from surface water can be used sustainably in two ways (STOWA, 2018): 1. Extraction and underground storage for direct cooling or upgraded heating via heat pumps. 2. Direct cooling from deep pools, canals, or strong-flow rivers.
	Infrastructure	Multi-utility tunnels integrate stormwater drainage and heat networks, enabling efficient maintenance with fewer excavations (Fletcher et al., 2015).
Informational	Data	Real-time control technology optimizes pumping stations based on rainfall forecasts and energy price fluctuations, reducing costs and maximizing renewable energy use (STOWA, 2019).
Project-based	Planning	Coordinating sewer replacement with heat network installation minimizes disruption and reduces costs (Merkx, 2020). Sharing maintenance schedules between stakeholders enhances integration opportunities. Energy transition measures affect every household—linking these with climate adaptation efforts in private spaces can provide additional benefits (Klimaatbestendige Stad, 2020).

2.6. Mobility transition

Mobility refers to all human movement within the landscape, composed of various mobility systems. A mobility system includes a transport mode and the resources required for its function (Touker, 2020).

The EU and the Dutch government have formulated long-term visions for mobility in the European Mobility Strategy (European Commission, 2021b) and the Dutch Mobility Vision (I&W, 2023c). These visions aim to reduce greenhouse gas emissions from the transport sector by 2050, in line with the Paris Agreement and the Dutch Climate Agreement.

The mobility transition extends beyond emission reductions, aiming for broader sustainability and a more equitable distribution of public space and funds (Loorbach et al., 2021). The Dutch Mobility Vision emphasizes accessibility as a key goal, linking it to socio-economic functions, and addresses mobility's contributions to safety, climate, the living environment, and health.

Similar to the adaptation and energy transitions, the mobility transition is realized at regional and municipal levels. The Dutch Knowledge Institute for Mobility Policy (KiM) (*Kennisinstituut voor Mobiliteitsbeleid*) studied the shifting role of automobility in municipal mobility policies (KiM, 2023). In large cities (population >200,000) and medium-sized municipalities (population 40,000-150,000), a transition has been recognized from car-centric planning to a more comprehensive focus on accessibility-based planning (Akse et al., 2021).

Low-traffic (*autoluw*) policies aim to improve livability and accessibility by enhancing spatial quality, reducing air and noise pollution, and creating a cleaner, healthier, more inclusive, and space-efficient mobility environment. Nearly all municipalities involved in the study cited initiating a mobility transition as a key motivation for these policies (KiM, 2023).

The mobility transition consists of several interrelated concepts that aim to optimize transportation use, reduce car parking infrastructure needs, and promote alternative travel modes. These approaches can decrease reliance on private cars and improve accessibility and quality of life in urban areas.

- **Mobility as a Service (MaaS)** provides convenient, on-demand access to various transport

Figure 2.5: Example from the Hertogstraat in Eindhoven showing how the mobility transition, in the form of lane reduction (from a two-way to a one-way road), provides space for climate adaptive measures (Source: Google Street View; old picture from 2016, new picture from 2021).

modes through integrated digital platforms, centralizing mobility use over vehicle ownership (Goudappel, n.d.).

- **Smart Mobility** refers to integrating technologies and innovations into transport systems to enhance efficiency, sustainability, safety, and user experience (CROW, 2022).
- **The STOMP principle** (*Stappen, Trappen, Openbaar Vervoer, MaaS, Particuliere auto* [Steps, Paddling, Public Transport, MaaS, Private Car]) establishes a sustainable transport hierarchy, prioritizing modes that are affordable, healthy, and space-efficient (Litman, 2022).
- **Tour de Force Programma**: In line with the STOMP principle, the central government launched this program in cooperation with decentralized governments, CROW, and other partners (CROW, 2017). Its goal is to increase bicycle use through research and concrete measures such as fast cycling routes and additional bike parking at railway stations.

The 2024 Mobility Fund allocated 150 million euros to promote sustainable and smart mobility (I&W, 2023b). However, this budget does not fully align with how this research defines the mobility transition. In this research, the mobility transition specifically refers to promoting active mobility and public transport, reducing car use, and limiting car ownership (Loorbach et al., 2021).

2.6.1. Relation with climate adaptation

The mobility transition has significant potential to free up space for climate adaptation. Bikes, shared mobility hubs, and bus stops require far less space per person than privately owned cars (Deloitte, 2017; Duijnisveld, n.d.; Erlwein & Pauleit, 2021; KiM, 2023; Tsavachidis & Petit, 2022). The reduction of parking spaces, in particular, could substantially contribute to adaptation efforts.

Moreover, integrating green infrastructure (BGI) into the urban environment as part of climate adaptation efforts can further drive sustainable mobility. The aesthetic and psychological benefits of vegetation can encourage individuals to choose walking or biking over driving (Kolokotsa et al., 2020; Stefanakis et al., 2021).

Kreijen (2023) examined the connection between the climate adaptation and mobility transitions in urban environments, focusing on three mobility aspects: reducing parking spaces, reducing road space, and creating car-free urban areas. He applied an exploratory multiple case-study approach across four Dutch cities on three spatial scales. His key findings include:

- Municipal policy documents show a growing focus on sustainable transportation and a reduced emphasis on privately owned cars in urban areas, reflecting the mobility transition.
- Case studies demonstrate that the mobility transition can provide sufficient space for water storage, helping meet adaptation goals related to pluvial flooding and heat stress.
- Interviews with experts confirmed this potential, with some stating that a shift from car-oriented urban planning might be essential to meet the adaptation goals outlined in the Delta Plan on Spatial Adaptation.
- The interviews also highlighted several barriers to the adaptation and mobility transitions, and their integration:
  - Resistance to implementing BGI due to higher construction and maintenance costs.
  - Pushback from residents and business owners against reduced car space.
  - Organizational divides between the mobility and climate adaptation sectors in urban planning.

2.7. Circular economy

Globally, half of total greenhouse gas emissions, along with over 90% of biodiversity loss and water stress, result from resource extraction and processing. Achieving a sustainable future society requires not only reducing greenhouse gases from the energy and mobility sectors, but also transforming the current model of production and consumption. The existing linear ”take-make-use-dispose” economy must be replaced by a system that emphasizes recycling, reuse, and repair. The ideal is a fully circular economy that produces no non-recyclable waste, as depicted in the model in Figure 2.6.

Similar to the previously discussed transitions, the move towards a circular economy is guided by European and national programs. The European Circular Economy Action Plan (European Commission, 2020a) and the program Circular Netherlands in 2050 (I&M & EZK, 2016) are key frameworks. The Netherlands aims to achieve full circularity by 2050, with concrete measures outlined in the National Program Circular Economy 2023-2030 (I&W, 2023d). The proposed measures are categorized into four ”knobs” to foster circularity: reducing resource use, substituting unsustainable resources, extending the lifespan of products, and closing the loop. The program includes a budget of 450 million euros for the period leading up to 2030.

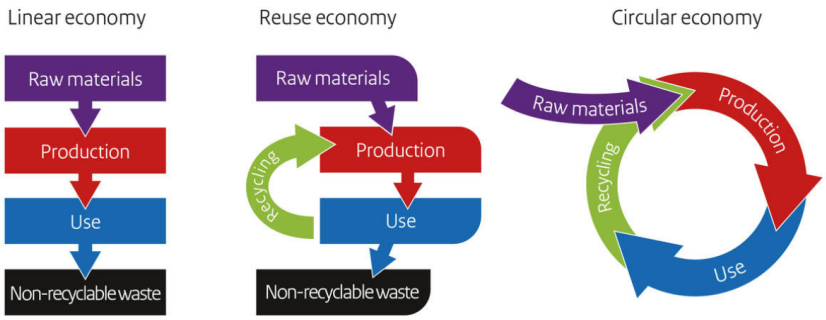

Figure 2.6: Diagram explaining the conceptual difference between linear, reuse, and circular economies (I&M & EZK, 2016).

In the context of this research, the transition to a circular economy is defined as practices related to circularity, including material reuse, reducing consumption (such as through local supply chains and rainwater capture and reuse), circular construction, and waste prevention.

2.7.1. Relation with climate adaptation

Climate adaptation, particularly through BGI, can complement the circular economy by promoting sustainable management of the built environment. BGI offers a circular alternative to conventional urban water management. While traditional infrastructure is largely linear and made of artificial materials like concrete, BGI incorporates circular, bio-based elements. Additionally, BGI often processes stormwater decentrally rather than centrally, reducing the need for extensive infrastructure.

Unlike gray infrastructure, BGI provides a range of ecosystem services, including cooling, carbon sequestration, water purification, aesthetics, recreation, and psychological well-being, all without relying on additional unsustainable resources. This demonstrates BGI's potential to meet various human needs in a circular manner (Stefanakis et al., 2021).

In the context of the circular economy, domestic sewage and rainwater are viewed as valuable resources (Dinkwaterplatform, 2021; Schootstra, 2019; Timmermans, 2023). Rainwater can be captured, cleaned, and stored for various uses, helping restore the natural water cycle. Domestic sewage can be utilized for heat generation, and both resources and biogas can be extracted at wastewater treatment plants (WWTPs). While this process is not directly tied to climate adaptation, it can further drive efforts to separate household water from stormwater.

2.8. Environmental health

Critical issues such as COVID-19, socio-economic disparities, and environmental concerns emphasize the importance of a healthy living environment. National policy documents such as the *Landelijke nota gezondheidsbeleid 2020-2024* (National health policy paper 2020-2024) from VWS (2020) and the NOVI from BZK (2020) address the need for efforts to create a healthy living environment following a strategy based on a "Health in All Policies" approach. This means that health issues are addressed from a broad perspective, transcending various domains.

The *Gezond en Actief Leven Akkoord* (GALA) (Healthy and Active Living Agreement) is a further elaboration of this strategy where municipalities, regional health services (GGD), health insurers, and the VWS collaborate to promote a healthy and active lifestyle for citizens. One of the focal points of this agreement is the healthy living environment.

In line with GALA's goals, the *Programma Gezonde Groene Leefomgeving* (Healthy Green Living Environment Program) was established by (VWS, 2021) to further support these efforts by ensuring that health is fully integrated into policies related to the physical living environment. This new program is cross-sectoral and cross-ministerial, involving all levels of scale, from national government to municipalities.

As the title of the policy document suggests, considerable attention is now being given to greening. This trend has become more prominent on the policy agenda compared to a decade ago (de Vries et al., 2022). The subject has gained new supporters, leading to increased backing for more ambitious green initiatives.

VWS (2021) defines a healthy living environment as one that is pleasant, encourages healthy behavior, minimizes health pressures, and emphasizes individuals' own capabilities. Such an environment promotes positive health (*positieve gezondheid*). Positive health is a relatively new concept aimed at broadening the traditional view of health, focusing not only on illness and physical aspects but also on individuals' feelings, resilience, and what makes their lives meaningful (Huber et al., 2016).

Incorporating green elements is seen as conducive to a healthy living environment, as they are associated with various mechanisms that improve well-being: enhancing air quality, reducing noise pollution, combating heat stress, alleviating mental stress, boosting immune function, stimulating physical activity, and fostering social cohesion. The following points outline these mechanisms, with supporting scientific evidence:

- Trees can reduce outdoor air pollution by lowering particulate matter, though their effects are limited and, in some cases, they can exacerbate pollution by blocking wind flows that would bring cleaner air (Nowak et al., 2013; Van Moorselaar & Van Der Zee, 2020).
- Incorporating greenery in residential areas may reduce perceived noise pollution, though the exact mechanisms and effectiveness remain unclear (Dzhambov et al., 2018). Evidence on the

impact of greenery on actual noise levels and perceived annoyance is mixed, but some studies show benefits, particularly for road and rail traffic noise (Attenborough, 2019).

- The role of trees in cooling the built environment, and thereby helping to combat heat stress, is discussed in 2.3.1.
- Chronic stress, linked to poor mental and physical health, is reduced through nature contact, which is one of the most supported mechanisms in current research, though causality remains unclear. Stress levels are considered a significant mediator of overall health (Davis et al., 2021; Fleckney & Bentley, 2021; Vanaken & Danckaerts, 2018).
- Nature is linked to improved gut health through influencing the composition of air-borne bacteria, which may strengthen the immune system, though empirical evidence for this mechanism remains limited (Brame et al., 2021).
- Nature stimulates physical activity. Some studies show a positive relation between green areas and increased physical activity, though this effect is not always consistent. Local green spaces can influence where people engage in physical activity, which can activate other mechanisms that benefit well-being (Bancroft et al., 2015; Triguero-Mas et al., 2017). For young children, green spaces with play opportunities in their immediate environment are important sources of physical activity (see Figure 2.7 for an example).
- Green spaces foster social cohesion and neighborhood interactions, which help reduce social isolation and loneliness, particularly among the elderly (Kemperman & Timmermans, 2014; Wan et al., 2021). Therefore, ensuring the safety and maintenance of green spaces is important.

Moreover, proximity to or contact with green spaces is associated with a wide range of positive health outcomes, including higher birth weights for babies (Akaraci et al., 2020), a reduced risk of premature mortality (Yuan et al., 2021), improved well-being and development in children (Davis et al., 2021), and a lower prevalence of obesity (Yuan et al., 2021). Despite efforts to statistically control for other factors, questions about the causal nature of these relation remain.

Figure 2.7: Example of a diverse natural play area constructed in 2021 on what was previously a public bare lawn in Willem Marislaan, Maassluis (source: (Stad-en-groen, 2023)).

From a policy perspective, there is a pressing need for better understanding which types of green spaces, with specific characteristics, are most effective in promoting health and well-being. The current recommendation is to prioritize spacious, diverse, and well-maintained green areas, ensuring that they are suitable for various functions and cater to diverse population needs. Alongside public green spaces,

private green spaces and small elements like street trees are also important. Scientific literature emphasizes the importance of being in close proximity to and interacting with green spaces (de Vries et al., 2022).

Building on the conclusion about a diverse range of green spaces, the recently introduced 3-30-300 rule by Konijnendijk (2023) seems to better align with scientific insights: three trees visible from the home, 30% canopy cover in the neighborhood, and a green space of at least 1 hectare within 300 meters. However, empirical evidence supporting this specific guideline is lacking.

Although environmental health extends beyond the relation with green spaces, encompassing aspects like noise pollution and food environments, this research focuses on aspects directly related to urban greening of the urban environment. In this context, environmental health is defined as actions aimed at enhancing the living environment to improve (mental) health, including urban greening and the provision of health-promoting amenities such as play areas, bike paths, walking paths, and seating areas.

2.8.1. Relation with climate adaptation

Climate adaptation and creating a healthy living environment both necessitate increasing green elements within the built environment, presenting significant potential for synergies between these objectives which is emphasized by national and municipal policies (de Vries et al., 2022). The two transitions even have certain goals in common such as providing thermal comfort and reducing urban flooding and its accompanying health risks.

Negative relations are also taken into consideration, such as health risks from allergies and infectious diseases transmitted by mosquitoes, ticks, and rats.

2.9. Nature inclusiveness

Biodiversity is declining at an unprecedented rate, with extinction rates 100 to 1000 times higher than the natural baseline (Dasgupta, 2021). This rapid decline poses a significant risk, with the potential loss of 20% to 50% of all species within this century (Kolbert, 2014). Experts agree that we are experiencing the sixth mass extinction event, driven by human activities (Cowie et al., 2022). The Netherlands is no exception, performing poorly in nature conservation despite national goals and international agreements (CBS, 2021; Raad voor de leefomgeving en infrastructuur, 2022).

However, there is growing recognition of the importance of nature for prosperity and well-being, as seen in global, European, and national conservation initiatives (European Commission, 2020b; IPBES, 2019; Raad voor de leefomgeving en infrastructuur, 2022). This approach seeks to integrate nature and economy. Following the report by IPBES (2019), the Dutch government launched the Agenda Nature Inclusive (LNV, 2022), with a long-term goal of a nature-inclusive society by 2050.

Nature inclusiveness involves integrating nature into social and economic activities, creating space for biodiversity beyond traditional conservation. It prioritizes nature in every stage of planning, policy, decision-making, and management, recognizing the interdependence of humans and ecosystems (Natuur Inclusief Overleg, 2023). Urban greening is viewed not just as a way to improve human living conditions but to promote biodiversity, treating humans and nature as equals (Planbureau voor de Leefomgeving, 2023).

Interviews with policymakers confirm the shift towards nature inclusiveness, with increasing urban biodiversity seen as a key goal of urban greening (de Vries et al., 2022). The NOVI also supports the enhancement of urban greenery and connectivity with surrounding areas (BZK, 2020). Starting January 1, 2025, new construction and major renovations must include shelters for certain species like house sparrows, swifts, and bats (Addie Schulte, 2024).

Securing biodiversity requires focusing on the quality, rather than the quantity, of green spaces. Some municipalities use a point system to ensure biodiversity in development projects (Snep & Goossen, 2022). A nationally uniform point system has been established to guide nature-inclusive development (OSKA, 2023).

In this research, the transition to nature inclusiveness is defined as actions to improve biodiversity, such as urban greening, creating wildlife habitats, and enhancing nature appreciation.

2.9.1. Relation with climate adaptation

Both nature-inclusive and climate-adaptive urban development call for increased green space in cities, presenting significant potential for synergy. However, their objectives for green spaces differ. Climate adaptation focuses on functions such as stormwater storage, infiltration, evapotranspiration, and shading. In contrast, nature-inclusive development prioritizes supporting biodiversity and specific indicator species. While these goals differ, they do not undermine the potential for synergy but instead highlight the need for carefully tailored urban green space design. For example, the selection of vegetation and trees can be tailored to meet both objectives, as demonstrated by the integration of an intensive green roof and green facades on small utility buildings, illustrated in Figure 2.8.

A notable synergy between the two is that soils rich in organics can enhance infiltration capacity, reducing stormwater runoff and increasing local water storage. The establishment of green zones with trees and shrubs, for example, can improve soil structure, making it more porous and allowing better water infiltration. This is due to the root systems of plants, which help keep the soil loose and facilitate the downward movement of rainwater. Additionally, the incorporation of organic matter, such as compost, increases the soil's organic content, further improving its water retention and permeability. These measures not only support stormwater management but also contribute to reducing the risk of flooding and enhancing drought resilience (Kuehler et al., 2017).

Figure 2.8: An example of the maximum level of nature inclusivity on the scale of nature inclusiveness for small utility buildings of Naturalis and KPN, featuring an intensive green roof, green facades, and other assets designed to support local wildlife (source: (Naturalis, 2022)).

2.10. Answering the research questions

Research question 1. Which urban transitions are linked with climate adaptation according to the literature?

A wide range of both academic and gray literature was reviewed. The following transitions were repeatedly identified and examined for their potential connections to climate adaptation transitions: the energy transition, the mobility transition, and transitions related to circular economy, environmental health, and nature inclusiveness. Table 2.5 contains these transitions, their general implications for the urban environment and national and international agreements and policies hat guide the transitions.

Budgets provided by the central government, discussed in more detail in the literature study, are also included in the table. These illustrate the relative urgency attributed to each of the transitions by successive governments. For some transitions, designated central financing is lacking, while for others, the allocated budgets seem inadequate for the tasks at hand. In such cases, fulfilling the ambitions will require decentralized funding or reallocating existing budgets.

Table 2.5: Climate adaptation and other transitions that influence the urban environment. For each transition, general implications and foundational policy documents are provided including central funding.

Transition	General implications for urban environment	Guiding policy instruments
Climate adaptation	By 2050 the urban environment has to be climate resilient. Investments in gray and blue-green infrastructure are required to reduce the adverse effects of climate change, whereby the former is preferred due to its multifunctional and cost-effective nature.	Nationale klimaatadaptatie- strategie (2016) Deltaplan Ruimtelijke Adaptatie (2018) *Impuls: 300 million euro (2021-2027)* Nationale Omgevingsvisie (2020)
Energy transition	By 2050, all homes and buildings must be free of natural gas. This means they will need to be insulated and use sustainable heat and electricity. Achieving this requires interventions in and around each house and street, including the installation of heat networks, grid reinforcement, solar panels, heat pumps, and more.	Paris Agreement (2016) Dutch Klimaatakkoord (2019) *Klimaatfonds: 35 billion euro(2021-2030)* *Including CDOKE: 1 billion (2023-2025)*. Regionale Energiestrategie (various documents) Nationale Omgevingsvisie (2020)
Mobility transition	The mobility transition entails a shift from an (auto)mobility oriented planning approach to a more comprehensive focus on social aspects, known as accessibility-based planning. In the urban environment this results in an orientation towards shared and active mobility with reduced car use and ownership as result.	European Mobility Strategy (2021) Mobiliteitsvisie 2050 (2023) Nationale Omgevingsvisie (2020)
Circular economy	By 2050, the Netherlands aims to be fully circular. This implies that the input of new raw materials is reduced to be fully sustainable. Used products are recycled with minimum quality loss and there is no residual waste.	European Circular Economy Action Plan (2020) Nederland circulair 2050 (2016) Nationaal Programma Circulaire Economie (2023) *Budget: 450 million euro (2023-2030)*
Environmental health	There is an increased attention for environments that are experienced as pleasant, that invite healthy behavior and where pressure on health is as low as possible. Incorporating green elements is conducive for public health in several ways.	Landelijke nota gezondheidsbeleid 2020-2024 (2020) Nationale Omgevingsvisie (2020) Programma Gezonde Groene Leefomgeving *Impuls: 1.2 million euro (2024)*
Nature inclusiveness	A nature inclusive urban environment is envisioned for 2050. The interest of nature is to be included in urban planning. Conditions should be provided to ensure sufficient biodiversity.	Agenda Natuurinclusief (2022) Nationale Omgevingsvisie (2020)

Research question 2. In what ways can climate adaptation interface with these urban transitions according to literature?

The literature review disclosed several connections between the identified transitions. Most of these relations remain fairly general due to the broad perspective typically offered by academic and (inter)national gray literature.

Additionally, the studied policy documents primarily reveal relations at a strategic level, where pos-

sibilities are considered without constraints. In contrast, actual limitations and boundaries only emerge at the tactical level, where concrete decisions are made. A minority of studies delved deeper into these relations, including analysis at the tactical level.

The identified relations as portrayed in the literature are outlined in table 2.6. The (+) and (-) represent the overall nature of the relation for a given transition type. The (+) suggests that, in general, there is potential for successful integration and synergies, while the (-) indicates that the transitions are generally more difficult to align and may hinder each other.

Table 2.6: Relations between different transitions as found in assessed literature.

Transition	Relation type	Description
Energy transition	Geographical (-)	Subsurface interventions, such as a heat networks, reduce the available space for implementing climate adaptation measures.
	Physical (+)	Climate adaptation measures that cool the environment can decrease the need for active cooling systems, thereby limiting energy use.
	Project-based (+)	Simultaneously implementing measures can offer advantages in both public and private space.
Mobility transition	Geographical (+)	The mobility transition, particularly by a reduction of parking spaces, has the potential to offer a substantial amount of space to significantly contribute to climate adaptation goals.
Circular economy	Geographical (+)	Both transitions view rainwater as potential resource. It can be collected and utilized in an around the house or, when absorbed by BGI, can provide ecosystem services, thereby fulfilling human needs sustainably.
Environmental health	Geographical (+)	Both transitions call for green space in the urban environment. A mutually beneficial design of that space requires attention.
	Physical (+)	Both transitions emphasize the importance of vegetation to achieve their goals, which partially overlap.
Nature inclusiveness	Geographical (+)	Both transitions call for green space in the urban environment. A mutually beneficial design of that space requires attention.
	Physical (+)	Both transitions transitions highlight the significance of vegetation in attaining their objectives. However, since their goals differ, careful design is required.

Part III.

Multiple Case Study

A render of a street in New Brooklyn, a new neighborhood currently under construction in Almere. New Brooklyn is analyzed as part of the project study.
Source: Heijmans, retrieved from https://newbrooklyn-almere.nl/

3

Introducing the Multiple Case Study

This research focuses on a multiple case study of three municipalities, comprising a policy study, a project study, and expert interviews (chapters 5, 4, 6). The policy study examines goals and strategies in policy documents, analyzing the interactions between climate adaptation and other urban transitions at a strategic level. In contrast, the project study investigates these relations at the tactical and operational levels. Interviews will provide field-based insights and validate the findings from the other parts of the study. These components allow for cross-scale comparisons and validation of research findings.

The exploratory case study methodology is chosen due to the limited existing research and the complexity of the topic. As Robert K. (2014) notes, this methodology is well-suited for addressing ”how” questions and exploring causal relations that may be too intricate for traditional survey or experimental methods.

Using inductive reasoning, this case study can generate new theories, while its outcomes will offer practical insights for policymakers and urban planners regarding the relation between climate adaptation and other urban transitions.

3.1. Introduction of cases

The municipalities of Almere, Lelystad, and Urk serve as the three cases in this multiple case study. This section outlines the rationale for selecting these municipalities, along with essential background information on each case. Their most important shared contextual aspect—their location in the polder—will also be discussed to frame the research.

3.1.1. Case Selection

Convenience played a significant role in selecting these cases, as the municipalities responded positively to the supervisor’s inquiry. However, a key geographical similarity, combined with a sufficiently diverse set of variables, makes this selection well-suited to address the central inquiry of this research.

The three municipalities are all located in the deep polder province of Flevoland, situated on average 5 meters below sea level[1] (“Gemalen in Flevoland | Waterschap Zuiderzeeland”, n.d.). Their location in the polders presents unique challenges related to water management, freshwater availability, and climate adaptation. This common characteristic serves as a constant across the case studies, allowing for the isolation of variables that may differ among the municipalities.

In addition to these shared characteristics, there are significant variations among the municipalities that contribute to their uniqueness. These include differences in the design and layout of the built environment (infrastructure and buildings), shaped by distinct historical trajectories. Furthermore, variations in geological conditions, water management practices, population sizes and demographics, as well as governance structures, strategies, and financial capacities further differentiate the municipalities. These differences are expected to provide diverse approaches to climate adaptation and other urban transitions, as well as varying ways in which these aspects interconnect.

[1] Source: https://www.zuiderzeeland.nl/over-ons/wat-doet-zzl/water-op-peil/gemalen (Accessed February 2025)

3.1.2. A shared context: the Flevopolder

These municipalities are geographically, governmentally, and historically connected by their location in Flevoland, shaping their character and layout.

Urk was first mentioned in the 10th century[2]. At the time, it was an island formed by a glacial till mound (*keileembult*) in the lake of *Aelmere* at the mouth of the IJssel. The surrounding water was fresh, and the island was inhabited by a small farming community. Due to climate changes, peat excavations, and floods in the 12th and 13th centuries, Aelmere became the Zuiderzee, a saltwater bay. This led to land erosion, forcing Urk's inhabitants to shift from farming to fishing. In 1859, the nearby island of Schokland was evacuated due to the increasing flood risk.

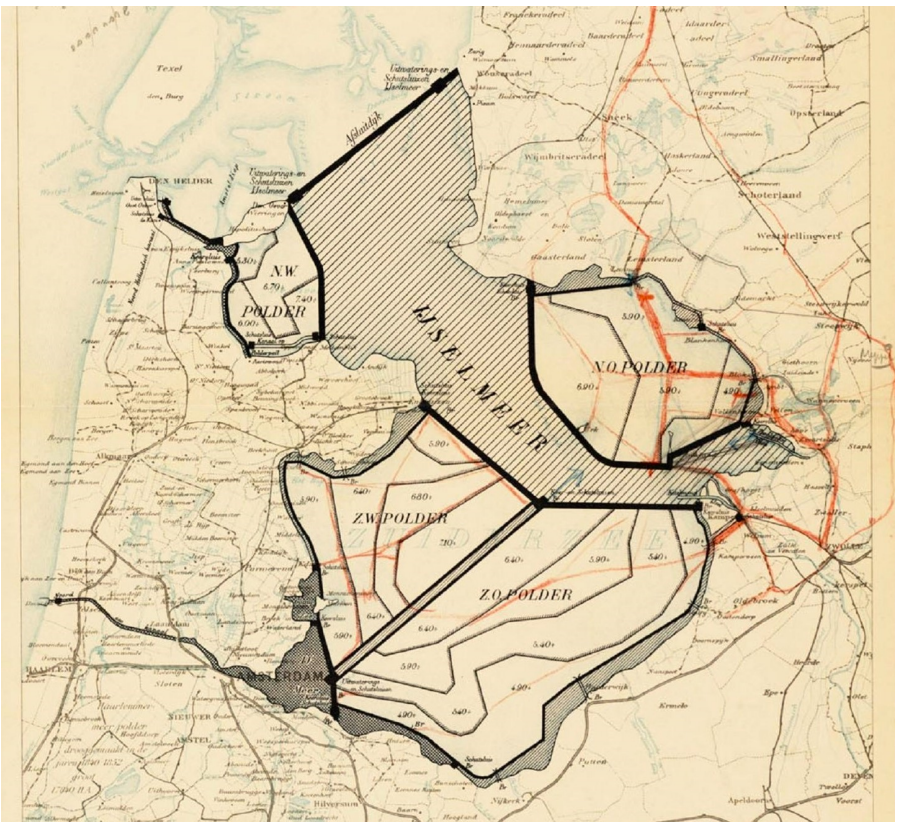

Figure 3.1: Revised plan for the Zuiderzeewerken in 1924, closely matching the final plan

Plans to close off the Zuiderzee date back to 1667[3], but it was not technically feasible at the time. By the early 20th century, war-related food shortages and a major flood in 1916 accelerated action. The 1918 Zuiderzeewet (Zuiderzee Law) was adopted, aiming to (1) improve flood protection, (2) create fertile agricultural land, (3) enhance water management, and (4) strengthen connections between the Randstad and the north (Haartsen & Thissen, 2018).

The 32-kilometer-long Afsluitdijk, completed in 1932, transformed the Zuiderzee into the freshwater IJsselmeer (see figure 3.1). Reclamation began with the Wieringemeerpolder (1930), followed by the Noordoostpolder (1942), which incorporated Urk and Schokland. The process continued with the creation of Oostelijk and Zuidelijk Flevoland in 1957 and 1968, forming the Flevopolder.

Initially, the land was primarily intended for agriculture, but by the 1960s, shifting priorities led to the planning of the cities of Lelystad and Almere, along with recreation and nature areas. A fourth polder, the Markerwaard, was planned but ultimately canceled in 2003 due to environmental and freshwater concerns (Haartsen & Thissen, 2018).

[2]Source: https://www.urk.nl/de-tijdlijn-van-urk (Accessed October 2024)

[3]Source: https://www.rijkswaterstaat.nl/water/waterbeheer/bescherming-tegen-het-water/100-jaar-zuiderzeewet#plannen-voor-afsluiting-zuiderzee (Accessed October 2024)

3.1.3. Urk

Urk was incorporated into the Noordoostpolder in 1942, ending its isolation (see figure 3.2). By this time, a strong cultural identity centered around the Protestant Christian church, fishing, and its unique heritage had developed. The island's limited capacity had also become evident (Post & Post, 2018).

Figure 3.2: The island of Urk, including the two dikes connecting it to the mainland in the north (top left) and east (bottom right), along with a work island and a lock under construction (Post & Post, 2018).

Initially, none of the 48,000 hectares of reclaimed land in the Noordoostpolder was allocated for Urk's expansion. The central government, focused on agricultural development, considered Urk unsuitable for growth due to its distant fishing grounds. However, in 1949, political intervention secured 100 hectares for Urk. Over the decades, further land expansions followed, allowing the community to grow, and supporting the rise of a thriving fish-trading industry. By 2024, Urk's territory had expanded to 1,347 hectares, and its population grew from 4,200 to 21,500, projected to reach 26,500 by 2040, largely due to high birth rates and strong local attachment (Post & Post, 2018).

Today, around 200 people are employed by the municipality of Urk[4], and its total budget for 2023 was 74.7 million euros (Gemeente Urk, 2023).

3.1.4. Lelystad

Lelystad was planned as the capital of Flevoland, designed to accommodate 100,000 inhabitants by 2000. Its layout was inspired by the "garden city" concept, aiming to combine town and country for a high quality of life. The city featured a spacious layout, strict functional separation, and inward-facing neighborhoods centered around green spaces and community facilities (see figure 3.3) (Gemeente Lelystad, 2021).

[4] Source: https://www.urk.nl/vacatures (Accessed October 2024)

Figure 3.3: Aerial photo of Lelystad, 1974 (Amsterdam City Archives)

The first neighborhoods were completed in 1967, but development was slower than planned due to delays in infrastructure projects and the postponed Markerwaard project. By the 1980s, Almere became a more attractive option for people in the Randstad, while Lelystad faced issues like vacancy and unemployment. In the 1990s, the city shifted focus with renovations, and by 2024, the population had grown from 58,000 in 1988 to 80,000.

Lelystad has a distinct ambition to grow and finally fulfill its original promise. The latest demographic forecasts project a population of 136,000 by 2043[5]. However, the realization of this forecast depends on the municipality's ability to provide sufficient housing—specifically, 1,000 new homes per year.[6] In 2024, around 700[7] about people are employed by the municipality. The city had a total yearly budget of 401.4 million euros.

3.1.5. Almere

In 1968, the reclamation of Zuidelijk Flevoland led to the creation of Almere, intended to alleviate housing pressure in Amsterdam. The city was planned to accommodate 100,000 people, with a central core surrounded by smaller neighborhoods separated by green spaces, resembling the Gooi region. A team of idealistic urban planners, seeking to break away from 1960s urban design, conceived Almere with a focus on human-scale development, unlike the high-rise, functionally separated models of the Bijlmer and Lelystad[8,9].

Almere Haven, the first neighborhood, opened in 1976 and was inspired by old Dutch Zuiderzee towns, emphasizing a more village-like, humanistic style. It was also an early example of a "bloemkoolwijk" (cauliflower neighborhood) design. Over 48 years, Almere has grown to 228,500 inhabitants by 2024, maintaining its polycentric layout. The city now includes Almere Stad and surrounding neighborhoods like Almere Haven, Buiten, Hout, and Poort, with a new neighborhood, Almere Pampus, planned (Gemeente Almere, 2021).

According to Almere's "realistic" urban development scenario, the population is expected to grow to approximately 270,000 inhabitants by 2040[10]. The municipality employs around 2,200 people, with an annual budget of approximately 1.2 billion euros[11].

[5] Source: https://lelystadinzicht.nl/dashboard/dashboard/bevolkingsprognose (Accessed October 2024)
[6] Source: https://flevopost.nl/lelystad/Bouw-woningen-in-Lelystad-komt-op-stoom-27473033.html (Accessed October 2024)
[7] Source: https://nl.indeed.com/cmp/Gemeente-Lelystad/(Accessed February 2024)
[8] Source: https://anderetijden.nl/aflevering/674/Almere-40-jaar-pionieren-in-de-polder (Accessed October 2024)
[9] Source: http://www.canonvanalmere.nl/planologie (Accessed October 2024)
[10] Source: https://oens.almere.nl/bevolkingsprognose (Accessed October 2024)
[11] Source: https://almere.begroting-2024.nl/ (Accessed October 2024)

Figure 3.4: Aerial photo of Almere in 1987, showing Almere Haven in the foreground and early stages of Almere Stad in the background. (Photo by Bart Hofmeester/AeroCamera)

3.1.6. Water Management and Climate Adaptation in the Flevopolder

To understand water management and climate adaptation in the built environments of Urk, Lelystad, and Almere, it is essential to first understand the underlying water system of the polders where these cities are located. The Zuiderzeeland Water Board is responsible for managing the water systems of the Flevopolder and the Noordoostpolder. However, municipalities also play an important role in water management (see Table 2.2), and they continuously collaborate with the water board. In the context of climate adaptation, the *Klimaatadaptatie Flevoland* (KAF) initiative was established by these authorities, along with other involved stakeholders, to share knowledge and coordinate efforts to pursue the goals of the DPRA (I&W, 2018).

The information in the sections below is drawn from documents by the Zuiderzeeland Water Board, including *Waterbeheerprogramma* 2022-2027 (2022), *Watervisie* (2021), *Waterbeschikbaarheid* (2023), *De Uitbeelding* (2011), as well as one document from the Province of Flevoland: *Waterprogramma* (2021).

Water management

A significant portion of the polders of Flevoland is situated at a low elevation and surrounded by high external water levels. The polders of Flevoland lie an average of 4 meters below NAP, with higher elevations near the old mainland compared to the IJsselmeer and Markermeer sides. Water levels are managed accordingly, with elevated areas (*hoge afdeling*) maintaining higher levels and low-lying areas (*lage afdeling*) having lower levels. Within these sections, smaller water level compartments (*peilgebieden*) are managed individually, based on the water level management decision (*peilbesluit*), which are matched with the interests of the land use, such as agriculture, nature or the built environment. In general, the difference between ground level and water level, referred to as *drooglegging*, is at least 1.2 meters. The polder soil, often poorly permeable (clay, peat), makes groundwater issues common, including significant mounding (*opbolling*). To address this, large parts of the polder are equipped with drainage pipes, reducing the drainage depth (*ontwateringsdiepte*). See Figure 3.5[12].

[12] Source: https://www.riool.net/kennisbank/water-en-klimaat/stelsels-en-voorzieningen-in-het-stedelijk-watersysteem/stelsels-in-de-openbare-ruimte/grondwaterstelsel-ondergronds-doorlatend (accessed December 2024)

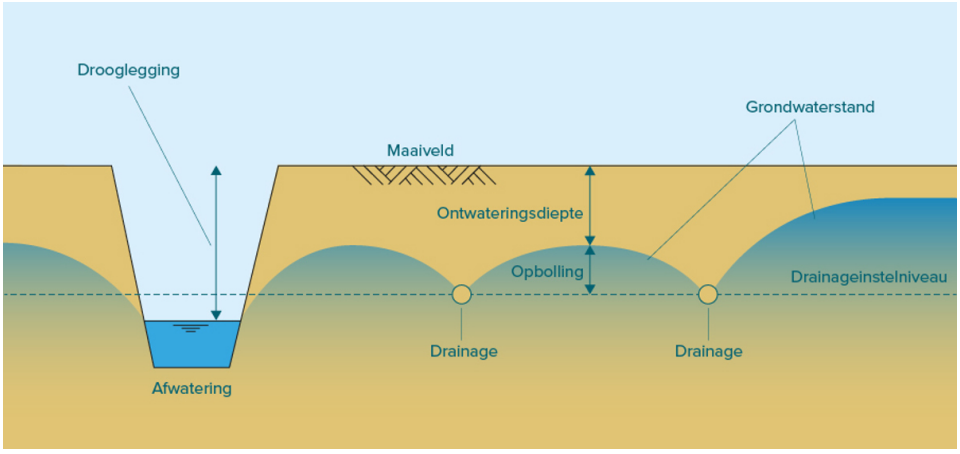

Figure 3.5: Basic principles of groundwater management.

A carefully designed water management system must be maintained to regulate water levels in accordance with the water level decision. The water board manages these levels using inlets, weirs, and pumping stations. External water, situated at a higher elevation, flows into the polder system, while internal water is directed across sections. Weirs retain water where needed, and pumping stations remove excess, lifting it from lower to higher elevations—a process that requires significant energy. A schematic of the water system is shown in Figure 3.6, and the soil conditions in Figure 3.7.

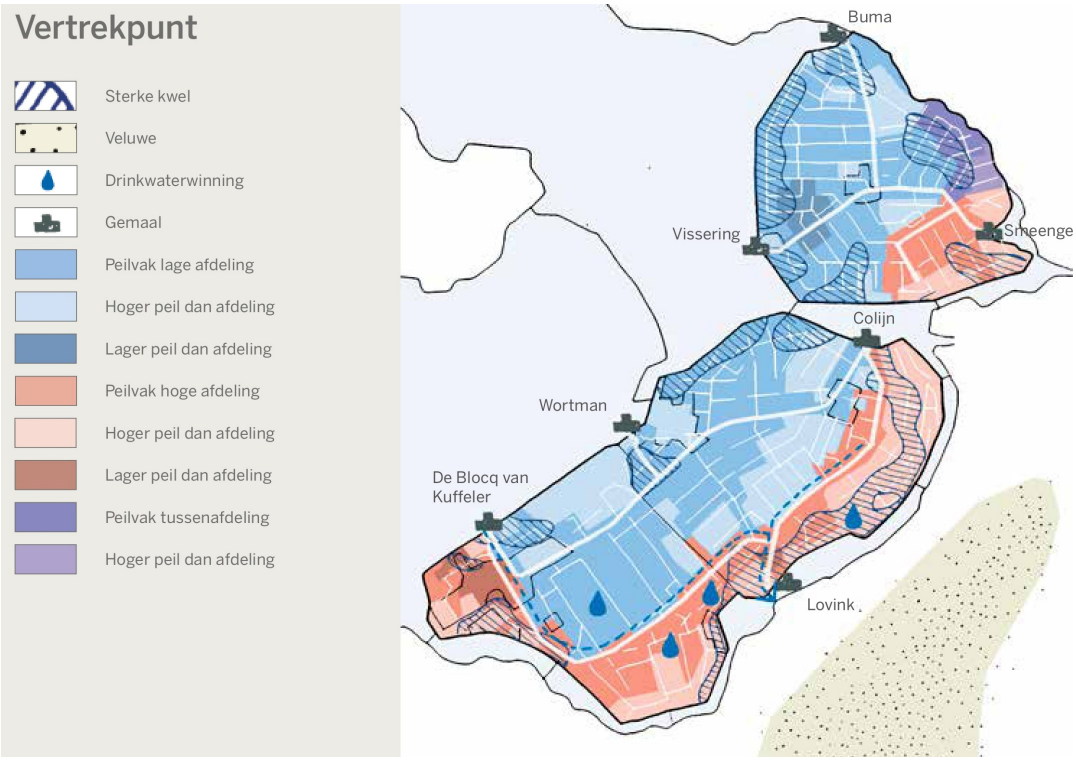

Figure 3.6: Schematic representation of water system of Flevoland (Source: *Watervisie* (2021)).

Seepage

Incoming sources of water are precipitation and seepage (*kwel*). The deep location of the polders results in a continuous influx of groundwater seepage. This includes shallow seepage under the dikes, originating from adjacent water bodies, as well as a persistent, deeper flow from elevated regions such as Noordwest-Overijssel, the Veluwe, and the Utrechtse Heuvelrug. Even during dry periods, this

groundwater influx necessitates continuous pumping to maintain balance.

Generally, the shallow seepage from water bodies is of lower quality (e.g. nutrients, salt and iron), depending on soil and groundwater conditions. In contrast, the regional seepage that emerges further inland within the polder tends to be of higher quality. Areas with with worsening water quality are flushed with with better quality water, originating from precipitation, good quality seepage, or when these are insufficient adjacent surface water bodies.

Precipitation

Another source of incoming water is precipitation. While some rainfall evaporates, the rest must be pumped out of the polder. Although the water systems of the polders were designed to be robust, the ongoing expansion of cities, land subsidence, and climate change, resulting in more persistent precipitation as well as more frequent and intense extreme precipitation, pose challenges to the water system.

To address these challenges, the water board has implemented several measures. Since 2003, the water board has set norms determining how often the water level in watercourses may rise to the ground surface level (inundation). The pumping capacity out of the polder is limited, with seven pumping stations at the edges of the polders providing a total average capacity of approximately 15 millimeters per day. Therefore, adequate storage capacity within the polder is crucial.

In the context of the urban development projects studied in this research, regulations regarding compensation for paved surfaces are particularly relevant. The Waterboard Zuiderzeeland has maintained water storage requirements, which were updated in line with climate scenarios in 2013[13] and will be revised again in 2027[14]. Alterations to the existing Zoning Plan (*Bestemmingsplan*, or *Omgevingsplan* under the new Environmental Planning Act) must comply with the regulations in effect at the time of their initiation. This, along with other water-related concerns, is ensured through the requirement of a *Watertoets* (or *Weging van waterbelang* under the new Environmental Planning Act).

According to this regulation, the adverse effects of spatial developments must be compensated within the planning area. Specifically, discharge from the area should not increase due to the expansion of impermeable surfaces and resulting precipitation runoff. Therefore, on average, 5 to 6 percent of the total area of a new neighborhood should consist of surface water or other elements that can serve as water storage, such as wadi's, green strips that can be flooded, and similar features. The potential rise in water levels and the presence and quality of seepage also influence how water storage is integrated into a development project.

Land subsidence

Subsidence is occurring in parts of the polders of Flevoland. It is caused by soil consolidation due to drainage (*rijping*) and the presence of peat in the subsurface. When peat is exposed to oxygen, it oxidizes, leading to further subsidence. Since their reclamation, Eastern Flevoland and Southern Flevoland have subsided by an average of 0.75 and 1 meter, respectively. In the Noordoostpolder, subsidence is also significant in some areas. The extent of subsidence depends on soil composition and the timing of reclamation, both of which vary spatially. Future subsidence is expected primarily in areas with young clay soils still consolidating (mainly in Southern Flevoland) and regions with shallow peat layers (notably in parts of the Noordoostpolder).

Subsidence reduces drainage depth (*drooglegging*), which diminishes stormwater storage capacity in water bodies and increases the risk of inundation as water overflows from canals onto land or streets. Additionally, it lowers the distance between groundwater and the surface (*ontwateringsdiepte*), potentially leading to groundwater-related issues. In general, subsidence becomes critical when drainage depth falls below 70 cm. Lowering water levels in subsiding peat areas is not a sustainable solution, as it accelerates subsidence, fragments the water system, and causes additional seepage, which can degrade water quality. It may also shift water-related issues to other areas. For these reasons, water levels are not automatically adjusted downward with subsidence.

Drought

Flevoland is well-positioned for freshwater supply. Its low elevation allows groundwater to flow into the polders as seepage, making the area nearly self-sufficient even during extreme droughts (see

[13] Source: https://lokaleregelgeving.overheid.nl/CVDR301884 (Accessed December 2024)

[14] Source: https://zoek.officielebekendmakingen.nl/wsb-2024-26227.html (Accessed December 2024)

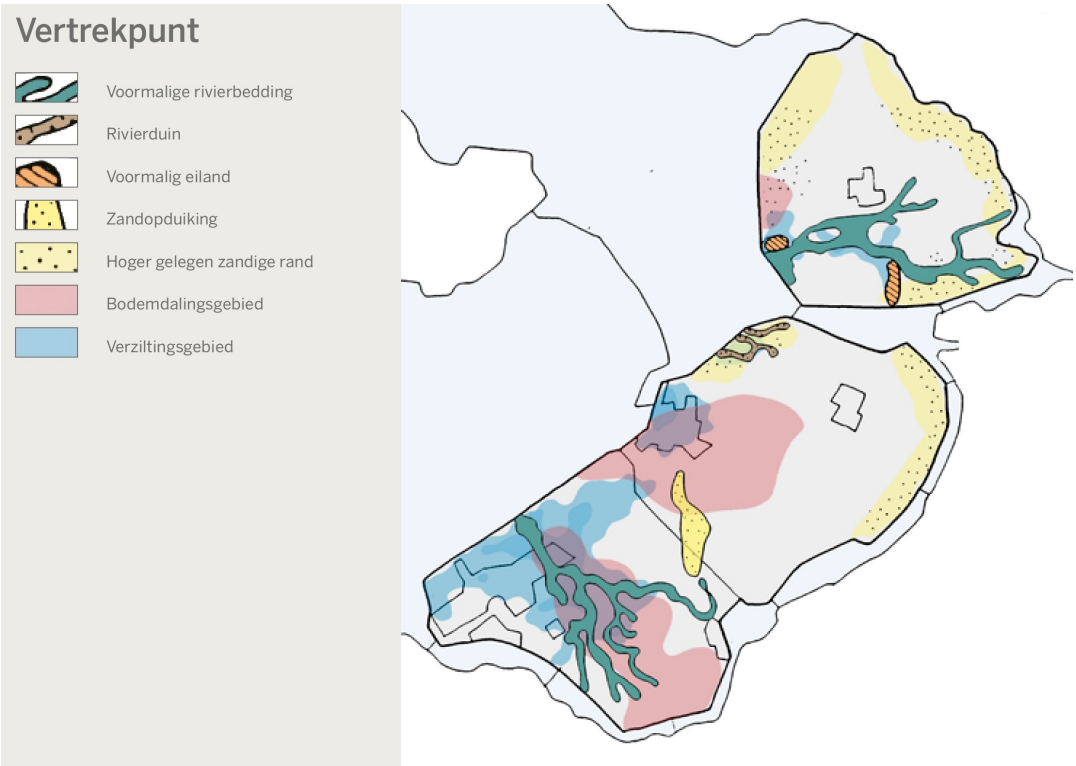

Figure 3.7: Schematic representation of soil conditions of Flevoland (Source: *Watervisie* (2021)).

Figure 3.8). However, water is also usually let in, especially in the Noordoostpolder, to improve water quality. Typically, more water is discharged than let in, but during the dry summer of 2018, local issues arose in agriculture, nature, and urban areas related to water quantity and quality. This was also the first year with a brief period of net water import. The projection is that water demand will increase significantly, up two doubling, as a result of increasing water demand.

Policy focuses on collaboration to reduce pressure on the freshwater resources of the IJsselmeer and Markermeer. Locally, it emphasizes efficient use, prioritizing key consumers, and increasing self-sufficiency by retaining good-quality seepage and stormwater rather than draining it.

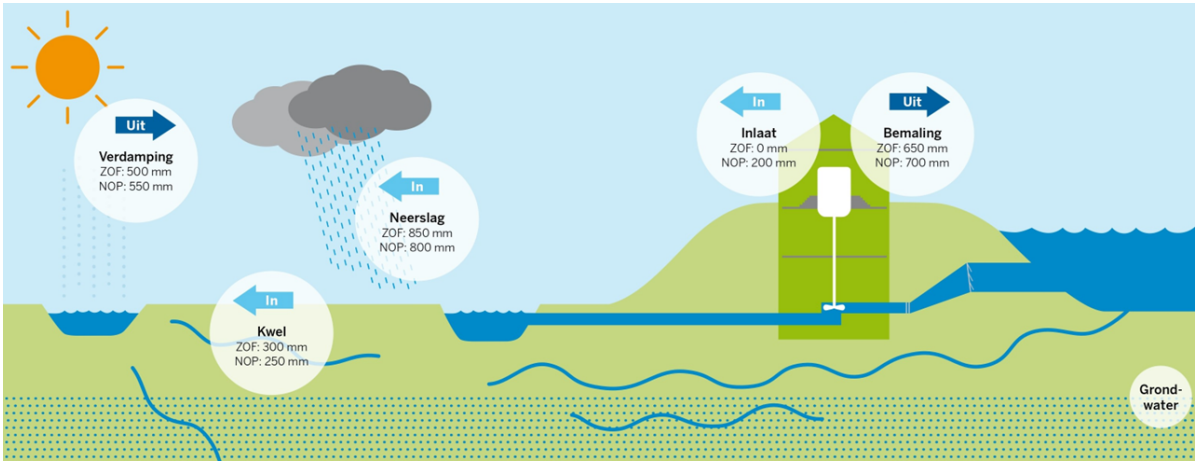

Figure 3.8: The water balance in the polders of Zuid- and Oost-Flevoland (ZOF) and Noordoostpolder (NOP).

4

Policy Study

This chapter presents the methods and results of the municipal policy study conducted on the case studies, addressing sub-questions 3 and 4. It focuses on how climate adaptation integrates with other urban transitions, primarily at a strategic level. This chapter highlights one facet of the relationship and lays the groundwork for the project study, which will further explore these connections in a practical context.

The methodology of the policy study is explained in Section 4.1, detailing the document selection, coding method, and analysis process. The results of this analysis are divided into two categories. Section 4.2 provides a quantitative overview, using tables and graphs to highlight the presence of various transitions in the analyzed municipal documents, along with the frequency and nature of their relation to climate adaptation. Section 4.3 delves into the qualitative aspects, exploring the content of the texts to identify general trends, themes, and key objectives for each transition. It also examines how each transition relates to climate adaptation, discussing the dominant themes and categorizing the interconnections.

4.1. Method of the policy study

This section explains the processes of document selection, document coding, and the subsequent analysis of the codes.

4.1.1. Policy document selection

It is possible to distinguish between policies in two categories: strategic and operational. Strategic policy sets the long-term direction for the municipality, while operational policy deals with the day-to-day implementation of these strategies.

In studying the relationships between climate adaptation and other urban transitions, strategic policies are prioritized for their long-term perspective. This aligns with the research goal of exploring overall urban planning strategies and their interplay with different long-term transitions. Additionally, strategic policies guide operational decisions, so studying them will also help to understand the principles shaping daily actions.

These arguments, combined with time limitations, have led to a selection of documents with a primarily strategic rather than operational character. The distinction in practice is, however, not as black and white, and some documents with a more operational character, such as the *Gemeentelijke Rioleringsplannen* (municipal sewage plans), were included in the study due to their high relevance for climate adaptation.

Policy documents were selected to ensure representation from all sectors involved in the transitions. This process led to the selection of 12 documents from Almere and Lelystad and 7 documents from Urk (see Table 4.1). Additionally, a regional document on climate adaptation was included due to its high relevance and overarching role.

The documents vary in their scope. While some are more sectoral, such as the *Gemeentelijke Rioleringsplannen* and the *Transitievisies Warmte* (Heat Transition Visions), others are designed to

be more integrative, such as the *Omgevingsvisies* (Environmental Visions) and *Duurzaamheidsvisies* (sustainability visions). The documents are grouped into nine categories, based on their nature.

Table 4.1: Overview of the 32 analysed policy documents

Category	Almere	Lelystad	Urk
Climate Adaptation	Visie op Almeerse klimaattadaptatie (2024)	Lelystadse Adaptatie Strategie (2023)	
	Regionale adaptatie strategie (2024)[1]		
Water Management	Waterplan Almere 2017-2022 (2017)	Gemeentelijk rioleringsplan 2022-2031 (2022)	Gemeentelijk Water-en Rioleringsplan Urk (2023-2028) (2022)
Energy Transition	Transitievisie Warmte (2021)	Transitievisie Warmte Lelystad 2020-2050 (2020)	Transitievisie Warmte Urk (2021)
	Visie op de Almeerse Energietransitie (2023)		
Mobility	Mobiliteitsvisie Almere 2020-2030 (2020)	Mobiliteitsvisie Lelystad (2020)	Gemeentelijk Verkeers- en Vervoersplan Urk (2021)
Health	Samen op avontuur (2019)	Samen Gezond in Lelystad (2019)	
	Sportvisie Almere (2021)	Sport - en beweegvisie Lelystad (2022)	
Ecology	Visie ecologie 2020 (2020)	Strategie agenda natuur 2030 (2023)	
Sustainability	Duurzaamheidsagenda Almere (2020)	Kadernota Duurzaamheid (2016)	Duurzaamheidsvisie Urk (2020)
Housing	Woonvisie Almere (2020)	Woonvisie Lelystad (2022)	Woonvisie Urk (2021)
Integrated Environmental	Almere, stad met toekomst (2021)	Omgevingsvisie 2040 (2021)	Omgevingsvisie Urk tot 2030 (2021)
	Visie openbare ruimte Almere (2021)	Uitvoeringsdocument Lelystad next level (2022)	Structuurvisie Urk 2035 (2019)
		Koersdocument (2020)	

[1] Developed by the collaborative network Climate Adaptive Flevoland (*Klimaatadaptief Flevoland* (KAF)), which includes the municipalities of Almere, Lelystad, and Urk, the principles outlined in the RAS serve as guidelines to allow for customization of local municipal policies.

4.1.2. Coding process

All documents were thoroughly read, and paragraphs, as well as individual lines in cases of summations that contained core messages, were labeled with one or more “codes” when they met the relevant criteria. This process was facilitated by computer-aided qualitative data analysis software (CAQDAS), specifically ATLAS.ti, available through TU Delft.

Most of the codes applied were derived a priori from the theory. This top-down approach, rather than the more common bottom-up method, was chosen to ensure a seamless progression from, and comparison with, the findings of the literature study. As the initial documents were analyzed, this coding strategy naturally emerged, leading to the development of a codebook with clear criteria to maintain consistency throughout the process (see Table 4.2).

The final codebook consists of four code groups. The first group includes climate adaptation and

the five other transitions, allowing for the possibility of labeling a single paragraph with multiple codes from this group.

The final code group contains the label ”*Relation*,” which was applied when a paragraph not only addressed climate adaptation and another transition individually (co-occurrence), but also indicated or implied a connection or interaction between them.

These relations were further analyzed to determine their type and valence, as represented by the third and fourth code groups. Based on Table 2.6, the relation types were categorized as *Geographical*, *Physical*, *Informational*, or *Project-based*. All paragraphs containing a *Relation* were assigned one or more Relation types according to the criteria outlined in the codebook.

Valence described how the relationship was framed, either as a synergy or a challenge. Passages that framed a relation neutrally were not assigned a valence code.

4.1.3. Analysis of the results

The analysis consists of both a quantitative and a qualitative section, described in Section 4.2 and Section 4.3. ATLAS.ti tools will be used to compile tables that reveal patterns in coding frequencies, which will form the basis of the quantitative section. This part focuses on the numerical aspects of the analysis, using tables to highlight key findings.

The qualitative section will delve into the content of the transitions and their relationship with climate adaptation as presented in the text. With the support of ATLAS.ti, relevant text segments will be identified and isolated, allowing for a detailed discussion and interpretation of these connections.

Table 4.2: Codebook with 13 codes divided into 4 code groups.

Code (group)	Application criteria
Transition	The label is applied when the text contains:
Climate Adaptation	motives for climate adaptation such as the impacts of extreme precipitation, heat and drought, as well as references to other policy documents that support these needs.
	climate adaptation measures, such as urban greening, expanding urban drainage capacity, and disconnecting rainwater from sewer systems.
Energy Transition	motives for the energy transition, and references to other policy documents or sources that support this need.
	actions related to the energy transition such as replacing fossil fuels with renewable alternatives, generation of renewable energy and reducing energy demand.
Mobility Transition	motives for the mobility transition, and references to other policy documents or sources that support this need.
	actions related to the mobility transition such as promotion of active mobility and public transport, reducing car use and ownership. The mere electrification of mobility is excluded.
Circular Economy	Motives for adopting circular economy principles, including references to broader policy documents or goals.
	actions related to circular economy practices, such as material reuse, reducing consumption, local supply changes, rainwater capture and reuse, circular construction and waste prevention.
Environmental Health	motives for enhancing health trough altering the environment, including references to broader policy documents or goals.
	actions to enhance the living environment for improved (mental)health, such as encouraging physical activity, relaxation and socializing, trough urban greening and provision of health promoting amenities such as play areas, bike and walking paths and seating areas.
Nature Inclusiveness	motives for enhancing nature inclusiveness, including references to broader policy documents or goals.
	actions related to improving biodiversity and nature values such as urban greening, providing habitats for wildlife, and enhancing nature experience and appreciation.
Relation type	The label is applied when the climate adaptation code and one other transition code is mentioned and the relation in the text concerns:
Geographical	the spatial alignment of the transitions in the same area.
Physical	shared use of infrastructure or resources for different transition purposes.
Informational	shared use of data or information for different transition purposes.
Project-based	alignment of rehabilitation and construction plans for different transition purposes.
Relation valence	The label is applied when the text mentions on:
Synergy	benefits, cooperation, or mutual enhancement between climate adaptation and the other transition.
Challenge	conflicts, obstacles, or trade-offs between climate adaptation and the other urban transition.
Relation	The label is applied when the text:
Relation	goes beyond co-occurrence of climate adaptation and another transition and links actions across these different transition areas, showing how one transition influences or is planned in conjunction with another, either directly stated or strongly implied through the text.

4.2. Quantitative results

This section presents the quantitative results of the policy study, focusing on the frequency and co-occurrence of labels in policy documents. The analysis is structured into two parts: first, Subsection 4.2.1 examines the distribution of scores, and second, Subsection 4.2.2 explores the *Relations* between climate adaptation and the other transitions.

4.2.1. Scores

The number of times a label was assigned within a document is referred to as a score. Together, these scores constitute the quantitative results of the policy study. They provide insights that contribute to answering the research question, as they can be compared individually or summed by category.

The scores indicate the level of integration of climate adaptation in two ways. While high scores across various transitions within a document suggest engagement with multiple transitions, a high score for *Relation* specifically indicates meaningful connections between climate adaptation and other transitions. As stated in the codebook, a score for *Relation* is assigned when a paragraph not only addresses climate adaptation and another transition individually (co-occurrence) but also explicitly or implicitly indicates a connection or interaction between them, thereby highlighting a relation. These scores, per document, summed by document category, or grouped by municipality, are evaluated in Subsection 4.2.1.

Scores per Policy Document

The raw results of the coding process, displayed in Table 4.3, provide the individual scores for both *Transitions* and *Relations* across all documents before summation. This presentation enables comparison of scores within individual documents as well as between different documents. A complete table including these scores along with those related to relation characteristics can be found in Appendix A.

A trend that emerges from this table is that all the transitions are generally recognized, with the highest scores appearing in documents most closely aligned with those specific transitions. Additionally, categories with a weaker sectoral focus but a more integrated approach generally present a more diverse picture.

For example, documents in the *Climate Adaptation* category score high on climate adaptation, reflecting their sectoral character. However, compared to other sectoral documents, they often address other transitions as well, particularly in the case of the *Regionale Adaptatie Strategie*, and to a lesser extent in the *Lelystadse Adaptatie Strategie*. The high scores for *Relation* in these documents indicate a strong level of integration, further explored in Subsection 4.2.2.

The Water Management sector is closely related to climate adaptation, as shown in the results. This is most evident in Urk's *Water- en Rioleringsplan*. Almere's *Waterplan*, which serves as the municipality's integrated interpretation of the mandatory sectoral *Gemeentelijk Rioleringsplan*, scores relatively high across all transitions.

At the most sectoral end of the integration spectrum are the documents in the Energy Transition category. These documents primarily show high scores for the energy transition, which aligns with their singular purpose.

Documents in the Mobility category display a typical pattern: high scores for the mobility transition and consistent, significant scores for the energy transition. Other transition recognitions are present but limited, except for *Circular Economy*, which is notably absent.

The documents in the Health category score the lowest for their related transition, *Environmental Health*. Although this transition is recognized, it is comparatively underrepresented. However, these documents do touch upon other transitions, including climate adaptation, most notably in Almere's *Samen op Avontuur*.

The Ecology category stands out with relatively high scores for the *Climate Adaptation* and *Environmental Health* transitions. Additionally, the high scores for *Relation* are notable.

Table 4.3: Overview of individual policy documents and their scores.

Cat.	Mun.	Documents	Pp.	CA	ET	MT	CE	EH	NI	Rel.
CA	Alm.	Almeerse klimaattadaptatie	*14*	47	1	0	2	6	7	6
	Lel.	Lelystadse Adaptatie strat.	*41*	113	6	3	4	11	16	24
	Reg.	Regionale Adaptatie strat.	*39*	156	6	2	10	21	36	34
WM	Alm.	Waterplan Almere	*75*	37	23	0	30	5	34	8
	Lel.	Rioleringsprogramma	*43*	18	2	0	2	0	0	4
	Urk	Water en Rioleringsplan	*104*	90	3	0	6	0	4	5
ET	Alm.	Visie Energietransitie	*28*	3	113	7	2	1	1	0
		Transitievisie Warmte	*58*	1	161	0	0	0	0	1
	Lel.	Transitievisie Warmte	*28*	2	96	0	1	1	1	0
	Urk	Transitievisie Warmte Urk	*39*	5	194	0	0	0	0	0
MO	Alm.	Mobiliteitsvisie Almere	*49*	1	32	86	0	3	2	1
	Lel.	Mobiliteitsvisie Lelystad	*60*	0	36	95	0	12	0	0
	Urk	Verkeers- en Vervoersplan	*86*	2	24	77	0	1	2	2
HE	Alm.	Samen op avontuur	*24*	5	0	5	6	26	3	4
		Sportvisie Almere	*46*	4	0	2	0	14	4	1
	Lel.	Samen Gezond	*56*	2	0	0	0	7	2	1
		Sport- en beweegvisie	*76*	5	2	3	1	14	4	2
EC	Alm.	Visie ecologie	*62*	15	2	0	3	17	107	8
	Lel.	Strategie agenda natuur	*27*	21	2	1	0	22	41	12
SU	Alm.	Duurzaamheidsagenda	*28*	18	26	8	26	10	23	5
	Lel.	Kadernota Duurzaamheid	*40*	9	53	16	28	7	20	0
	Urk	Duurzaamheidsvisie Urk	*52*	22	52	6	39	0	0	0
HO	Alm.	Woonvisie Almere	*47*	8	18	0	6	4	6	2
	Lel.	Woonvisie Lelystad	*40*	12	12	0	2	8	10	6
	Urk	Woonvisie Urk	*19*	5	7	1	1	5	5	2
IE	Alm.	Almere, stad met toekomst	*100*	26	15	6	11	18	22	4
		Visie openbare ruimte	*72*	37	10	6	14	32	30	7
	Lel.	Omgevingsvisie 2040	*96*	48	29	20	19	34	44	26
		Lelystad next level	*109*	28	8	4	11	37	50	4
		Koersdocument	*8*	10	4	0	1	8	9	1
	Urk	Omgevingsvisie Urk	*57*	33	20	17	9	16	15	4
		Structuurvisie urk 2035+	*70*	12	11	5	2	7	9	1
Tot.			*1693*	795	968	370	236	347	507	175

[1] *Abbreviations top row*: Cat., Category; Mun., Municipality; Pp, Page count; CA, Climate adaptation; ET, Energy Transition; MT, Mobility Transition; CE, Circular Economy; EH, Environmental Health; NI, Nature Inclusiveness; Rel., Relations.

[2] *Abbreviations first column*: CA, Climate Adaptation; WM, Water Management; ET, Energy transition; MO, Mobility; HE, Health; EC, Ecology; SU, Sustainability; HO, Housing; IE, Integrated Environmental.

[3] *Abbreviations second column*: Alm., Almere; Lel., Lelystad

[4] *Conditional coloring*: applied uniformly to all transition scores, so excluding the page and *Relations* column.

The last three document categories show a more diverse scoring pattern, as they are less strongly linked to a single transition. The Sustainability category scores relatively high across all transitions, which are all sustainability-related. Particularly noteworthy is the consistently high score for *Circular Economy*, with only the *Waterplan Almere* showing a comparable score. These documents also give some attention to *Climate Adaptation*, particularly the *Duurzaamheidsagenda Almere*, which records five *Relations*.

Documents in the Housing category consistently address several transitions, including some *Relations* with climate adaptation. Lastly, documents in the Integrated Environmental category live up to their name by consistently addressing all transitions, with particularly high scores for *Climate Adaptation*, *Environmental Health*, and *Nature Inclusiveness*, along with recognition of the other transitions.

The scores were also summed per document category, confirming the patterns observed in Table 4.3. To avoid redundancy, the table is provided in the appendix in Table A.2.

Scores Categorized per Municipality

Summing the scores per municipality resulted in Table 4.4, which also includes the total scores for all documents.

Overall, all transitions are regularly recognized in the policy documents of the municipalities. The recognition of transitions generally follows the same pattern: *Energy Transition* and *Climate Adaptation* consistently score high, together accounting for over half of all transition recognitions (32% and 21%, respectively). In contrast, *Circular Economy* was recognized the least, comprising just 8% of all transition recognitions.

A noteworthy difference is Urk's lower score for *Environmental Health* and *Nature Inclusiveness*, even when accounting for differences in document length. This could be due to a lack of policy documents from Urk addressing these topics.

The most *Relations* emerged in the policy documents of Lelystad, followed by Almere, and then Urk. The characteristics of the *Relations* show a clear pattern: most are of a *Geographical* nature, followed by *Physical*, *Project-based*, and finally *Informational*. These relations are almost always framed as *Synergies*.

Table 4.4: Overview of scores, sorted per municipality.

Mun.	Pp.	CA	ET	MT	CE	EH	NI	Rel.	Geo.	Phy.	Inf.	P.b.	Syn.	Cha.
Alm.	*603*	202	401	120	100	136	239	47	40	21	2	8	43	4
Lel.	*624*	268	250	142	69	161	197	80	72	19	3	14	71	4
Urk	*427*	169	311	106	57	29	35	14	10	5	1	1	13	2
Reg.	*39*	156	6	2	10	21	36	34	26	20	1	7	31	3
Tot.	*1693*	795	968	370	236	347	507	175	148	65	7	30	158	13

[1] *New abbreviations*: Geo., Geographical; Phy., Physical; Inf., Informational; P.b., Project-based; Syn., Synergy; Cha., Challenge.
[2] For other abbreviations see Table 4.3.
[3] Conditional coloring is applied separately for transitions and relations, as indicated by vertical borders.

4.2.2. Co-occurrences and Relations

Using Atlas.ti, the co-occurrence of labels was also analyzed. This revealed the co-occurrence of different *Transitions* and allowed for a more detailed assessment of the identified *Relations*. For each passage signifying a *Relation*, the involved Transitions, Relation type, and Valence were determined. These results are evaluated per document, per category, per municipality, and in total, in that order, as presented in this section.

Relations per Document

Table Table 4.5 shows the the amount of *Relations* with climate adaptation, per document, and also shows which transitions were involved in these *Relations*. The *Relations* are rather unequally divided

over the policy documents, with the top three documents containing nearly half (84 of 175) of all *Relations*. These are the documents *Regionale Adaptatie Strategie*, *Lelystadse Adaptatie Strategie* followed by the Lelystadse *Omgevingsvisie 2040*. These three documents show very similar scoring patterns concerning the transitions with which climate adaptation is related: Most relations emerge with nature inclusivenss, followed by environmental health, the energy transition and the circular economy transition.

Table 4.5: Relations per policy document.

Cat.	Mun.	Documents	Pp.	Rel.	ET	MT	CE	EH	NI
CA	Alm.	Almeerse klimaattadaptatie	*14*	6	1	0	2	3	4
	Lel.	Lelystadse Adaptatie strat.	*41*	24	6	3	2	9	13
	Reg.	Regionale Adaptatie strat.	*39*	34	5	2	6	19	21
WM	Alm.	Waterplan Almere	*75*	8	0	0	1	4	8
	Lel.	Rioleringsprogramma	*43*	4	2	0	2	0	0
	Urk	Water en Rioleringsplan	*104*	5	1	0	3	0	2
ET	Alm.	Visie Energietransitie	*28*	0	0	0	0	0	0
		Transitievisie Warmte	*58*	1	1	0	0	0	0
	Lel.	Transitievisie Warmte	*28*	0	0	0	0	0	0
	Urk	Transitievisie Warmte Urk	*39*	0	0	0	0	0	0
MO	Alm.	Mobiliteitsvisie Almere	*49*	1	0	1	0	1	1
	Lel.	Mobiliteitsvisie Lelystad	*60*	0	0	0	0	0	0
	Urk	Verkeers- en Vervoersplan	*86*	2	1	1	0	1	2
HE	Alm.	Samen op avontuur	*24*	4	0	0	0	4	3
		Sportvisie Almere	*46*	1	0	0	0	1	1
	Lel.	Samen Gezond	*56*	1	0	0	0	1	1
		Sport- en beweegvisie	*76*	2	0	1	1	2	2
EC	Alm.	Visie ecologie	*62*	8	0	0	0	4	8
	Lel.	Strategie agenda natuur	*27*	12	0	1	0	9	12
SU	Alm.	Duurzaamheidsagenda	*28*	5	2	0	2	2	5
	Lel.	Kadernota Duurzaamheid	*40*	0	0	0	0	0	0
	Urk	Duurzaamheidsvisie Urk	*52*	0	0	0	0	0	0
HO	Alm.	Woonvisie Almere	*47*	2	0	0	0	1	2
	Lel.	Woonvisie Lelystad	*40*	6	1	0	1	4	6
	Urk	Woonvisie Urk	*19*	2	0	1	1	2	2
IE	Alm.	Almere, stad met toekomst	*100*	4	2	0	3	2	2
		Visie openbare ruimte	*72*	7	3	1	4	3	4
	Lel.	Omgevingsvisie 2040	*96*	26	13	1	10	15	21
		Lelystad next level	*109*	4	0	1	0	4	4
		Koersdocument	*8*	1	1	0	0	1	0
	Urk	Omgevingsvisie Urk	*57*	4	0	0	0	2	4
		Structuurvisie urk 2035+	*70*	1	0	0	0	1	1
Tot.			*1693*	175	39	13	38	95	129

[1] For abbreviations see Table 4.3.
[2] *Conditional coloring*: applied uniformly to all scores.

Relations per Category

Summing the *Relations* per document category results in Table 4.6. The table largely reinforces previous findings, with the same document categories, Climate Adaptation, Integrated Environmental, Ecology, and Water Management—showing strong integration with climate adaptation, as discussed earlier. Similarly, the same pattern emerges across transitions, where nature inclusiveness has the strongest relation with climate adaptation, while the mobility transition has the weakest. This trend remains consistent across all categories.

A notable insight from this table is that *Relations* between climate adaptation and both the *Energy Transition* and *Mobility Transition* are scarcely present in their corresponding policy document categories, Energy Transition and Mobility.

Table 4.6: *Relations* with climate adaptation categorized per policy document category.

Cat.	Pp.	Rel.	ET	MT	CE	EH	NI
CA	*94*	64	12	5	10	31	38
WM	*222*	17	3	0	6	4	10
ET	*153*	1	1	0	0	0	0
MO	*195*	3	1	2	0	2	3
HE	*202*	8	0	1	1	8	7
EC	*89*	20	0	1	0	13	20
SU	*120*	5	2	0	2	2	5
HO	*106*	10	1	1	2	7	10
IE	*512*	47	19	3	17	28	36
Tot.	*1693*	175	39	13	38	95	129

[1] For abbreviations see Table 4.3.
[2] *Conditional coloring*: applied uniformly to all scores.

Relations per Municipality

Comparing results across municipalities provides further insight. To facilitate this comparison, the results are summed per municipality (Table 4.7). Given the unequal number of policy pages analyzed per municipality, the scores are normalized by dividing by the total number of pages for each municipality and multiplying by 100. This yields the average number of *Relations* per 100 pages, as shown in Table 4.8.

Lelystad consistently exhibits the highest number of *Relations*, followed by Almere, with Urk scoring the lowest. The only exception is the *Relation* with the Mobility Transition, where Urk surpasses Almere. The number of relations serves as an indicator of the level of climate adaptation integration, enabling mutual comparison. However, direct comparison remains challenging. Adjusting for the unequal number of total pages does not fully eliminate discrepancies, as the selected policy documents are not directly comparable. For example, Urk lacks documents in the categories of Climate Adaptation, Health, and Ecology, an absence that is itself a relevant finding.

Table 4.7: *Relations* with climate adaptation categorized per municipality.

	ET			MT			CE			EH			NI		
	Alm.	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**
Rel.	9	23	2	2	8	2	12	16	4	25	46	6	38	59	11
Geo.	7	20	1	2	8	2	9	15	1	25	45	5	34	54	10
Phy.	4	1	0	0	2	0	7	5	2	9	7	1	18	14	3
Inf.	0	2	0	0	0	0	1	1	1	0	1	0	1	2	1
Pb.	3	7	1	0	0	0	3	4	0	4	6	0	6	10	0

[1] Conditional coloring applied per transition.

Table 4.8: *Relations* with climate adaptation categorized per municipality and normalized. Normalization is done by dividing the number of relations by the total number of pages per municipality and multiplying by 100, yielding the number of relations per 100 pages.

	ET			MT			CE			EH			NI		
	Alm.	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**	**Alm.**	**Lel.**	**Urk**
Rel.	1.5	3.7	0.5	0.3	1.3	0.5	2.0	2.6	0.9	4.1	7.4	1.4	6.3	9.5	2.6
Geo.	1.2	3.2	0.2	0.3	1.3	0.5	1.5	2.4	0.2	4.1	7.2	1.2	5.6	8.7	2.3
Phy.	0.7	0.2	0.0	0.0	0.3	0.0	1.2	0.8	0.5	1.5	1.1	0.2	3.0	2.2	0.7
Inf.	0.0	0.3	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.0	0.2	0.0	0.2	0.3	0.2
Pb.	0.5	1.1	0.2	0.0	0.0	0.0	0.5	0.6	0.0	0.7	1.0	0.0	1.0	1.6	0.0

[1] Conditional coloring applied per transition.

Total Relations

Table 4.9 focuses on the co-occurrences and the *Relations* involving *Climate Adaptation* including the results from all policy documents together. The top row displays the total co-occurrences of Transitions. The second row indicates how often these co-occurrences were also a *Relation*. Each *Relation* is assigned one or more type labels, and the results are shown in the table.

While the overall dominance of *Geographical Relations* has been discussed previously, an interesting finding is the relatively high scores for *Physical Relations* associated with *Circular Economy* and *Nature Inclusiveness*. Additionally, *Project-based* scores are notably high for *Energy Transition*, *Circular Economy*, and *Environmental Health*.

Table 4.9: Emerging *Relations* with climate adaptation.

	ET	**MT**	**CE**	**EH**	**NI**
Co-occurences	84	22	77	216	275
From which a Relation	39	13	38	95	129
Geographical	33	14	28	90	117
Physical	7	3	20	25	48
Informational	2	0	4	1	4
Project-based	12	0	9	15	19

[1] Conditional coloring applied per transition (vertically).

Table 4.10 shows the valence (*synergy* or *challenge*) of the *Relations* between climate adaptation and the other urban transitions. Framing that focuses on challenges and conflicts is far outnumbered by the emphasis on synergies and opportunities for integration.

Table 4.10: The valence of the *Relations* between climate adaptation and the other transitions.

	ET		MT		CE		EH		NI	
	Syn.	**Cha.**	**Syn.**	**Cha.**	**Syn.**	**Cha.**	**Syn.**	**Cha.**	**Syn.**	**Cha.**
Relations	24	9	12	1	32	2	92	1	119	7
Geographical	22	8	12	1	21	2	85	0	104	7
Physical	7	0	3	0	16	1	24	1	44	3
Informational	1	0	0	0	4	0	1	0	4	0
Project-based	7	2	0	0	7	0	13	0	15	0

[1] Conditional coloring applied per transition.

4.3. Qualitative results

In this section, the focus shifts to the qualitative aspects of the results concerning the relationship between climate adaptation and the other urban transitions. The content of the municipal policy documents will be examined, specifically the sections that were coded. While the quantitative results provide an overview of coding frequencies and patterns, this section aims to add depth to those findings, further laying the foundation for the subsequent project study. The passages of text that contain the *Relations* are provided in Appendix B.

From the quantitative results, especially Table 4.4, it is evident that all transitions were identified several hundred times, amounting to approximately 3,200 instances. Additionally, 173 *Relations* were identified. The passages associated with these codes offer potentially valuable insights. Key illustrative phrases will be translated and presented. Emerging trends and notable observations will be summarized systematically.

Each section will address a different transition. It will start with a summary of what that transition entails for the municipalities, including any quantifiable goals identified. Following this, the emerging relations with climate adaptation will be analyzed, organized by *Relation type*. This structured approach aims to clarify the interplay between these transitions.

4.3.1. Climate Adaptation

Climate adaptation is prominently addressed in the selected policy documents, with 795 reconditions, particularly in the categories *Climate Adaptation* 316, *Water Management* (145), and *Integrated Environmental* (194). Overall, it is the second most frequently coded transition (Table A.2). This section explores the content of the coded passages. The chapter begins with a discussion of the municipalities' risk assessments, followed by an examination of trends in their approaches, and concludes with an analysis of the central goals formulated regarding climate adaptation.

Risk Assessment of Climate Adaptation

Documents from all municipalities indicate that the risks associated with climate change have been assessed through stress tests. These tests revealed that all three municipalities contain vulnerable areas within the built environment, particularly susceptible to extreme precipitation and heat stress. Heat stress is most pronounced in densely paved areas, such as city and town centers and certain older neighborhoods, where temperatures can far exceed 40 degrees Celsius. The tests also indicated that during a scenario of 70 mm of rainfall within an hour, localized water nuisance could occur across all municipalities. In Lelystad and Almere, specific access roads could become impassable for emergency vehicles (*Waterplan Almere*, 2017; *Lelystadse Adaptatie Strategie*, 2023 [LAS Lelystad]; *Regionale Adaptatie Strategie*, 2024 [RAS]; *Gemeentelijk Water en Rioleringsplan Urk*, 2022 [GWRP Urk]).

Drought is also considered a significant risk, though its impact on the built environment tends to be less direct, with responsibilities shared among stakeholders. One direct risk identified in *LAS Lelystad* is the drying of topsoil layers, which can adversely affect vegetation, particularly newly planted species with immature root systems. The high, artificially maintained water table and the large freshwater bodies surrounding the polder are valuable assets for drought management: "thanks to seepage and the high groundwater level, there is barely any lowering of the surface water level, even during prolonged droughts," as stated in *Waterplan Almere* (2017). However, the more recent *RAS* (2024) states that even these reserves are not limitless during extreme droughts. This poses a risk, as freshwater intake is necessary for managing the water table, ensuring water quality, and providing irrigation, particularly in dry periods. In such cases, surface water quality can deteriorate, and damage to buildings and infrastructure may occur due to subsidence, as noted in *LAS Almere*, *LAS Lelystad*, and *GWRP Urk*. Additionally, deeper-rooted vegetation and natural areas may also suffer damage. These effects are influenced by the underlying water system, for which the water board Zuiderzeeland is responsible, and the demands of rural areas for water play a significant role. Compared to managing the risks of extreme precipitation and heat stress, municipalities have a comparatively smaller role in drought management.

Theme I: Integrated Approach

Various policy documents from all municipalities outline three themes or approaches that guide climate adaptation practices. The first theme is an integrated approach, wherein climate adaptation is a core component of urban (re)development alongside water and soil management. Climate adaptation measures are intended to align seamlessly with other transitions and objectives within the living

environment, such as the energy transition, public health, and housing development. As stated in the *RAS*, ”Different goals cannot be seen in isolation.” This integration requires ”*maatwerk*” or ”customized solutions.” These principles are echoed in other municipal strategies, such as the *LAS Almere* and the *GWRP* of Urk. The *LAS Lelystad* summarises it as ”Climate adaptation is not a separate policy domain, but a different way of working.”

Theme II: Blue-Green Solutions

The second theme, consistently emphasized across all climate adaptation policies, is the preference for ”ecological, nature-based solutions over technical ones,” as stated in the *RAS*. This ”green-unless” (*groen, tenzij*) principle is explicitly mentioned in both the *LAS Lelystad* and the *RAS* as a guiding approach for climate adaptation measures. Although Almere and Urk are less explicit in their language, a similar preference for blue-green, low-impact solutions is evident. ”Fine-meshed and robust blue-green infrastructure” is one of the four pillars for a climate-robust future in Almere (*LAS Almere*). Likewise, Urk emphasizes disconnecting stormwater (*afkoppelen*) and local rainwater processing, along with enhancing green spaces in both existing and new urban environments (*GWRP Urk, Omgevingsvisie Urk*).

Green and blue-green solutions are preferred because, unlike many technical (gray) solutions, they generally address multiple dimensions of climate change: extreme precipitation, heat, and drought (see Table 2.1), while simultaneously contributing to broader municipal goals related to safety, well-being, health, ecology, recreation, and mobility. This approach can be more cost-effective when considering long-term benefits, as emphasized in *LAS Lelystad*, *LAS Almere*, and the *RAS*. In this context, Almere and Lelystad benefit from their design as garden cities, characterized by spacious green areas and numerous water bodies. The municipalities express their intention to leverage these features in the context of climate adaptation.

Theme III: Preferential Order of Stormwater Management

As addressed in the literature review, blue-green solutions or infrastructure (BGI) function by restoring natural hydrological processes. This approach is closely aligned with the preferential order for managing stormwater and drought, as outlined in the *RAS* and *LAS Lelystad*, and reflected in the *LAS Almere* and *GWRP Urk*. The order is as follows:

1. Capture and store water where it falls for potential reuse.
2. Drain stormwater via surface routes to local infiltration facilities, allowing storage in the soil.
3. Temporarily store excess water in facilities such as open bodies of water with buffering capacity.
4. Discharge excess water to the higher-level water system.

In Almere, Lelystad, and Urk, the infiltration and storage of water in the soil present challenges. These municipalities are almost entirely located in deep polders with high water tables, resulting in a limited unsaturated zone. Additionally, the soils in these areas are often poorly permeable, consisting of clay, loam, and peat, which restricts the effectiveness of infiltration and storage (*LAS Lelystad*, *GWRP Urk*, *RAS*).

Another factor limiting widespread infiltration and storage of stormwater is the design of local water systems, primarily focused on draining rainwater. Almere and Lelystad, being relatively young cities, along with certain newer neighborhoods in Urk, are equipped with separate sewer systems that quickly discharge collected stormwater into surface waters. In these areas, disconnecting stormwater from the sewer system does not yield the same benefits as it would in locations with combined sewer systems, where it can reduce the load on sewage treatment plants and lower the risk of combined sewer overflows. However, infiltration remains crucial for replenishing soil water locally, especially during dry periods when soil water levels drop. This decline can be exacerbated by the extensive network of drainage pipes throughout the polder, which are used to drain excess soil water, maintain desirable soil water levels, and prevent groundwater-related issues (*LAS Almere*, *LAS Lelystad*, *GWRP Urk*).

Based on the policy documents, Almere and Lelystad adhere to a drainage strategy built around a separated sewer system. Additional capacity to mitigate the impacts of climate change is sought through storage and infiltration facilities and the buffering capacity of surface waters (*LAS Lelystad*; *LAS Almere*). In contrast, Urk has indicated that viable opportunities to disconnect stormwater from combined sewers are being pursued, and for new developments, all stormwater will be collected at the surface level (*GWRP Urk*).

Quantifiable objectives for stormwater management

The following list outlines the quantifiable goals for addressing extreme precipitation events:

- A precipitation event of 70 mm/hour (T=100 years in 2050) is set as the normative standard. Such an event should not cause damage to buildings, infrastructure, or facilities (*RAS*, *LAS Lelystad*, *GWRP Urk*).
- Where possible, especially in new urban developments, the ambition is to manage events with 90 mm/hour (T=250 years in 2050) as the standard (*RAS*).
- An extreme precipitation event of 90 mm/hour should not cause damage to critical infrastructure or facilities. Escape routes, access roads, and railroads must remain passable (*RAS*).
- During these normative events, water levels of up to 20 cm on streets are acceptable. Urban (re)development should ensure that building elevations accommodate this standard (*RAS*).
- ”Hydrologically neutral development” (*Hydrologisch neutraal ontwikkelen*) refers to an approach ensuring that new developments do not lead to additional water inflow or outflow. The aim is to retain as much rainwater as possible, infiltrate it into the soil, and reuse it within the planned area. Discharge requirements are determined on a case-by-case basis, depending on the specific characteristics of the area (*RAS*).

Quantifiable objectives for managing drought

The following list outlines central goals and principles for managing drought:

- Prolonged drought, characterized by a potential maximum precipitation deficit of 300 mm occurring once every 10 years, should not cause damage to buildings, roads, or greenery. Prolonged drought should not result in damage to buildings, infrastructure, or other critical physical elements (*RAS*).

Quantifiable objectives for managing heat stress

The following list outlines central goals and principles for mitigating heat stress:

- 3-30-300 rule: Every home should have visibility of at least 3 trees, with 30% of each neighborhood’s area being green (including foliage). Additionally, there should be a park or green space within 300 meters of every home. Each park or green space should be at least 200 m² in size and provide at least 30% shade. Redevelopment plans will consider the feasibility of this rule (*RAS, LAS Almere, Omgevingsvisie Urk*).
  In *LAS Lelystad*, a slightly different form of the 3-30-300 rule is applied. Instead of requiring 30% canopy coverage of the total urban environment, it mandates 30% shading of only the street, achieved using not only trees but also buildings and other structures.
- Shade in busy areas: In high-traffic areas (e.g., city centers), near retirement homes, and on central slow-traffic routes, there should be at least 40% shade provided by trees, buildings, or structures (*RAS*, *LAS Lelystad*).
- Heat-reflective surfaces: In new construction and restructuring projects, it is recommended that at least 50% of all horizontal and vertical surfaces be heat-reflective or cooling. This can be achieved through shading (e.g., trees, green facades, and roofs), blinds, or the use of light-colored bricks and paving (*RAS*).
- Building Orientation and Ventilation: In new construction and restructuring projects, the positioning and orientation of buildings should optimize street ventilation through wind currents (natural air conditioning) and prevent direct sunlight from entering homes, helping to keep indoor spaces cooler (*RAS*).

4.3.2. Energy transition

The energy transition was recognized more frequently than any other transition, with a total of 968 recognitions. These primarily occurred in the category *Energy Transition*, with 564, or 58%, but also in the categories *Mobility*, 92, *Sustainability* 131, and *Integrated Environmental* 97. In line with national policy, municipal documents consistently focus on reducing fossil fuel use and lowering carbon emissions.

The prominence of the energy transition among the various transitions is reflected in the *Duurzaamheidsvisie Urk* (2030) (Sustainability Vision Urk), where it is identified as the primary theme, even though the document also addresses climate adaptation and the circular economy.

Sectoral documents focused on the energy transition include three *Transitie Visies Warmte* (TVW's) (Heat Transition Vision) from Almere (2021), Lelystad (2020), and Urk (2021), as well as the *Visie op de Almeerse energietransitie* (2023). The number of heat transition visions indicates their relevance within the broader context of the energy transition in the built environment. These documents also detail the municipality's role in coordinating this aspect of the transition.

Trias Energetica approach to the energy transition

The municipalities each have different starting positions in the energy transition due to variations in neighborhood age, infrastructure, and the availability of sustainable energy sources. Consequently, achieving objectives with minimal societal costs varies not only between municipalities but also within individual neighborhoods, streets, and even houses. Despite these differences, some common strategies can be identified.

A key approach followed by the municipalities is the three-step "*Trias Energetica*". This approach is explicitly addressed in the *TVW Lelystad* and consists of: (1) reducing energy consumption by preventing waste, (2) maximizing the use of energy from sustainable sources, and (3) using fossil energy as efficiently as possible to meet remaining needs.

Reducing energy consumption (point 1), primarily through improved insulation, is characterized as a "*geen-spijt*" or "no-regret" strategy and recognized as a "*kernelement*" or "core element" of the transition (*TVW Urk*, *TVW Almere*). Most neighborhoods in the three municipalities, with the exception of the former island of Urk, have a favorable starting position in this regard, as they were constructed after 1960, making them generally more suitable for insulation. Additionally, buildings constructed after 1995 are typically already well-insulated.

In their *TVW*, the municipalities outline potential strategies for transitioning to sustainable heat sources across different neighborhoods (point 2). Depending on the context, options range from centralized to more individualized (electric) solutions. Centralized solutions often involve heat networks, which can vary in scale and temperature. Generally, three types of heat networks are identified: high, medium, and low temperature. Lower temperature networks require enhanced building insulation and often necessitate specialized in-home heating systems, along with electric backup for heating tap water.

A sustainable heat network also necessitates a reliable heat source. Potential sources identified include residual industrial heat, geothermal energy, ground-coupled heat exchangers, sewer heat, aquathermal energy, and biomass. The *TVWs* provide context for each municipality's approach. For instance, Urk plans to utilize residual heat from its fishing industry to heat a new housing district (*Zeeheldenbuurt*) and the industrial area itself. Almere currently operates a heat network serving over half its homes, but transitioning this system to sustainable sources will require lowering the network temperature and making infrastructure adjustments alongside improved home insulation. Lelystad features a relatively new biomass-fueled heat network that supplies heat to approximately 15% of its houses.

The feasibility of implementing heat networks depends on several factors, including the availability of a heat source, sufficient subsurface space for infrastructure, and a heat demand density that justifies the infrastructural investment. Based on these criteria, certain neighborhoods are excluded from heat network plans, such as the old island of Urk, which faces space constraints, as well as well-insulated and/or less dense neighborhoods in Almere and Lelystad. In these cases, fully electric systems, small collective systems, or renewable gas solutions (in the case of Urk) are proposed. The anticipated increase in electricity demand from these solutions will also require upgrades to the electricity network (*TVW Urk*, *TVW Almere*).

Quantifiable objectives for the energy transition

Central goals and ambitions expressed in the documents are largely uniform and align with the Dutch Climate Agreement. The following objectives are outlined:

- Achieve a 49% reduction in greenhouse gas emissions by 2030 and a 95% reduction by 2050. Almere aims for a 55% reduction by 2030 (*TVW Almere, TVW Lelystad, TVW Urk*).
- Phase out the use of natural gas for heating buildings by 2050. All new buildings will be natural gas-free (*TVW Almere, TVW Lelystad, TVW Urk*).

Relations with Climate Adaptation

Geographical The *Relations* with climate adaptation are primarily *Geographical*, focusing on spatial alignment between the transitions within the same area. This was the case for 33 of the 39 identified *Relations* (see Table 4.9).

In most instances, the *Synergetic Geographical Relation* highlights the importance and potential for integrating climate adaptation with the energy transition (see Table 4.10). Some documents identify integration as a way to limit conflicts between these transitions. For example, the *LAS Lelystad* recognizes that both climate adaptation and the energy transition require adequate space for implementation. It positions climate adaptation as a unifying element. Similarly, the *RAS* views climate adaptation as integral to other spatial transitions, such as the energy transition, suggesting that these goals are interconnected and should not be pursued in isolation. To support this integration, the *Visie Openbare Ruimte Almere* proposes a new approach to urban development: ”This requires a new method of area development where management, design, and implementation work more closely together. We need to manage by designing and design through management.”

The *Omgevingsvisie Lelystad 2040* offers a more concrete example, emphasizing the potential of enhancing urban green spaces and surrounding woodland to support both climate adaptation and the energy transition.

Most *Challenging Relations* relate to the limited availability of space for multiple transitions, with three cases specifically involving subsurface space. The *Omgevingsvisie Lelystad 2040* emphasizes the need for policies that balance these competing demands. It also highlights a particular challenge in business parks, where integrating climate adaptation and nature inclusiveness is difficult due to the energy transition taking priority in subsurface space allocation.

Physical A smaller portion (7) of the *Relations* involves the shared use of infrastructure and resources across various transitions, categorized as *Physical Relations*. All of these were coded as *Synergy*.

One prominent example is the use of green roofs and facades, which can improve building insulation, reduce energy consumption for heating and cooling, and contribute to urban cooling and water retention. This synergy is noted in the *LAS Lelystad*, *RAS*, and *Almere, stad met toekomst*.

Beyond green infrastructure attached to buildings, shading from outdoor vegetation is recognized as a viable strategy for passive cooling, reducing indoor temperatures. This method decreases the demand for active cooling systems, such as heat pumps or air conditioning, which consume energy and contribute to outdoor heat. As highlighted in the *RAS*: ”We are fully committed to greening and the passive cooling of homes.”

Informational 2 of the relations involve the shared use of data or information for different transition purposes, categorized as informational relations.

One example is the collective data definition in urban water management (*gegevenswoordenboek stedelijk water*), which facilitates coordination among various transitions, as addressed in the *Gemeentelijke Rioleringsprogramma*(GRP) of Lelystad. Another example is the neighborhood-oriented information programs for residents, which integrate climate adaptation with other transitions (*LAS Lelystad*).

Project-based The second-largest group of *Relations* is the *Project-based* group (12), which encompasses relations concerning the alignment of rehabilitation and construction plans, as well as other programs, for different transition purposes.

From both the perspective of the energy transition and the perspective of climate adaptation (including sewer works), the other transition is seen as a potential candidate for project-based synergies to reduce costs and nuisance (*GRP Lelystad, LAS Lelystad, TVW Almere*). In the *Omgevingsvisie Lelystad 2040*, it is stated the sustainability transitions function as a ”catalyst” for neighborhood renewal: ”The necessary sustainability efforts, development toward a circular economy, energy transition, and making the living environment climate-adaptive act as a catalyst for neighborhood renewal.”

4.3.3. Mobility Transition

The *Mobility Transition* encompasses actions aimed at promoting active mobility and public transport, reducing car use, and limiting car ownership. It was recognized a total of 370 times, placing it in the

middle range among all transitions, behind the *Energy Transition* and *Climate Adaptation*. 258 of these recognitions, or approximately 70%, originated from documents categorized under *Mobility*.

Enticing over Enforcing Approach to the Mobility Transition

The extent to which the municipalities pursue the mobility transition varies. However, two key similarities emerge. First, in efforts to encourage people to refrain from using cars, the strategy of ”enticing” (*verleiden*) generally takes precedence over ”enforcing” (*afdwingen*). Consequently, policies are oriented towards improving cycling and walking infrastructure, routing and safety, as well as enhancing public transport and transfer facilities (*Mobiliteitsvisie Lelystad, Mobiliteitsvisie Almere, Gemeentelijk Verkeers- en Vervoersplan Urk [GVVP]*).

This focus on enticing does not imply that car mobility is neglected or its significance downplayed. The car remains an essential mode of transport for residents, with usage rates at 50% in Lelystad and 45% in Almere (*Kadernota Duurzaamheid Lelystad, Mobiliteitsvisie Almere*). In comparison, Amersfoort, with a population of approximately 150,000, has a car usage rate of about 39% for all movements (CBS, 2023). The strong competitive position of cars in Lelystad and Almere is attributed to their spacious layouts, efficient traffic flow, and ample parking facilities. Additionally, car traffic is largely separated from bike lanes, and in Almere, also from bus lanes, thereby enhancing traffic flow and safety for all modes of transport.

In Urk, cars are similarly viewed as a crucial mode of transport, particularly due to the town’s relative isolation and limited public transport connections. The nearest train station (Lelystad Centrum) is 23 km away, in contrast to the average distance of 5 km that a person typically needs to travel to reach a station (*Structuurvisie Urk*). The *Omgevingsvisie Urk* explicitly states the preference for accessibility and economic considerations over sustainability: ”We prefer to strengthen the economy and accessibility of Urk by car (external accessibility). The transition to sustainable mobility is secondary.”

Nevertheless, all municipalities express the ambition to actively enhance the modal share of active transport and public transport. This aspiration is particularly emphasized for movements within the municipalities and in high-density areas such as the historic center of Urk and the city centers of Almere and Lelystad, which are envisioned as vibrant places for gathering, prioritizing pedestrians and cyclists. Parking facilities are planned to be located at the edges of these areas and/or within buildings (*Geactualiseerde Structuurvisie Urk, Mobiliteitsvisie Lelystad, Mobiliteitsvisie Almere*).

While all municipalities aim to increase the share of active transport, only Lelystad has explicitly addressed the need to reduce car traffic. It is also the only city to establish specific targets (see below).

Quantifiable objectives for the Mobility Transition

A single quantifiable objective was identified.

- Achieve a 10% reduction in car traffic and a 10% increase in the share of bicycles and e-bikes on the Lelystad road network by 2025, targeting a total modal split of 35% compared to projected levels without measures (*Mobiliteitsvisie Lelystad*).

Relation with climate adaptation

Geographical The relationship between climate adaptation and the mobility transition is entirely geographical, with all 14 identified relations falling into this category.

A recurring positive effect noted is that urban greening can stimulate active transport. Lelystad specifically addresses this in three different documents: *Sport- en Beweegvisie*, *Uitvoeringsprogramma Lelystad Next Level* and *Strategie Agenda Natuur*. In the latter, it is articulated as follows: ”Lelystad offers a healthy living environment: on one hand through health protection (environmental effects and external safety) and on the other hand through health promotion (stimulating healthy behavior, for example by encouraging more movement in the city). Green urbanization is the spatial implementation of this.”

The relationship between green elements and active mobility can also have negative aspects. For example, in *Mobiliteitsvisie Almere*, a potential downside highlighted by a resident survey is that detached bike paths, separated from other infrastructure and running through green areas between neighborhoods, can create a sense of social insecurity.

Another, more direct relationship between climate adaptation and the mobility transition, mentioned 3 times, concerns one of the major objectives of climate adaptation: keeping the urban environment

livable and suitable for physical activity during periods of (extreme) heat. Both the *LAS Lelystad* and the *RAS* emphasize the importance of providing shade (40%) along slow-traffic routes, using trees, buildings, or structures, to make these modes of transport more attractive, even during warm weather. This relationship also fits the criteria for the physical relation type and was coded as such, explaining the 3 occurrences for this relation type.

Another geographical relation concerns the space that the mobility transition can provide for climate adaptation and other urban transitions. Lelystad, for instance, aims to reduce traffic intensity on some of its parkways (*dreven*) by rerouting the traffic to higher-level roads around the city. The function of the wide, green avenues can then shift to also facilitate climate adaptation, biodiversity, and the energy transition (*Omgevingsvisie Lelystad*, 2021). Although the text links the shift in function with facilitating these goals, it does not imply that it is strictly conditional.

In the literature study the reduction of parking spaces was seen as an element of the mobility transition that has a large potential for providing space for climate adaptation, as noted in Kreijen (2023). *Mobiliteitsvisie Lelystad* addresses the high spatial demand that parking puts on public space and indicates that it will capitalize on trends in car use.

An example of these trends is shared mobility, as discussed in *Mobiliteitsvisie Almere*: ”When residents of Almere share a car, they don’t each need to have their own. This reduces the space that cars take up in public spaces. This space can then be used for other purposes, such as greenery.” Additionally, Almere states that for the first time, it will apply different parking standards in different areas, ”Especially when more attention is given to densification and the quality of public space in certain areas” (*Mobiliteitsvisie Almere*).

Urk is tightening its parking policies in the city center for livability reasons, but in other neighborhoods, it emphasizes the importance of sufficient parking space (for family cars). The importance of green space and recreation areas is, however, also recognized and can receive primacy in new developments: ”When planning new neighborhoods, we ensure there is enough space for greenery, as well as play and meeting places for children and young people, even if this comes at the expense of the number of parking spaces.” (*Duurzaamheidsvisie Urk, Woonvisie Urk*).

4.3.4. Circular Economy

The transition to a circular economy was recognized the least, appearing a total of 236 times across the documents analyzed. None of the documents were exclusively dedicated to this transition. Instead, it primarily featured in integrated policy documents, with the highest frequency in the categories of *Sustainability* (93 times), *Integrated Environmental* (67 times), and *Water Management* (38 times).

Within these integrated documents, municipalities largely emphasize areas within their direct influence: circular construction practices, the management of municipal properties, reducing, recycling, and upcycling waste, and promoting circular entrepreneurship.

Quantifiable objectives for Circular Economy

Quantifiable objectives were identified.

- 50% reduction in the use of primary resources by 2030 (*Duurzaamheidsagenda Almere*, *Duurzaamheidsvisie Urk*).
- 10% of stormwater falling on roofs is used for flushing toilets, drinking water, or industrial process water (*Waterplan Almere*).
- By 2030, 50% of biomass originating from the management of public open waters will be reused in a high-quality manner (*Waterplan Almere*).

Relations with climate adaptation

Geographical 28 out of the 38 *Relations* have a *Geographical* character. These relations primarily emerged from passages in the text that emphasize the importance of developing and redeveloping urban spaces in a climate-adaptive as well as circular manner. Often, the circular aspect concerns the materials that this newly built environment is made from; less often, it relates to spatial designs that utilize rainwater as a resource. The following quotation is an example of the former: ”The ambition is to create a climate-adaptive public space and a built environment that is at least energy-neutral in its design and operation, where the second life of raw materials and materials is secured at the front end with minimal impact on CO_2 emissions.” (*Sustainability Agenda Almere*).

Physical A relatively large share, 20, of the *Relations* is of the *Physical* type. The *Relations* are very similar to the *Geographical Relations*, but the emphasis lies on the shared use of infrastructure and resources rather than geographical alignment. Ten of these center around the capture and reuse of rainwater, a practice that contributes to adaptation to extreme precipitation and drought while also reducing drinking water use.

The other portion focuses on the circular elements that contribute to a climate-adaptive environment. Playgrounds are a typical example: ”The goal is to create a playground of diverse quality, challenging in nature, and preferably consisting of natural elements and greenery.” (*Sport- en Beweegvisie Lelystad*).

Informational The informational relation occurred 4 times. In 2 instances, this took the form of informational programs for the inhabitants. One instance concerned the improvement of data management by the municipality, and another involved the development of new national legislation.

Project-based Project-based relations between climate adaptation and the transition to a circular economy were identified 9 times in the analyzed documents. These instances highlight that municipalities aim to address both transitions simultaneously during (re)development projects, ensuring integrated approaches to urban planning and sustainability.

4.3.5. Environmental health

In the context of this research, the environmental health transition is focused on enhancing the living environment to improve (mental) health. This includes promoting physical activity, relaxation, and social interaction through urban greening and amenities such as walking and biking infrastructure. It was recognized a total of 347 times, ranking it relatively low in comparison with the other transitions.

These recognitions primarily occurred in the *Integrated Environmental* category of documents, with 152 mentions. Other contributions came from the *Health* category, with 61 recognitions, followed by *Climate Adaptation* with 38, and *Ecology* with 39.

Municipalities are driven to adapt their public environments due to concerns about aging populations, loneliness, obesity, and a general lack of physical activity. These factors are considered potential risks to public health and well-being and are addressed in all documents from the *Health* category. For example, the *Sport- en Beweegvisie* of Lelystad notes that 57% of its residents meet the exercise standard (*beweegnorm*), compared to 63% nationally. Almere also lags behind, as mentioned in the *Visie samen op avontuur*. Lelystad has set the goal of meeting the national average by 2026. These same documents also highlight that residents of both Almere and Lelystad exhibit higher-than-average obesity rates, starting at young ages.

Aging is addressed in documents from all municipalities. Currently, Almere, Lelystad, and Urk have relatively young populations. Nationally, 27% of the population is younger than 25. In Almere and Lelystad, this is approximately 30%, while in Urk, it’s 43%. In contrast, 20% of the population nationally is over 65, while the corresponding figures for Almere, Lelystad, and Urk are 14%, 18%, and 10%, respectively (CBS). Despite these younger demographics, the documents anticipate future aging trends and account for them in housing, environmental planning, and facility policies (*Omgevingsvisie Urk*, *Omgevingsvisie Lelystad*, *Almere, stad met toekomst*).

All municipalities emphasize the importance of high-quality green spaces that provide areas for relaxation, play, physical activity, and social interaction. These spaces are considered valuable for the health and well-being of residents of all ages. In line with these findings, the concept of ”positive health” (*positieve gezondheid*) was highlighted in documents from Lelystad and Urk, emphasizing a holistic approach to well-being. This approach recognizes that both physical and mental health are shaped by the environment and activities that promote resilience and social interaction (*Samen Gezond inn Lelystad*, *Omgevingsvisie Urk*).

Quantifiable objectives for Environmental Health

Quantifiable objectives were identified.

- The 3-30-300 rule of thumb is applied (*LAS Almere, RAS, Omgevingsvisie Urk*).
- Ensure at least 40% shade in high-traffic areas, such as city centers, near retirement homes, and along central slow-traffic routes (*RAS*).

- Increase play spaces to 5% of built-up areas, ensuring every child has access to a neighborhood facility within 200 meters and a district facility within 500 meters,(*Sport- en Beweegvisie*, Lelystad)

Relation with Climate Adaptation

A total of 96 *Relations* were identified, making it the transition with the second-highest number of *Relations* with climate adaptation. Given that *Climate Adaptation* was recognized 795 times, in over 10% of these passages, *Environmental Health* was also acknowledged.

Geographical Out of these, 90 were characterized as *Geographical*, making it the largest group. Synergies between environmental health and climate adaptation frequently emerged when ambitions for the built environment were discussed.

A significant portion focused on providing green spaces that serve dual purposes: physical activity, play, and active mobility, alongside climate adaptation. For instance, in the *Omgevingsvisie Lelystad*: ”Courtyards and neighborhood green spaces become new collective places with room for sports and play, urban agriculture, and where new challenges such as a climate-resilient city are addressed.” Similarly, the *RAS* states: ”We connect robust green structures in public spaces as much as possible with other green structures, towards the countryside, to draw cool air into the city or neighborhood. These green corridors also serve as places for children to play.”

Other documents emphasized creating a pleasant and healthy living environment as a whole, one of the core objectives of climate adaptation. In this respect, the two transitions are closely linked. This is clearly stated in the *RAS*: ”A healthy and safe living environment for everyone forms the foundation for why we take climate-adaptive measures.”

Physical In 25 instances, the *Relation* was characterized as *Physical*. These *Relations* were comparable to, and sometimes overlapped with, the *Geographical Relations*, but with a stronger focus on shared infrastructure and resources rather than geographical alignment. The infrastructure typically involved green elements and plants, as illustrated by the following example: ”To prevent flooding in Urk, public spaces must become greener (less stone where possible). Our residents can also contribute by, for example, planting more plants in their gardens instead of stone patios.”

In one case, the relation was identified as a ”challenge,” addressing the potential drawbacks of urban greening, such as pests, the spread of infectious diseases, and allergens, as discussed in the *RAS* (2024).

Project-based 15 instances were categorized as *Project-based Relations*. Some involved linking with existing programs, as exemplified by: ”Climate adaptation offers opportunities to connect with preventive health-promoting programs such as JOGG and Positive Aging.” (*RAS*).

In other cases, these were connected to (re)development projects, such as: ”When creating new parks, we can also consider placing circular play equipment that encourages children to be active, thus combining circularity and the goals from the Vision Samen op Avontuur with Almere’s climate adaptation. In short, much is possible, and by seizing these opportunities, more support and impact are generated.” (*LAS Lelystad*).

4.3.6. Nature Inclusiveness

Nature Inclusiveness, defined as actions aimed at improving biodiversity and nature values, was recognized 507 times, making it the third most frequently identified transition. It appeared most prominently in the categories *Integrated Environmental* (179 recognitions), *Ecology* (148), and notably, *Climate Adaptation* (59).

All municipalities declared efforts to provide space for nature within and around the built environment, and each explicitly mentioned the concept of nature inclusiveness at least once. However, the emphasis each municipality places on this development varies.

Lelystad has developed a strategy that emphasizes nature both in and around the city. It envisions Lelystad as the *Hoofdstad van de Nieuwe Natuur*, which can be translated as the ”Capital of Rewilding.” The newly developed national park Nieuwland and the Oostvaardersplassen are located in close proximity to the city. Additionally, the city is spacious, interwoven with blue and green elements, and surrounded by a ribbon of forest, embodying the concept of a garden city. The municipality aims to expand these characteristics and capitalize on them by attracting visitors and financially capable

residents to enhance the city's vitality. In line with this strategy, Lelystad commits to nature-inclusive development, stating: "In Lelystad, development and construction always go hand in hand with the development of nature. Anyone living in Lelystad (both in new developments and existing neighborhoods) lives in or near nature." (*Koersdocument Lelystad*).

Almere's environment shares similar characteristics and likewise aims to emphasize and nurture this aspect of the city: "Building Almere also means building nature and green spaces. This connection is essential to ensure that, even in the future, we remain an attractive and pleasant green city," and, "Increasing ecological values and biodiversity in the city is a significant task. This extends from public spaces to, and even inside, buildings. Continuously adding quality must remain the guiding principle."

In Urk, the transition to a nature-inclusive environment is less prominent but still present. There is a focus on smart structuring and design of natural areas to improve livability in Urk, as illustrated by the following quotes: "By connecting the green areas, natural links are created between neighborhoods and nature areas. This stimulates livability in Urk. The interaction between public green spaces, nature, and water contributes to a varied living environment and to a richness of plants and animals," and, "The protection of nature also contributes to biodiversity and livability in Urk. The water-retaining function of nature provides cooling during hot periods. In the development of new areas, we also carefully consider climate-adaptive features. For example, by reserving space for various tree species and looking for ways to optimally use, preserve, and care for nature. In this way, we are not only prepared for extreme weather conditions, but we also ensure a healthy living environment."

Quantifiable objectives for Nature Inclusiveness

One quantifiable objective was identified.

- The 3-30-300 rule of thumb, as proposed by Konijnendijk (2023) and discussed in Section 2.8, is applied in *LAS Almere*, *RAS*, and *Omgevingsvisie Urk*.

Relations with Climate Adaptation

A total of 129 *Relations* were identified, making it the transition with the highest number of *Relations* to climate adaptation. In 16% of instances where *Climate Adaptation* was recognized, *Nature Inclusiveness* was also recognized. Of these 129 *Relations*, 77 also included *Environmental Health*. This indicates a strong connection between the goals and actions that define these transitions, with greening of the built environment serving as a key link between them.

Geographical 117 *Relations* were classified as Geographical, addressing the alignment of climate adaptation and ecological interests. Environments can pursue climate adaptation goals but also provide a habitat for plants and animals. Examples of such *Relations* that do not include *Environmental Health* but focus purely on ecological aspects are: "In new developments, the framework of ecological corridors will be strengthened" (*LAS Lelystad*), and "In public spaces, climate adaptation measures are combined with measures for biodiversity" (*Woonvisie Almere*).

Physical *Physical Relations* were identified 48 times. Vegetation and blue-green infrastructure (BGI) are described as resources that benefit both transitions. It was often noted that these infrastructural elements must contribute to climate adaptation and biodiversity while being climate adaptive and robust themselves. An example of a *Relation* involving only *Climate Adaptation* and *Nature Inclusiveness* is found in the *Strategische Agenda Natuur* of Lelystad: "The creation of climate/water buffers, green roofs, and green facades with as many native, robust species as possible." Another example, from the *Omgevingsvisie Urk*, identifies rainwater as a mutually beneficial resource: "When designing our outdoor spaces, we separate clean (rainwater) from dirty water. This strengthens the development of wet nature and climate-adaptive water storage."

Informational 4 *Informational Relations* were identified in the policy documents. Three of these focus on the combined approach to climate adaptation and ecological value in educational and informational programs for residents (*LAS Lelystad, GWRP Urk*). One example involves the formulation of a "Water Usage Profile" (*Watergebruiksprofiel*) by experts from the municipality and water board, which also addresses climate adaptation and ecology.

Project-based In 19 instances, the *Relation* was characterized as *Project-based*. These instances involved the simultaneous implementation of climate adaptation and ecological development. All of these examples also included other *Relation* types, as they occurred within the environmental planning or informational context.

4.4. Answering the Research Questions

Research Question 3: Which municipal policy documents address the identified urban transitions?
A wide range of documents was selected, encompassing all sectors where the transitions occur, along with numerous documents that have a more integrated character. The documents, organized by category and municipality, can be found in Table 4.1.

The documents were read and coded systematically. Table 4.11 provides an overview of central goals and principles found in the policy documents that reflect or are related to one or more of the transitions. For each of these, one document from each municipality that expresses this goal or principle is provided, along with the related area of legislation or "scope".

Table 4.11: Overview of central goals and key principles identified in municipal policy documents, reflecting the transitions analyzed in this study.

Item	Trans.	Scope	Document	Goal or core principle
#1	CA, ET, MT, CE, EH, NI	All	*Almere stad met toekomst, Omgevingsvisie Lelystad and -Urk*	Environmental (re)development projects simultaneously address the energy transition, mobility transition, circular economy, health, ecological quality, and climate adaptation.
#2	CA, EH, NI, MT	All	*RAS, LAS Almere and -Lelystad, GWRP Urk*	Blue-green climate adaptive solutions are prioritized over technical solutions.
#3	CA, NI	All	*RAS, LAS Almere and -Lelystad, GWRP Urk*	Climate adaptation and developing ecological quality go hand in hand
#4	CA, CE	All	*RAS, LAS Almere and -Lelystad, GWRP Urk*	Preferential order of water management: 1. Utilize and Save 2. Retain and Infiltrate into the Soil 3. Store 4. Discharge.
#5	CA	Reg., Lel., Urk	*RAS, LAS Lelystad, GWRP Urk*	A precipitation event of 70 mm/hour (T=100, by 2050) should not cause damage to buildings or infrastructure.
#6	CA	Reg.	*RAS*	Where possible, for example in new construction, the standard is increased to 90 mm/hour (T=250 by 2050).
#7	CA	Reg.	*RAS*	Hydrologically neutral new development means that the new water situation in the developed area must remain at least equal to the baseline situation. Where the paved surface increases or paved surface is disconnected, measures must be taken to manage the runoff rainwater.
#8	CA	Reg.	*RAS*	Prolonged drought, with a 300 mm precipitation deficit every 10 years, should not damage buildings, infrastructure, or greenery
#9	CA, EH, NI, MT, ET	Alm., Lel.	*RAS, LAS Almere and Omgevingsvisie Urk*	The 3-30-300 rule, as defined by Konijnendijk (2023), is applied.
#10	CA, EH, NI, MT, ET	Reg., Lel.	*RAS, LAS Lelystad*	Ensure 40% shade in high-traffic areas, near retirement homes, and on central slow-traffic routes.

#11	CA, ET	Reg.	*RAS*	In new construction and restructuring projects, at least 50% of horizontal and vertical surfaces should be heat-reflective or cooling.
#12	CA, ET	Reg.	*RAS*	In new construction and restructuring projects, buildings should be positioned to optimize street ventilation and reduce direct sunlight in homes.
#13	ET	All	*TVW Almere, -Lelystad and -Urk*	Apply Trias Energetica approach.
#14	ET	All	*TVW Almere, -Lelystad and -Urk*	Achieve a 49% reduction in greenhouse gas emissions by 2030 and a 95% reduction by 2050.
#15	ET	All	*TVW Almere, -Lelystad and -Urk*	Phase out the use of natural gas for heating buildings by 2050. All new buildings will be natural gas-free.
#16	MT, ET	All	*Mobiliteitsvisie Almere and -Lelystad, GVVP Urk*	Increase walking and biking by encouraging improvements in cycling and walking infrastructure, routing, and safety rather than through enforcement.
#17	MT, ET	Lel.	*Mobiliteitsvisie Lelystad*	Achieve a 10% reduction in car traffic and a 10% increase in bicycles and e-bikes on the local road network by 2025.
#18	MT	Lel.	*Mobiliteitsvisie Lelystad*	Trends in mobility and demand are monitored, and where possible, infrastructure and parking facilities are reduced or downgraded.
#19	MT, CA, EH, NI	Alm., Urk	*Mobiliteitsvisie Almere, Woonvisie Urk*	In (re)development projects, parking facilities can be reduced if necessary to prioritize the quality of public space, green areas, and meeting and play spaces.
#20	CE	All	*Duurzaamheidsagenda Almere, Duurzaamheidsvisie Urk*	50% reduction in the use of primary resources by 2030
#21	CE, CA	Alm.	*Waterplan Almere*	10% of stormwater falling on roofs is used as gray water.
#22	CE	Alm.	*Waterplan Almere*	By 2030, 50% of biomass originating from the management of public open waters will be reused in a high-quality manner
#23	EH, CA, MT, NI	All	*Sportvisie Almere, Sport- en Beweegvisie Lelystad, Omgevingsvisie Urk*	Ensure high-quality green spaces that invite relaxation, play, physical activity, and social interaction
#24	EH, CA, NI	Alm., Lel.	*Visie samen op avontuur, Sport- en Beweegvisie Lelystad*	The playgrounds are diverse, encourage engagement, and preferably consist of natural elements and greenery.
#25	EH	Lel.	*Sport-en Beweegvisie Lelystad*	Increase play spaces to 5% of built-up areas, ensuring every child has access to a neighborhood facility within 200 meters.
#26	NI	Reg.	*RAS, LAS Lelystad*	When planting new greenery, consideration is given to biodiversity value and climate resilience

Research question 4. What do these policy documents state about the interface between climate adaptation and other urban transitions?

Trough analysis, relations between the different transitions emerged from the document. Table Table 4.12 summarizes the findings, categorized per transition.

Table 4.12: Overview the relations between climate adaptation and the other transitions

Scores	Summary of relations with climate adaptation from policy documents
Tot: 37	**Energy transition**
Geo: 25	Both climate adaptation and energy transitions demand space above and below ground, leading to potential spatial conflicts. An integrated approach is proposed to align these spatial needs, promoting synergies and reducing conflicts.
Phy: 6	Shared infrastructure, like green roofs, facades, and outdoor vegetation, enhances energy efficiency through winter insulation and summer passive cooling.
Inf: 2	Shared data, such as water management definitions and neighborhood information programs, to coordinate climate adaptation with other transitions.
P.b: 10	Coordinated infrastructure projects, such as energy and sewer works, improve cost-effectiveness and support neighborhood renewal.
Tot: 10	**Mobility transition**
Geo: 9	Urban greening supports active transport, such as walking and cycling.
	Concerns about social insecurity on detached bike paths through green areas.
	Reducing parking spaces, where demand allows, creates room for livability and supports environmental goals like climate adaptation, biodiversity, and the energy transition.
Phy: 2	Emphasis on providing shade along slow-traffic routes to facilitate active mobility during heat.
Tot: 34	**Circular economy**
Geo: 21	Emphasis on developing urban spaces that are both climate-adaptive and circular, often utilizing sustainable materials and incorporating rainwater reuse in spatial designs.
Phy: 15	Considerable focus on infrastructure for capturing and reusing rainwater, enhancing climate adaptation and reducing water consumption.
Inf: 4	Involved programs for residents, integral municipal data management and the development of new national legislation.
P.b: 8	Municipalities integrate climate adaptation and circular economy goals in urban (re)development projects through a combined approach.
Tot: 93	**Environmental health**
Geo: 81	Focus on creating green spaces that promote physical activity and play while addressing climate adaptation, fostering a healthy living environment as a core goal of both transitions.
	Emphasis on fostering a healthy living environment as a core goal of both transitions.
Phy: 19	Center on shared infrastructure, such as public green spaces and plant-based elements in playgrounds.
P.b: 19	Highlight opportunities to integrate climate adaptation with health-promotion programs and urban (re)development projects, ensuring synergies between the two transitions.
Tot: 124	**Nature inclusiveness**
Geo: 101	Focus on aligning climate adaptation efforts with ecological interests, emphasizing the integration of biodiversity and ecological zones.
Phy: 40	Underscore the role of vegetation and blue-green infrastructure as resources that support both climate adaptation and ecological goals while being climate adaptive themselves
Inf: 4	Emphasize educational initiatives aimed at promoting awareness of the combined benefits of climate adaptation and ecological value.
P.b: 15	Illustrate the simultaneous implementation of climate adaptation and ecological development within environmental planning contexts.

5

Project Study

This chapter presents the methods and results of the project study conducted on projects in the three municipalities, addressing research questions 5, 6, and 7. The focus is on how climate adaptation and other urban transitions manifest in these projects and what relationships emerge between climate adaptation and these transitions. The study examines one recent new residential development project and one renewal project in each municipality.

While the policy study addressed relationships at the strategic level, the project study explores these connections at the tactical and operational levels. Findings from the policy study are systematically reflected on in the project study. The selected projects are diverse, situated in varying contexts, and analyzed at different scales, offering a comprehensive perspective.

The methodology of the project study is detailed in Section 5.1, including the project selection criteria and the approach to project analysis. The results of the analyses are presented in Section 5.2, organized by project type: new development projects first, then renewal projects.

5.1. Method

5.1.1. Project selection

The selection process for projects in this study began with identifying suitable candidates that were either ongoing or recently completed and had detailed, finalized or far advanced, street-level designs available. This criterion ensures alignment with the analyzed policies, enabling an in-depth examination of tactical-level relationships and specific choices among the transitions. Additionally, projects were chosen to reflect diversity and ideally encompass various aspects of all transitions, broadening the perspective on these relationships and enhancing the generalizability of insights and conclusions. An overview of the selected projects is presented in Table 5.1.

Table 5.1: Projects selected for project study.

Municipality	New development project	Renewal project
Almere	New Brooklyn, Almere Poort	Regenboogbuurt Noord, Regenboogbuurt
Lelystad	Groot Nooten, Warande	Stationsgebied Oost
Urk	Het Nieuwe Dorp, Zeeheldenwijk	Molenkamp

To ensure diversity, one new development project and one renewal project were selected per municipality, resulting in a total of six projects. Selection was conducted in consultation with municipal experts. The focus was placed on residential areas to establish a consistent basis for mutual comparison and to narrow the study's scope.

An exception to this focus is the station area renewal project in Lelystad. This project was included because of its tone-setting and iconic function within the larger urban (re)development project in the city center and its prominent role in the lives of local residents.

In four cases, the project includes two names, e.g., New Brooklyn, Almere Poort. This indicates that the analysis focuses on the neighborhood (e.g., New Brooklyn) within the larger development of the city district (e.g., Almere Poort). These projects are analyzed at varying scales. The remaining two projects are considered more independently.

The scale of analysis for each project was determined by the strength of relationships across scales identified in the project documents, particularly concerning climate adaptation and water management. For example, in new development projects, water storage capacity or district-level parks were often facilitated outside the smaller neighborhood scale.

This multi-scale analysis approach provides flexibility, allowing for detailed examination at a smaller scale or general insights at a larger scale, depending on the availability of project documents and the feasibility of analysis methods.

5.1.2. Analysis

The project analysis aims to uncover how urban transitions relate to climate adaptation within the built environment. This involves two steps: identifying the effects of each transition within the projects and examining how these effects connect to climate adaptation. The analysis structure aligns with the literature and policy studies, which also examined transition impacts before exploring their relationships with climate adaptation.

The analysis evaluates each project against the goals and principles identified in the policy study. These goals, defined by municipalities or included in regional documents, provide a framework to assess the extent to which the transitions are reflected in the projects. This includes goals and principles that may fall outside the project's specific policy scope, allowing for additional insights through a flexible approach. A reflection scheme is applied to assess each item's presence:

x = Not applicable to the project or beyond the scope of this study.
0 = Not present: No indication or evidence of the goal or principle.
1 = Partially evident: Some indication or suggestion, but no clear or direct evidence, calculations, or thorough analysis to confirm it.
2 = Clearly present: Direct, clear evidence or detailed analysis confirming the presence of the goal or principle.

The set of goals and principles is extensive, diverse, and not always quantifiable. This approach remains flexible and concise, focusing on overarching implications rather than granular details. It acknowledges the constraints of this study, including the limited availability of time, resources, and specialized expertise required for detailed assessments.

Quantifiable goals regarding surface areas, surface fractions, and distances were assessed using tools available in Google Maps, and design drawings were analyzed through pixel color distribution for surface area estimation using Photoshop.

The goals and principles identified in the policy study (refer to Table 4.11) are numerically labeled (e.g., #1, #2) for easy reference. A summary of the reflections from the project study analysis for each project is provided in tables within Appendix D, using corresponding labels. The final table in this appendix summarizes the results across all projects. Additionally, a copy of Table 4.11 is included in this appendix to facilitate cross-referencing between the tables. Further elaboration on climate adaptation, other transitions, and their interrelationships is provided in the respective sections for each project.

After assessing the presence and effects of transitions, the analysis shifts to the relationships with climate adaptation explicitly reflected in project documents and designs. Examples include reducing parking spaces to create space for climate adaptation or designing green areas to integrate climate adaptation, physical exercise, and nature inclusiveness.

However, not all relationships are apparent in project documents. For example, conflicts like insufficient underground space for infiltration due to heat network installations or an inability to meet tree-planting goals due to parking constraints may not be explicitly documented. Chapter 6 will further explore these relationships through interviews, uncovering hidden connections and the motivations behind design decisions.

The analysis relies on various project-specific documents, including Zoning Plans (*Bestemmingsplannen*) and their Explanations (*Toelichting*), Water Assesments (*Watertoetsen*), and design drawings. Most of these documents were freely accessible online and located using search engines such as Google. For the new development project New Brooklyn and the renewal project Molenkamp, additional documents were obtained through municipal contacts. For the remaining projects, either sufficiently detailed documents were freely available online, or inquiries with the respective municipalities did not yield further materials.

5.2. Project Study Results

This section presents the project study results, organized by project type: new development projects first, followed by renewal projects, each in the order of Almere, Lelystad, and Urk.

5.2.1. Almere: New Brooklyn, Almere Poort

The expansion of Almere into Almere Poort was first envisioned in 1983 through spatial structural plans. Located to the southwest of the existing city, this area is bordered by the existing built environment, the A6 highway, connecting Almere to Amsterdam and the rest of the Randstad, and the IJmeer. Covering a total of 868 hectares, the Zoning Plan of 2017 projected that upon completion, the district would contain approximately 15,500 houses. By 2024, around 8,500 houses had been completed (CBS), with the area expected to be fully developed by 2030.

New Brooklyn is one of the neighborhoods within Europakwartier, a subarea of Almere Poort, currently under construction. Spanning 26 hectares, it will accommodate 1,400 houses (54 houses per hectare). The design combines a high urban density with green spaces and vegetation, inspired by the architecture of Brooklyn, United States. The location of Almere Poort and New Brooklyn's position within it, near Almere Poort train station, are shown in Figure 5.1.

The concise results for the New Brooklyn project can be found in Table D.2 and a further elaboration on transitions and relations is presented in sections below. The following sources were used in the analysis: the Zoning Plan for Almere Poort Oost en Duin and its Explanation , the *Watertoets* for Almere Poort Oost en Duin (2016), the *Beeldkwaliteitsplan* (2019), the *Inrichtingsplan* (2020), and designs for the municipal outdoor space from 2021, as shown in Appendix C.

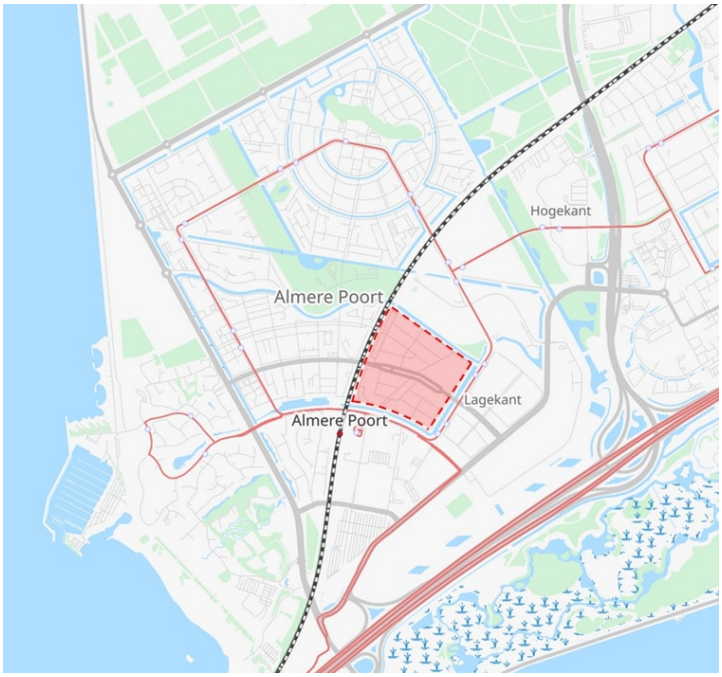

Figure 5.1: Almere Poort in the southwest corner of Almere, with New Brooklyn (near the Almere Poort train station) highlighted within it (Source: OpenStreetMap).

Water Management and Climate Adaptation

Water System The plan area of Almere Poort is part of the water system connected to the pumping station Gemaal De Blocq van Kuffeler, as shown in Figure 5.2. The water board has established a standard for the area based on the inundation of watercourses during an extreme precipitation event, which is projected to occur once every hundred years on average (T=100 years). The water system design is based on this standard, ensuring that watercourses can handle such events. Additionally, the municipality has set a guideline allowing a water level rise of 50 cm, enough to inundate bicycle tunnels with limited overhead clearance, once every ten years on average.

In principle, any negative water-related impacts caused by developments must be compensated within the plan area itself. However, with future developments in mind, the municipality proactively constructed the Noorderplassen in the 1990s. A portion of these water bodies, with a total surface area of 320 hectares, can be used for water storage to compesate for Almere Poort's development. This approach is more land-efficient than relying on expanding the water bodies within the district itself, as the water level in Almere Poort (NAP -4.7 to -4.4 meters) is higher than that of the Noorderplassen (NAP -5.2 meters). To enable sufficient discharge capacity for draining water towards the Noorderplassen, the Galjoottocht, the watercourse connecting the two areas, must be expanded. This involves increasing the channel's profile and upgrading four culverts. Simultaneously, water storage within Almere Poorts watercourse is maximized through the use of weirs.

Figure 5.2: Main discharge route towards Noorderplassen en pumping Station Blocq van Kuffeler (Source: Watertoets Almere Poort Oost en Duin (2016)).

The Almere Poort water system does not receive inflow from other water bodies and relies entirely on stormwater and seepage. During periods of drought, the lack of inflow creates risks of water stagnation and deterioration in water quality. Solutions under consideration include the installation of a circulation pump (*circulatiegemaal*) or the adjustment of weir locations. Where possible, nature-friendly banks are implemented. The partially submerged vegetation along these banks contributes to water filtration, helping to improve water quality.

Urban Water Management and Climate Adaptation In parts of Almere Poort, innovative drainage systems have been implemented, such as wadis, permeable roads and parking spaces, and surface drainage towards verges. These measures are particularly evident in Homeruskwartier, one of the earliest developed areas of Almere Poort.

The rest of the district primarily relies on stormwater sewers for water drainage. These systems are designed based on the normative extreme weather events outlined in the *Leidraad Riolering* and also account for more extreme precipitation scenarios related to climate change, as detailed in the Zoning Plan and the *Watertoets*. No further technical details on the applied normative events were provided in the project documents. The stormwater sewers discharge into the watercourses that crisscross Almere Poort. The *Watertoets* also stipulates that building levels must be at least 10 cm higher than street level.

Zooming in on New Brooklyn, for which more detailed documents were available, additional insights into climate adaptation measures are revealed. Like the rest of Almere Poort, this neighborhood is fitted with separate stormwater sewers that collect water from streets and private properties. Rainwater from roofs is drained via pipes attached to the front façades and connected to the underground sewer system. Back alleys leading to backyards are also equipped with stormwater sewers. All collected stormwater is discharged into the watercourses bordering three sides of the neighborhood.

Despite the reliance on stormwater sewers, green elements and blue-green infrastructure are prominent. For example, the *Beeldkwaliteitsplan*, which elaborates on the desired aesthetic of the neighborhood, emphasizes the importance of green space in its design: "*Weldadige groene straten en sterke adressen, duurzaamheid (gegarandeerde wortelzone) en microklimaat voorop*" (Lush green streets and strong addresses, sustainability (guaranteed root zone), and microclimate as priorities). Centrally located within the neighborhood is a cross-shaped park with trees, as shown in Figure 5.3a. This park spans 1.5 hectares and is within a 300-meter range of all houses in the neighborhood.

(a) Overview of the New Brooklyn design plan, showing the layout of residential blocks and green spaces, with a focus on areas detailed further in Figures 5.3b and 5.4b.

(b) Close-up detail of the New Brooklyn design plan, highlighting the green corridor near the railroad, the main bike route (in red), and the parking spaces at the edge of the neighborhood.

Figure 5.3: (a) provides an overview of the New Brooklyn design plan, showing the general layout and key features. (b) focuses on the top-left section, including the green corridor along the railroad, bicycle connections, and parking spaces.

Additionally, most west-east oriented streets feature trees on the northern side, reducing direct sunlight exposure on buildings. While tree beds in the pavement are relatively narrow, a rootable zone of 25 m³ filled with tree substrate is reserved beneath the pavement, ensuring healthy root growth and long-term vitality of the trees. Parking spaces, as well as cables and piping, are located on the opposite side of the roads to avoid root conflicts (see Figure 5.4a and 5.4b).

The watercourses and the train line bordering the neighborhood are also lined with trees. The definitive designs include approximately 550 trees, representing about 20 different species of varying sizes. Assuming an average canopy diameter of 8 to 10 meters for mature trees (based on design plans), an estimated canopy coverage of 50 to 80 m² per tree was calculated. This results in a future tree canopy coverage of 11 to 17% of the total neighborhood surface area.

There are private gardens along the southern-facing streets, and within the building blocks, collective courtyards and private gardens are also present. In total these make up roughly 6 ha or 23% of the surface area of the neighborhood. While the *Beeldkwaliteitsplan* expresses a strong preference for green gardens and trees, no regulations prohibit homeowners from paving these spaces.

Other noteworthy climate adaptation measures include requirements from the *Beeldkwaliteitsplan* stipulating that all flat roofs with less than 50% PV-cell coverage must be green roofs. Additionally, parking spaces on the edges of the neighborhood are constructed using grass tiles to improve permeability.

Emerging Relations Between Climate Adaptation and Other Transitions

The policy study identified shared goals between climate adaptation, environmental health, and nature inclusiveness, all emphasizing vegetation and green spaces. This connection is clearly recognized in the New Brooklyn development, where green spaces include diverse tree species for shade and biodiversity, bulb- and flower-seeded park surfaces, and maintenance practices that balance ecology with user-friendliness. Play areas accommodate children of all ages, featuring a natural play zone parallel to the railroad and parks with various play structures.

A clear link exists between climate adaptation and mobility. In Almere, parking norms are determined by factors such as housing typology, tenure type, price category, and urban zone classification. Due to its proximity to the Almere Poort train station, the district center, and its higher density, New Brooklyn is classified as ”highly urban” under Almere’s 2020 parking norms. This classification assigns ground-level owner-occupied homes a parking norm of 1.5 spaces, compared to 2.1 spaces in other areas of Almere Poort. The neighborhood averages 1.3 parking spaces per home, totaling 1,830 spaces, all situated on municipal ground.

(a) Artist impression **(b)** Technical street profile

Figure 5.4: An east-west oriented one-way street with houses and large trees strategically planted to provide shade. Front gardens are situated on the sun-facing side, enhancing green cover while mitigating heat (Source: *Inrichtingsplan* (2020)).

Approximately half of these parking spaces are located at the edges of the neighborhood and are constructed with grass pavers. Consequently, the predominantly one-way streets within New Brooklyn feature longitudinal parking on one side, leaving the opposite side available for walking paths, gardens, and trees (Figure 5.4). Furthermore, the neighborhood includes a major city cycling route, shaded by trees, that runs through the green zone to the west.

New Brooklyn is connected to Almere's heat network, powered by a gas-fueled combined heat and power plant. To prevent sub-surface infrastructure conflicts between energy, water, and climate adaptation, utilities are allocated to one side of the road, while tree roots are accommodated on the other. Houses are well-insulated, and the street orientation, combined with strategic tree placement, fosters a comfortable microclimate, reducing the need for active cooling. PV panels are mandatory on roofs, unless replaced by green roofing, as stipulated in the *Beeldkwaliteitsplan* (2019). Additionally, 10% of the parking spaces are either equipped or prepared for car charging stations.

5.2.2. Lelystad: Groot Nooten, Warande

In the southern part of Lelystad, a major expansion district is under development. Initially, the planned development of approximately 700 hectares of farmland was named Warande. The first phase of this plan, provisionally called ”Warande Subarea 1,” began in 2009 and is now well advanced.

In 2024, the municipality of Lelystad introduced a new master vision for the as-yet-undeveloped part of the district, excluding the largely completed Warande Subarea 1. This vision presented ambitious conceptual designs and rebranded the area as Zuiderhage. Once completed, Zuiderhage will be located between Lelystad’s existing urban area and the Hollandse Hout forest reserve, as illustrated in Figure 5.5. The district will also feature a new train station, Lelystad Zuid, as part of the Flevolijn, connecting Almere and Lelystad.

Zuiderhage is planned to accommodate approximately 9,000 to 16,000 new homes, in addition to the 4,000 homes currently under construction in Warande Subarea 1. The development will progress in phases with a flexible approach and is projected to continue until around 2050.

Figure 5.5: Location of Zuiderhage in Lelystad, with Warande Subarea 1 highlighted in red (Source: Mastervisie ZuiderC (2024) and OpenStreetMap)

In Warande Subarea 1, hereafter referred to as Warande, more than half of the 4,000 planned houses have been completed. This subarea comprises several neighborhoods, as depicted in Figure 5.6. The subplans (*Deelgebieden*) shown in the figure roughly correspond to the development sequence, with most houses in Subplans 1 and 2 now completed, while development in Subplan 3 is currently underway.

One of the neighborhoods within subplan 3 is Groot Nooten. Covering 12 hectares, it borders two park forests and a watercourse while connecting to two other new neighborhoods. It provides space for approximately 290 houses (24 houses per hectare). The layout of Groot Nooten is defined by a green corridor that links the two parks on either side of the neighborhood and divides it into two sections, as illustrated in Figure 5.7.

The concise results of the analysis can be found in Table D.3. Further elaboration on climate adaptation and the emerging relationships, as encountered in the project documents, is provided in the paragraphs below. The findings are based on the Zoning Plan and its Explanation, the *Toolbox Openbare Ruimte* (2022) for the public space design of Warande Phase 1, and publicly available urban design plans for Warande Subarea 1 and Groot Nooten (2022) (see Appendix C).

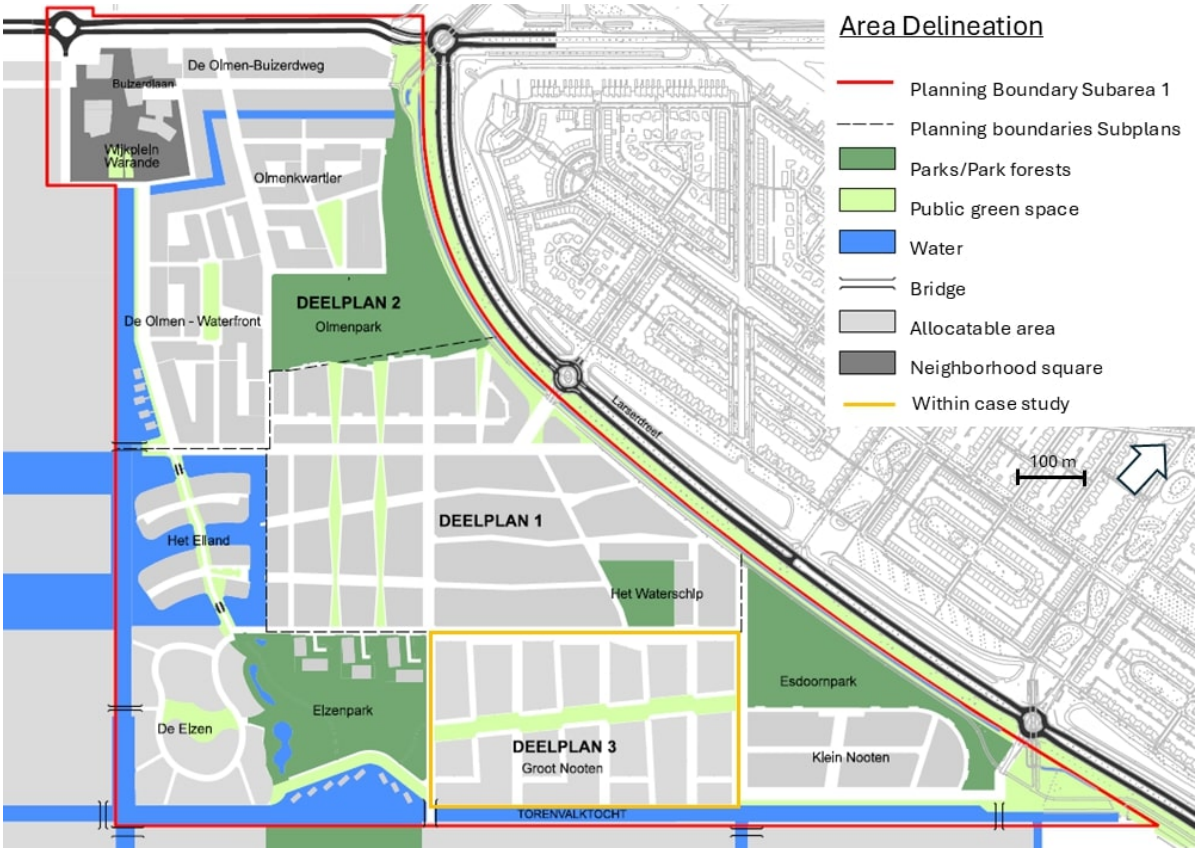

Figure 5.6: Area delineation of Warande Subarea 1 (Source: *Toolbox Openbare Ruimte Warande Deelgebied 1*)

Figure 5.7: Definitive design of Groot Nooten (Source: Municipality of Lelystad).

Water Management and Climate Adaptation

Water System Similar to the new development project in Almere, Warande must comply with the water board's safety norms regarding inundation, which require local water storage compensation for development. The normative inundation event, defined by the water board in the early 2000s, corresponds to 97.8 mm of precipitation over 24 hours (T=100). To meet this requirement, 15.6% of Warande's total surface area has been allocated to water bodies. A separate water level section was established in Warande, where water levels are naturally managed (*"natuurlijk peil"*), fluctuating within target levels depending on weather conditions. Within this system, water levels range between NAP -5.5 m and NAP -5.2 m, with discharge regulated by an automated weir, permitting a maximum rate of 1.5 l/s per hectare. The water system of Warande is depicted in Figure 5.8.

The system is designed to withstand climate change impacts while maintaining good water quality. The open water provides sufficient storage capacity for extreme rainfall events, preventing inundation even at the maximum water level (NAP -5.2 m) under limited discharge conditions. A flexible water level minimizes reliance on inflows from external systems during droughts, which typically have poorer water quality. In extreme drought, water can be pumped into the polder from adjacent external lakes and introduced into Warande's newly created water level section via the adjacent static water level section (LS2, NAP -5.4 m). Designed as a circular system to prevent stagnation and enhance water quality, the addition of a circulation pump is under consideration as a potential improvement.

Figure 5.8: New water system of Warande, with the outlines of newly created water bodies for compensation highlighted in blue. (Source: *Bestemmingsplan Deelgebied 1 Warande (Postzegels)*)

Urban Water Management and Climate Adaptation Warande, including Groot Nooten, is equipped with a separate sewer system. Wastewater is directed to the nearby treatment plant, while stormwater is directed into open water bodies. Potentially polluted stormwater, such as runoff from roads with over 1,000 vehicles per day, is treated locally through infiltration in wadi systems before being discharged into surface water. These wadi systems are also located in the central green zone of Groot Nooten.

The plan for Groot Nooten includes 186 public trees. Assuming a canopy size of 50 to 80 m² upon maturity, the crown coverage is estimated to be between 8% and 13%. All homes in Groot Nooten are located within 300 meters of green areas larger than 1 hectare, thanks to two large parks and the connecting green corridor that runs through Groot Nooten.

Emerging Relations Between Climate Adaptation and Other Transitions

The design and construction of water bodies within a closed water level section illustrate the integration of multiple transitions. These water bodies serve as storage for clean stormwater, support good water quality, and form the foundation for a resilient ecological system while creating a recreation-friendly living environment. Nature-friendly banks enhance their functionality by providing habitats for submerged plants and halophytes, which further improve water quality and biodiversity. Non-motorized recreational activities on the water are permitted, and public jetties are available, including one located in Groot Nooten.

The parks, park woodlands, connecting green elements, and street trees throughout Warande and Groot Nooten contribute to the health, nature-inclusiveness, and mobility transitions, as illustrated by the green corridor in Groot Nooten Figure 5.9. These areas feature play facilities, walking paths, and other amenities that encourage physical activity, relaxation, social interaction, and play. Additionally, diverse vegetation has been introduced to enhance biodiversity and ecosystem resilience.

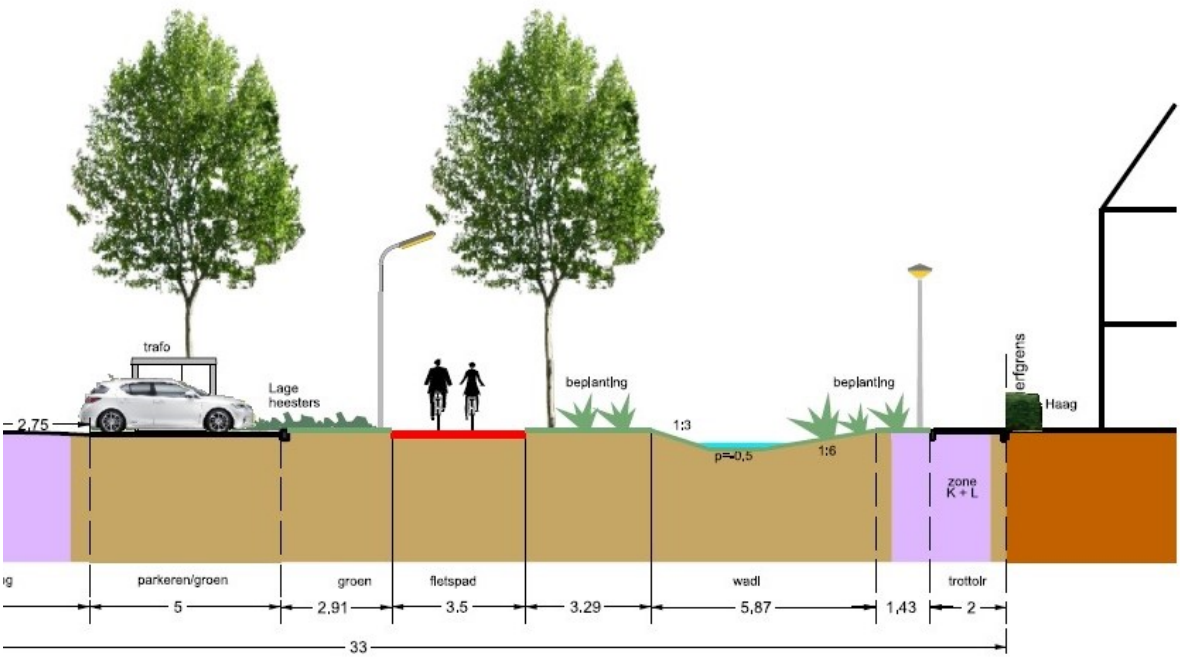

Figure 5.9: Profile of the green corridor through Groot Nooten, featuring a play and exercise area, a wadi with vegetation, a tree-lined biking path, and a transformation station.

Warande and Groot Nooten also include dedicated and separate infrastructure for slow traffic, offering safe and accessible routes to the neighborhood center and Lelystad's city center. These routes are lined with water features and trees, providing cooling, shade, and aesthetic value.

Based on the analyzed project documents, no reduction in car use or parking spaces was observed. The municipal parking norms policy from 2009 was applied without modifications. Parking requirements are determined by housing typologies, tenure type, price category, and the typology of the urban zone. Since Groot Nooten is located within a zone of relatively low urbanity, the plans include 561 parking spaces (1.93 per home), of which 274 are located on municipal grounds.

The two meandering streets in the northern and southern parts of the neighborhood (see Figure C.2) are two-way roads with a width ranging from 4.5 to 5.5 meters. Trees are planted only on one side, and there is ample space for a profile beneath the road to accommodate cables and pipes, including the heat network. While the neighborhood is currently served by a heat network powered by a nearby biomass plant, the potential transition to geothermal energy is currently under exploration.

5.2.3. Urk: Het Nieuwe Dorp, Zeeheldenwijk

To accommodate Urk's growing population, the development of the Zeeheldenwijk has begun. The Zeeheldenwijk is the first residential district south of the Urkervaart canal (see Figure 5.10). Once completed, the Zeeheldenwijk will provide space for approximately 1,775 houses, along with amenities and commercial establishments on roughly 80 hectares.

The Zeeheldenwijk is being developed in phases, with the first phase, Het Nieuwe Dorp, currently underway since 2021. This initial phase includes approximately 320 houses on 11 hectares, achieving a density of 30 houses per hectare. The designs for Het Nieuwe Dorp are at an advanced stage, and the first houses have already been completed. A conceptual plan of the Zeeheldenwijk, with Het Nieuwe Dorp highlighted, is shown in Figure 5.11.

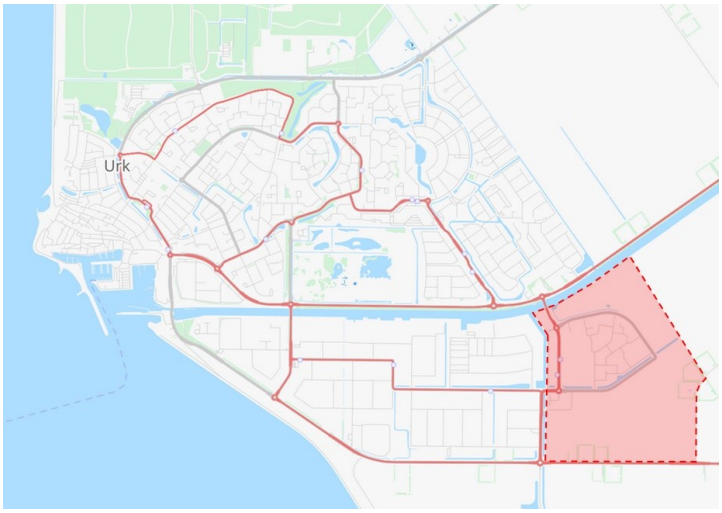

Figure 5.10: Location of the Zeeheldenwijk in Urk (Source: OpenStreetMap).

The concise results of the Het Nieuwe Dorp analysis in Zeeheldenwijk are presented in Table D.4, with further elaboration in the following paragraphs. The findings are based on the Zoning Plan and its Explanation, the *Masterplan Zeeheldenwijk* (2023), and publicly available urban design plans for Het Nieuwe Dorp (2023) (see Appendix C).

Water Management and Climate adaptation

Water System The *Masterplan Zeeheldenwijk* outlines the development of the district as climate-adaptive. This is reflected in compliance with recent water safety standards and the inclusion of trees and vegetation.

To meet Water Board regulations regarding water system innundation, the increase in impervious drainage area (*Afwaterend Oppervlak*), totaling 50.45 hectares, and the dampening of existing drainage ditches require compensation through additional water storage. This is achieved by creating new watercourses and an open water body surrounding a future island neighborhood, covering approximately 1 and 2 hectares, respectively, roughly 3.5% of total plan area. The water bodies will have a direct connection to the Urkervaart, a canal linking Emmeloord to Urk, which includes a sluice and a two-way pumping station at Urk.

Unlike the case in Lelystad, the Zeeheldenwijk does not feature a separate water level section. The water quality will be influenced by nutrient-rich runoff from adjacent farmlands, the Urkervaart, and iron-rich seepage. However, as no stagnant water is created, the water quality is not expected to deteriorate beyond that of the Urkervaart, which is generally considered robust ("*robuust*") in terms of nutrient levels according to the Zoning Plan (2020).

Urban Water Management and Climate Adaptation Stormwater is primarily collected through street gullies and conveyed via a separate sewage system to the nearby open water bodies. Private property stormwater must be directed above surface level to municipal land at parcel boundaries to prevent faulty connections. Wherever possible, such as along access roads, stormwater is infiltrated through verges. The stormwater sewer system is designed to:

1. Prevent street flooding during *Bui09* (29 mm in 60 minutes),
2. Minimize nuisance during *Bui10* (35.7 mm in 45 minutes), and
3. Protect property from water damage during extreme rainfall (*Klimaatbui*) of 90 mm in 2 hours.

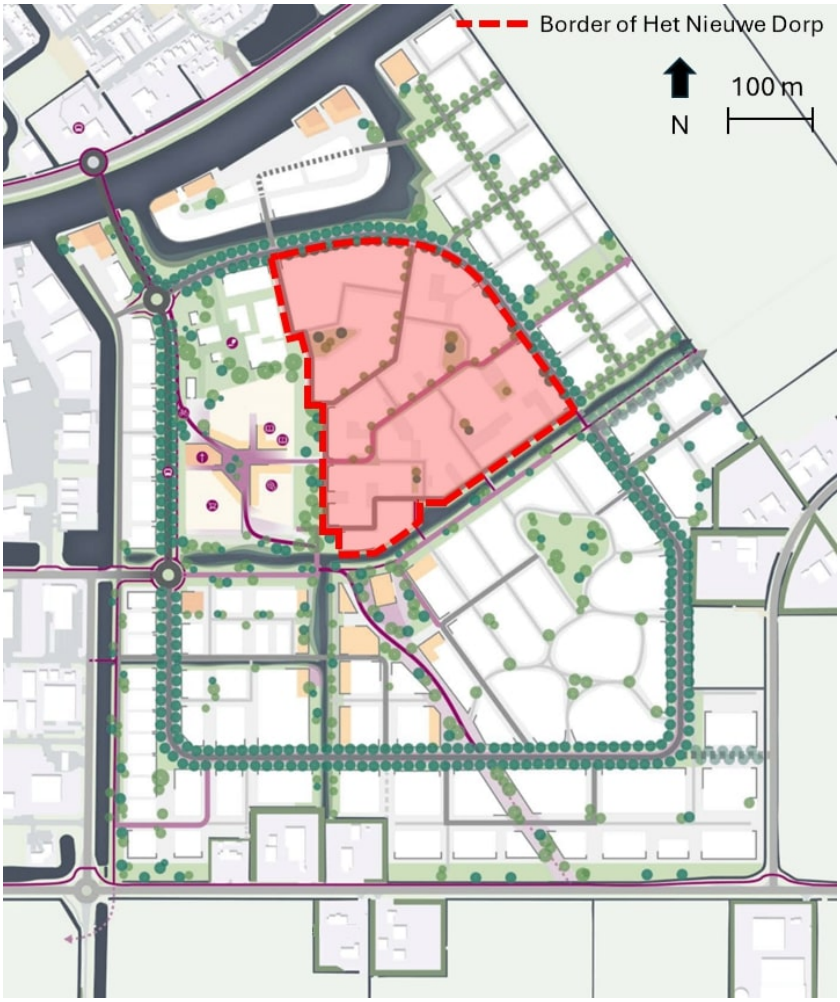

Figure 5.11: Conceptual design of the Zeeheldenwijk with Het Nieuwe Dorp highlighted (Source: *Masterplan Zeeheldenwijk* (2023))

The *Masterplan Zeeheldenwijk* also prioritizes biodiversity-focused green zones and ecological maintenance. At the district level, this takes the form of green corridors along slow-traffic routes and watercourses. Additionally, each neighborhood is planned to include local parks of varying sizes.

For Het Nieuwe Dorp, more detailed urban design plans are available, as illustrated in Figure 5.12. These plans feature three green play areas (1.5 hectares, or 13.5% of the total area) and numerous smaller vegetated spaces (0.26 hectares, or 2.4% of the total area) distributed throughout the neighborhood. Details regarding tree planting are not available.

The Zoning Plan addresses climate adaptation through plan rules, mandating that at least 20% of the non-built surface area of building plots (excluding parking spaces) must remain unpaved, unless compensated by green roofs. This rule could potentially add 0.84 hectares of vegetation to the total neighborhood area. However, as it only limits "*verharding*" (paved surfaces), it does not necessarily ensure an increase in vegetation. Details regarding tree placement are not yet available.

Emerging Relations Between Climate Adaptation and Other Transitions

Vegetation and water bodies emerge as elements that connect multiple transitions by offering attractive spaces for recreation, play, social interaction, active mobility, biodiversity, and climate adaptation.

Similar to the new development case in Lelystad, the open water bodies created for climate-adaptive water management are also designated as spaces for recreation and nature. The larger water body surrounding the island is planned to feature nature-friendly banks. Additionally, the island itself might include a small harbor, supporting recreation both on and around the water.

As shown in Figure 5.13, the major slow-traffic routes are separate from car traffic and align closely

Figure 5.12: Function map of urban development plan for Het Nieuwe Dorp.

with green spatial structures and watercourses. This demonstrates the vision of promoting sustainable and healthy mobility practices by creating attractive and safe routes, as outlined in the *Masterplan Zeeheldenwijk* (2023). While no detailed vegetation plans are available, the *Masterplan Zeeheldenwijk* (2023) emphasizes biodiversity considerations in planting and maintenance.

Parking norms follow those in effect since 2021. For houses, they are determined by housing typologies, tenure type, and price category. In contrast to Almere and Lelystad, these norms apply uniformly across the entire area of Urk. In total, Het Nieuwe Dorp features 625 parking spaces (1.95 per home), with 369 located on municipal grounds.

The energy transition is evident in the highly energy-efficient, gas-free buildings connected to a heat network powered by residual heat from the adjacent fishing processing industry. The development of the neighborhood also includes the provision of charging stations at parking spaces and attention to circular material use during construction. However, strong links between climate adaptation and the energy transition were not observed in this case.

Figure 5.13: Primary spatial structures: access roads, green zones, and water bodies (Source: *Masterplan Zeeheldenwijk*, 2023).

5.2.4. Almere: Regenboogbuurt Noord, Regenboogbuurt

The Regenboogbuurt is a neighborhood located in the district of Almere Buiten, in the northeast of Almere. Developed between 1994 and 1998, it comprises approximately 2,000 houses. As its name suggests, the neighborhood is renowned for its distinctive and well-thought-out color scheme, making it an architectural highlight.

Like many areas in Almere, the Regenboogbuurt is built on peat-rich soil, which has led to uneven subsidence of more than 20 cm since its construction. This has caused issues such as deteriorating pavements, increased water nuisance, and a decline in the overall quality of living in several parts of the neighborhood approximately 20 years after its development.

In response, the municipality of Almere initiated a "*groot onderhoud plus*" renewal project. This project aims to address the subsidence by raising streets and repairing damaged underground infrastructure. Additionally, the project incorporates objectives aligned with circular economy principles and climate adaptation, such as reducing heat stress and mitigating water nuisance. These risks were identified through stress tests (see Figure 5.14). Importantly, the renewal process has been carried out with input from local residents through consultation sessions.

Figure 5.14: Stress test results from the information website about the Regenboogbuurt renewal project[1], sourced from the *klimaatatlas*, showing water levels on streets following a precipitation event of 60 mm in one hour. Dark blue areas indicate water depths exceeding 20 cm.

The renewal has been executed in phases since 2018, covering five segments of the neighborhood. The final phase will involve redesigning the centrally located Prismapark. For this analysis, the entire renewal project of Regenboogbuurt is considered, with a focus on phase 4b, the most recently renewed section: Regenboogbuurt Noord. This section comprises 508 addresses, representing roughly a quarter of the entire neighborhood. Covering an area of 14.4 hectares, it has an address density of 35 addresses per hectare.

A summary of the analysis results for Regenboogbuurt is presented in Table D.5, with further elaboration provided in the paragraphs below. Sources include the project information website[1], the climate adaptation knowledge portal (*Kennisportaal Klimaatadaptatie*)[2], and the definitive design of phase 4b of Regenboogbuurt Noord (see Appendix C).

Water Management and Climate Adaptation

Addressing the challenges of land subsidence, mitigating the effects of extreme precipitation and heat was central to this project.

Across Regenboogbuurt, stormwater runoff to the sewer system was reduced through the implementation of wadi's, permeable pavement for nearly all parking spaces, and the removal of excess paving. In Regenboogbuurt Noord, the renewal included one wadi, and all 734 parking spaces, averaging 1.44 per address and covering approximately 6% of the section's surface, were made permeable.

[1]Source: https://regenboogbuurt.info/ (Accessed December 2024)

[2]Source: https://klimaatadaptatienederland.nl/@295987/almere-bouwt-groene-klimaatbestendige/ (Accessed December 2024)

According to the *Kennisportaal Klimaatadaptatie*, impervious surfaces across the entire Regenboogbuurt were reduced by 30% through pavement removal. While this figure could not be independently verified for this study, measurements using Google Maps and the renewal design indicate that approximately 2,650 m² of paving was removed in Regenboogbuurt Noord, replaced with trees and shrubs.

This transformation was most prominent on the three central streets in Regenboogbuurt Noord: Ecrustraat, Koraalstraat, and Okerstraat. Originally dominated by impermeable surfaces, these streets were redesigned from two one-way roads with a parking median into a central two-way road with parking spaces on both sides. Previously, unpaved areas were limited to 84 small tree beds (each 0.6 by 0.6 m), totaling just 30 m² within the 13,000 m² street surface. After the renewal, unpaved areas increased to 2,470 m², covering 19% of the total street layout (1.3 hectares).

Additionally, the 254 permeable parking spaces in these streets now account for 23% of the layout. Together, these changes enhance stormwater infiltration and reduce runoff, aligning with the project's climate adaptation goals.

Figure 5.15: Ecrustraat before renewal in 2020 (above) and after renewal in 2024 (below). Source: Google Maps, Street View.

In addition to mitigating water nuisance, the project also targeted heat stress reduction. The decrease in paved surfaces helps lower heat accumulation in the built environment, while the newly freed spaces were planted with shrubs and trees, contributing to cooling through evaporation and providing shade.

In Regenboogbuurt Noord, the new layout design includes 636 trees, many of which are located along the neighborhood's borders. In most areas, new trees were planted only as replacements for diseased, dead, or missing ones, maintaining the original layout. Across Regenboogbuurt Noord, these 636 trees could provide a canopy cover of 22% to 35% of the total plan area, assuming future canopy sizes range from 50 to 80 m².

Along the central streets: Ecrustraat, Koraalstraat, and Okerstraat, where the street design underwent significant changes, all existing trees were removed. After 20 years, the previous trees had shown minimal growth, providing little shade and conflicting with the new street layout (see Figure 5.15). The original 84 trees were replaced with 112 new ones in the redesigned layout.

These new trees were planted in larger tree beds and provided with 15 m³ of tree substrate each to promote healthy growth. Assuming future canopy sizes between 50 and 80 m², the new trees have the potential to achieve canopy coverage of 43% to 69% of the street surface.

Centrally located in Regenboogbuurt is a wedge-shaped park. Before the renewal project, the park was primarily a grass field with a bus lane, a drainage ditch leading to a small wetland, and two play areas along with two small soccer fields. In the final phase of the renewal project, the Prismapark undergoes a transformation, as illustrated in Figure 5.16.

According to the information on the Regenboogbuurt website, this park serves as a connection between the open polder landscape and the built environment, allowing cool air to flow into the area. The redesign enhances this cooling function by introducing a wide variety of trees. Seventy-five of these trees are part of an Urban Climate Arboretum, in collaboration with the Urban Forestry program at the Technical University of Delft, which studies how different tree species contribute to urban cooling efforts [3].

The updated park design features a paved meandering stream fed by stormwater collected in the Paarlemoervijver (visible in the top right of Figure 5.16a), which flows into wetlands at the lower end of the park near the Lage Vaart. From there, water is slowly released into the Lage Vaart via a spillover. However, the park has no notable drainage function for the built environment of the neighborhood (determined via personal communication). Walking paths cross over the stream and wetlands, and additional trees have been planted along the paths.

Emerging Relations Between Climate Adaptation and Other Transitions

Several connections emerge in the renewal project of Regenboogbuurt, particularly between climate adaptation and other urban transitions. The relationship between climate adaptation and environmental health is especially evident in the redevelopment of Prismapark. Designed to provide a cool refuge during heatwaves, the park is located within 300 meters of most of the neighborhood. The new meandering walking paths also link adjacent green spaces, creating attractive routes through varied vegetation and trees. The redesigned drainage ditches and wetlands, now enhanced with boardwalks, contribute to the area's environmental quality. The increased diversity of vegetation further boosts ecological health, while the addition of benches, upgraded play areas, and sports facilities enhances the park's overall appeal.

An analysis of the renewal of Regenboogbuurt Noord revealed that the redesign of the three central streets significantly increased unpaved areas, trees, and vegetation. Once fully grown, this new vegetation is expected to notably reduce heat stress, reducing the need for active cooling systems. Moreover, the trees will create more livable outdoor spaces for residents and provide habitats for insects and animals.

The renewal plans for Regenboogbuurt did not include a reduction in parking spaces. In contrast, two streets in Regenboogbuurt Noord, Ecrustraat and Terra Cotta straat, saw a small number of additional parking spaces created.

The reduction in paved surfaces was achieved by rearranging roads and parking areas without compromising functionality. For the three central streets in Regenboogbuurt Noord, the two one-way roads were replaced with a single two-way road, and diagonal parking spaces were replaced with more space-efficient perpendicular parking spaces (see Figure 5.19). An initial design proposed by the municipality, which featured one-way roads, was reconsidered after concerns raised by local residents.

Circularity, a key theme of the renewal project, is evident in the reuse of existing pavement. A notable connection to climate adaptation appears in the repaving of parking spaces. Although the same materials were reused, the paving pattern was changed from a stretcher bond (*halfsteensverband*), which is impervious, to a windmill pattern (*molenwiekverband*), allowing for water infiltration, as shown in Figure 5.17.

Two minor connections to the energy transition were observed. During the renewal project, 10% of the parking spaces were designated for electric vehicle charging, with some charging stations installed during the project. Further installations will be based on demand. Requests from residents to remove large, existing trees that blocked sunlight for solar panels were not approved. The homes in the neighborhood retain gas connections, and there is no information about the introduction of a heat network. According to the Heat Transition Vision, Regenboogbuurt is considered more suitable for individual or small collective heating solutions. Furthermore, no grid reinforcement efforts were mentioned, despite ongoing issues with network congestion in the area[4].

[3] Source: https://www.urbanforestry.nl/urban-climate-arboreta/almere/ (Accessed December 2024)
[4] Source: https://www.almere.nl/vol-stroomnet (Accessed December 2024)

(a) Prismapark in 2008 (source: Topotijdreis)

(b) Renewal design of Prismapark (2023)

Figure 5.16: Plans for the redevelopment of the existing Prismapark include walking paths (1), recreation fields (2), an outdoor classroom (3), play areas (4 and 8), flora-rich zones (5), relaxation areas (6), exercise facilities (7), a sports field (9), and a natural wetland (10).

(a) Parking space with stretcher bond, before renewal.

(b) Parking space with windmill pattern after renewal.

Figure 5.17: Metamorphosis of the pavement of public parking spaces in the Regenboogbuurt, Terracottastraat. (Source: Google Maps, Street View)

5.2.5. Lelystad: Stationsgebied Oost

The municipality of Lelystad is working to enhance the attractiveness and livability of the city center while increasing urban density by adding new housing. As part of this initiative, the station area is undergoing significant renewal. This study focuses on Stationsgebied Oost (Station Area East), which includes a square connecting the city's train station to the Stadshart, an area featuring shops, theaters, and a concert hall. The station area also features a bus station and a major cycling route, ensuring smooth access for cyclists to the station.

The project aims to create an inviting space where people can meet, wait for their bus or train, and seamlessly transition between various modes of transport. Additionally, the area is envisioned to serve as an iconic, welcoming, and distinctive gateway to Lelystad, reinforcing its identity as the *Hoofdstad van de Nieuwe Natuur* (Capital of New Nature).

Concise results of the project analysis are presented in Table D.6. The findings are based on information from the municipality of Lelystad's website[5], articles from Omroep Flevoland[6], the updated zoning plan, and renewal designs published by West 8[7]. A plan view of the renewal design is provided in Appendix C.

Climate adaptation

In terms of climate adaptation, this project stands out for its efforts to reduce heat stress, particularly in the station square, which experiences high pedestrian traffic. The changes are visible in Figure 5.18 and Figure 5.19. The station square is bordered by the station, bike lane, and bus station, and will be enlarged by relocating the bus station farther from the station entrance. The area previously featured 9 trees of the same species, each in a 1 m^2 tree bed. In the redesign, the square will include 31 trees in elevated plant beds covering nearly half of the square, totaling approximately 1,600 m^2. This change will achieve 55% canopy coverage based on a projected mature canopy size of 50 m^2 per tree, with plant beds filled with vegetation.

Across the entire plan area, the number of trees increases significantly, from approximately 100 to 173 in the new design. These trees are strategically positioned along biking routes, near the bus station, and along roads, where shade and coverage are beneficial.

A small parking lot and an outdoor bicycle parking area from the old design are removed. Combined with the reorganization of the station square and traffic flows, this reduces paved surfaces by approximately 10% across the entire plan area. This reduction helps mitigate heat stress and improve soil water storage. Consequently, the project meets the Watertoets requirements by ensuring that the redevelopment does not negatively affect the water system. The city center, including Stationsgebied Oost, originally featured a separate sewer system that drained into nearby open water bodies. While no specific details on refitting this system were found, it is assumed that its principles remain unchanged, with adjustments made to align with the new design.

Drought is not considered a significant issue, as noted in the zoning plans, due to the strong connection to the water system. The system maintains a consistent water level year-round, with water being added or removed as needed to preserve balance.

Emerging Relations Between Climate Adaptation and Other Transitions

In this renewal project, the relationship between climate adaptation and the mobility transition is particularly evident.

The Middenweg is being transformed from a through road to a destination road, allowing for a reduction in its width. In the old situation, the Middenweg (approaching from the left side of Figure 5.18 and passing under the train tracks toward a roundabout) was a two-lane, two-way road with a central verge, measuring 10 meters in width over approximately 300 meters within the plan area. Research revealed that 70% of traffic on this road was through traffic with no destination in the city center, contributing to significant congestion. The municipality's goal is to redirect this through traffic to routes around the city center, reserving the road for local traffic, such as vehicles accessing the Zilverpark parking garage, which can only be reached via this road.

Traffic will be rerouted through other measures within the city. The Middenweg will be further restricted by converting the roundabouts at both ends into priority intersections, requiring traffic on the

[5] https://www.gemeentelelystad.nl/Stationsgebiedoost (Accessed December 2024)
[6] https://www.omroepflevoland.nl/dossier/nieuwe-inrichting-stationsgebied-lelystad (Accessed December 2024)
[7] https://www.west8.com/projects/stationsplein-lelystad/ (Accessed December 2024)

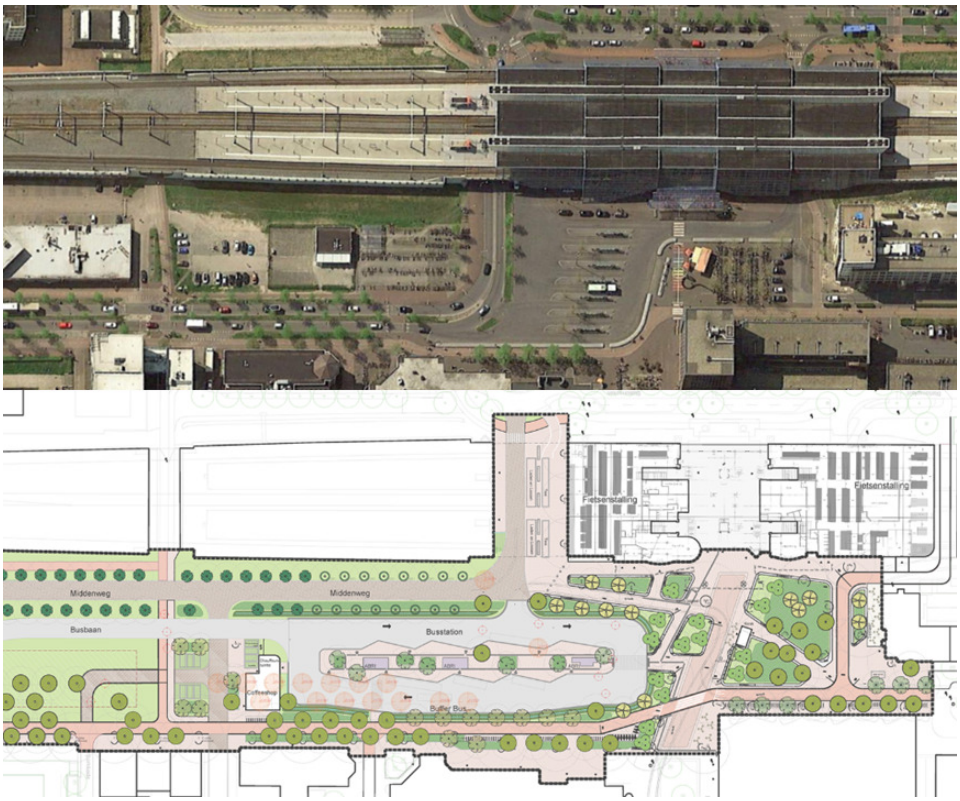

Figure 5.18: Top view of the old situation (above) and a cutout of the same section from the new plan design (below). (Source: Google Maps and West 8)

Figure 5.19: The old situation at the station (above) and a 3D render of the new design (below). (Sources: Google Maps, Street View, and West 8)

Middenweg to yield to other vehicles. Additionally, 'smart' metering lights will regulate traffic flow during busy periods. The redesigned Middenweg will have a width of 5.5 meters, freeing up 1,350 m^2 for other uses.

In the old situation, there were 23 public parking spaces and 8 additional spaces near a coffee shop for its customers and employees. In the new design, this has been reduced to 10 short-term parking spaces near the relocated coffee shop within the plan.

While the volume of car traffic and the space allocated for its infrastructure are being reduced, the infrastructure for public transport, cycling, and pedestrians is being enhanced and expanded to accommodate these modalities.

For instance, the addition of considerable greenery and trees in the station square was made possible by the provision of extra space. These alterations create a calmer and more pleasant environment for waiting for buses and trains or meeting others. The kiosk in the square, along with the vegetation, will offer shelter from wind, rain, and sun, enhancing the user experience.

The design is also tailored to support nature, which is essential as this area serves as the gateway for residents and visitors to Lelystad, the *Hoofdstad van de Nieuwe Natuur*. The vegetation and trees have been carefully selected to ensure diversity and promote biodiversity, as outlined in the project documents.

Additionally, the existing bicycle route is widened to 4 meters and is equipped with an entrance to the expanded bicycle parking facilities beneath the station.

5.2.6. Urk: Molenkamp

De Molenkamp, highlighted in Figure 5.20, is a residential street in the De Top neighborhood, covering approximately 3,500 m², excluding the private properties of the 46 adjacent houses. Developed in the early 1970s, De Top's public spaces are now due for renewal. A 2019 stress test identified De Molenkamp and its surroundings as *"knelpunten"* (bottlenecks), particularly prone to water accumulation on streets during heavy rainfall (70 mm/hour).

The municipality of Urk has taken the opportunity presented by this renewal task to address these drainage issues and "revitalize" the street. The revitalization includes improvements to green and recreational spaces, corrections for land subsidence, and measures to enhance traffic safety. Given the climate-adaptive nature of the measures, the municipality requested supportive funding from the central government through the *impulsregeling klimaatadaptatie* (see Section 2.3 for more information on the *impulsregeling klimaatadaptatie*). Implementation is scheduled to begin in 2024. An impression of the old street layout is provided in Figure 5.21.

The concise results of the Molenkamp renewal project analysis are presented in Table D.7, with further elaboration on climate adaptation, transitions, and their relationships in the following paragraphs. The analysis is based on sources such as the application form for the *impulsregeling* and the definitive design drawings of the renewal project (see Appendix C).

Figure 5.20: Aerial picture of Molenkamp in the De Top neighborhood.

Figure 5.21: Street view image showing the old situation in Molenkamp. The perspective corresponds to the location of cross-section A, as indicated in Figure 5.21 (Source: Google Maps, Street View).

Climate adaptation

The Molenkamp renewal project addresses the challenges of extreme precipitation, heat stress, and drought.

Currently, stormwater from roofs and pavements drains into the combined sewer system. As part of the renewal, stormwater (excluding roof runoff, as confirmed through personal communication) will be detached from the sewer system. All 51 parking spaces will feature permeable pavement. The existing road will be replaced with a hollow profile, and new street drains will be centrally placed. These drains will discharge into four Rockflow (Rockwool) retention-infiltration packages beneath groups of 8 to 11 perpendicular parking spaces. Each package covers 51.84 m², is 50 cm high, and is embedded in a layer of drainage sand. According to product specifications, 95% of each package's volume is available for water storage, providing approximately 100 m³ of storage capacity. Based on the impermeable pavement (2240 m²), the Rockflow system is expected to store up to 45 mm of stormwater.

The overflow from these packages will be connected to a newly constructed IT sewer with a diameter of 200 mm, planned to be centrally located beneath the road (which is at sea level) at -2 m NAP, without slope. Maximum groundwater level is assumed at -1 m NAP but the surface water level in De Top is maintained at -2 NAP. The IT sewer, with a diameter of 200 mm, will therefore be permanently filled with water and will drain into open waters below the water surface level. The IT-sewer is located in a layer of drainage sand 30 cm above and below pipe.

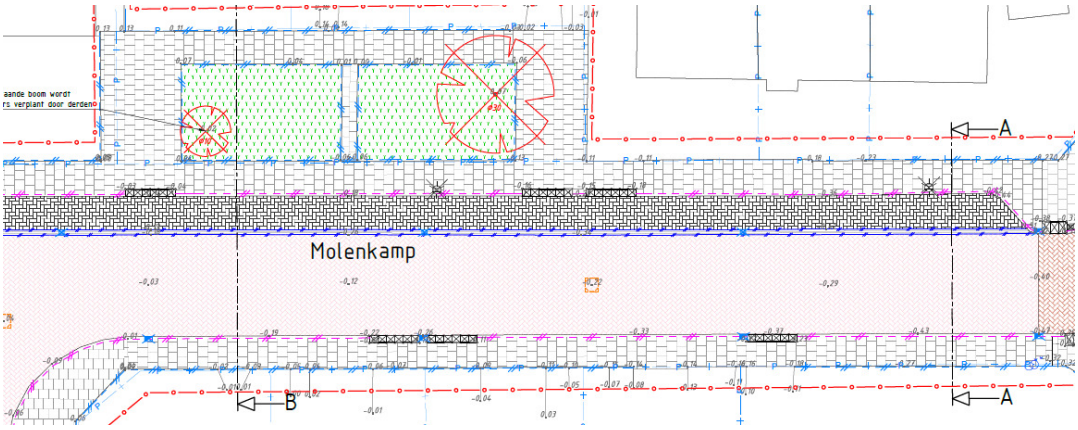

Figure 5.22: Old plan design of north-eastern of Molenkamp.

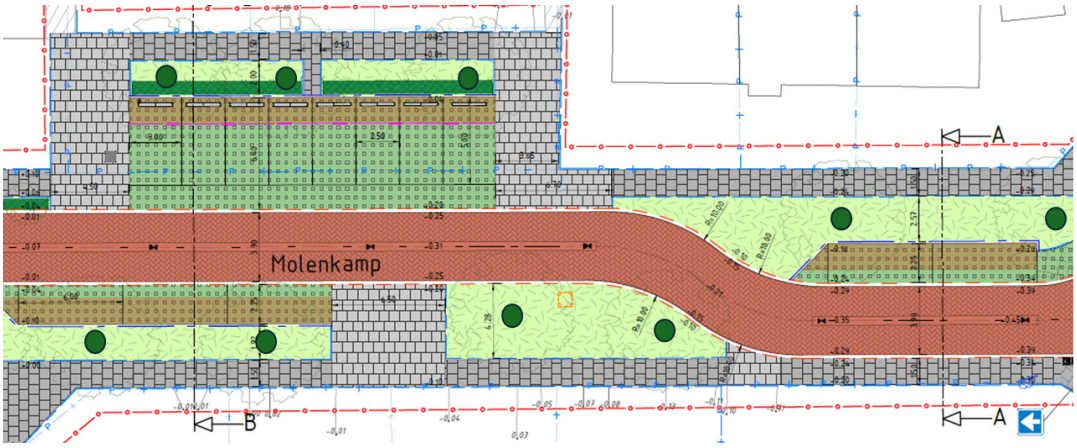

Figure 5.23: New plan design for the northern part of Molenkamp. The road width is reduced, and longitudinal parking spaces, along with on-street parking, are replaced by mostly perpendicular parking spaces made of permeable pavement. Part of the freed-up space is designated for additional vegetation. The locations of new trees are marked with green circles.

In periods of drought, the ground water table can decline, albeit a limited amount as was found in the stress test. The permeable pavement and the Rockflow packages, will contribute to preventing the ground water table from declining by using stormwater optimally. This contributes to retaining stormwater, and reduces the need to take in water from surrounding areas.

In periods of extreme drought, when there is no precipitation, this will not be a factor. The IT-sewer will however prevent the groundwater table from falling below -2m NAP, if water level is maintained at that level.

The renewal plans contribute to preventing heat stress in several ways. The amount of impermeable stoney pavement is reduced by about 30% by the introduction of permeable pavement and the expansion of green area. Additionally the 3 trees in the original situation are supplemented to 31 trees of varying species and sizes. Assuming an average canopy size of 50m2, 44% of the street surface area will be covered.

Emerging Relations Between Climate Adaptation and Other Transitions

The relationship with the mobility transition is the most prominent among the connections to other transitions. One of the main goals in the project documents is improving road safety, which is achieved by transforming the former two-way road into a one-way road. This change allows the road width to be reduced, which is expected to help limit driving speeds (decreasing from 6 meters to 3.9 meters). Additionally, parking alongside the road, which previously accommodated about 23 parking spaces, is prohibited. As a result, while the number of formal parking spaces slightly increases, the total number of parking spaces on municipal grounds is reduced from 68 to 51.

The freed-up space from the road width reduction is used to increase the green area from 250 m² to 450 m², create six additional formal parking spaces, and establish dedicated container placement areas, all of which are paved with permeable materials.

Furthermore, the road design is changed from a cambered road (*bolle weg*) with gullies on the sides to a hollow road, where the gullies are placed in a gutter in the center of the road. This adjustment increases the potential rainwater storage and might also contribute to reducing driving speeds[8], [9].

The vegetation and trees contribute to goals related to environmental health and nature. The documents state that the trees and shrubs are specifically selected to support indigenous insect and animal species. Larger trees with roots partially located beneath the permeable pavement are fitted with substrates to ensure healthy growth.

There is no notable relation to the energy transition, other than the potential reduction in heat stress, which could lower the need for active cooling and ease the load on the WWTP by redirecting stormwater. Houses are currently heated by gas, and according to the Heat Transition Vision, a transition to either a heat network or individual and small collective systems is still being considered. The old combined sewer system is left in place. Reuse of old pavement is not addressed.

[8] Source: https://openresearch.amsterdam/nl/page/76231/holle-weg (Accessed December 2024)

[9] Source: https://kampen-live.nl/2022/02/18/goot-in-bestrating-noordweg-een-doorn-in-het-oog/ (Accessed December 2024)

6 Interviews

As the final part of the case study, interviews were conducted with five professionals from the field. These professionals are employed by the three municipalities and are involved in climate adaptation and the other sustainability transitions studied in this thesis. The primary goal of the interviews is to gain insights from professionals regarding the relationship between climate adaptation and other urban transitions. A secondary goal is to validate and reflect on general and case-specific research findings from the preceding study components.

This chapter is structured as follows: the interview method is described in Section 6.1, covering participant selection, the interview process, and the method of analysis. The results are presented in Section 6.2.

6.1. Method

6.1.1. Interview Method

The decision was made to conduct semi-structured and qualitative interviews. This method combines a pre-determined set of open questions with the opportunity for the interviewer to explore particular themes or responses further, while the interviewee is not restricted in their response. This method is deemed fitting for the current research due to the broadness of the topics and the expected diversity of views and experiences from the interviewees, as adressed by Kallio et al. (2016). At the same time, this interview method ensures sufficient structure to ensure consistency across the different interviews.

The framework of Kallio et al. (2016) was used to prepared the interviews. Background knowledge was gained through conducting the preceding study parts of this thesis. This laid the foundation for formulation of the initial interview guide. Due to the limited amount of interviewees and time constraints, the interview could not be pilot tested. To compensate for this trial runs were conducted with non-target participants to develop the clarity and flow of the questions. Additionally, the guide was adjusted dynamically after initial interviews. The complete final semi-structured interview guide can be found in Appendix E.

To ensure privacy, interviews were conducted anonymously, with no personal details included except for a general description of the interviewee's role and expertise within the municipality. Consent was obtained from all participants in advance.

The interviews took place in person at the city halls and lasted between 30 and 60 minutes. They were recorded to facilitate easier analysis afterward.

6.1.2. Participant selection

Professionals who have served as the primary contacts at their respective municipalities since the start of the current thesis were approached for the interviews. These professionals are experts in the fields of strategy and policy concerning climate adaptation, urban water management, and/or one or more of the sustainability transitions. The total number of interviews is limited to three due to time constraints.

Table 6.1 presents the interviews, the interview participants, their expertise, and the municipality where they are employed. For Urk, three interviewees participated in the interview at the initiative of

the interviewees, to provide a combined expertise.

Table 6.1: List of interviews and interviewed professionals.

Interview	Interviewee (#)	Expertise	Municipality
1	1	Water and climate adaptation policy	Almere
2	2	Sustainable environmental planning policy	Lelystad
3	3	Civil engineering policy	Urk
	4	Sustainability policy	Urk
	5	Spatial project manager	Urk

6.1.3. Analysis

After the interviews were conducted, they were transcribed. The transcripts were then coded using Atlas.ti, with 8 labels in total: 6 corresponding to the different transitions, and 1 each for obstacles and opportunities related to climate adaptation. Using Atlas.ti's analysis tools, patterns were identified and synthesized, resulting in the initial interview findings.

Any remaining or newly raised questions were sent via email for clarification. The resulting paragraph was shared with the interview participants to verify whether their viewpoints were accurately represented and to allow them to suggest any additions or changes. Feedback was reviewed and incorporated into the analysis.

6.2. Interview Results

Policy integration

All interviewees acknowledge the presence of climate adaptation and the other sustainability transitions addressed in this thesis within their municipalities. On a strategic level, climate adaptation and the other sustainability transitions are integrated, for example, in Omgevingsvisies or Duurzaamheidsvisies. These visions are translated into more concrete implementation plans, programs, and tools that provide guidelines and support for implementation and integration. For instance, both Lelystad and Almere have recently adopted the *Leidraad Duurzame Gebiedsontwikkeling*, which consolidates and makes the latest spatial policies applicable and assessable. In comparison, Urk has developed *Impactkaarten* to guide project managers in integrating sustainability ambitions.

The interviewee from Almere also emphasized the *Structuurvisie Amsterdam-Almere-Markermeer (RRAAM)*, where the national government and the Amsterdam-Almere region work together on new housing and employment, integrating nature, recreation, and mobility into the plans.

From policy to practice

A recurring theme is the difficulty of translating ambitions on paper into reality. Decisions are made by urban planners, landscape designers, and project managers under constraints in time, space, and financial resources. Policy experts from Lelystad and Urk noted that while they advocate for their respective fields, competing priorities often overshadow their efforts. Climate adaptation and urban greening are frequently relegated to being "*sluitpost*" (final items) or perceived as "*ambities stapelen*" (stacked ambitions), resulting in compromises in favor of other objectives.

Interviewees from Lelystad and Urk highlighted the disproportionate reliance on individual project managers to achieve these goals. Success depends heavily on their expertise, time, and ability to align stakeholders, which is increasingly strained by labor shortages and the pressure to rapidly deliver new housing. However, municipalities are learning to adapt. For instance, Lelystad is transitioning to a project-based development approach, where strategic teams prioritize goals early in the process. Furthermore, recently developed tools, such as the *Leidraad Duurzame Gebiedsontwikkeling* and *Impactkaarten*, aim to facilitate structural implementation and control.

Climate Adaptation and Synergies

The urgency of climate adaptation is recognized across all municipalities. Localized issues, such as stormwater management, heat stress, and drought, are prevalent, with drought being a concern not only due to land subsidence but also because of freshwater availability. However, this urgency is often reactive, with problems gaining attention only when they manifest.

Stress tests are systematically applied to assess climate risks, and all municipalities follow the preferential water management order, *vasthouden-hergebruiken-bergen-afvoeren*, prioritizing retention and infiltration over rapid discharge. However, challenges persist in implementing this strategy. For example, the separate drainage systems in Almere and Lelystad discharge water too quickly, which exacerbates drought issues. Solutions such as wadis and IT-sewers are being explored and implemented, but they require tailored approaches due to varying soil permeability, which is often poor.

Urban greening emerges as a key element of climate adaptation, exemplified by the "*groen tenzij*" (green unless) approach in Lelystad. In Almere, for example, this is realized by protecting the existing blue-green framework and extending green corridors into the urban environment. There is also increasing attention to how it can contribute to other municipal goals. All interviewees highlighted its positive impact on health and well-being. Shifts in politics, government priorities, and public awareness at both local and national levels are driving increased interest. For instance, Interviewee 2 from Lelystad mentioned a growing reconsideration of mobility's role in urban planning. Initially, there were doubts about removing cars from neighborhoods to create more living and green spaces, but it turned out that people actively sought out these types of projects.

Efforts to enhance the quality of green spaces to improve livability for both people and animals include replacing monocultures with biodiverse planting plans and making green areas more "*beleefbaar*" (experiential) by adding active transport routes and aligning plantings with the needs of local fauna. Initiatives like Lelystad's implementation of the national program Basic Quality of Nature exemplify such approaches.

Climate Adaptation and Conflicts

Despite growing awareness of the benefits of climate adaptation and urban greening, several obstacles remain. Space constraints are a common challenge. Interviewees from Lelystad and Urk highlighted that green initiatives often lose out to more immediate priorities, such as parking, heat networks, and electricity infrastructure. As one interviewee noted, "Green always loses out to parking." Moreover, the long-term benefits of climate adaptation are often experienced by external stakeholders, such as health insurers, rather than municipalities, which face more immediate pressures.

Parking norms in municipalities remain high, complicating efforts for densification. Interviewees suggest these norms be reconsidered in light of current housing demands and the need for livable neighborhoods. Similarly, energy and heating infrastructure often compete for space, as seen in the Molenkamp and Het Nieuwe Dorp projects, where the late-stage integration of gas and heat networks delayed implementation and compromised green ambitions.

In Lelystad, Interviewee 2 expressed dissatisfaction with the Warande development, which fell short of its green space goals. Many areas are overly built-up, with small, paved gardens. This has led to issues with stormwater drainage and heat stress, although improvements are expected in later phases, such as Groot Nooten. However, the implementation of these improvements remains to be seen.

Additionally, 40 energy storage houses need to be integrated into existing public spaces in Lelystad. With space already limited, the question is: "*Waar dan?!*" Chances are, green space will need to be sacrificed. However, there are opportunities to combine climate adaptation with the energy transition, such as by adding green roofs to these energy storage houses or incorporating climate-adaptive measures into heat network infrastructure.

Part IV.

Discussion

Chamoisstraat, an iconic street in the Regenboogbuurt, Almere. The renewal project of Regenboogbuurt is analyzed as part of the project study.
Source: Open Monumentendag, retrieved from https://www.openmonumentendag.nl/activiteit/regenboogbuurt/

7

Connecting Case Study Results to Literature

This chapter connects the case study findings with existing literature. This includes the literature introduced in the literature study (Chapter 2) as well as new relevant sources. By examining the transitions one by one, case study findings are linked to existing research: do the findings align or contradict prior studies, and do they introduce new nuances or insights?

Existing research on the relations between climate adaptation and other urban transitions is limited. When such research is available, such as in the case of the energy transition, it often focuses on a single transition rather than considering multiple transitions simultaneously. Moreover, these studies typically take a theoretical perspective, emphasizing institutional and policy frameworks (Grafakos et al., 2019; Rigolon et al., 2024; Warbroek et al., 2023).

In contrast, this study examines multiple urban transitions concurrently through an applied and empirical approach with a spatial-technical focus. Rather than merely evaluating policy frameworks, it explores how the relations between climate adaptation and other transitions manifest in local policy documents and real-world urban projects.

Energy Transition

In the case studies, the energy transition often conflicted with climate adaptation, primarily due to limited spatial availability and challenges in project integration.

Merkx (2020) provides quantitative evidence to support this observation. In her case study on heat network implementation in existing neighborhoods, she found that limited space in some streets hindered the achievement of the climate adaptation goal of storing a 70 mm rainfall event on public land. As a result, measures that conflicted with Rotterdam's conventions or relied on private property were necessary. She suggested that in such cases, a trade-off must be made between mitigating damage and the investment costs of alternative solutions. This aligns with the findings of SWECO (2018), which indicate that climate adaptation measures, especially for pluvial flooding, may not always be cost-effective.

Although the context of the present research differs from that of Merkx (2020), with more modern, less dense streets and infrastructure, and without the simultaneous construction of heat networks in existing neighborhoods, her findings offer a quantifiable example of the consequences of conflicting spatial integration, a challenge also observed in this study.

Similarly, Warbroek et al. (2023) argues that while climate adaptation and heat transition policies promote integration through horizontal linkages, a finding confirmed in the current research, these connections remain superficial. Economic and policy instruments to coordinate integration during implementation are lacking, and there are no strict requirements to enforce integration. Furthermore, the two transitions involve different sets of actors with divergent interests, leading some to deliberately avoid integration to prevent added complexities and delays. As a result, the implementation of heat grids and climate adaptation measures remains largely sectoral. Although this study did not examine heat network implementation in existing neighborhoods, the findings of Warbroek et al. (2023) help explain

the integration difficulties observed in Het Nieuwe Dorp in Urk and the challenges noted in stakeholder interviews.

Mobility Transition

The literature study highlights substantial evidence on the mobility transition's potential to free up space for other purposes. In this research, it emerged as the only transition capable of actively creating space. Kreijen (2023) was the sole researcher identified who examined this potential at the implementation level, conducting a case study of several projects in Dutch municipalities. He confirmed that the mobility transition is necessary to meet climate adaptation goals, particularly by reducing road width as a promising strategy.

Interestingly, the the present study found that in all renewal projects, reducing road width was the primary, or even sole, means of creating additional space for climate adaptation. These cases demonstrate that downsizing car infrastructure can generate the needed space without requiring radical or unpopular changes to car accessibility. It should be noted, however, that these projects involved relatively low-density neighborhoods and outdated, inefficient car infrastructure, which facilitated such subtle interventions. This study builds on Kreijen (2023) by emphasizing the potential for incremental street design changes to contribute to both climate adaptation and overall livability. Moreover, gradual adjustments may help address resident opposition by shifting perspectives on mobility.

In that context, a recent study by Walker and Brömmelstroet (2025) shows that people are more open to a car-reduced society than often assumed. This growing acceptance of less car-dependent environments may help mitigate resistance to reducing car infrastructure in urban planning, making space for climate adaptation without requiring radical changes to car accessibility.

Additionally, this research explored the relationship between the mobility transition and climate adaptation beyond space creation, particularly regarding shared interests in urban greening and shade provision. de Vries et al. (2022) and Kolokotsa et al. (2020) indicate that vegetation can enhance active mobility by offering aesthetic and psychological benefits, a relationship supported by findings from both policy and project studies. Furthermore, policy documents studied in the present study emphasize the importance of shade along active mobility routes, a concept reflected in project plans through the strategic alignment of green zones. This is especially relevant for pedestrians and cyclists, who are most exposed to extreme heat, aligning with observations by Melnikov et al. (2022) that pedestrians may opt for longer, shaded routes on hot days.

Circular Economy

This research did not identify a strong substantive link between climate adaptation and the transition to a circular economy. In the academic literature, the opinion paper by Stefanakis et al. (2021) was the only work explicitly connecting the two transitions. He argues that nature-based solutions, such as blue-green infrastructure, serve as circular tools for climate adaptation by providing ecosystem services (e.g., cooling, water retention, shading, and benefits related to health and biodiversity) in a cyclical manner.

While this study encountered numerous examples of these ecosystem services being utilized and a clear preference for green climate-adaptive solutions, these practices were rarely explicitly linked to the circular economy. This may suggest that the relationship between the two is either not considered sufficiently relevant or is simply overlooked.

The Knowledge Platform for Drinking Water Supply in the Netherlands Dinkwaterplatform (2021) also highlights a shift in water management practices in an article on their website. Water boards and drinking water companies advocate for transitioning from a linear to a circular water management model, citing the vulnerability of the Dutch freshwater supply and the risk of droughts. To address this, the traditional focus on rapid discharge is being replaced by strategies that prioritize local water retention. Water is increasingly treated as a resource to be kept where it falls, allowing infiltration for groundwater recharge, contributing to drinking water availability, supporting irrigation, and providing other ecosystem services.

The case studies revealed numerous examples of these practices (*vasthouden-hergebruiken-bergen-afvoeren*), with the open water body in a newly established water level section in Warande serving as a prime example. More concrete examples of circular water practices include rainwater storage and reuse (e.g., rain barrels) or using rainwater as greywater to directly reduce drinking water needs. These were the only practices classified as circular economy examples in the case studies.

Environmental Health

The Landelijke nota gezondheidsbeleid 2020-2024 (VWS, 2020) promotes a healthy living environment through a ”Health in All Policies” approach, addressing health issues from a broad, cross-sectoral perspective. However, this holistic approach is not consistently reflected across all policy documents analyzed in this research, particularly in the mobility and water management sectors. This could be explained by differences in how environmental health is defined or by the period in which certain documents were produced. In contrast, more recent climate adaptation documents explicitly integrate environmental health, demonstrating both the potential and the strategy for aligning these practices with national guidelines.

de Vries et al. (2022) observed an increasing focus on environmental greening among Dutch policymakers. They documented the links between greening and both physical and mental health, drawing on scientific research that supports these connections. This evidence reinforces the idea that urban greening is a valuable tool in urban planning for enhancing health. Across policy documents, projects, and interviews in this study, the relationship between urban greening and improved well-being is consistently emphasized.

The 3-30-300 rule, as proposed by Konijnendijk (2023), was recognized in regional climate adaptation policy, the climate adaptation policy of Almere, and the *Omgevingsvisie* of Urk. While the ”3” and ”300” components of the rule were generally achieved, the target of 30% canopy coverage from municipal trees proved overly ambitious, even in low-density neighborhoods such as Groot Nooten and Het Nieuwe Dorp. Meliefste (2023) expands on these findings, critiquing the application of the international 3-30-300 rule in the Dutch urban environment. He argues that it is ill-suited for the relatively dense Dutch built environment, where currently only 7% of houses meet the target. Additionally, he warns that an overemphasis on this simplified rule could lead to a narrow focus on ”*stammen tellen*” (counting tree trunks), potentially neglecting important aspects such as stratification and diversification of green spaces. He also highlights the risk of prioritizing many small trees over fewer, larger ones. As an alternative, he proposes a different approach to urban greening.

Overall, the present study demonstrates that integrating climate adaptation and environmental health is not merely a theoretical concept but is actively implemented in practice. Municipalities are taking concrete steps to realize the benefits outlined in the literature. In essence, combining these two transitions proves both feasible and effective, underscoring the value of integrated strategies in urban planning.

Nature Inclusiveness

de Vries et al. (2022) identified enhancing biodiversity as a key motivation for policymakers to promote urban greening. Additionally, Climate Adaptation Services (n.d.-c) offers a range of tools that facilitate the integration of biodiversity objectives with urban greening strategies. The case studies showed that the potential for synergy is actively being pursued in practice too.

The findings help deepen the theoretical understanding of urban transitions and demonstrate how these dynamics play out in real-world settings. Evidence from local policy documents and urban projects reveals practical challenges and opportunities, which are discussed further in the recommendations for policymakers and researchers.

8

Limitations of the Research

This research employed a literature study and an exploratory case study of three municipalities to answer the main research question: What is the relation between climate adaptation and other urban transitions in Almere, Lelystad, and Urk? The case studies analyzed strategic policy documents, project documents, and three additional interviews with field professionals. This multi-perspective approach provided a broad and inclusive view of the subject, focusing on how these relations are envisioned for the future in policy and how they currently manifest in recent projects. The findings are primarily qualitative.

The study centers on spatial-technical relationships. Aspects such as governance mechanisms, financing structures, stakeholder coordination, and detailed analyses of ecological quality, health, or mobility were not explored in depth. These aspects offer valuable directions for future research.

Policy Study

- A limitation arises from the **selection of policy documents**. The focus on strategic documents aligned with the long-term trajectory of transitions and their relations, offering insight into overarching policy directions. However, these documents often present abstract, idealized visions rather than concrete, short-term relationships. In hindsight, including more tactical documents or municipal urban planning handbooks could have provided additional perspectives on how these transitions materialize in practice in the short term.
- The **coding system**, developed to analyze these documents, introduced challenges. Broad labels sometimes overlapped, and finding a balance between interpretative breadth and specificity was difficult. Despite conditional definitions, some ambiguity persists in the coding process.

Project Study

- **Project selection:** Due to time constraints, only a small number of projects were examined, limiting the generalizability of the findings. The selection was also biased toward redevelopment projects central to climate adaptation, which may not fully represent typical urban redevelopment efforts. Additionally, the study was unable to include projects focused on the installation of heat networks in existing neighborhoods, a crucial area likely to grow in importance.
- **The qualitative and exploratory nature** of the project analysis provided insight into emerging relationships rather than focusing on quantitative measurements. Performing detailed calculations, such as for stormwater management, shading, or cooling would have required additional time and a different methodological approach. Given the need to maintain oversight across multiple transitions, this study prioritized a broader spatial-technical perspective over more detailed calculations of individual aspects.
- The **project analysis captures only snapshots** of ongoing transitions, providing a limited view of the long-term relationships between transitions. Transitions in urban planning are gradual and long-term but can be difficult to identify in new development projects, making it challenging to distinguish transitions from established practices. Physical changes may not be immediately visible, whereas redevelopment projects offer clearer comparisons between old and new practices.

Interviews

- **Limited sample size**: Interviews were carried out at the end of the research process but in a limited number due to time constraints. While they provided valuable insights beyond the theoretical perspectives found in policy and project documents, the small sample size means the findings cannot be fully generalized. The interviews were primarily used to illustrate and complement the other research components rather than serve as an equal source of data.
- Extra interviews would not only make the findings more valid and generalizable, but they could also **provide more knowledge of the municipal context**, including their organization, operations, and financial practices—knowledge that I do not have with my background in civil engineering and that was also not obtained from the studied documents. This would have allowed me to better place and understand the meaning and context of my research findings.
  However, since this research primarily focused on the spatial-technical aspects of urban transitions, rather than their organizational and financial dimensions, the absence of these insights does not fundamentally undermine the study. Nonetheless, a stronger understanding of municipal structures could have allowed me to better assess the implications and position my research findings within the municipal framework.
- **Difficulty in comparison**: The limited number of interview participants also made it difficult to draw direct comparisons between responses. The unequal number of participants per interview adds an additional layer of complexity when considering how the findings can be compared across municipalities.
- **Interview participant selection**: The focus on policymakers provided insights into the policymaking process but did not fully capture the range of practical challenges faced by municipalities. Involving a broader range of participants, such as practitioners and other relevant stakeholders, could have offered a more comprehensive view of the real-world decision-making processes and the obstacles in implementing climate adaptation measures and other transitions.

Despite these limitations, this research provides valuable insights into the spatial-technical dynamics underlying urban transitions. Each limitation highlights potential areas for future research, whether through a broader selection of case studies, more diverse methodologies, or deeper quantitative analysis. These recommendations will be further elaborated in Chapter 10.

Part V.

Conclusion and Recommendations

A render of the green connecting zone along the biking path, cutting through the new development project Groot Nooten in Warande, Lelystad. Groot Nooten is analyzed as part of the project study.
Source: Centrada, retrieved from https://www.centrada.nl/projecten/groot-nooten/

9

Synthesized Conclusion

This chapter presents a synthesized conclusion, where the key findings of the research are integrated to answer the research question. For a more concise summary of the results and the recommendations, please refer to Chapter 10, which provides a condensed version of the most important insights.

This research set out to answer the central research question:

What is the relation between climate adaptation and other urban transitions in Almere, Lelystad, and Urk?

This study examined how these transitions influence one another, where synergies emerge, and where obstacles arise, with a strong focus on the spatial-technical domain. To address this question, the research first identified relevant urban transitions in the Dutch context through a literature study. Climate adaptation was found to be linked to the energy transition, the mobility transition, the circular economy transition, the environmental health transition, and the nature-inclusiveness transition.

An exploratory case study was conducted in Almere, Lelystad, and Urk. It included an analysis of municipal policy documents to assess strategies and ambitions, along with a project study examining transition strategies and relations in practice. The project study focused on three new development and three redevelopment projects. To supplement and contextualize the findings, three interviews were conducted with involved field professionals.

This chapter synthesizes the results from the different research components to answer the research question. It is structured as follows: first, the climate adaptation strategies and implementations in the projects are examined and evaluated. Next, the relations with other transitions are discussed. These findings are categorized by relation type—geographical, physical, and project-based—following the framework of Nieuwenhuis (2023) (see Subsection 2.4.1), which was also applied in the policy study. No substantial findings were identified for the informational relation type, so this category is not considered in this chapter.

As stated above, the project study examined how the ambitions and strategies found in policy documents were reflected in practice. This was not intended as an evaluation of the projects, but rather as a method to assess the presence of transitions and their relationship with climate adaptation.

It is important to note a temporal mismatch between the analyzed policy documents and the studied projects. While most policy documents are relatively recent—many from 2020 or later, with some even from 2024—the projects were initiated several years or even decades earlier. Consequently, depending on the scale of the projects analyzed, they reflect policies that are several years or decades old. This discrepancy may explain differences between the strategic focus outlined in policy and the practical execution of the projects in this study.

Climate adaptation in the municipalities of Almere, Lelystad and Urk

Understanding the relation between climate adaptation and other urban transitions began with an examination of climate adaptation policy strategies. Almere and Lelystad adopted climate adaptation policy documents in 2024 and 2023, respectively, while Urk is currently developing its own. Additionally, Almere, Lelystad, and Urk collaborated with neighboring municipalities and regional authorities on a regional climate adaptation policy document, which was adopted in 2024. This document provides guidelines for municipal policies and translates national policy into a regional framework. The policy study showed that climate adaptation is also frequently addressed in other policy sectors, particularly water management and integrated environmental policies, such as the *Omgevingsvisies* of Lelystad and Urk.

Policy Visions on Climate Adaptation

In the municipal strategies, three recurring themes were identified that characterize the way climate adaptation is pursued. First, climate adaptation is integrated into municipal spatial planning and development rather than treated as a separate sector. In Lelystad's climate adaptation policy, this is explicitly phrased as a "new way of working, rather than a new policy domain." All municipalities emphasize that water management and climate adaptation should serve as boundary conditions in urban planning projects, in line with the *Water en Bodem Sturend* principle. Furthermore, the climate adaptation policies from Almere and Lelystad explicitly highlight *Meekoppelen* (synergizing) with other sustainability transitions as central element to climate adaptation. This integrative approach aligns with national climate adaptation policy, which identifies coupling efforts *Meekoppelen* as a core pillar of climate adaptation.

Second, as outlined in climate adaptation policies, municipalities prioritize stormwater management with the principle of *vasthouden-hergebruiken-bergen-afvoeren*, emphasizing local retention, reuse, and infiltration over rapid discharge. However, this approach has nuances, particularly in polder contexts where high water tables and poorly permeable soils limit local storage and infiltration capacity. Almere and Lelystad have modern, efficient separate sewer systems that quickly convey stormwater to local open water bodies. While this reduces the urgency to disconnect areas from the sewer system and prioritize local retention, thereby easing the load on the sewer system, the rapid discharge can exacerbate drought issues. In contrast, Urk is already replacing its aging combined sewer systems with infiltration-transportation systems that drain into open water. For new developments, all stormwater will be collected at the surface level. Despite the emphasis on preferential stormwater management to reduce pressure on stormwater systems and address drought concerns, municipalities continue to rely on separate sewer systems as the backbone of urban water management.

Third, in line with the focus on local storage and infiltration, and restoring natural water processes, municipalities primarily implement nature-based and blue-green solutions, such as open water, wadis, and green spaces, which are deemed cost-effective and multifunctional. These measures help mitigate the effects of extreme precipitation and drought, as well as heat, and they support other municipal ambitions, such as enhancing public health, well-being, and biodiversity. This preference for nature-based solutions is emphasized in all municipal policies, in line with the "green-unless" principle (*groen, tenzij*), which is explicitly mentioned in the Lelystad and regional climate adaptation policies. While Almere and Urk do not explicitly mention the "green-unless" principle, their policies demonstrate a similar preference for blue-green infrastructure. In Almere, "fine-meshed and robust blue-green infrastructure" is considered one of the four pillars for a climate-resilient future. Similarly, Urk emphasizes the importance of disconnecting stormwater and local rainwater processing, alongside enhancing green spaces in both existing and new urban areas. All municipalities have incorporated the 3-30-300 rule of Konijnendijk (2023) into their policies, with Lelystad applying a slightly modified version.

Climate Adaptation in Current Practice

In the project study, the working principles for climate adaptation are partially reflected in the analyzed projects. In the three new development projects, these principles are especially evident in the water board's requirement to create sufficient local water storage to compensate for increased stormwater runoff created by the extra pavement and prevent additional strain on the underlying water system. All three projects provided additional storage capacity via water bodies. In Groot Nooten (Lelystad) and Het Nieuwe Dorp (Urk), this storage was created locally as part of the project, whereas in New Brooklyn (Almere), the available storage was located farther outside the project area but remained linked through

open water. Most stormwater in these areas is drained through separate sewer systems. In Groot Nooten and Het Nieuwe Dorp, local infiltration solutions, such as a wadi and drainage in green areas, were implemented. Additionally, both Almere and Urk have policies that support using permeable pavement for parking spaces, as confirmed in the interviews.

In all three analyzed redevelopment projects, the proportion of impermeable pavement was reduced, enhancing local water infiltration. In Regenboogbuurt (Almere), wadis and permeable pavement were installed, while in Molenkamp (Urk), the municipality experimented with Rockflow (Rockwool) retention-infiltration packages beneath permeable parking spaces, allowing stormwater from the road to infiltrate locally.

Regarding heat stress reduction and the 3-30-300 rule, the redevelopment projects saw a considerable increase in tree cover. However, achieving 30% canopy coverage proved overly ambitious for both redevelopment and new development projects.

Geographical Relations: Providing Space for Climate Adaptation

Traditional urban climate management primarily relied on subsurface solutions, particularly sewer systems, to handle most precipitation events. However, climate change introduces a broader range of risks. Blue-green mitigation measures for stormwater management, drought and heat stress reduction require additional space both above and below ground. This increasing spatial demand necessitates a reconsideration of the limited urban space. The mobility transition and the energy transitions proved particularly important in this regard.

Mobility Transition: A delicate shift from car space to green space

The mobility transition focuses on promoting active mobility and public transport while reducing car use and ownership. These efforts aim to lower emissions, create a more balanced distribution of public space, and improve safety and health in urban environments. However, shifting mobility behavior is a slow and politically sensitive process, often facing public resistance, as highlighted in previous research and interviews. Additionally, Almere and Lelystad's spacious urban layouts and high commuting shares, as well as Urk's limited public transportation options, further complicate this transition.

Despite these challenges, policy documents reveal ambitions to support the transition. Urk's policy documents express an ambition to stimulate active mobility, while Almere and Lelystad go further and explicitly aim to increase the share of active mobility. This implies that all three municipalities seek to reduce car dependency. Rather than enforcing restrictions, they focus on incentivization by investing in safe and attractive active mobility infrastructure and improving convenient transfer options between transport modes.

Among the transitions considered in this research, the mobility transition is unique because it is the only one capable of freeing up public urban space for climate adaptation measures. This potential is recognized in policy documents. In their mobility visions, Almere and Lelystad outline how they plan to capitalize on mobility trends to reduce car infrastructure in favor of greenery and urban spatial quality, especially in highly urban areas. Urk, in its *Duurzaamheidsvisie*, emphasizes the importance of ensuring sufficient green space and play areas in new development projects, even at the cost of parking spaces. Although these connections are meaningful, the policy study revealed that, among all transitions, the mobility transition had the fewest links to climate adaptation, with only a small portion emerging in sectoral mobility policies.

Despite the modest number of links between climate adaptation and the mobility transition identified in the policy documents, the project study revealed a strong spatial connection between the two. This is particularly evident in the redevelopment projects, where 30- to 50-year-old public space designs were replaced with new configurations, clearly indicating a redistribution of public space. In the context of these projects, transitions illustrate not so much a gradual shift, as in the definition of Rotmans et al. (2001), but also more structured, stepwise transformations, particularly in response to redevelopment or renewal cycles of sewer systems or the renovation of the public environment.

All three redevelopment projects show a reduction in car infrastructure. In the Molenkamp project, the road was transformed from a two-way to a one-way street, reducing both road width and informal parking spaces. In Stationsgebied Oost, the former through road was redesigned as a local road, with traffic rerouted, allowing for a narrower road, and parking spaces were also reduced. In Regenboogbuurt Noord, the total number of parking spaces and the road's functionality remained unchanged,

but through considerable space efficiency improvements, the spatial claim of car infrastructure was reduced. In all these projects, the freed-up space benefited green space and the amount of trees.

These projects illustrate the stepwise transformation of the urban environment driven by the mobility transition. The reduction of parking and road space was not the result of decreased car use; all areas remain easily accessible by car, and high parking norms continue to be upheld. Instead, subtle and effective changes to parking and road design helped eliminate outdated and inefficient car infrastructure, freeing up space for urban greening.

In new development projects, changes in the spatial distribution between car infrastructure and green space are less immediately visible, as these aspects are predetermined in the design phase rather than retrofitted. In both Almere and Lelystad, newly introduced parking policies reflect a shift, where parking norms are still relatively high but have become more diversified and stricter, particularly in areas with higher urban density and better accessibility. For example, in New Brooklyn, parking norms are lower than the typical standards for Almere, due to its location in a highly urbanized area. This, along with the implementation of partial peripheral parking and the reduction of road width through one-way streets, has freed up more space for urban greenery. In contrast, these strategies were not applied in the less urbanized areas of Het Nieuwe Dorp and Groot Nooten.

Energy Transition: The spatial competition between mitigation and adaptation

Climate adaptation is not the only development requiring space; the energy transition, as part of climate change mitigation, also requires additional space both above and below ground. Municipalities receive considerable financial support to facilitate the energy transition, as evident in the policy study, where it was the most frequently recognized transition in the selected policy documents. These documents emphasize the importance of geographically integrating both transitions to enhance their effectiveness and achieve their respective objectives.

The municipalities are not yet implementing large-scale energy infrastructure in the existing build environment making its integration with climate adaptation in this context difficult to evaluate. The new development projects however did show the implementation of large-scale energy transition interventions in the public environment, all of which included heating networks.

In New Brooklyn and Groot Nooten, heating infrastructure was installed on one side of the street, leaving the other side available for trees to provide shade and cooling—a form of geographical integration. Conversely, in Het Nieuwe Dorp, delays in integrating the heating network into the design resulted in the loss of planned green spaces, undermining climate adaptation goals, as noted in the interview. This loss could contribute to future heat stress or pluvial flooding if the deficit in public green space is not offset by sufficient private green space or alternative stormwater detention solutions.

Supplementary email contact with employees of the municipality of Almere also reaffirmed that, as part of the energy transition, extra cables, pipelines, and transformer stations are required. This necessitates wider street profiles and increased pavement. Likewise, in the design process of New Brooklyn, trees and green space were reduced to accommodate energy infrastructure.

Physical Relations: Shared Infrastructure

Policy documents indicate a general preference for green and blue-green climate adaptation measures due to their multifunctionality. This section examines how various urban transitions contribute to the growing demand for green space and how these spaces are designed to accommodate multiple needs.

Environmental Health: Promoting Health through Urban Greening

The policy study revealed a strong interconnection between climate adaptation and environmental health, with frequent co-occurrences of these themes and a high degree of alignment. Both transitions share similar goals and strategies and are often presented as complementary.

First, a core motivation for climate adaptation is to create a healthy and safe living environment, making the objectives of both transitions inherently aligned. Second, urban greening serves as a key strategy for both climate adaptation and environmental health. Beyond improving the microclimate, well-designed green spaces can support physical activity, relaxation, social interaction, and overall well-being. The concept of experiential quality (*beleefbaarheid*) emerged as a key theme. This synergy is evident not only in the policy documents but also in the project study and is further illustrated in the interviews.

All studied projects involved the creation or modification of green areas that integrate environmental health transitions with climate adaptation measures. In Groot Nooten, a green zone was established, incorporating trees, diverse vegetation, a biking path, sports and play facilities, and a wadi. The redevelopment of Prismapark in the Regenboogbuurt serves as another example of how climate adaptation and environmental health can be integrated in practice. While no specific designs for green areas in Urk were obtained, the interview revealed that stormwater was directed to an unpaved play area, suggesting an effort to integrate climate adaptation. Additionally, compensatory open water bodies in the new development projects of Lelystad and Urk were explicitly designed to support a healthy living environment, featuring jetties, natural banks, and open spaces for recreation.

Additionally, the interviews provided some insights, with two interviewees explicitly addressing a causal relationship between urban greening and reduced health issues, reinforcing the benefits of green infrastructure. Several interviewees also noted a growing emphasis on green spaces in urban planning, reflecting an increasing awareness of their health and climate adaptation benefits.

Despite the overall positive relationship between urban greening and health, some challenges were noted. Policy documents highlighted potential drawbacks, such as pests, allergens, and infectious diseases. Additionally, they emphasized preventing prolonged water retention in wadis to mitigate health risks.

Mobility Transition: Enhancing Active Mobility through Urban Greening

As discussed above, the mobility transition is pursued by enticing people to opt for non-car modes of transport, preferably active transport. A key strategy for promoting active mobility is therefore the facilitation of high-quality infrastructure for walking and cycling, which makes it also closely align with the environmental health transition. In policy documents, all municipalities indicate that this is pursued through ensuring safe, attractive, and carefully mapped-out infrastructure.

This is reflected in biking and walking infrastructure that is sufficiently wide and largely separated from car traffic. Almere and Lelystad emphasize in their policy documents that aligning green and blue structures with biking infrastructure enhances the aesthetic appeal of this mode of transport. The regional and Lelystad climate adaptation policies also highlight the climatological benefits of this alignment by providing shade and cooling. In this regard, the mobility transition and climate adaptation are complementary, as both emphasize urban greenery and prioritize creating a pleasant environment.

All municipalities, but particularly Almere, with its spaced-out districts separated by green spaces, also point out the flipside of integrating green space with active mobility infrastructure: social insecurity can be a downside.

This alignment between mobility transition and climate adaptation is also reflected in concrete policy plans. The project study found that in all the new development projects examined, wide, continuous, and separate biking paths were integrated into the local cycling network. These paths were intentionally aligned with water bodies, trees, and green spaces, creating the green veins of the neighborhoods. In two of the redevelopment projects, Stationsgebied Oost in Lelystad and Regenboogbuurt in Almere, walking, cycling, and public transport infrastructure were upgraded in an integrated manner alongside climate adaptation measures. Urban greening played a key role in encouraging shifts in travel behavior by making routes more aesthetically pleasing and providing a comfortable microclimate. In this sense, climate adaptation and mobility transition goals were well aligned.

Nature Inclusiveness: Blue-Green Infrastructure for Habitats and Ecosystems

The relationship between climate adaptation and nature inclusiveness mirrors that with environmental health as their goals and strategy overlap. Similarly to humans and their cities, animals, plants and ecosystems are vulnerable to the effects of climate change and climate adaptation has as goal to mitigate these effects and thereby cater to these organisms. In addition, both transitions advocate for increasing urban blue and green spaces. Successful integration of these elements dependent on thoughtful and well-executed design.

This strong connection became evident in the policy study, where nature inclusiveness exhibited the most relationships with climate adaptation. More than half of these relationships also encompassed themes of environmental health, highlighting a robust triangular connection.

Both policy and project approaches emphasize an integrated strategy, where green spaces serve the dual purpose of supporting climate adaptation and fostering nature inclusiveness. This integration

spans from large-scale planning layouts to more detailed aspects such as planting schemes, maintenance, and the inclusion of water management features like wadis. The selection of plants is crucial: they must be climate-resilient, suitable for local conditions, and cater to the needs of native fauna.

In project developments, particularly in new areas, we see this macro-level design integration in action. Most green elements are incorporated into broader blue-green networks, forming a cohesive environmental structure. In the case of Prismapark in the Regenboogbuurt in Almere, for instance, the green wedge was specifically promoted as a “green lung” for the neighborhood, drawing cool air from the surrounding polder environment and introducing it into the urban area, reducing heat stress.

An intriguing aspect of these projects is the role of clean stormwater in supporting ecological health. By contributing to the flushing of water bodies and improving the quality of nutrient-rich polder waters, clean stormwater plays a vital ecological role. In Warande, an open water body was created to compensate for the increase in impermeable surfaces. This water body is located in a separate water level section, fed primarily by local clean stormwater, with the expectation that it will improve water quality, enhance ecological integrity, and provide the flexibility to withstand the impacts of drought and extreme precipitation.

Circular Economy: Climate Adaptation, a Theoretically Circular Practice with Limited Follow-up

The policy study revealed limited strong links between climate adaptation and the circular economy transition, as defined in this research. One exception is the preferential order of stormwater management, which prioritizes rainwater storage and reuse (e.g., rain barrels) or using rainwater as gray water to reduce drinking water needs. However, this practice was not found in the project documents.

The literature study, however, presented a broader interpretation of the circular economy. Stefanakis et al. (2021) explicitly connects the two transitions, arguing that nature-based solutions like blue-green infrastructure act as circular tools for climate adaptation by providing ecosystem services (e.g., cooling, water retention, shading, and benefits related to health and biodiversity) in a circular manner.

Similarly, the Knowledge Platform for Drinking Water Supply Dinkwaterplatform (2021) highlights a shift to circular water management, where stormwater is treated as a valuable resource to be retained where it falls, supporting groundwater recharge, drinking water availability, irrigation, and other ecosystem services.

Applying this broader interpretation, climate adaptation strategies that focus on blue-green solutions and retention-oriented stormwater management are closely aligned with the circular economy. The project study revealed multiple examples of this alignment, though these practices were rarely explicitly linked to the circular economy, suggesting that the relationship is either deemed insufficiently relevant or simply overlooked.

Energy Transition: Passive Solutions for Indoor and Outdoor Climate Control

The energy transition can be infrastructurally integrated with climate adaptation through measures such as fitting utility houses with green roofs and walls. Additionally, outdoor cooling provided by vegetation can reduce the need for active indoor cooling, thereby lowering energy demand. Green roofs and facades can also improve insulation. However, increasing insulation could, in turn, reduce the demand for outdoor cooling.

Project-based Relations: Aligning Stakeholder Agendas

Whether it concerns providing space or the shared use of infrastructure, proper geographical or infrastructural integration requires project-based collaboration. This necessitates stakeholders from both within and outside municipal organizations to align their agendas and integrate their interests as much as possible. In the policy documents, the importance of integrated projects—those that combine climate adaptation with other transitions and challenges to limit costs and nuisance—is repeatedly emphasized.

However, translating these ambitions into practice presents challenges. These challenges remained largely hidden during the project and policy study but were highlighted during the interviews. It should be noted, however, that the small sample size (only three interviews) limits the ability to draw conclusions. Interviewees highlighted difficulties in integrating climate adaptation and balancing various priorities, often due to a lack of time, expertise, or training. Additionally, climate adaptation and urban greening were sometimes treated as secondary priorities, leading to compromises. The integration of the energy transition was particularly difficult due to the complexity and scale of energy projects.

While these insights are informative, the limited number of interviews means that more extensive research is needed to fully assess these challenges and potential solutions.

10

Key findings and Recommendations

This chapter presents the key findings of this research, followed by recommendations for further research and practical recommendations for the municipalities of Almere, Lelystad, and Urk. The Key Findings section provides a concise synthesis of the main conclusions, summarizing only the essential insights needed to understand the recommendations.

10.1. Key Findings

This research explored the relation between climate adaptation and other urban transitions in Almere, Lelystad, and Urk, with a focus on the intersections between climate adaptation and transitions in energy, mobility, circular economy, environmental health, and nature inclusiveness. The study employed a grounded theory approach, using literature, strategic policy documents, project documents, and three additional interviews to assess the dynamics in these municipalities.

The policy study revealed that the climate adaptation strategies of the municipalities focus on three key themes: (1) integrating climate adaptation into spatial planning as a new approach rather than a separate sector, (2) advocating a preferential order for stormwater management—local retention, reuse and infiltration over rapid discharge, and (3) prioritizing blue-green solutions for climate adaptation, for their cost-effectiveness and multidimensionality.

Despite the fact that climate adaptation policies are more recently developed than the studied projects, something which went for most policies and projects studied, these climate adaptation strategies are largely recognized in the projects.

The following sections present key findings on climate adaptation relations, categorized into geographical, physical, and project-based relations.

Geographical Relations: Providing Space for Climate Adaptation

The mobility and energy transitions play an important role in the allocation of space for climate adaptation in Almere, Lelystad, and Urk. Municipal policies in all three municipalities indicate a clear effort to increase the share of active mobility and reduce car use. This reduction in car dependence can be leveraged to free up space for urban greening, thereby supporting climate adaptation. While this connection was only occasionally highlighted in the policy documents, the project study, particularly the redevelopment projects, demonstrated how the reduction of car infrastructure, through incremental changes in design and functionality, can create space for green areas and facilitate climate adaptation.

The energy transition, which requires space for infrastructure such as heating networks and cables, competes with climate adaptation needs. Policy documents emphasize the importance of spatial integration of both transitions. In two of the new development projects, both transitions are integrated spatially, but even then, the spatial impact of the energy transition is large. In the new development project in Urk, a lack of project-based integration undermined climate adaptation efforts by yielding green space. No large-scale energy transition measures were included in the redevelopment projects.

Physical Relations: Shared Infrastructure

Some urban transitions show strong synergies in shared infrastructure, particularly through green and blue-green infrastructure. Climate adaptation closely aligns with the environmental health transition, as

both strive for a healthy living environment and rely on urban greening as part of their strategy. Policy documents revealed extensive connections between these transitions, often overlapping with nature inclusiveness. For the environmental health transition, a key word is *beleefbaarheid* (experiential quality) of blue and green spaces. This was reflected in project studies: water bodies for stormwater storage are designed to also serve recreational purposes, while green spaces include amenities for play and exercise, while simultaneously incorporating wadis and trees. Closely related is the alignment of active mobility infrastructure with blue-green structures to provide aesthetics and pleasant microclimates, stimulating active transport. Even though the link between health and urban green is strong and emphasized in interviews, challenges such as allergens, pests, maintenance, and social security need to be managed.

Nature inclusiveness and climate adaptation strongly align, as both aim to expand blue-green infrastructure to support ecosystems and mitigate climate change impacts. Projects integrate green spaces into broader blue-green networks, as seen in Prismapark in Almere, where a green wedge reduces heat stress. Clean stormwater also plays a crucial role in ecological health, as demonstrated in Warande in Lelystad, where a water body fed by local stormwater improves water quality and resilience to extreme weather.

The circular economy and energy transitions present integration opportunities through sustainable water management and energy-efficient infrastructure. While strategies such as rainwater reuse are mentioned in policy, their practical application in projects was not observed. The energy transition can integrate with climate adaptation through green roofs and walls, which contribute to cooling and insulation.

Project-based Relations: Aligning Stakeholder Agendas

Successful geographical and infrastructural integration of climate adaptation with other transitions requires project-based collaboration, aligning stakeholder agendas. Policy documents emphasize integrated projects to reduce costs and disruption, but interviews revealed challenges in practice. Limited time, expertise, and prioritization often hinder integration, with climate adaptation and urban greening sometimes treated as secondary concerns. The energy transition, in particular, poses difficulties due to its complexity and scale. However, given the small sample size of interviews, further research is needed to fully understand these challenges and solutions.

10.2. Recommendations for Further Research

This study identified key relations between climate adaptation and various urban transitions, highlighting both synergies and conflicts. While these findings provide a strategic foundation, further research is needed to deepen understanding and refine actionable strategies. This section first outlines recommendations for future research, followed by preliminary recommendations for the municipalities of Almere, Lelystad, and Urk.

1. **Study the Relationship Between Climate Adaptation and Other Transitions in Isolation:** This research explored the relationships among climate adaptation and various transitions. To delve into further detail, the relationship between climate adaptation and other transitions can be studied in isolation. Distinguishing between the different effects of climate adaptation—such as pluvial flooding, drought, and heat stress—could provide additional insights.
2. **Focus on the Integration of Climate Adaptation and the Energy Transition:** In this context, the relationship between climate adaptation and the energy transition was found to be particularly complex and therefore fruitful for further research. This integration is especially valuable given its future implications, large spatial impacts both above and below ground, and the comparable time frame of the transitions (with end goals in 2050). Future research could pursue several directions. In addition to distinguishing among the various aspects of climate adaptation, studies could differentiate between energy transition implementations—such as heat networks, grid reinforcement, or above-ground utility houses for power storage or voltage transformation. Moreover, a distinction can be made between spatial-technical integrations and stakeholder engagement integrations. According to the current researcher, these options are underexplored and hold promising potential.
3. **Evaluate Successful Integration Projects Across a Larger Scale:** To further investigate the integration of climate adaptation, future research should evaluate successful integration projects

across a larger number of municipalities or projects and determine the key factors that contribute to their success. This research could focus on one or several of the transitions.

4. **Examine the Economic Valuation of Integrated Urban Transitions:** This study did not examine the monetary aspects in detail; although there is existing research on the economic valuation of climate adaptation, further analysis is needed to adapt these insights to the integrated approaches discussed here. Future research should investigate how the costs of well-designed blue and green spaces that integrate urban transitions across various sectors can be covered. This involves estimating the future added value, or potential cost limitations, in monetary terms to enable well-informed trade-offs. Secondly, it is important to map out where the added value of well-integrated climate adaptation practices materializes and to leverage that information for innovative financing solutions.

10.3. Recommendations Almere, Lelystad, and Urk

1. **Prioritize Local and Integrated Solutions:** Encourage the use of blue-green infrastructure not only for its climate adaptation benefits but also for its multifunctionality in promoting health, biodiversity, and environmental quality. Municipalities should focus on the long-term added value of well-designed green spaces, even if these solutions require trade-offs, such as reducing car infrastructure or rethinking urban mobility. These integrated solutions can deliver more sustainable, resilient, and vibrant urban environments.
2. **Incentivize Interdisciplinary Collaboration:** Given the limited space and resources, as well as the long-term impact of today's design choices, municipalities should encourage collaboration across departments and areas of expertise to integrate climate adaptation with multiple urban transitions. The integration of the energy transition and mobility sectors has proven effective in creating space for climate adaptation but policy links were relatively modest. Additionally, linking health and ecology is essential for designing multifunctional and high-value green spaces that support multiple urban transitions simultaneously. Such collaboration can lead to a more coordinated approach to spatial allocation and potentially help align sectoral municipal budgets.
3. **Recognizing the Value of blue-green infrastructure:** Municipal investments and the allocation of space for blue-green infrastructure could benefit from a well-demonstrated understanding of their value. However, blue-green infrastructure often struggles to compete with other priorities, such as car infrastructure or housing, as its benefits unfold over the long term, while political cycles favor short-term returns. To strengthen the position of nature in decision-making, municipalities need quantifiable data on its benefits, such as cooling, health improvements, and economic value. Decision-support tools can help. For example, the TEEB Stad Tool[1] assesses the societal value of green and blue infrastructure, providing a data-driven foundation for investment decisions. Integrating such tools into urban planning can ensure that nature is recognized as an essential component of sustainable development.

[1] Source: https://www.atlasnatuurlijkkapitaal.nl/teebstadtool (Accessed February 2025)

Part VI.

References and Appendices

The view from the dike at the foot of the old Urk lighthouse.
Source: Nationale Omgevingsvisie (2020)

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A

Overview of Policy Study Results

Table A.1: Overview of individual policy documents and their scores.

Cat.	Mun.	Documents	Pp.	CA	ET	MT	CE	EH	NI	Rel.	Geo.	Phy.	Inf.	P.b.	Syn.	Cha.
CA	Alm.	Almeerse klimaattadaptatie	*14*	47	1	0	2	6	7	6	4	4	0	3	6	1
	Lel.	Lelystadse Adaptatie strat.	*41*	**113**	6	3	4	11	16	24	21	10	2	6	25	0
	Reg.	Regionale Adaptatie strat.	*39*	**156**	6	2	10	21	36	34	26	20	1	7	31	3
WM	Alm.	Waterplan Almere	*75*	37	23	0	30	5	34	8	7	2	1	1	8	0
	Lel.	Rioleringsprogramma	*43*	18	2	0	2	0	0	4	1	2	1	1	2	0
	Urk	Water en Rioleringsplan	*104*	**90**	3	0	6	0	4	5	1	2	1	1	4	1
ET	Alm.	Visie Energietransitie	*28*	3	**113**	7	2	1	1	0	0	0	0	0	0	0
		Transitievisie Warmte	*58*	1	**161**	0	0	0	0	1	0	0	0	1	0	0
	Lel.	Transitievisie Warmte	*28*	2	**96**	0	1	1	1	0	0	0	0	0	0	0
	Urk	Transitievisie Warmte Urk	*39*	5	**194**	0	0	0	0	0	0	0	0	0	0	0
MT	Alm.	Mobiliteitsvisie Almere	*49*	1	32	**86**	0	3	2	1	1	0	0	0	1	0
	Lel.	Mobiliteitsvisie Lelystad	*60*	0	36	**95**	0	12	0	0	0	0	0	0	0	0
	Urk	Verkeers- en Vervoersplan	*86*	2	24	**77**	0	1	2	2	2	0	0	0	1	1
HE	Alm.	Samen op avontuur	*24*	5	0	5	6	26	3	4	4	1	0	1	4	0
		Sportvisie Almere	*46*	4	0	2	0	14	4	1	1	0	0	1	1	0
	Lel.	Samen Gezond	*56*	2	0	0	0	7	2	1	1	0	0	0	1	0
		Sport- en beweegvisie	*76*	5	2	3	1	14	4	2	2	1	0	0	2	0
EC	Alm.	Visie ecologie	*62*	15	2	0	3	17	**107**	8	8	4	0	0	8	0
	Lel.	Strategie agenda natuur	*27*	21	2	1	0	22	41	12	10	4	0	2	12	0
SU	Alm.	Duurzaamheidsagenda	*28*	18	26	8	26	10	23	5	3	5	0	1	5	0
	Lel.	Kadernota Duurzaamheid	*40*	9	**53**	16	28	7	20	0	0	0	0	0	0	0
	Urk	Duurzaamheidsvisie Urk	*52*	22	**52**	6	39	0	0	0	0	0	0	0	0	0
HO	Alm.	Woonvisie Almere	*47*	8	18	0	6	4	6	2	2	2	0	0	2	0
	Lel.	Woonvisie Lelystad	*40*	12	12	0	2	8	10	6	6	1	0	1	6	0
	Urk	Woonvisie Urk	*19*	5	7	1	1	5	5	2	2	0	0	0	2	0
IE	Alm.	Almere, stad met toekomst	*100*	26	15	6	11	18	22	4	4	2	0	0	4	0
		Visie openbare ruimte	*72*	37	10	6	14	32	30	7	6	1	1	0	4	3
	Lel.	Omgevingsvisie 2040	*96*	48	29	20	19	34	44	26	26	1	0	4	18	4
		Lelystad next level	*109*	28	8	4	11	37	**50**	4	4	0	0	0	4	0
		Koersdocument	*8*	10	4	0	1	8	9	1	1	0	0	0	1	0
	Urk	Omgevingsvisie Urk	*57*	33	20	17	9	16	15	4	4	3	0	0	5	0
		Structuurvisie urk 2035+	*70*	12	11	5	2	7	9	1	1	0	0	0	1	0

[1] *Abbreviations top row*: Cat., Category; Mun., Municipality; Pp, Page count; CA, Climate adaptation; ET, Energy Transition; MT, Mobility Transition; CE, Circular Economy; EH, Environmental Health; NI, Nature Inclusiveness; Rel., Relation; Geo., Geographical; Phy., Physical; Inf., Informational; P.b., Project-based; Syn., Synergy; Cha., Challenge.

[2] *Abbreviations first column*: CA, Climate Adaptation; WM, Water Management; ET, Energy transition; MO, Mobility; HE, Health; EC, Ecology; SU, Sustainability; HO, Housing; IE, Integrated Environmental.

[3] *Abbreviations second column*: Alm., Almere; Lel., Lelystad

[4] *Conditional coloring*: Cells with a light red background indicate values larger than 20. Bold values indicate scores larger than 75.

Table A.2: Overview of scores, sorted per document category.

Cat.	Pp.	CA	ET	MT	CE	EH	NI	Rel.	Geo.	Phy.	Inf.	P.b.	Syn.	Cha.
CA	*94*	316	13	5	16	38	59	64	51	34	3	16	62	4
WM	*222*	145	28	0	38	5	38	17	9	6	3	3	14	1
ET	*153*	11	564	7	3	2	2	1	0	0	0	1	0	0
MO	*195*	3	92	258	0	16	4	3	3	0	0	0	2	1
HE	*202*	16	2	10	7	61	13	8	8	2	0	2	8	0
EC	*89*	36	4	1	3	39	148	20	18	8	0	2	20	0
SU	*120*	49	131	30	93	17	43	5	3	5	0	1	5	0
HO	*106*	25	37	1	9	17	21	10	10	3	0	1	10	0
IE	*512*	194	97	58	67	152	179	47	46	7	1	4	37	7
Tot.	*1693*	795	968	370	236	347	507	175	148	65	7	30	158	13

[1] For abbreviations see Table A.1.
[2] Conditional coloring applied across all scores in the table.

B

Emergent relations in policy documents

Table B.1: All *Relations*, including source document and granted codes, sorted by document category and municipality.

#	Document	Cat.	Quotation Content	Codes
1	Visie Almeerse klimaatadaptatie (2024)	Alm. CA	De gemeente gaat samen met inwoners en bedrijven aan de slag. Mensen maken immers de stad. Elke ruimtelijke ontwikkeling draagt bij of doet in ieder geval geen afbreuk aan de klimaatbestendigheid en waterrobuustheid van de stad. Klimaatadaptieve ontwikkelingen worden gekoppeld aan andere (duurzame) ontwikkelingen en opgaves zoals die van ecologie. Op die manier ontstaat synergie. Bovendien speelt monitoring een rol om voortgang inzichtelijk te maken en te houden. Ook wordt vroegtijdig gelet op rechtvaardigheid in de verdeling van klimaatadaptatiebaten en -kosten. Alleen op die manier wordt maximale, positieve impact bereikt. Vanzelfsprekend wordt hierbij de betaalbaarheid niet uit het oog verloren.	Interlinked CA NI Project-based Synergy
2	Visie Almeerse klimaatadaptatie (2024)	Alm. CA	Om het ontstaan van stedelijke warmte-eilanden en hittestress tegen te gaan, is het van belang om te voorkomen dat de stad opwarmt. De groenblauwe infrastructuur van de Almeerse Founding Fathers wordt daarom versterkt en uitgebreid. Een fijnmazige en robuuste groenblauwe infrastructuur draagt namelijk sterk bij aan het vergroten van het thermisch comfort van inwoners. Schaduwrijke plekken worden toegevoegd, verdampingskoeling wordt bewerkstelligd, zonnestraling wordt gereflecteerd en afvoer van warmte door ventilatie wordt gefaciliteerd. Behalve dat dit de leefbaarheid van de stad verbetert, zorgt het ook voor een betere luchtkwaliteit, ondersteunt het de biodiversiteit en beperkt het de wateroverlast. Het draagt bij aan de algemene gezondheid en het welzijn van zowel mens als dier. Het uitgangspunt voor het bewerkstelligen van een fijnmazige en robuuste groenblauwe infrastructuur is als volgt:	Interlinked CA EH NI Geographical Physical Synergy
3	Visie Almeerse klimaatadaptatie (2024)	Alm. CA	De fijnmazige en robuuste groenblauwe infrastructuur brengt verkoeling aan de gehele stad	Interlinked CA EH NI Geographical Physical Synergy
4	Visie Almeerse klimaatadaptatie (2024)	Alm. CA	Almere bouwt klimaatadaptief en daarmee met oog op de toekomst. Stapsgewijs wordt huidige bebouwing aangepast en nieuwbouw wordt meteen klimaatadaptief neergezet. In 2021 heeft Almere de Intentieovereenkomst klimaatbestendige nieuwbouw12 van de Metropoolregio Amsterdam ondertekend. Almere hanteert hiervoor als basis de Landelijke maatlat voor een groene klimaatadaptieve gebouwde omgeving13. Ook wordt breder gekeken naar klimaatadaptieve maatregelen zoals het toepassen van regenwater voor het doorspoelen van toiletten. Almere gaat bij woningbouw, utiliteitsbouw en andere ruimtelijke ontwikkelingen uit van het comply or explain principe. Het gebeurt klimaatadaptief, tenzij een degelijke uitleg wordt gegeven waarom dit niet kan. Daarnaast heeft de ministerraad in november 2022 besloten14 dat bij ruimtelijke keuzes water en bodem sturend zijn. Wat dit precies gaat inhouden voor Almere, zal de komende tijd duidelijker worden. Almere houdt de volgende uitgangspunten aan:	Interlinked CA CE Physical Synergy
5	Visie Almeerse klimaatadaptatie (2024)	Alm. CA	Door klimaatadaptatie te koppelen aan andere (duurzame) ontwikkelingen wordt voortgang geboekt op een scala aan Almeerse doelen. Beleidsstukken Almere, stad met toekomst17 en de Duurzaamheidsagenda18 onderschrijven dit. Door de uitbreiding van de fijnmazige en robuuste groenblauwe infrastructuur kunnen bijvoorbeeld doelstellingen uit de Visie ecologie19 en het Meerjarenperspectief groenblauw20 worden behaald. Bij het aanleggen van nieuwe groenstroken wordt bijvoorbeeld ingezet op het versterken van de leefomgeving van belangrijke diersoorten en het verstevigen van ecologische verbindingen in de stad. Ook kan bij het aanleggen van nieuwe parken worden gekeken naar het neerzetten van circulaire speeltoestellen die kinderen in beweging brengen, waardoor circulariteit en doelen uit de Visie samen op avontuur21 worden gecombineerd met Almeerse klimaatadaptatie. Kortom, veel is mogelijk en door koppelkansen te benutten ontstaat meer draagvlak en meer impact.	Interlinked CA CE EH NI Geographical Physical Project-based Synergy

6	Visie Almeerse klimaatadaptatie (2024)	Alm. CA	Klimaatadaptatie wordt ook gekoppeld aan andere opgaves als de energietransitie en stedelijke verdichting. Deze opgaves hebben fysiek ruimte in de stad nodig om te vorderen.Klimaatadaptatie kan hierin worden gebruikt als bindende factor. Door vroegtijdig in gesprek te gaan en koppelmogelijkheden te onderzoeken, zal worden getracht het spanningsveld rondom de verschillende ruimteclaims te minimaliseren.	Interlinked CA ET Geographical Project-based Challenge Synergy
7	Waterplan Almere 2017-2022 (2017)	Alm. WM	Almere is gezegend met een royaal en gezond water systeem. Inwoners waarderen de groene en waterrijke omgeving. Maar water staat nooit stil. Verschillende regionale en mondiale trends hebben invloed op ons waterbeheer. Zo confronteert klimaatverandering ons vaker met extreme neerslag, hitte en droogte. De recreatie ervaart overlast als gevolg van waterplan ten, terwijl de biodiversiteit op sommige plekken achterblijft bij de potentie en waterplanten bijdragen aan een goede waterkwaliteit. We merken dat lokale bodemdaling en mondiale grondstoffenschaarste vra gen om innovaties in de waterketen. Anderzijds biedt water bij elk bouwproject een fantastische kans voor duurzame oplossingen en een aantrekkelijke leefom geving. En dat is belangrijk, want in een groeiende metropoolregio wordt de positie van Almere als stad van water en natuur steeds waardevoller.	Interlinked CA CE EH NI Geographical Physical Project-based Synergy
8	Waterplan Almere 2017-2022 (2017)	Alm. WM	Dankzij het doordachte ontwerp van een groen-blauwe stad bestaat Almere tegenwoordig voor maar liefst 11% uit water binnendijks. In andere Nederlandse ste den schommelt dat percentage tussen de drie en acht.Het royale groenblauwe netwerk geeft Almere nu een voorsprong in de weerbaarheid tegen klimaatveran dering en biedt een kraamkamer voor natuurontwik keling en recreatie. Een tweede historische keuze die Almere positief onderscheidt van andere Nederlandse steden is het gescheiden rioolstelsel. In veel wijken van oudere steden worden afvalwater en regenwater via één buis afgevoerd ('gemengd stelsel'), met als nadelen hogere zuiveringskosten, overstort van vuil water bij hevige regenbuien en een gebrekkige doorspoeling van grachten en sloten. Deze problemen kent Almere niet omdat het schone regenwater rechtstreeks naar de dichtstbijzijnde watergang wordt geleid.	Interlinked CA EH NI Geographical Synergy
9	Waterplan Almere 2017-2022 (2017)	Alm. WM	Een robuust, stabiel ecosysteem ontstaat pas als er meerdere soorten voorkomen, die ook onderlinge relaties hebben. Zo'n systeem is in staan om een stootje te kunnen opvan gen, zoals de effecten van heftige hoosbuien of langdurige droogte. In een meer waarin verschillende soorten waterplanten voorko men, bestaat minder kans op plaagvorming.Met een waterplantenrijk meer heb je meer verschillende vissoorten, waarvan een deel planteneter is. Je ziet meer vogels waarvan ook een deel verzot is op planten (meerkoet, knob belzwaan). Echter, zolang het systeem nog niet helemaal op orde is, is het mogelijk dat waterplanten woekeren en daarmee overlast veroorzaken voor de recreatie.	Interlinked CA NI Geographical Physical Synergy
10	Waterplan Almere 2017-2022 (2017)	Alm. WM	Nieuwe natuur in het IJsselmeergebied is een mondi aal uniek fenomeen. Nederland kan zich als gidsland ontwikkelen voor delta's op het gebied van synergie tussen verstedelijking, natuur en waterveiligheid.Tegelijkertijd is er nog veel werk te verzetten en is er een grote behoefte aan kennis op het gebied van jonge zoetwatermilieus, zoals de dominantie van exo ten als de Amerikaanse rivierkreeft, Watercrassula en de Reuzenberenklauw. Gemeente en waterschap verkennen met de regionale partners om sterker in te zetten op de ontwikkeling van de Oostvaarders plassen, het Markermeer en IJmeer tot een uniek samenhangend blauw natuurgebied ('New Land, New Nature'). Het uiteindelijke perspectief is een interna tionale proeftuin voor zoetwatermilieus, ecotoerisme en klimaatadaptatie.	Interlinked CA NI Geographical Synergy
11	Waterplan Almere 2017-2022 (2017)	Alm. WM	Het gebied vanaf Almere Poort tot en met de wijk Noorderplassen-West heeft een samenhangende wa terstructuur met een stroomrichting in de richting van de Noorderplassen. Uit recente verkenningen blijkt dat De Gouden Randen van Pampushout een belangrijke schakel kan worden als waterbuffer en natuurlijke zuiveringszone voor voedselrijk water uit Poort.	Interlinked CA NI Geographical Synergy
12	Waterplan Almere 2017-2022 (2017)	Alm. WM	Met het concept 'Gouden Randen Pampushout' heeft Het Flevo-landschap het initiatief genomen om opga ven te combineren: waterberging, natuur en beleving komen hier samen. De basis van dit concept is de aan leg van een strook natte natuur, met rietland als na tuurlijke overgang tussen water, open gebied en bos.Deze vormen een prachtige aanleiding voor struinen, spelen, varen met kano's of open sloepen, waterna tuur en uiteindelijk ook wonen 'in de wetlands'. Met deze inrichting krijgt het water rondom Pampushout meer betekenis dan alleen maar afvoer en lossen we tegelijkertijd de waterbergingsopgave van Poort op.Via Poort-Oost wordt daarvoor een tweede watergang gecreëerd die de nieuwe wijken verbindt met Pam pushout. Het Flevo-landschap, gemeente, provincie en andere partijen werken dit concept nader uit.	Interlinked CA EH NI Geographical Synergy
13	Waterplan Almere 2017-2022 (2017)	Alm. WM	Bij iedere stadsuitbreiding of – inbreiding is er een waterbergingsopgave, afhankelijk van de mate van verharding in het plangebied. Deze bergingsopgave ontwerpen we op een hoger schaalniveau dan het be treffende plan, namelijk per samenhangend stroom gebied. Hierdoor komt een groter aantal oplossingen in beeld waarmee we robuuste watersystemen kunnen ontwikkelen, die beter zijn te beheren en onderhou den. Bovendien is de kans groter dat er zo slimme combinaties kunnen worden gemaakt met natuuront wikkeling en recreatief gebruik	Interlinked CA EH NI Geographical Synergy
14	Waterplan Almere 2017-2022 (2017)	Alm. WM	Gemeente en waterschap stellen expertiseteams samen die in de initiatieffase worden betrokken bij grotere, complexere wateropgaven zoals in ruimtelijke plannen, gebiedsontwikkeling, integrale wijkver nieuwing of bij Kaderrichtlijn Water (KRW) voor het › Voorbeeld van ontwerpen aan water (concept-plankaart Olympiakwartier West).Weerwater en Noorderplassen. De expertiseteams stellen een 'watergebruiksprofiel' op, dat helpt om besluiten over oevergebruik, peilvakken, maaiveld- en vloerhoogtes, doorvaarthoogtes, bruggen, duikers, sluizen en ecosysteem beter in samenhang te bezien.Resultaten van het watergebruiksprofiel worden - afhankelijk van het gewenste detailniveau en verde ling van verantwoordelijkheden - vastgelegd in het ontwikkelingsplan, tenderdocument, peilbesluit en omgevingsplan. Dit vraagt om inzet en samenwerking, waardoor uiteindelijke kosten worden beperkt.	Interlinked CA NI Informational Synergy
15	Transitievisie Warmte Almere (2021)	Alm. ET	Inschatting van het tempo om woningen de komende decennia van het aardgas af te halen. De inschatting is gebaseerd op verschillende criteria waaronder de leeftijd van het aardgasnetwerk, plannen voor groot onderhoud (bijv. Het riool) en andere natuurlijke momenten om in een wijk aan de slag te gaan.	Interlinked CA ET Project-based

16	Mobiliteitsvisie Almere 2020-2030 (2020)	Alm. MO	Wanneer Almeerders samen een auto delen, hoeven ze niet ieder afzonderlijk een auto te hebben. De ruimte die auto's innemen in de openbare ruimte neemt daardoor af. Deze ruimte kan worden gebruikt voor andere doeleinden, zoals bijvoorbeeld groen. Deelmobiliteit draagt dus in hoge mate bij aan de groene en gezonde stad. Concreet voorbeeld hiervan is de ontwikkeling van de Floriadewijk waar plannen zijn voor een deelautoconcept.	Interlinked CA EH MT NI Geographical Synergy
17	Visie Samen op Avontuur (2019)	Alm. HE	Kinderen spelen om zich voor te bereiden op de toekomst. Al spelend kunnen ze zich moto - risch, sociaal en cognitief ontwikkelen. En hoe meer vrijheid, groen en ruimte, hoe langer kinderen kunnen spelen en hoe gelukkiger ze zijn.	Interlinked CA EH Geographical Synergy
18	Visie Samen op Avontuur (2019)	Alm. HE	Almere is een van de groenste steden van Nederland en het vele groen wordt door de inwo ners goed gewaardeerd. Uit verschillende onderzoeken blijkt dat hoe meer groen, hoe langer kinderen spelen. Bovendien helpt de aanwezigheid van groen bij het voorkomen van gedrags stoornissen en depressie, ook bij kinderen. Een groene omgeving kalmeert en ontspant. Groen maakt gelukkig, en spelen in het groen is daarom voor kinderen dubbel zo gunstig.	Interlinked CA EH NI Geographical Synergy
19	Visie Samen op Avontuur (2019)	Alm. HE	Uit onderzoeken blijkt dat de ideale speelvriendelijke omgeving mogelijkheden biedt voor verschillende soorten spel, met losse elementen, hoogteverschillen, schuilplekken en water.Een uitdagende omgeving maakt nieuwsgierig, nodigt uit tot ontdekken en verkennen en biedt talloze mogelijkheden. Door de speel- en beweegruimte in Almere op een meer avontuurlijke manier in te richten, verwachten we dat kinderen en volwassenen de essentie van spelen weer in gaan zien. Avontuurlijk betekent: volop ruimte voor ontdekken, creëren, bouwen, slepen, klauteren, gevaar leren inschatten en omgaan met risico's. Veel groen, zand en water en vrijheid om te ontdekken wat je hier allemaal mee kan. Spelen in een natuurlijke, groene en uitdagende omgeving, en waar dat kan met losse materialen, dat is avontuurlijk spelen!	Interlinked CA EH NI Geographical Physical Synergy
20	Visie Samen op Avontuur (2019)	Alm. HE	Om de waarde van het avontuurlijk spelen voor het kind, stimuleren we bij aanleg en vervanging een groene inrichting van de speelomgeving. Dit in overleg en samenwerking met buurtbewoners en scholen. De gemeente vervult niet alleen een faciliterende maar ook een stimulerende en ondernemende rol om het kind in de behoefte van het natuurlijk spelen te voorzien	Interlinked CA EH NI Geographical Project-based Synergy
21	Sportvisie Almere Sportstad Vol Betekenis (2021)	Alm. HE	De afgelopen jaren hebben wij ingezet op vroegtijdige inhoudelijke afstemming over een sportieve en beweegvriendelijke inrichting van de openbare ruimte bij alle planvorming voor (her)inrichting van wijken en gebieden. Sport en bewegen in de buiten ruimte wordt namelijk steeds belangrijker. De corona crisis heeft het belang van een beweegvriendelijke inrichting van de openbare ruimte nog meer benadrukt. Veel Almeerders sporten al buiten de traditionele structuur van sportverenigingen en gebruiken de mogelijkheden die de openbare ruimte hen biedt. De groen blauwe structuur in de stad en de buitengebieden bieden wandelaars, fietsers, hardlopers en watersporters de perfecte omgeving om hun sport te beoefenen. Samen met diverse gemeentelijke teams zoals Sport, Spelen, Recreatie en Gebiedsontwikkeling zetten wij ons er voor in om de buitenruimte zo goed mogelijk sportief in te richten en daarmee optimaal te benutten.	Interlinked CA EH NI Geographical Project-based Synergy
22	Visie Ecologie Almere 2020 (2020)	Alm. EC	Een gezonde natuur is daarom niet alleen belangrijk voor de natuur zelf, maar ook voor de mensen die in Almere wonen en werken. Denk bijvoorbeeld aan de inzet van natuurlijke bestrijding van de eiken processierups door sluipwespen, koolmezen en vleermuizen. En aan de rol die de natuur speelt in een klimaatbestendige stad.	Interlinked CA EH NI Geographical Synergy
23	Visie Ecologie Almere 2020 (2020)	Alm. EC	Voor de nieuwe visie zijn we het gesprek met de stad aangegaan. De inwoners en groene partners waarderen de goede basis. Maar ze vinden ook dat met de groei van de stad, het groen onder druk staat. Als Almere een grote groene stad wil zijn, moeten we inzetten op een "goed inrichten en behe ren"-beleid. Dat betekent bewuste ecologische inpassingen bij stedelijke ontwikkelingen en ook het bestaande groen meer (bio)divers maken om de stad leefbaar te houden Bij dit toekomstbeeld hebben we het volgende voor ogen:	Interlinked CA NI Geographical Physical Synergy
24	Visie Ecologie Almere 2020 (2020)	Alm. EC	De stad is steeds meer een toevluchtsoord voor veel planten en dieren. We hebben bij het inrich ten en beheren van de openbare ruimte een verantwoordelijkheid in het voortbestaan van plant- en diersoorten. Een grotere biodiversiteit zorgt voor geschikte voedselbronnen en schuilplekken voor dieren en maakt het groen minder kwetsbaar voor weersextremen, ziekten en plagen.	Interlinked CA NI Geographical Physical Synergy
25	Visie Ecologie Almere 2020 (2020)	Alm. EC	Groengeoriënteerde organisaties en verenigingen wijzen op het belang van biodiversiteit en ecologi sche verbindingen. Zij zien kansen in combinatie met klimaatadaptieve maatregelen	Interlinked CA NI Geographical Synergy
26	Visie Ecologie Almere 2020 (2020)	Alm. EC	Het mag duidelijk zijn dat we, samen met de inwoners van de Almere, de betekenis onderstrepen van het ecologisch systeem voor de aantrekkelijke stad. Het natuurlijk systeem is een leverancier van zogenoemde ecosysteemdiensten. Allereerst voor de stadsmens zelf, die zich zo bevindt in een aan trekkelijke omgeving om in te wonen, te recreëren, te bewegen en te participeren. En daarnaast voor de biodiversiteit - omdat de stad een thuis is voor veel plant- en diersoorten.	Interlinked CA EH NI Geographical Synergy
27	Visie Ecologie Almere 2020 (2020)	Alm. EC	Het Meerjarenperspectief Groenblauw uit 2020 schetst de stad als landgoed voor een gezonde toekomst van Almere en haar bewoners. Daarin wordt het natuurlijk systeem beschreven als het fundament voor de diensten die groen en water leveren aan de stad. De grote groen- en watergebieden om de stad zijn daarvoor belangrijk, maar ook het groen en water in de stad.Een robuust stedelijk ecologisch systeem, dat goed verbonden is met de omgeving, vormt het wezen van de groene stad.	Interlinked CA EH NI Geographical Synergy

28	Visie Ecologie Almere 2020 (2020)	Alm. EC	We weten dat gebouwen met aanpassingen bijdragen aan het functioneren van een veerkrachtig ste delijk ecosysteem. Nu al broeden er tientallen scholeksters op Almeerse groene daken, en bovendien leveren deze daken verkoeling op zomerse dagen. Het oppervlak en de diversiteit van groene daken kan echter nog worden vergroot.	Interlinked CA NI Geographical Physical Synergy
29	Visie Ecologie Almere 2020 (2020)	Alm. EC	Tuinen zijn niet alleen voor planten en dieren van belang maar spelen ook een belangrijke rol in het dempen van de klimaateffecten. Groene tuinen bergen water bij hevige buien en zijn koeler in tijden van hitte. De groene tuin heeft een groot positief effect op het welzijn van mensen.	Interlinked CA EH NI Geographical Physical Synergy
30	Duurzaamheid-sagenda Almere (2020)	Alm. SU	De groei van de stad houdt de komende decennia aan, zowel in de uitleggebieden als in de bestaande stad. Daarnaast dient zich een omvangrijke stadsvernieuwingsopgave aan. Er vinden in de komende decennia dus nog omvangrijke investeringen plaats in de fysieke structuur van Almere. De gemeente regisseert en is grotendeels zelf verantwoordelijk voor deze investeringen. Voortbouwend op onze bestaande activiteiten, biedt dit ons de uitgelezen kans om toe te werken naar een 100% duurzame, natuur-inclusieve gebiedsontwikkeling en stedelijke vernieuwing in 2030. De ambitie is een klimaat adaptieve openbare ruimte en een gebouwde omgeving die in aanleg en exploitatie tenminste energieneutraal is, waar het 2e leven van grondstoffen en materialen aan de voorkant is geborgd met een minimale impact op de uitstoot van CO2. Hierbij zijn de wettelijke verplichtingen de basis waar we aan voldoen, ook zodra deze in de (nabije) toekomst strenger worden. Daar werken we stapsgewijs naar toe, met een verschillend tempo voor diverse (materiaal)stromen, segmenten en gebieden: in 2025 staan we gemiddeld op 50%.	Interlinked CA CE ET NI Geographical Physical Project-based Synergy
31	Duurzaamheid-sagenda Almere (2020)	Alm. SU	Het beheren van de stad heeft de afgelopen jaren een grote sprong gemaakt richting circulair, ecologisch en klimaat adaptief beheren. Er is veel geëxperimenteerd, en pilots zijn succesvol afgesloten. Klimaatadaptatie in de regenboogbuurt, circulaire speeltoestellen, betonpuin dat naar de groene beton centrale gaat. Het beheer & groot onderhoud is in 2030 volledig duurzaam, in 2025 is dat gemiddeld 50%. Onder volledig duurzaam verstaan we tenminste energie neutraal, ecologisch beheer van de openbare ruimte - met mogelijk voedselproducerende openbaar groen - en zoveel mogelijk hergebruik van materialen. De uitdaging ligt nu bij het opschalen naar een grootschalige toepassing in het beheer van de gehele stad, en steeds meer materiaalstromen die efficiënt hergebruikt kunnen worden.	Interlinked CA CE ET NI Physical Synergy
32	Duurzaamheid-sagenda Almere (2020)	Alm. SU	Een gezond, divers en veerkrachtig stedelijk ecosysteem, met extra zorg voor de toekomstige stedelijke verdichtingsopgaves. Een gevarieerde beplanting draagt bij aan een grotere variatie en aantallen insecten, vogels en zoogdieren in de stad;	Interlinked CA NI Physical Synergy
33	Duurzaamheid-sagenda Almere (2020)	Alm. SU	Almere kan haar netwerk van groen en water in en om de stad nog efficiënter inzetten om de klimaatuitdagingen van de toekomst, zoals hitte en droogte, het hoofd te bieden door het robuuste systeem met voldoende groen en water duurzaam in stand houden. Het netwerk van bossen, parken en plantsoenen vormen immers de groene longen en de 'koelelementen' van Almere. Ze bieden natuurlijke beschutting tegen de elementen en vangen het teveel aan water op. In de stad zorgen bomen en beplanting voor verkoeling en dragen zo bij aan een prettig leefbare stad.	Interlinked CA EH NI Geographical Physical Synergy
34	Duurzaamheid-sagenda Almere (2020)	Alm. SU	Ook inwoners van Almere kunnen bijdragen aan klimaatadaptatie. In de transitie naar meer duurzaam gedrag kan de gemeente daar publiciteit aan geven en haar inwoners nog beter van informatie voorzien. Niet alleen over de klimaatveranderingen maar ook over de initiatieven in Almere die effecten verminderen zoals wadi's (hoe werken ze?) en het planten van grote bomen (hittereductie).Ook stimuleert Almere de vergroening van tuinen en daken zodat water beter vastgehouden kan worden en daarmee bijdraagt aan de waterberging bij hoosbuien en verdroging voorkomt.	Interlinked CA EH NI Geographical Physical Synergy
35	Woonvisie Almere (2020)	Alm. HO	Door de klimaatsverandering is te verwachten dat het aantal en de intensiteit van hoosbuien zal toenemen. Ook zijn er meer hittegolven te verwachten. Daar willen we in het ontwerp van nieuwe wijken en bij nieuwe plannen voor bestaande wijken rekening mee houden. Dat kan bijvoorbeeld door meer beplanting toe te voegen en minder verhard oppervlakte aan te leggen. Ook bij het bouwen van woningen kan rekening gehouden worden met de klimaatsverandering. Hierbij kan gedacht worden aan groene daken en groene gevels, voor waterberging en verkoeling. Een bijkomend voordeel is een positief effect op biodiversiteit in de stad.	Interlinked CA NI Geographical Physical Synergy
36	Woonvisie Almere (2020)	Alm. HO	Almere kan haar netwerk van groen en water in en om de stad nog efficiënter inzetten om wateroverlast of juist hitte en droogte het hoofd te bieden door het robuuste systeem met voldoende groen en water duurzaam in stand houden. Het netwerk van bossen, parken en plantsoenen vormen immers de groene longen en de 'koelelementen' van Almere. Ze bieden natuurlijke beschutting tegen de elementen en vangen het teveel aan water op.In de stad zorgen bomen en beplanting voor verkoeling en dragen zo bij aan een prettig leefbare stad.	Interlinked CA EH NI Geographical Physical Synergy

37	Almere stad met toekomst (2021)	Alm. IE	Groen en water blijven naar de toekomst toe een elementair onderdeel van het DNA van Almere. De stad is trots op deze groene, duurzame erfenis. Een kwaliteit die ook als springplank dient naar een geactualiseerde versie van een groene en gezonde stad. Zo kunnen, met een mix van bestaande kwaliteiten én met nieuwe inzichten en toevoegingen, de uitdagingen van morgen het hoofd geboden worden. Groen en water vormen een bewezen en vertrouwde basis voor de snel veranderende leefomgeving van mens, plant en dier.Een leefomgeving die steeds meer onder druk komt te staan door de gevolgen van klimaatverandering. De aanwezige stadsnatuur biedt gelukkig oplossingen voor die klimaatverandering en het verlies van biodiversiteit. Diezelfde natuur biedt eveneens kansen voor hergebruik en circulariteit. Groen in verschillende verschijningsvormen draagt bij aan het welzijn en de gezondheid van de inwoners van Almere en vormt de kern van haar imago.In Almere lopen landschap en stad in verschillende gradaties en met verschillende thematische accenten naadloos in elkaar over. Het groen en het water worden volop gebruikt door inwoners en bezoekers. De stad loopt voorop op het gebied van duurzaamheid.Dat is te zien in het straatbeeld; in duurzaam ontwikkelde stadswijken, bij natuurinclusieve bouw en in het centrum, waar veel ruimte voor innovatieve en circulaire bedrijvigheid is.De groene kwaliteiten van Almere manifesteren zich ook in 2050 onverminderd in het omliggende landschap en vice versa. Tussen de groene kwaliteiten op grotere, regionale schaal en Almere is een duidelijke relationele band blijven bestaan. Die is, waar dat mogelijk was, ook verder versterkt. De wisselwerking tussen stad en de kwaliteiten van het omringende landschap zijn ook sturend en bepalend geweest bij de uitwerking van de plannen voor en de profilering van nieuwe gebieden als Almere Pampus en de Baai van de MRA.	Interlinked CA CE EH NI Geographical Synergy
38	Almere stad met toekomst (2021)	Alm. IE	Bouwen aan Almere betekent daarmee ook bouwen aan natuur en groen. Die koppeling is essentieel om zo, ook in de toekomst, een aantrekkelijke en aangename groene stad te kunnen blijven. De principes onder en gedachten over de relatie van stad en groen zijn in de loop der jaren op bepaalde punten wel gewijzigd of aangevuld.Naast de evidente meerwaarde van het wonen in of nabij groen - zoals rust, sport en ontspanning en de verhoogde woonkwaliteit zijn daar de laatste jaren ook nieuwe betekenissen en waarden aan toegevoegd. Denk aan de betekenis voor de biodiversiteit, de ruimte die het de klimaatadaptatie biedt, het belang voor gezondheid en leefbaarheid én de mogelijkheden voor voedselproductie.Het vergroten van de ecologische waarden en de biodiversiteit in de stad is een grote opgave. Die strekt zich uit van de openbare ruimte tot aan en zelfs in gebouwen. Voortdurend moet het toevoegen van kwaliteit het uitgangspunt zijn. Want alleen zo kunnen doelen op het gebied van, bijvoorbeeld, meer biodiversiteit ook daadwerkelijk gehaald worden. Het overtuigd streven naar en werken aan een dynamische en robuuste groenblauwe structuur kan de stad extra en geactualiseerde kwaliteiten als groene stad opleveren, zoals wateropvang, verkoeling en natuurlijk een aantrekkelijke leefomgeving voor mens en dier. Door de kwaliteiten van de stadsnatuur uit te breiden en goed te beheren kan de betekenis van het groenblauwe raamwerk zo verder toenemen.	Interlinked CA CE EH NI Geographical Synergy
39	Almere stad met toekomst (2021)	Alm. IE	Ook in nieuwe stadsdelen wordt deze ambitie, zoveel als mogelijk, vanaf de aanvang meegenomen en wordt tevens ingezet op klimaatneutrale bouw. Bij de ontwikkeling van energie-, watervoorziening- en telecomnetwerken wordt ingezet op meer decentrale netwerken. Deze zijn minder kwetsbaar dan centraal aangestuurde systemen, bijvoorbeeld in het geval van overstromingen. Decentrale netwerken bieden bovendien goede mogelijkheden voor de energietransitie en circulariteit. In de stad die er al is zullen de veranderingsprocessen op dit gebied meer geleidelijk verlopen en wordt per wijk bekeken welke oplossingen het meest passend zijn.	Interlinked CA CE ET Geographical Physical Synergy
40	Almere stad met toekomst (2021)	Alm. IE	Maatregelen op gebouwniveau, zoals betere isolatie, zonnepanelen op het dak, groene daken én individuele en collectieve duurzame warmteoplossingen zijn in elk geval kansrijk. Op gebiedsniveau moet gedacht worden aan het vergroenen van de openbare ruimte, het vervangen van verhard straatoppervlak door onverhard materiaal, het fijnmaziger maken van het groenblauwe raamwerk en het aansluiten op warmte- en koelnetten.	Interlinked CA ET Geographical Physical Synergy
41	Visie openbare ruimte Almere (2021)	Alm. IE	e weten dat er in de toekomst steeds langere perioden van droogte en hitte zullen zijn en dat er steeds vaker sprake zal zijn van extremere regenbuien. Deze ontwikkeling betekent een grote uitdaging om onze stad in de toekomst leefbaar te houden voor mens, plant en dier. Onze openbare ruimte speelt hier een belangrijke rol in. Tegelijkertijd moet er in de openbare ruimte ook ruimte gemaakt worden voor de energietransitie en duurzamere vormen van mobiliteit.Daarnaast moeten we in de toekomst zuiniger omgaan met onze grondstoffen. We hebben dan ook een forse opgave om de komende jaren onze openbare ruimte te verduurzamen.	Interlinked CA CE ET MT Geographical Challenge
42	Visie openbare ruimte Almere (2021)	Alm. IE	Almere laat nu al zien wat er mogelijk is op het gebied van een duurzame openbare ruimte. Hier bouwen we op voort. Wij willen toe naar een openbare ruimte die grotere perioden van hitte, droogte en extremere regenbuien aan kan. Een openbare ruimte met een robuust ecosysteem met een grote diversiteit aan planten en dieren en waar de stedelijke omgeving verbonden is met de groene hoofdstructuur van de stad. Een openbare ruimte die zoveel mogelijk gebouwd is met hergebruikte en lokale grondstoffen. Een openbare ruimte die inspeelt op de groei van CO2-arm vervoer en de energietransitie. De lokale ondernemers en kenniscentra hebben hierin een actieve rol als innovator en producent. Zo benutten we jong talent en bieden we kansen aan lokale starts-ups.	Interlinked CA CE EH ET NI Geographical Synergy
43	Visie openbare ruimte Almere (2021)	Alm. IE	Alhoewel we eerst zorgdragen voor een goede basis van de openbare ruimte streven we meer na. Met het beheren van de openbare ruimte kunnen we waarde toevoegen aan de openbare ruimte. Dat betekent dat we niet alleen maar letten op de veiligheid, functionaliteit en kosten, maar ook attent zijn op de waarde die onze assets zouden kunnen toevoegen aan de kwaliteit van de openbare ruimte voor de bewoner en gebruiker. Hiermee bedoelen we dat we in onze keuzes en afwegingen, ook meewegen wat onze beheerinspanning extra kan bijdragen aan bijvoorbeeld een gezondere leefstijl, meer mogelijkheden voor ontmoeting en recreatie of een klimaat bestendigere openbare ruimte. Met deze waardetoevoegingen kunnen we met het beheer bijdragen aan de drie opgaven die we in hoofdstuk 2 hebben geformuleerd. Hiervoor hebben we op basis van de drie opgaven drie beheerambities geformuleerd met onder elke ambitie beheermaatregelen die genomen kunnen worden:	Interlinked CA EH Geographical Synergy
44	Visie openbare ruimte Almere (2021)	Alm. IE	Groen en water zijn altijd dichtbij. Onze wijk- en stadsparken hebben we nodig om te ontspannen, te bewegen en te ontmoeten. Daarom gaat hier de prioriteit uit naar de gezonde en sociale ambitie. Vervolgens geven we aandacht aan de duurzaamheidsambitie omdat het groen en water van belang zijn om klimaateffecten op te vangen en ruimte bieden voor planten en dieren.	Interlinked CA EH NI Geographical Synergy

45	Visie openbare ruimte Almere (2021)	Alm. IE	Almere groeit niet alleen meer door in nieuwe gebieden te bouwen, maar steeds meer door in de bestaande stad te bouwen. De druk op de bestaande openbare ruimte neemt hierdoor toe.Daarnaast zien we, zoals in hoofdstuk 1 en 2 al is omschreven, grote transities op ons afkomen die van grote invloed zijn op de openbare ruimte. Bijvoorbeeld op het gebied van energie voorziening, klimaat en ecologie. Die vragen om een andere manier van gebiedsontwikkeling waarbij beheer, ontwerp en realisatie van gebiedsontwikkelingen nauwer met elkaar samen werken. We moeten beherend gaan ontwerpen en ontwerpend gaan beheren.	Interlinked CA ET NI Geographical Challenge
46	Visie openbare ruimte Almere (2021)	Alm. IE	Het is essentieel om een schaalsprong te maken in ons databeheer. We willen data integraal kunnen benutten om inzicht te hebben in de effecten van verdichting op de boven- en ondergrond.We willen real time inzicht hebben in het hergebruik en de mogelijkheden daartoe van materialen, in de effecten van droogte en hitte, en van vuil- en schoonwaterstromen. En ook real time inzicht in meldingen van bewoners en het gebruik van de openbare ruimte. Om veel meer met data te kunnen doen, hebben we een integraal systeem nodig waar we real time en in 3D als de 'digital twin city', op de totale openbare ruimte kunnen sturen. We hoeven in deze ontwikkeling niet voorop te lopen, zodat we tevens ontwikkelingskosten vermijden.	Interlinked CA CE Informational Synergy
47	Visie openbare ruimte Almere (2021)	Alm. IE	De ambities met betrekking tot de openbare ruimte zijn de afgelopen jaren sterk toegenomen, zonder dat hiervoor extra budget beschikbaar is gekomen. Daardoor moet het klimaatadaptief, circulair, inclusief, leefbaar en biodivers maken van de openbare ruimte binnen bestaand budget worden opgelost. Soms lukt dit, maar vaker leidt dit toch tot hogere kosten, waardoor achterstanden verder oplopen.	Interlinked CA CE NI Geographical Physical Challenge
48	Lelystadse Adapatie Strategie (2023)	Lel. CA	Klimaat adaptieve maatregelen en het versterken van biodiversiteit gaan hand in hand. We gaan uit van 'groen, tenzij': alleen waar noodzakelijk passen we elementen verharding (tegels, klinkers) of gesloten verharding (asfalt, beton) toe.	Interlinked CA NI Geographical Physical Synergy
49	Lelystadse Adapatie Strategie (2023)	Lel. CA	We hanteren een integrale aanpak. Een klimaat adaptieve inrichting wordt integraal opgepakt met andere opgaves zoals water- en riolering, beheer en onderhoud, groenbeheer, vastgoed, energie transitie, gezond heid en mobiliteit. Op deze manier maken we werk-met-werk, zijn de kosten beperkter en is er minder overlast van werkzaamheden.	Interlinked CA ET Geographical Project-based Synergy
50	Lelystadse Adapatie Strategie (2023)	Lel. CA	Lelystad is ontworpen als parkstad. Het is één van de groenste steden van Nederland: 33% van het Lelystadse grondgebied is bos of open natuurlijk terrein (t.o.v. 14% voor een gemiddelde Nederlandse stad). In de stad is een netwerk van watergangen. Dat biedt kansen voor efficiënte opvang van grote hoeveelheden hemelwater bij piekbuien, waarbij de sloten als een soort tijdelijke badkuip gebruikt worden. De bebouwde kom van Lelystad grenst voor een groot deel aan groene randen zoals het nationaal park Nieuw Land, het Zuigerplas bos en het Gelderse Hout. Deze gebieden en de Lelystadse kust bieden ook een groot aanbod van recreatieve mogelijkheden en verkoeling buiten de bebouwde omgeving. Het zichtbaar maken en uitbouwen van de "groe ne vingers" in de stad, en een plaats bij de top-5 van de meest groene gemeenten van Nederland in 2026 zoals omschreven in de Opgave Natuur bieden optimale kansen voor een klimaat adaptieve inrichting.	Interlinked CA NI Geographical Physical Synergy
51	Lelystadse Adapatie Strategie (2023)	Lel. CA	We hanteren een integrale aanpak. Een klimaat adaptieve inrichting wordt integraal opgepakt met andere opgaves zoals water- en riolering, beheer en onderhoud, groenbeheer, vastgoed, energie tran sitie, gezondheid en mobiliteit. Op deze manier maken we werk-met-werk, zijn de kosten beperkter en is er minder overlast van werkzaamheden.	Interlinked CA ET Geographical Project-based Synergy
52	Lelystadse Adapatie Strategie (2023)	Lel. CA	Op langzaam-verkeersroutes (fietsen en wandelen) is er 40% schaduw door bomen, gebouwen of structuren;	Interlinked CA EH MT Geographical Physical Synergy
53	Lelystadse Adapatie Strategie (2023)	Lel. CA	Bij nieuwe ontwikkelingen en vervanging is het uitgangspunt om klimaatbestendig en natuurinclusief te bouwen en vervangen	Interlinked CA NI Geographical Project-based
54	Lelystadse Adapatie Strategie (2023)	Lel. CA	De basiskwaliteiten van de parkstad Lelystad zijn uitermate geschikt voor een robuuste, klimaat adaptie ve inrichting. We maken gebruik van deze basiskwaliteiten. Een groene en diverse leefomgeving bevor dert onze gezondheid en ons welzijn;	Interlinked CA EH Geographical Synergy
55	Lelystadse Adapatie Strategie (2023)	Lel. CA	Met passend (extensief) beheer van de bodem voorkomen we bodemverdichting en bevorderen we een gezond bodemleven. Dit bevordert de sponswerking van de bodem waardoor deze meer water kan opne men en vasthouden;	Interlinked CA NI Physical Synergy
56	Lelystadse Adapatie Strategie (2023)	Lel. CA	Bij aanplant van nieuw publiek groen wordt rekening gehouden met de biodiversiteitswaarde en water beschikbaarheid in een veranderend klimaat. We zetten in op robuuste soorten waarvan we verwachten dat ze bestand zijn tegen een veranderd klimaat. Dat kunnen dus ook niet-invasieve soorten zijn die hier nu (nog) niet voorkomen, maar wel goed passen of geschikt zijn in het toekomstige klimaat;	Interlinked CA NI Physical Synergy

57	Lelystadse Adapatie Strategie (2023)	Lel. CA	Bij nieuwe ontwikkelingen wordt het raamwerk van de ecologische verbindingszones versterkt.	Interlinked CA NI Geographical Synergy
58	Lelystadse Adapatie Strategie (2023)	Lel. CA	Inwoners weten vaak niet goed wat ze kunnen doen en welke acties effectief zijn. Maak daarom klimaat adaptatie zo eenvoudig, concreet en laagdrempelig mogelijk. Het is daarbij goed om helder te maken welke kleine acties een groter doel dienen. Hierin ligt een zekere overlap tussen wijkgerichte aanpakken voor circulariteit, biodiversiteit en de energie- & warmtetransitie.	Interlinked CA CE ET NI Informational Project-based Synergy
59	Lelystadse Adapatie Strategie (2023)	Lel. CA	Lelystad, de hoofdstad van de Nieuwe Natuur. Het groene karakter van Lelystad biedt een enorm strategi sche uitgangspositie voor klimaat adaptatie. We gebruiken de groenblauwe netwerken in en rondom de stad als berging en voorraad van zoet water. We verbinden het stedelijk groen nog beter met de grote natuurge bieden rondom de stad. Klimaat adaptatie zal daarom een onderdeel zijn binnen de nog op te stellen Agen da Natuur. De maatregelen die we nemen om te komen tot een klimaat adaptieve inrichting gaan hand-in hand met het versterken van de biodiversiteit. Hoe we dat precies zullen doen zullen we verder uitwerken passend bij de opgaven binnen de Agenda Natuur. Te denken valt aan het inzetten op verdere versterking en kwaliteit van het aanwezige groen in de stad, het gebruik van zoveel mogelijk vaste planten en het inzetten op soorten die een bijdrage leveren aan de biodiversiteit, robuust zijn onder klimaatverandering en langere perioden van droogte of wateroverlast overleven. Daarbij is het mogelijk dat kosten verschuiven van hogere initiële investeringskosten naar lagere onderhouds- en beheerkosten.	Interlinked CA NI Geographical Physical Synergy
60	Lelystadse Adapatie Strategie (2023)	Lel. CA	Lelystad heeft te maken met wijken met een sociaal zwakke structuur, bovengemiddelde jeugdzorg problematiek en een achterblijvend gemiddeld inkomensniveau per inwoner ten opzichte van het landelijk gemiddelde. Vooral in de oudere wijken van de 70- en 80-er jaren wonen relatief veel kwetsbare groepen inwoners. Klimaat adaptatie wordt vaak gezien als fysieke, ruimtelijke opgaven. Toch heeft het juist veel te bieden in het sociale domein. Klimaat adaptieve maatregelen zorgen voor een groenere omgeving waar mensen recreëren, elkaar ontmoeten en spelen. Groen maakt inwoners gelukkiger en gezonder.	Interlinked CA EH Geographical Synergy
61	Lelystadse Adapatie Strategie (2023)	Lel. CA	We zetten daarom klimaat adaptatie in om een prettige en gezonde leefomgeving te realiseren in de wijken.Onderdeel van het IHP en ook genoemd in het Actieplan Duurzaamheid is de toename van groene school pleinen. Op groene schoolpleinen kunnen kinderen fijn spelen in het groen, wordt minder gepest, en het creëert bewustwording van ouders rond het thema. Een groen schoolplein biedt ook mogelijkheden om educatie over groen en klimaat in het lesprogramma te verweven. De prioriteit ligt in wijken waar mensen deze gezonde leefomgeving het meest kunnen gebruiken en de minste middelen hebben om dat zelf te realiseren. Vergroening en klimaat adaptieve maatregelen kunnen mits goed uitgevoerd een bijdrage leve ren aan het opwaarderen van de ruimtelijke kwaliteit. En dat nodigt dan weer andere activiteiten uit, zoals recreëren en ontmoeten. Zo realiseren we een win-win op gebied van klimaat adaptatie, socia le cohesie én gezondheid.	Interlinked CA EH Geographical Synergy
62	Lelystadse Adapatie Strategie (2023)	Lel. CA	In veel gemeenten wordt klimaat adaptatie gekoppeld aan de andere duurzaamheidsopgaven zoals de ener gie transitie, circulaire economie en duurzame mobiliteit. Ook in het Actieplan duurzaamheid van Lelystad staat klimaat adaptatie als onderdeel van het speerpunt “fysieke leefomgeving”. Klimaat adaptieve maatre gelen dragen bij aan andere duurzaamheidsdoelen. Denk daarbij aan isolatie van huizen (goed tegen hitte in de zomer), groene gevels (verdere isolatie in de winter), groene daken (hoger rendement van zonnepa nelen), elektrische deelauto’s (minder auto’s en parkeerplekken in de fysieke buitenruimte creëert ruimte voor water, groen en speelmogelijkheden), etc.	Interlinked CA EH ET MT Geographical Physical Synergy
63	Lelystadse Adapatie Strategie (2023)	Lel. CA	Natuur en groenbeheer zijn essentieel om de adaptatieopgave te realiseren. We zetten in op robuuste beplanting, versterken van groenblauwe structuren en we onderzoeken nieuwe vormen van beheer en onderhoud.	Interlinked CA NI Geographical Physical Synergy
64	Lelystadse Adapatie Strategie (2023)	Lel. CA	Met een wijkgerichte aanpak bij klimaat adaptatie realiseren we een win-win op gebied van klimaat adaptatie, sociale cohesie én gezondheid.	Interlinked CA EH Project-based Synergy
65	Lelystadse Adapatie Strategie (2023)	Lel. CA	Klimaat adaptatie maatregelen zijn vaak te koppelen met andere duurzaamheidsthema’s zoals her nieuwbare energie, isolatie of duurzame mobiliteitsvormen.	Interlinked CA ET MT Geographical Synergy
66	Lelystadse Adapatie Strategie (2023)	Lel. CA	De maatregelen om Lelystad klimaat adaptief in te richten kunnen in sommige gevallen gaan vragen om extra investeringen. Het is de kunst om deze investeringen zo strategisch mogelijk te doen. We focus sen op de meerwaarde en baten van klimaat adaptatie voor veiligheid, welzijn en gezondheid. Zo laten we zien dat we onze gemeentelijke taak om voor een veilige leefomgeving te zorgen serieus nemen. We brengen de kosten van een klimaat adaptieve inrichting in beeld en wegen ze af tegen de, voor de ge meente relevante, verwachtte schade op lange termijn. Waar nodig, investeren we wat extra op korte termijn, omdat we weten dat dit op de langere termijn veel schade en (verborgen) meerkosten scheelt.	Interlinked CA EH Geographical Synergy

67	Lelystadse Adapatie Strategie (2023)	Lel. CA	Klimaat adaptieve maatregelen en het versterken van biodiversiteit gaan hand in hand. We gaan uit van 'groen, tenzij', alleen waar noodzakelijk passen we elementen verharding (tegels, klinkers) of gesloten verharding (asfalt, beton) toe.	Interlinked CA NI Geographical Physical Synergy
68	Lelystadse Adapatie Strategie (2023)	Lel. CA	Deze strategie bevat vijf leidende principes voor klimaat adaptieve inrichting. We versterken de biodiver siteit, en gaan samenwerkend, effectief en integraal te werk volgens de methode van comply or explain;	Interlinked CA NI Geographical Synergy
69	Lelystadse Adapatie Strategie (2023)	Lel. CA	We focussen op de meerwaarde en baten van klimaat adaptatie voor veiligheid, welzijn en gezondheid.Zo laten we zien dat we onze gemeentelijke taak om voor een veilige leefomgeving te zorgen serieus nemen	Interlinked CA EH Geographical Synergy
70	Lelystadse Adapatie Strategie (2023)	Lel. CA	Op dit moment lopen we ook een proces met betrekking tot het opstellen van de Agenda Natuur. De Agenda Natuur biedt het fundament voor de gemeentelijke inzet op de opgave Natuur. Het beantwoordt de vraag: wat is ervoor nodig om de kwantiteit en kwaliteit van de natuur in Lelystad te verbeteren met als resul taat een gezond leefklimaat voor onze inwoners en hiermee het profiel van Lelystad als hoofdstad nieuwe natuur te versterken en uit te dragen? De LAS is nauw verbonden met de Agenda Natuur waarbij we in de uitvoering voor een goede afstemming en uitvoering zorgen.	Interlinked CA EH NI Informational Synergy
71	Lelystadse Adapatie Strategie (2023)	Lel. CA	Andere ambities waar de LAS op voortbouwt zijn het reeds vastgestelde koersdocument en de IVO 1.0 waarin staat dat Lelystad zich ontwikkelt op een duurzame, klimaatbestendige en energie neutrale manier door kwaliteitsimpuls in het groen. In het Uitvoeringsplan Lelystad Next Level is omschreven dat Lelystad inzet in op het kwalitatief groeien van de stad. Door groene urbanisatie met een duurzame insteek: natuur inclusief, klimaat adaptief, energieneutraal en circulair. "Klimaatrobuustheid" wordt hierbij genoemd als randvoorwaardelijk. Lelystad heeft het in zich de hoofdstad van de nieuwe natuur te worden en kan een voorloper zijn in het klimaat robuust ontwikkelen van een stedelijk gebied verbonden met de natuur. Hier ligt vanzelfsprekend ook een relatie met de Agenda Natuur, de LAS zal hier een onderdeel van uitmaken.	Interlinked CA CE ET NI Geographical Synergy
72	Gemeentelijk rioleringspro-gramma 2022-2031 (2022)	Lel. WM	Kernformulering van het hemelwaterbeleid Hemelwater is schoon daarom willen we dit nuttig toepassen. Daarom zamelt de Gemeente Lelystad het hemelwater, dat op verharde oppervlakken binnen de bebouwde kom valt, apart van het afvalwater in en voert dit af naar oppervlaktewater. Daar waar mogelijk, o.a. buiten de bebouwde kom, wordt hemelwater op eigen terrein benut of direct op het oppervlaktewater geloosd. Overlast door extreme buien wordt zoveel als mogelijk is voorkomen.	Interlinked CA CE Geographical Physical Synergy
73	Gemeentelijk rioleringspro-gramma 2022-2031 (2022)	Lel. WM	Een gebiedsgerichte uitwerking van het gemeentelijke beleid per buurt tot op perceel niveau wordt opgesteld in de looptijd van dit GRP en opgenomen in het omgevingsplan en het Digitaal Stelsel Omgevingswet (DSO). Het beleid voor hemelwater wordt opgebouwd via de voorkeursvolgorde: • Schoonhouden; • Benutten; • Vertragen; • Infiltreren; • Lozen; • Inzamelen.	Interlinked CA CE Physical Synergy
74	Gemeentelijk rioleringspro-gramma 2022-2031 (2022)	Lel. WM	Correcte gegevens van het te beheren areaal vormen de basis voor goed beheer. De gemeente Lelystad gebruikt het beheerpakket 'Kikker' voor de gegevens van riolen, inspectieputten, kolken en aansluitleidingen. Voor het gemalenbeheer wordt gebruik gemaakt van het beheerpakket 'SAM' en voor de aansturing van de gemalen van 'C.A.R.S.'. Deze gegevens moeten correct zijn, maar zijn dat niet altijd. Veranderingen en aanpassingen dienen snel verwerkt te worden. Immers, kennis van het systeem en de werking ervan zijn de basis voor een goed begrip en daarmee kan adequaat op veranderende situaties worden ingespeeld. Voor de komende jaren is dit een speerpunt. Enerzijds vanwege de betrouwbaarheid van de data en anderzijds vanwege de eenduidigheid. In het verleden noemden we betrouwbaarheid Inhoudsopgave Terug naar: 'de basis op orde', of 'areaal op orde', mede omdat veel keuzes in het beheer belang hebben bij goede en vooral betrouwbare informatie.Eenduidigheid is van belang, omdat in het beheer van stedelijk water en riolering gegevens steeds belangrijker worden. Meerdere ketenpartijen zijn betrokken bij het beheer van stedelijk water en riolering, denk hierbij aan gemeenten, bedrijven en waterschappen. Het doelmatig managen van (afval)watersystemen vereist een gemeenschappelijke taal. Ook de maatschappelijke opgaven zoals klimaatadaptatie, energietransitie en de bouwopgave vereisen een (digitale) integrale aanpak, waarbij gezamenlijke gegevensdefinities een voorwaarde zijn. Sinds 23 maart 2020 zijn overheden in dat kader verplicht om te voldoen aan het gegevenswoordenboek stedelijk water (GWSW). Het beheersysteem van de Gemeente Lelystad voldoet daar op dit moment niet aan. Daarom zetten we hier de komende jaren op in om dit medio 2025 af te ronden. Ook daarna vraagt het op orde houden van de data om blijvende aandacht.	Interlinked CA ET Informational
75	Gemeentelijk rioleringspro-gramma 2022-2031 (2022)	Lel. WM	Het besluit om een rioolbuis te vervangen staat niet op zichzelf. Gezien de consequenties van de rioolvervanging qua omvang van de werkzaamheden (straat open, brede sleuf en wegdek vervangen) hangt het besluit samen met andere aspecten die spelen in de openbare ruimte, zoals de kwaliteit en ouderdom van de weg, plannen om de openbare ruimte anders in te richten, toegankelijkheid, duurzaamheid en mogelijk toekomstige opgaven in het kader van de energietransitie, zoals aanleggen van een warmtenet of uitbreiding van het elektriciteitsnet.	Interlinked CA ET Project-based
76	Nota Samen gezond in Lelystad (2019)	Lel. HE	Een voorwaarde om prettig en veilig te blijven wonen in de eigen omgeving is een omgeving die is aangepast aan wat ouderen nodig hebben. Een aandachtspunt is de beschikbaarheid van passende woningen en woonvormen in Lelystad. Denk hierbij aan woonvormen die sociale cohesie bevorderen (bijvoorbeeld hofjes) en initiatieven die laagdrempelige ondersteuning aan huis bevorderen (bijvoorbeeld Lang zult u wonen). Ook is het belangrijk om de juiste condities te creëren voor ouderen om zich veilig en vlot te kunnen verplaatsen.Denk aan de begaanbaarheid van straten en stoepen, verbindingen die korte routes faciliteren, maar ook een omgeving die bijdraagt aan het veiligheids- en leefbaarheidsgevoel in de wijk (bijvoorbeeld veel groen, voldoende verlichting en ruimte). Concreet is een koppeling naar het traject Lelystad senioren proof hier relevant. Maar in zijn algemeenheid is het structureel en op passende wijze opnemen van 'gezondheid' en 'leefstijl' als items in ruimtelijke beslissingen een beweging die wij in Lelystad verder vorm willen geven.	Interlinked CA EH NI Geographical Synergy

77	Sport- en Beweegvisie 2023-2030 (2022)	Lel. HE	3% van het bebouwde oppervlak inzetten voor speelruimte is een gangbare norm (Jantje Beton).In Lelystad is het groen en het water (hoofdstad van de nieuwe natuur) een krachtsbron, een positieve factor. Hierbij past ook een hogere norm qua percentage spelen en verblijven. We stellen daarom voor de norm te verhogen naar 5%. Tevens willen we voorstellen dat elk kind (minimaal 90% van de kinde ren vallen binnen de norm) binnen 200 meter een buurtvoorziening kan vinden en binnen 500 meter een wijkvoorziening. De insteek is: kwaliteit van de speelruimte is divers en daagt uit en bestaat het liefst uit natuurlijke elementen en groen.	Interlinked CA CE EH NI Geographical Physical Synergy
78	Sport- en Beweegvisie 2023-2030 (2022)	Lel. HE	Dit speerpunt sluit aan bij het raadsakkoord 2022 – 2026 en de doelen vanuit de omgevingsvisie die gericht zijn op een aantrekkelijke en beweegvriendelijke leefomgeving. In de Natuur Agenda wordt gewerkt aan het aantrekkelijker ma ken van de groene en blauwe kracht van Lelystad. De openbare ruimte nodigt uit tot bewegen, ontmoeten, verblijven en gezond gedrag bij inwoners van alle leeftijden. Het gaat onder meer over voldoende functioneel groen in de wijken, aantrekkelijke en multifunctionele verblijfplekken, veilige fietspaden, uitnodigende wandelroutes en aantrekkelijke en toegankelijke sport- en speelplekken met een divers aanbod aan beweegaanleidingen. We zien dit als een kans om sport- en beweegmogelijkheden en recreatieve mogelijkheden toe te voegen aan de stad, zeker gezien de hoeveelheid groen en water in en om de stad. We vinden het belangrijk dat recreatief water toegankelijk is en blijft.	Interlinked CA EH MT NI Geographical Synergy
79	Strategie Agenda Natuur (2023)	Lel. EC	Hoofdstad van de Nieuwe Natuur in 2040 (Omgevingsvisie) 'De stad biedt ruimte voor duurzame ontwikkeling. Er is fors geïnvesteerd in natuur rond de stad en deze is verbonden en verweven met het wonen in de bestaande stad door groene inprikkers en stadsparken. Lelystad heeft het groen benut voor de verduurzaming van de stad. Lelystad biedt een gezonde leefomgeving: ener zijds door gezondheidsbescherming (milieueffecten en externe veiligheid) en anderzijds door gezondheidsbe vordering (stimuleren van gezond gedrag door bijvoor beeld meer beweging in de stad te stimuleren). De groene verstedelijking is hiervan de ruimtelijke uitwer king.'	Interlinked CA EH MT NI Geographical Synergy
80	Strategie Agenda Natuur (2023)	Lel. EC	In de Omgevingsvisie 1.0 (2021) is deze ambitie vertaald in ruimtelijke hoofdprincipes, waaronder een verwe venheid tussen stad en landschap. Een hoofdstad van nieuwe natuur met aantrekkelijke woonbuurten en vitale bewoners waarbij als algemene strategie is gekozen voor groene verstedelijking. Momenteel wordt er gewerkt aan een doorontwikkeling van deze visie. Daarin blijven de ruimtelijke hoofdprincipes leidend en zijn er richtingge vende principes op stads- en gebiedsniveau gemaakt die vooral moeten inspireren om vanuit bepaalde waarden een afweging te kunnen maken voor ruimtelijke ont wikkelingen. De groenstructuren zijn aangemerkt als belangrijke ruimtelijke structuren en hebben een stevige positie in het afwegingskader voor de verdere ontwikke ling van de stad.	Interlinked CA EH NI Geographical Synergy
81	Strategie Agenda Natuur (2023)	Lel. EC	Voor de kortere termijn is er door de Gemeenteraad in haar raadsprogramma het belang van natuur voor de stad onderschreven. Zij heeft uitgesproken trots te zijn op Lelystad als de hoofdstad van de nieuwe natuur en wenst er daarom meer bekendheid aan te geven en te investeren in projecten en maatregelen die deze status versterken. Dit wil de gemeente onder andere doen door in te zetten op natuurbeleving, de realisatie van een Ken niscentrum Nieuwe Natuur, versterking van de natuur in de stad, te zorgen voor soorten die belangrijk zijn voor het ecosysteem, duurzaam beheer en klimaatadaptatie.	Interlinked CA EH NI Geographical Synergy
82	Strategie Agenda Natuur (2023)	Lel. EC	Gezond en prettig leefklimaat: Natuurlijke omgevingen leveren op verschillende manieren een bijdrage aan het verhogen van de betrokkenheid van mensen en hun gezondheid. Meer natuur in de directe woonomgeving verbetert het welzijn van de mens en kan bijdragen aan sociale cohesie in de buurt. De vitaliteit en weerbaar heid van onze inwoners wordt verhoogd en positieve gezondheid wordt gestimuleerd. Er is een duidelijke samenhang tussen verduurzamingsopgaven, natuur herstel en versterking van de biodiversiteit. Klimaat adaptatie betreft de inzet om hittestress te vermijden en wateroverlast beter op te kunnen vangen. (Stede lijke) soorten zijn in evenwicht, zodat het ontstaan van ziekten en plagen tot een minimum beperkt wordt.	Interlinked CA EH NI Geographical Synergy
83	Strategie Agenda Natuur (2023)	Lel. EC	Klimaatadaptieve maatregelen en versterken biodi versiteit gaan hand in hand	Interlinked CA NI Geographical Synergy
84	Strategie Agenda Natuur (2023)	Lel. EC	Bij nieuwe ruimtelijke ontwikkelingen zetten we in op natuurinclusief, waarbij maatschappelijke en economi sche activiteiten 'verweven' zijn met de natuur. Hiervoor kijken we naar de gesteldheid van bodem-, water- en ecosysteem en zetten we in op activiteiten die geen ne gatieve effecten mogen hebben op natuurwaarden, dat er optimaal gebruik wordt gemaakt van wat de natuur te bieden heeft en dat bijgedragen wordt aan verster king van de natuur. Door een 'Basiskwaliteit Natuur' te hanteren geven we de natuur een stem. We creëren een set van condities die als basis nodig zijn om algemene soorten algemeen te laten zijn binnen het Lelystadse ecosysteem. Het soortenmanagementplan (SMP) is hierbij het wettelijke minimum.	Interlinked CA EH NI Geographical Project-based Synergy
85	Strategie Agenda Natuur (2023)	Lel. EC	We verstevigen de positie van (stads)natuur door het ontwikkelen van nieuwe groenblauwe verbindingen in de stad en van de stad naar het omliggende landschap.We werken de knelpunten en kansen voor natuur in deze ecologische verbindingen verder uit. De knelpun ten- en kansenkaarten dienen als input voor het ver nieuwde groenblauwe raamwerk dat wordt vastgelegd in de Omgevingsvisie 2.0. Deze verbindingen dienen zowel de mens (recreatie, verkoeling etc.) als plant en dier (migratie, leefgebieden etc.). Ook lossen we bestaande knelpunten in verbindingen op. In de stad geven we invulling aan een natuurinclusieve samen leving en optimaliseren we het groen(beheer). Groene buitenruime is immers belangrijk in (hoogstedelijke) woongebieden.	Interlinked CA EH NI Geographical Synergy
86	Strategie Agenda Natuur (2023)	Lel. EC	Aanleggen en inrichten van meer (gebruiks)groen in de wijken en daarbuiten	Interlinked CA EH NI Geographical Synergy

87	Strategie Agenda Natuur (2023)	Lel. EC	We sluiten aan op de principes en doelen uit de Lely stadse Adaptatie Strategie (LAS). Deze zijn onder te ver delen in vier thema's: de woonomgeving, werklocaties, groenblauwe structuren en toekomstbestendige land bouw. Vanuit het leidende principe dat klimaatadaptieve maatregelen hand in hand gaan met het versterken van de biodiversiteit hanteren we 'groen, tenzij'. Om inte graliteit te waarborgen en het meeste effect te berei ken, streven we naar gezamenlijke inspanningen.	Interlinked CA EH NI Geographical Physical Project-based Synergy
88	Strategie Agenda Natuur (2023)	Lel. EC	Het aanleggen van klimaat/waterbuffers, groene daken en groene gevels met zoveel mogelijk in heemse robuuste soorten.	Interlinked CA NI Physical Synergy
89	Strategie Agenda Natuur (2023)	Lel. EC	Diversifiëring van bestaande bossen met zoveel mo gelijk inheemse klimaatrobuuste soorten.	Interlinked CA NI Physical Synergy
90	Strategie Agenda Natuur (2023)	Lel. EC	Omvorming van 'zinloze' verharding naar groen	Interlinked CA EH NI Geographical Physical Synergy
91	Woonvisie Lelystad (2022)	Lel. HO	Lelystad wordt op een duurzame, klimaatbestendige en energie neutrale manier ontwikkeld. Veel groen in Lelystad ondergaat een kwaliteitsimpuls en biedt daardoor ruimte voor nieuwe maatschappelijke opgaven zoals klimaatadaptatie, de energietransitie en gezond bewegen in de stad. Lelystad ontwikkelt zich als een klimaat adaptieve en natuur inclusieve stad door goed beheer en de bewustwording van de Lelystedeling voor natuurbelang te vergroten.	Interlinked CA EH ET NI Geographical Synergy
92	Woonvisie Lelystad (2022)	Lel. HO	De inspanningen binnen de opgave wonen zijn onder meer gericht op de groei van de stad met een groot aantal woningen. Tegelijkertijd zal deze groei zodanig vorm moeten worden gegeven dat het karakter van hoofdstad van de nieuwe natuur eerder wordt verstrekt dan verzwakt. Lelystad is straks koploper op het gebied van klimaatadaptatie, natuur en biodiversiteit. Binnen deze opgave zijn klimaat adaptief en waterrobuust ontwerpen en ontwikkelen randvoorwaarden, leidend tot een versterking van de biodiversiteit en daarmee een betere leefomgeving. Dit heeft uiteraard ook gevolgen voor de groenblauwstructuur in de stad met genoeg ruimte voor de recreatiebehoefte en natuurbeleving van onze inwoners.	Interlinked CA EH NI Geographical Synergy
93	Woonvisie Lelystad (2022)	Lel. HO	n de openbare ruimte gaan klimaatadaptatie maatregelen samen met maatregelen voor de biodiversiteit. Zo kunnen we ervoor zorgen dat, in ieder geval de gebouwbewonende soorten, in een goede staat van instandhouding worden gebracht of gehouden. We betrekken inwoners om hen te stimuleren hun woning en tuin te vergroenen.	Interlinked CA NI Geographical Project-based Synergy
94	Woonvisie Lelystad (2022)	Lel. HO	Lelystad profileert zich als om hoofdstad van de nieuwe natuur en dit zichtbaar en beleefbaar te maken in de stad. De openbare ruimte zal zowel in de bestaande stad, als in de nieuwe woonomgevingen, een natuurlijker karakter krijgen. Het klimaat- en natuurinclusief bouwen en ontwikkelen wordt de standaard; binnen het natuurbeleid wordt hier een toetsingskader voor ontwikkeld in de vorm van een puntensysteem of een vorm van 'Ecological Return on Investment'. Het klimaat- en natuurinclusief bouwen en ontwikkelen geldt zowel voor maatregelen aan/in gebouwen als in de openbare ruimte.Naast de versterking van de biodiversiteit, zorgt deze natuurinclusieve ontwikkeling voor een gezonde en prettige leefomgeving en de wettelijke taak van het borgen van de goede staat van instandhouding van (beschermde) soorten. Er zal een catalogus ontwikkeld worden met mogelijkheden voor beschermde en specifiek Lelystadse soorten en een Soorten Management Plan opgesteld. De mogelijkheid dit te koppelen aan een gebiedsontheffing en Omgevingsplan, en daarmee (ver)bouwen eenvoudiger te maken, wordt onderzocht.	Interlinked CA EH NI Geographical Synergy
95	Woonvisie Lelystad (2022)	Lel. HO	In veel gevallen kan natuurinclusief samengaan met klimaatadaptatie en andere functies zoals recreatie.Hierbij komen in ieder geval aan de orde: de juiste boom op de juiste plaats, stadsbos, kort gras/gazons alleen indien functioneel, geen monoculturen, klimaat/waterbuffers met inheemse robuuste soorten, natuurdaken en gevelbegroening, infiltratievoorzieningen, open verhardingen. Onder andere door het koppelen van natuurinclusief met andere functies en doelen is efficiënter grondgebruik mogelijk en worden inrichtings- en beheerkosten beperkt.	Interlinked CA EH NI Geographical Physical Synergy
96	Woonvisie Lelystad (2022)	Lel. HO	Lelystad biedt ruimte voor experimenten, innovatieve architectuur, innovatieve bouwstijlen en ontwikkelingen om het behoud van grondstoffen te stimuleren, zoals demontabel en circulair bouwen met houtbouw en bio-based materialen. Daarbij worden natuur-inclusiviteit en klimaatadaptatie gezien als overlappende onderwerpen. Lelystad maakt dit mogelijk door zelf ook proeftuinen te ontwikkelen en26 bij nieuwbouw én bestaande bouw hierover afspraken te maken met ontwikkelaars en corporaties om deze manier van bouwen aan te jagen. Door adaptief te bouwen in de nieuwbouw en bij de ombouw van panden ontstaat er flexibiliteit in de bestaande bouw. Daarmee zetten we een extra stap in de verduurzaming richting de toekomst. Voor het bouwen van woningen streven we naar duurzaamheid en circulariteit, gebruik van materialenpaspoorten en het recyclen van grondstoffen. Hiermee houdt Lelystad al rekening met de toekomstige landelijke eis of regionale ambitie voor alle nieuwbouw.	Interlinked CA CE NI Geographical Synergy

97	Koersdocument Lelystad 2040 (2020)	Lel. IE	Lelystad wordt op een duurzame, klimaatbestendige en energie-neutrale manier ontwikkeld. Veel groen in Lelystad ondergaat een kwaliteitsimpuls en biedt daardoor ruimte voor nieuwe maatschappelijke opgaven, zoals klimaat adaptatie, energietransitie en gezond bewegen in de stad.	Interlinked CA EH ET Geographical Synergy
98	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Aantrekkelijke en gezonde buurten Ontwikkelen, bouwen en wijkvernieu wing gaan in Lelystad altijd samen met de ontwikkeling van natuur. Wie in Lely stad woont (zowel in nieuwbouw als de bestaande buurten), woont in of nabij de natuur. Dit levert onderscheidende, groene woonmilieus op, uniek in de MRA. Lelystad biedt ruimte voor nieuwe woonlandschap pen en het aantrekkelijker maken van de bestaande woonwijken, groen en duur zaam bouwen, ruimte voor collectief en particulier opdrachtgeverschap.Lelystad heeft een transitie in gang ge zet waarbij de gezondheid in de buurten centraal komt te staan (in plaats van de zorg). Dit strategisch traject zal de komen de twee decennia in beslag nemen. Binnen de nieuwe buurtaanpak wordt deze tran sitie in de zorg aangepakt in combinatie met de andere maatschappelijke thema's, zoals energietransitie, circulaire economie en duurzaamheid, groot onderhoud, kli maatadaptatie, gedeeld eigenaarschap en veiligheid. Centraal staat het concept 'po sitieve gezondheid'. Positieve gezondheid geeft een bredere kijk op gezondheid en zorg. Het gaat niet alleen om de lichame lijke aspecten, maar ook om het mentaal welbevinden en het dagelijks functioneren die beïnvloeden hoe gezond iemand zich voelt. Daarmee wordt het accent op de mens in plaats van op een ziekte of beper king gelegd.	Interlinked CA CE EH ET NI Geographical Project-based Synergy
99	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Hoofdstad van de Nieuwe Natuur De stad biedt ruimte voor duurzame ont wikkeling. Er is fors geïnvesteerd in natuur rond de stad en deze is verbonden en verweven met het wonen in de bestaande stad door groene inprikkers en stadspar ken. Lelystad heeft het groen benut voor de verduurzaming van de stad. Lelystad biedt een gezonde leefomgeving: enerzijds door gezondheidsbescherming (milieuef fecten en externe veiligheid) en anderzijds door gezondheidsbevordering (stimule ren van gezond gedrag door bijvoorbeeld meer beweging in de stad te stimuleren).De groene verstedelijking is hiervan de ruimtelijke uitwerking.	Interlinked CA EH NI Geographical Synergy
100	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Klimaatadaptief mogelijkerwijs door nieuwe natuur, strand, eilanden	Interlinked CA NI Geographical Synergy
101	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Hoven en buurtgroen nieuwe collectieve plek ken met ruimte voor sport en spel, stadsland bouw en waarin nieuwe opgaven landen zoals klimaatrobuuste stad	Interlinked CA EH Geographical Synergy
102	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Eveneens integrale opgaven voor (bestaan de) bedrijventerreinen en industriegebieden.Hier liggen uitdagingen m.b.t . biodiversiteit, hittestress en wateroverlast. Ook bedrijven terreinen moeten straks aardgasvrij zijn	Interlinked CA ET NI Geographical Challenge
103	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Lelystad wordt op een duurzame manier ontwikkeld: natuurinclusief, energieneu traal, klimaatbestendig en circulair. Het landschap is de drager. Veel groen in Le lystad ondergaat een kwaliteitsimpuls en biedt daardoor ruimte voor nieuwe maat schappelijke opgaven. Dit gebeurt op alle schaalniveaus: van regio tot stad. Open bare ruimte in bestaande buurten was oorspronkelijk bedoeld en kan ook in de nabije toekomst zo worden ingericht dat de bewoners, flora en fauna er een thuis vin den. Sociaal-maatschappelijke aspecten, beheer en betrokkenheid spelen hierbij een belangrijke rol. De bewoners kunnen bijvoorbeed de openbare ruimte gezamen lijk beheren in de vorm van een buurttuin.Hiermee kan ook de gemeenschappelijke en sociale veiligheid in de buurt worden versterkt. Ruimte geven aan sport, spel en actieve vormen van beweging bevordert de gezondheid van bewoners.	Interlinked CA CE EH ET NI Geographical Synergy
104	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Natuurinclusief Als Hoofdstad van de Nieuwe Natuur gaat ontwikkelen en bouwen in Lelystad altijd samen met de ontwikkeling van natuur.Wie in Lelystad woont (zowel in nieuw bouw als de bestaande buurten), woont in of nabij de natuur. Dit levert onderschei dende, groene woonmilieus op die nau welijks aanwezig zijn in de MRA. Wonen in en nabij de natuur is daarmee dé kans om Lelystad opnieuw op de kaart te zetten. Le lystad biedt ruimte voor nieuwe woonland schappen en het aantrekkelijker maken van de bestaande woonwijken, groen en duur zaam bouwen (evenals de ontwikkeling van circulair bouwen), ruimte voor collectief en particulier opdrachtgeverschap.	Interlinked CA CE EH NI Geographical
105	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Ontwikkelen en bouwen gaan in Lelystad samen met ontwikkeling natuur;	Interlinked CA NI Geographical Project-based Synergy
106	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Lelystad gaat voor 'positieve gezondheid' waar het accent op de mens ligt in plaats van op de ziekte. Door integraal, wijkge richt en meer datagedreven te werken will Lelystad de gezondheid van haar inwoners verbeteren. Lelystad zal zich inzetten op actieve gezondheidsbevordering door een gezonde en beweegvriendelijke omge ving te creëren (met wandelen en fietsen als prioritaire vervoerswijzen, sport en spel in de woonomgeving, natuurspeel plaatsen). Ook zal Lelystad gezond eten en drinken stimuleren door bijv. de aanleg van een buurtmoestuin, schooltuintjes en geen fastfood restaurants nabij scholen toestaan. Lelystad zal ook meer ontmoe tingsplekken voor jong en oud creëren (speelplaatsen en bankjes).	Interlinked EH MT Geographical Synergy

107	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Lelystad houdt bij de ontwikkeling van bestaande en nieuwe woonmilieus vast aan de unieke kwaliteiten van de ruime en groene woonstad. Hiervoor gebruikt Le lystad de groene dragers binnen de oude wijken. Zo kan bijvoorbeeld het Woldpark, aansluitend op het Stadshart, opgewaar deerd worden tot stadspark met sportieve en/of recreatieve functies. Wijkparken zou den eventueel versterkt kunnen worden door het toevoegen van bebouwing aan de randen. Buurtvoorzieningen liggen vaak naast deze parken en kunnen hierdoor mo gelijkerwijs aan draagkracht winnen.	Interlinked CA EH NI Geographical Synergy
108	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	In de buurtvernieuwing liggen daarbij kansen om de natuur nog meer de stad in te brengen door natuurinclusief te ver nieuwen of bouwen en binnen de wijken het wonen naar het groen toe te keren. De noodzakelijke verduurzaming, ontwikke ling naar een circulaire economie, ener gietransitie en klimaatadaptief maken van de woonomgeving is een katalysator voor wijkvernieuwing. In de nabije toekomst zullen Waterwijk, Boswijk, Atol en Zuider zeewijk worden gerevitaliseerd. Naar aan leiding van onderzoek zal worden besloten of hier herinrichting wenselijk is.	Interlinked CA CE EH ET NI Geographical Project-based
109	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	De bestaande bedrijventerreinen worden geconsolideerd. Op de kleinere bedrijven terreinen (in de woonwijken) is maatwerk mogelijk en worden de mogelijkheden voor functiemenging onderzocht. Dit kan bijvoorbeeld op de kleine bedrijventerrei nen in Jol, Kempenaar en Griend. Klimaat adaptatie en natuurinclusiviteit zijn even eens integrale opgaven voor (bestaande) bedrijventerreinen en industriegebieden.Hier liggen uitdagingen m.b.t . biodiver siteit, hittestress en wateroverlast. Ook bedrijventerreinen moeten straks aardgas vrij zijn.	Interlinked CA ET NI Geographical Challenge
110	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Gemeente Lelystad wil samenwerking en communicatie vergroten ten behoe ve van toekomstbestendige en gezonde landbouwbedrijven. Ook wil de gemeente samen met de agrarische sector en andere partners de transformatie richting kring looplandbouw faciliteren (het zoveel mo gelijk denken in kringlopen en hergebruik van reststoffen). Onderwerpen als circula riteit, biodiversiteit (kwaliteit van bodem en water), duurzame energie (zonnevelden) en klimaatadaptatie (waterberging) komen hierin samen.	Interlinked CA CE ET NI Geographical Project-based
111	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Openbaar groen en water Vergroeningsopgaven die momenteel spelen in Lelystad is hoe te vergroenen in verdichte en versteende wijken waar hit testress en wateroverlast een probleem kunnen zijn. Ook wordt er binnen deze opgave gezocht naar een koppeling met biodiversiteit (klimaatrobuust groen).	Interlinked CA EH NI Geographical Synergy
112	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Naast bovengronds ruimtegebruik en de milieuhygiënische bodemkwaliteit krijgen ook ondergrondse functies steeds meer aandacht, zoals opslag van warmte en koude, opvang en vasthouden van (regen) water, ruimte voor kabels en leidingen. Op dit moment wordt beleid ontwikkeld zodat de kwaliteiten van het bodem- en onder grondsysteem niet worden aangetast.	Interlinked CA ET Geographical Challenge
113	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Lelystad wil zoveel mogelijk sturen op natuurvriendelijke inrichting van oevers en werken met robuuste peilvakken (gebied waar een en hetzelfde waterpeil wordt nagestreefd). Daarbij wordt gestreefd naar verbetering van de waterkwaliteit door inname van gebiedsvreemd water (water met een kwaliteit die niet van nature voor komt in een gebied) zoveel mogelijk te ver mijden. Er wordt zoveel mogelijk rekening gehouden met de belevingswaarde van het water en het recreatief gebruik hiervan.Daarom wordt water zichtbaar gemaakt, ook in de wijken, benut het en ontsluit (nieuwe) woonwijken op het water zonder de beleving van de openheid te beperken.Capaciteit van het stedelijk water wordt zoveel mogelijk afgestemd op de afkoppel ambitie (hemelwater niet langer op het vuilwaterriool lozen) van de gemeente.	Interlinked CA EH NI Geographical Synergy
114	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Lelystad zet bossen en natuurgebieden slim in voor recreatie en toerisme, voor gezonder en beweegvriendelijker ontspan nen (sport en spel), voor energietransitie (o.a. biomassa, wind en zon) en voor de klimaatadaptatie (waterretentie)	Interlinked CA EH ET NI Geographical Synergy
115	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Het stationsgebied en het Stadshart is voor veel bezoekers de entree van de Hoofdstad van de Nieuwe Natuur.Daarom wordt ook het Stadshart ver groend. Zo wordt de Hoofdstad van de Nieuwe natuur ook zichtbaar in het hart van de stad. Het Stadshart zal in de toekomst een verblijfsplek worden in plaats van een inkoopplek. Daarom ontwikkelt het Stadshart zich tot gast vrije verblijfsplek met evenementen op regelmatige basis. Het Stadshart houdt ook in de toekomst de functie als cultu reel hart van Lelystad	Interlinked CA EH NI Geographical Synergy
116	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Openbaar groen en water In de toekomst zal het groen van de dreven een rol gaan spelen voor klimaatadaptatie (waterberging, hittestress), biodiversiteit en energietransitie. Daarbij wil Lelystad expe rimenteren met verschillende oplossingen.Kleinschalig, onbenut groen in de buurten kan collectief worden beheerd, worden uit gegeven en kan een andere functie krijgen, zoals voor volkstuinen, stadslandbouw en tiny-bossen.	Interlinked CA CE ET NI Geographical Synergy
117	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	De bodem is de drager van de fysieke leefomgeving. Naast ruimte om veilig te bouwen en te wonen is ook voor bijvoor beeld de circulaire economie, energievoor ziening, voedselvoorziening, mobiliteit en kennis over de (pre)historie de rol van de ondergrond evident. Bodemdaling, kli maatverandering, verdroging, uitputting en verontreiniging kunnen deze functies bedreigen. Lelystad streeft naar een afge wogen gebruik en behoud van de kwali teiten van de bodem en ondergrond en zal hiervoor, waar nodig, beleid ontwikkelen.	Interlinked CA CE ET Geographical

118	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Het grid van dreven blijft de basis voor het interne autonetwerk. Op hoger schaal niveau gaan de A6 en N23/A23 een be langrijke rol spelen. Deze vormen een ring rond de stad met inprikkers die aantakken op de drevenstructuur. De intentie is om verkeer zo lang mogelijk op de omliggende infrastructuur en onnodige doorgaande bewegingen (door de stad) te voorkomen.Het systeem transformeert van een net werk van dreven dat Lelystad opdeelt en alles gelijkwaardig bereikbaar maakt, naar een systeem met hiërarchie waarbij ver keer zoveel als mogelijk op de omliggende hoofdinfrastructuur en de inprikkers blijft.De dreven zijn structuurbepalend en van cultuurhistorische waarde voor Lelystad.De functie voor autoverkeer kan worden aangepast, zonder de herkenbaarheid te verliezen. In de toekomst zal het groen van de dreven ook een rol kunnen gaan spelen voor klimaatadaptatie (waterberging, hit testress), biodiversiteit en energietransitie.	Interlinked CA ET MT NI Geographical Synergy
119	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Lelystad biedt haar inwoners een steeds aantrekkelijkere en groene woonomgeving in een bruisende stad. De ambities van de gemeente in deze omgevingsvisie zijn dan ook kristalhelder: Lelystad wordt een sterke stad in de regio en Hoofdstad van de Nieuwe Natuur. Lelystad gaat zich de komende jaren onvermoeid inzetten om voor haar toekomstige 100.000 inwoners een economisch sterke, groene en gezonde leefomgeving te ont wikkelen. Lelystad gaat voor groene verstedelijking!	Interlinked CA EH NI Geographical Synergy
120	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	woonhoven: een herwaardering van de woonhoven kan ruimte bieden aan de omschakeling naar een circulaire eco nomie, energietransitie en het klimaat robuust maken van de woonomgeving.Woonhoven geven de stad een men selijke maat door ruimte te geven aan ontmoeting en zijn een inspiratie voor nieuwe ontwikkelingen in Lelystad.	Interlinked CA CE EH ET NI Geographical Synergy
121	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Bij bestemmen van ruimte wordt prioriteit gegeven aan infrastructuur voor duurzame energieproductie en transport.	Interlinked CA ET Geographical Challenge
122	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	Een stad met ruime woonbuurten, veel groen, water en natuur en functioneel daarvan gescheiden werkgebieden. Een netwerkstad, onderdeel van de Am sterdamse metropoolregio, waar verbindingen centraal staan. Een stad aan het water met een kustzone gelegen aan Nationaal Park Nieuw Land. Een multiculturele stad met een krachtige diversiteit. Het realiseren van onze maat schappelijke opgaven De grote opgave van de stad is om de sociaal - econo mische problematiek te kantelen tot een sociaal sterk systeem waarin iedereen meedoet. Met aan de basis kwalitatief goed onderwijs en leefbare, veilige en duurzame woonbuurten. De ontwikkeling van de circulaire economie en het verzilveren van het groen, water en natuur bieden goede kansen voor het ver groten van de werkgelegenheid en daarmee voor het aantrekkelijk maken van de stad.	Interlinked CA CE EH NI Geographical Physical Synergy
123	Omgevingsvisie 2040 van Lelystad (2021)	Lel. IE	In de onstuimige jaren na de economische crisis heeft Lelystad hard ge werkt aan de ontwikkeling van de stad en het leefmilieu van haar bewo ners. Zo heeft Lelystad ruim baan gegeven aan de ontwikkeling van groen, water en natuur door de Marker Wadden en het Nationaal Park Nieuw Land toegankelijk te maken. Dit is niet verwonderlijk aangezien de verwe ving van stad en landschap diep in het DNA van de stad zit. De nieuwe na tuur geeft de inwoners van Lelystad een gezonde leefomgeving en nieuwe economische mogelijkheden.	Interlinked CA CE EH NI Geographical Synergy
124	Uitvoeringspro-gramma Lelystad Next Level 2021-2022 (2021)	Lel. IE	De aantrekkelijkheid van steden wordt jaarlijks door Atlas voor Gemeenten in kaart gebracht aan de hand van 8 indicatoren, zoals de nabijheid van banen, natuur en cultuur. Als je de stad aantrekkelijk wilt houden of maken, is het verstandig om in te zetten op indicatoren waar je onderscheidend vermogen ziet.Daar komt het unieke groene karakter van Lelystad om de hoek. Lelystad is een stad met veel ruimte, water en natuur .Dit onderscheidend vermogen blijkt ook uit de Monitor Brede Welvaart (zie figuur 1). Het Nationaal Park Nieuw Land met de Oostvaardersplassen, het Hollandse Hout en het Marker- en IJsselmeer, alsmede met het Zuigerplasbos, het Bovenwater, het Gelderse Hout en het Natuurpark 14Figuur 1. Monitor brede welvaart Lelystad dragen bij aan dit groene karakter van de stad. Daarbij is het groene karakter in ontwikkeling. In het Markermeer ligt nieuwe natuur: in de Marker Wadden wordt nieuwe natuur gecreëerd die nodig is voor een gezond ecosysteem, zodat het gebied zich kan herstellen. Lelystad heeft het in zich de hoofdstad van de nieuwe natuur te worden en kan een voorloper zijn in het klimaatrobuust ontwikkelen van een stedelijk gebied verbonden met de natuur.	Interlinked CA EH NI Geographical Synergy
125	Uitvoeringspro-gramma Lelystad Next Level 2021-2022 (2021)	Lel. IE	De kust vormt een brug tussen natuur- en recreatiegebieden, is de stad aan het water en is op een hoger schaalniveau onderdeel van het rondje Markermeer. Efficiënte verbindingen van de kuststrook met de verschillende toeristische poorten en parels is uitgangspunt van de visie.De kust is goed aangesloten op het regionale en stedelijke wegennet.In de visie richt de gemeente zich op een efficiënt openbaar vervoer en aantrekkelijke, centrale parkeerlocaties bij de recreatieve en toeristische gebieden, die direct zijn aangesloten op de ontsluitingswegen.Infrastructuur kan compact worden uitgevoerd, met meer groen ingericht en met aandacht voor voetgangers en fietsers ter hoogte van de stedelijke kust. Dit om het autoverkeer te beperken en om mensen te verleiden tot gezond gedrag.	Interlinked CA EH MT NI Geographical Synergy
126	Uitvoeringspro-gramma Lelystad Next Level 2021-2022 (2021)	Lel. IE	oel: Het ontwikkelen van een verstedelijkingskader waarin de ambitie 'Hoofdstad van de Nieuwe Natuur' terug te vinden is (zie ook inspanning 1). Natuur functioneert hierbij als paraplu voor de andere opgaven, uitnodigend, kaderstellend, en/ of randvoorwaardelijk. Daarnaast werkt de opgave via het klimaatrobuust ontwikkelen van het stedelijke gebied verbonden met de natuur door in LNL.	Interlinked CA EH NI Geographical Synergy

127	Uitvoeringsprogramma Lelystad Next Level 2021-2022 (2021)	Lel. IE	De inspanningen binnen de opgave natuur zijn gericht op versterking van toerisme en recreatie , een klimaatadaptieve en natuurinclusieve ontwikkeling van de stad en vergroting van en beheer en vergroting van bewustwording van natuur voor de inwoners van Lelystad . De bijdrage aan het bereiken van de ICL doelen zal indirect zijn. De inspanningen dragen niet bij aan een afname van de infrastructuur en wellicht indirect aan de groei van het aantal inwoners. Wel draagt deze opgave bij aan de werkgelegenheid en aantrekkelijkheid van de stad. Deze indirecte bijdrage kan in beeld worden gebracht door na te gaan wat het effect is op de werkgelegenheid, de naamsbekendheid en de waardering voor Lelystad.Een positief imago en toename van werkgelegenheid kan de keuze van mensen die op zoek zijn naar werk en een plek om te wonen positief beïnvloeden.Als onderdeel van de opgave natuur wordt het effect op de aantrekkelijkheid en werkgelegenheid in beeld gebracht om daarmee een beeld te geven hoe de inspanningen bijdragen aan het ICL doel van groei van de stad.	Interlinked CA EH NI Geographical Synergy
128	Gemeentelijk Water en Rioleringsplan Urk (GWRP 2023-2028)	Urk WM	Het GWRP biedt een programmering voor de activiteiten in de planperiode. Hierbij gaat het – naast het dagelijkse beheer en onderhoud – om onderzoeksactiviteiten en om vernieuwing van objecten die het einde van de levensduur hebben bereikt.Het afstemmen van de vernieuwingsopgaven voor de riolering op andere opgaven, zoals klimaatadaptatie, energietransitie, wegbeheer en dorpsvernieuwing, vraagt doorlopende aandacht in de gemeentelijke organisatie.	Interlinked CA ET Project-based Challenge
129	Gemeentelijk Water en Rioleringsplan Urk (GWRP 2023-2028)	Urk WM	Gemeente Urk streeft ernaar om hemelwater zoveel mogelijk lokaal te benutten, te infiltreren in de bodem of te lozen op oppervlaktewater. Als lokale oplossingen onvoldoende zijn, zamelt de gemeente het overtollige hemelwater in, liefst gescheiden van het afvalwater, om het op een geschikte plek te lozen op oppervlaktewater.Met name op het oude eiland wordt hemelwater gemengd met afvalwater afgevoerd naar de AWZI, met overstorten naar het oppervlaktewater.	Interlinked CA CE Physical Synergy
130	Gemeentelijk Water en Rioleringsplan Urk (GWRP 2023-2028)	Urk WM	Naast het ontwikkelen van bewustwording is het wenselijk om aan te sluiten bij educatie gericht op duurzaamheid, circulariteit en biodiversiteit.	Interlinked CA CE NI Informational Synergy
131	Gemeentelijk Water en Rioleringsplan Urk (GWRP 2023-2028)	Urk WM	Mogelijkheid tot gebruik van hemelwater in tuin en/of woning.	Interlinked CA CE Physical Synergy
132	Gemeentelijk Water en Rioleringsplan Urk (GWRP 2023-2028)	Urk WM	Kans op integrale keuzes gericht op klimaatadaptatie, duurzaamheid en biodiversiteit.	Interlinked CA NI Geographical Synergy
133	Gemeentelijk Verkeers- en vervoersplan (2019)	Urk MO	Onderzoek naar de aantrekkelijkheid van routes wijst erop dat fietsers over het algemeen groen, water, open ruimten en aansprekende architectuur kunnen waarderen; uitlaatgassen, congestie en subjectieve onveiligheid maken een route juist minder aantrekkelijk.	Interlinked CA EH MT NI Geographical Synergy
134	Gemeentelijk Verkeers- en vervoersplan (2019)	Urk MO	Voorwaarde: voldoende ruimte en geen belemmering van het zicht; - Bij voorkeur 120 centimeter doorloopruimte en minimaal 90 centimeter (laadpaal = 60 centimeter); - Voorkomen struikelgevaar, niet direct voor de deur, niet midden in groenstroken.; - Niet in nabijheid van andere objecten zoals bomen, containers en straatmeubilair.	Interlinked CA ET NI Geographical Challenge
135	Woonvisie Urk (2021)	Urk HO	De gemeente Urk zorgt voor voldoende passende woningen voor haar inwoners*. Er wordt gestreefd naar een samenstelling van de woningvoorraad die past bij de toekomstige bevolking. Op uitbreidingslocaties hanteren we hiervoor het woningbouwprogramma zoals dit in het Programma Wonen 1.0 is opgenomen.Binnen dit programma sturen we op nieuwe woonmilieus, waarbij we denken aan woonlandschappen met belevingsnatuur en innovatieve woonconcepten als circulaire bouw, houtbouw en fabrieksbouw.	Interlinked CA CE EH NI Geographical Synergy
136	Woonvisie Urk (2021)	Urk HO	In bestaande wijken zoeken we naar mogelijkheden tot vergroening bij herstructurering en verduurzamingsacties. Bij de opzet van nieuwe wijken zorgen we voor voldoende ruimte voor groen, evenals speel- en ontmoetingsplekken voor kinderen en jongeren. Ook als ditten koste gaat van het aantal parkeerplekken.	Interlinked CA EH MT NI Geographical Synergy
137	Omgevingsvisie Urk tot 2030 (2021)	Urk IE	Onze openbare ruimte moet aansluiten bij de beleving van Urk. Met de verhalen ‘Urk het eiland’ en ‘Urk in de polder’ zetten we ons dorp op de kaart. De groene omgeving is van grote invloed op de Urker identiteit. De puzzel is om constant te zoeken naar een slimme indeling. Door de groene gebieden op elkaar aan te sluiten ontstaan natuurlijke verbindingen tussen wijken en natuurgebieden. Dat stimuleert de leefbaarheid op Urk. De wisselwerking van openbaar groen, natuur en water draagt bij aan een gevarieerde leefomgeving en aan een rijkdom aan planten en dieren.	Interlinked CA EH NI Geographical Synergy
138	Omgevingsvisie Urk tot 2030 (2021)	Urk IE	Bij het inrichten van onze buitenruimte scheiden we schoon (regenwater) en vuil water. Dit versterkt de ontwikkeling van natte natuur en klimaatadaptieve waterberging	Interlinked CA NI Geographical Physical Synergy

139	Omgevingsvisie Urk tot 2030 (2021)	Urk IE	Bij de toekomstige nieuwe entree van Urk, langs het Urkerdwarspad, gaan we de inrichting met 'water' en 'groen' en de verkeerssituatie zorgvuldig uitvoeren. We willen een grote waterberging plaatsen ter hoogte van het Urkerdwarspad en de natuur tussen het Urkerbos en de Urkervaart met elkaar verbinden. In het stedelijk gebied plaatsen we een robuust watersysteem. Andere slimme wateroplossingen zijn het gebruik van grote peilvakken, hergebruik van regenwater en de aanleg van natuurvriendelijke oevers die bijdragen aan een veilige en duurzame leefomgeving.	Interlinked CA NI Geographical Synergy
140	Omgevingsvisie Urk tot 2030 (2021)	Urk IE	De extreme gevolgen van klimaatverandering zijn nu (2021: overstromingen door hevige regenval in heel Nederland) al duidelijk. Om overstromingen op Urk te voorkomen moet de openbare ruimte groener worden (minder steen waar mogelijk). Onze inwoners kunnen daar ook aan bijdragen door bijvoorbeeld meer planten in hun tuinen te zetten in plaats van stenen plateau's.	Interlinked CA EH NI Physical Synergy
141	Geactualiseerde structuurvisie urk 2035 (2019)	Urk IE	uitbreidingsgebieden wordt gestreefd naar zelfstandige en aaneengesloten groenstructuren gecombineerd met speelvoorzieningen. Het is ten aanzien van de ruimtelijke kwaliteit belangrijk dat het stedelijke groen geen gebieden fysiek afsluit. Op dit moment is hier sprake van ter hoogte van de Domineesweg en de groene zone ter hoogte van Lemsterhoek.	Interlinked CA EH NI Geographical Synergy
142	Regionale Adaptatie Strategie (2024)	Reg.	Zien klimaatadaptatie als integraal onderdeel van andere transities en opgaven in de leefomgeving zoals de energietransitie, landbouwtransitie en woningbouwopgave;	Interlinked CA ET Geographical Synergy
143	Regionale Adaptatie Strategie (2024)	Reg.	Een toekomstbestendig landelijk gebied wil zeggen dat onze buitengebieden, landbouw en natuur bestand zijn tegen klimaatverandering en de gevolgen daarvan zoals versnelde bodemdaling, verzilting en water tekorten of overschotten. Een robuust bodem en watersysteem is daarbij leidend. We werken aan een systeem waarin we bij langdurige droogte voldoende en kwalitatief goed water beschikbaar hebben voor onze natuur, onze drinkwatervoorziening en onze landbouw. We werken toe naar een systeem waarbij er zo min mogelijk langdurige wateroverlast ontstaat bij hevige neerslag. Onze ambitie is dat het landelijk gebied in 2050 één robuust ecosysteem is: onze natuur gebieden en landbouw zijn daar onderdeel van.Groenblauwe structureren lopen uit tot in het stedelijk gebied en nodigen inwoners uit tot recreatie. We versterken de biodiversiteit als kenmerk van een gezond en robuust ecosysteem. Dit hoofdstuk beschrijft onze ambities met betrekking tot een klimaatadaptief bodem en watersysteem, en daarbij passende landbouw en natuur.Flevoland heeft een gunstige uitgangspositie voor de zoetwatervoorziening. De provincie kan een beroep doen op de grote waterbuffer van het IJsselmeer en Markermeer. Water wordt met gemalen uitgeslagen op het IJsselmeergebied. Via inlaten en hevel kan water worden aangevoerd. Daarnaast stroomt er kwelwater de polders in. Dit is vaak zoet, maar op sommige plekken is er ook sprake van brakke of zoute kwel.	Interlinked CA EH NI Geographical Synergy
144	Regionale Adaptatie Strategie (2024)	Reg. CA	Op sommige plekken in Flevoland daalt de bodem door lokaal gewenst peilbeheer en inklinking. De natuurgebieden, die van oorsprong op meer zanderige bodem liggen en waar vaak hogere peilen en grond waterstanden zijn (waardoor de wel aanwezige klei minder rijpt en het eventuele veen niet oxideert), dalen relatief minder dan de rest van de (kleiïge) gronden en komen relatief steeds hoger en daardoor droger te liggen. Er moet op veel plaatsen water worden aangevoerd om de natuurgebieden nat genoeg te houden en de watervraag zal in de toekomst verder toenemen. Dit vraagt ook om het beter vasthouden van water in nattere tijden.	Interlinked CA NI Geographical Physical Challenge
145	Regionale Adaptatie Strategie (2024)	Reg. CA	Flora en fauna is sterk afhankelijk van de land schappelijke eigenschappen en klimaat. Hoe de biotopen in Flevoland zullen ontwikkelen in het veranderende klimaat is een grote onzekerheid.Een biodivers ecosysteem is beter bestand tegen droogte, wateroverlast of hitte dan een eenzijdig ingerichte polder. Daarmee is biodiversiteit een belangrijke voorwaarde voor een duurzame en klimaatbestendige leefomgeving.	Interlinked CA NI Geographical Physical Synergy
146	Regionale Adaptatie Strategie (2024)	Reg. CA	We hanteren een integrale aanpak in de leefomgeving: doelen voor klimaatadaptatie, waterkwaliteit en bodem kunnen niet los gezien worden van verstede lijking, woningbouw, landbouw en energievoorziening.	Interlinked CA ET Geographical
147	Regionale Adaptatie Strategie (2024)	Reg. CA	Met robuuste natuur bedoelen we natuur die dusdanig veerkrachtig is dat ze zich kan aanpassen aan klimaatverandering en bestand is tegen ziekten en calamiteiten. Gebieden met een hoge bio diversiteit zijn immers weerbaarder tegen klimaat verandering. Klimaatadaptatie en toekomstbestendige, veerkrachtige en diverse ecosystemen gaan hand in hand.	Interlinked CA NI Geographical Physical Synergy
148	Regionale Adaptatie Strategie (2024)	Reg. CA	In de toekomst is een nattere situatie in de omgeving van de natuurgebieden gewenst, zodat deze weer als spons kunnen fungeren in het landschap. In perioden van bovengemiddelde droogte, waarin ook de rest van het gebied extra water nodig heeft, zullen natte natuurgebieden echter vaak de grootste waterbehoefte hebben. Dit doordat specifieke natte natuur onherstelbare schade kan oplopen als het te droog wordt. De nattere natuur gebieden kunnen wel als spons dienen voor de omliggende omgeving, maar dan moet worden ingezet op het behoud van soorten die goed tegen zowel incidenteel natte als droge omstandigheden kunnen.	Interlinked CA NI Geographical Physical Challenge
149	Regionale Adaptatie Strategie (2024)	Reg. CA	Flevoland is en blijft een aantrekkelijke en gezonde plek om te wonen, werken en recreëren. De gevolgen van klimaatverandering zijn ook voelbaar in onze steden en dorpen. We zien opgaven op de thema's: gezondheid en veiligheid van inwoners, wateroverlast (overmatige regenval of overstroming), droogte en hitte. Het realiseren van groenblauwe structuren vormt een overkoepelende ambitie die oplossing biedt voor deze thema's. Om de leefbaarheid te waarborgen en verbeteren kiezen we voor natuurinclusief ver stedelijken met ecologische structuren die tot diep in de steden reiken. Waar we op welke manier wonen, werken, reizen en recreëren laten we leiden door water, bodem en biodiversiteit. Dit maakt niet alleen het natuurlijke fundament robuuster, maar maakt landschappen, dorpen en steden ook aantrekkelijker en leefbaarder.	Interlinked CA EH NI Geographical Synergy

150	Regionale Adaptatie Strategie (2024)	Reg. CA	We gaan uit van ‘groen’ tenzij, alleen waar nodig passen we verharding toe. Dit geldt niet alleen voor nieuwbouw maar ook juist voor de bestaande gebouwde omgeving zoals we hem nu al kennen.De transitie naar een klimaatadaptieve gebouwde omgeving laten we plaatsvinden op logische momenten, zoals bij herstructurering. Dit doen we integraal met andere opgaven, zoals groenbeheer, mobiliteit, circulaire economie en de energietransitie. Daarbij hebben we speciale aandacht voor het sociaal domein.Zo zorgen we niet alleen voor een klimaatbestendig stedelijk gebied, maar werken we ook aan de gezond heid en veiligheid van inwoners, een toename in de biodiversiteit en verbetering van de bodemkwaliteit.	Interlinked CA CE EH ET NI Geographical Project-based Synergy
151	Regionale Adaptatie Strategie (2024)	Reg. CA	naar inwoners om adaptieve maatregelen te treffen.Klimaatadaptatie is niet alleen een ruimtelijk vraagstuk, maar ook een gedragsvraagstuk. We leggen daarom de verbinding met het sociale domein en gezondheids programma’s. We zien klimaatadaptatie als een motor van een sociale, inclusieve en gezonde samenleving.	Interlinked CA EH Project-based Synergy
152	Regionale Adaptatie Strategie (2024)	Reg. CA	Een gezonde en veilige leefomgeving voor iedereen vormt de basis waarom we klimaatadaptatieve maatregelen nemen.	Interlinked CA EH Geographical
153	Regionale Adaptatie Strategie (2024)	Reg. CA	Veel jongeren kampen met gezondheidsproblemen. Met name overgewicht is in veel gemeenten een probleem. We werken aan bewust wording en zetten in op samenwerking met scholen voor de vergroening van schoolpleinen. Dit draagt bij aan het welzijn en gezondheid van de jeugd. Doordat groen een stressreducerende werking heeft en een beter welbevinden (zowel fysiek als mentaal en sociaal welbevinden) stimuleert, is er bewijs dat groen kan zorgen voor een betere ervaren gezondheid. Wie in een groene omgeving leeft, voelt zich gezonder. Een groene en uitnodigende buitenruimte kan jongeren stimuleren om meer te bewegen en gezonder te gaan leven. Ook communiceren we hiermee een bood schap aan ouders over het belang van klimaatadaptatie en vergroening. Klimaatadaptatie biedt koppelkansen met preventieve gezondheidsbevorderende programma’s zoals JOGG (Gezonde Jeugd, Gezonde Toekomst).	Interlinked CA EH Geographical Project-based Synergy
154	Regionale Adaptatie Strategie (2024)	Reg. CA	Het klimaatbestendiger maken gaat hand in hand met meer groen en water. Het is hierbij van belang rekening te houden met mogelijke ongewenste effecten zoals ongedierte, verspreiding van infectieziekten en het voorkomen van allergenen.De GGD heeft een adviserende rol in het belichten van gezondheidsaspecten bij klimaatmaatregelen.	Interlinked CA EH Physical Challenge
155	Regionale Adaptatie Strategie (2024)	Reg. CA	Naast de aandacht voor klimaatadaptatie in het ruimtelijk domein (bijv.adviezen bij de omgevingsvisies of bij duurzaamheids plannen) geven we met bovenstaande ontwikkelingen ook aandacht voor verder activatie van het sociaal domein in klimaatadaptatie. Klimaatadaptatie biedt koppelkansen met preventieve gezondheidsbevorde rende programma’s zoals JOGG en Positief Ouder Worden.	Interlinked CA EH Project-based Synergy
156	Regionale Adaptatie Strategie (2024)	Reg. CA	Om hittestress in dorpen en steden te voorkomen zetten we in op robuuste groenstructuren. Robuust betekent dat het groen overleeft in het warmere, drogere en nattere klimaat zonder excessieve kosten voor bewatering/herplanting/ ziektebestrijding. Groenstructuren zijn zoveel mogelijk verbonden. Aan de randen van de stad verbinden we het buitengebied met de gebouwde omgeving om de koelere lucht de stad in te trekken . Zo creëren we een natuurlijke airco.	Interlinked CA EH NI Geographical Physical Synergy
157	Regionale Adaptatie Strategie (2024)	Reg. CA	Met name het vergroenen van langzaam-verkeersroutes zoals fietspaden leveren een winwin situatie op.Groenstructuren worden zo ingericht dat ze ook een plek bieden aan kinderen om te spelen.	Interlinked CA EH MT Geographical Synergy
158	Regionale Adaptatie Strategie (2024)	Reg. CA	Op drukke plekken (bijvoorbeeld in stadscentra), bij bejaardentehuizen en op een aantal centrale langzaam-verkeersroutes ((fietsen en wandelen) is er minimaal 40% schaduw door bomen, gebouwen of structuren. We zoeken samenwerking met de betrokken partijen (bijv. bejaardentehuizen) om dit te realiseren.	Interlinked CA EH MT NI Geographical Physical Synergy
159	Regionale Adaptatie Strategie (2024)	Reg. CA	Airco’s dragen bij aan de opwarming van de directe buitenomgeving. We zetten vol in op vergroening en passieve koeling van woningen.Bij nieuwbouw zoeken we bij voorkeur naar oplossingen met passieve koeling, zodat de gebouw(installaties), zoals airco’s, niet tot directe opwarming van verblijfs plekken in de private of openbare buitenruimte leiden.We stimuleren andere maatregelen die tot koeling van de binnentemperatuur leiden zoals schaduw door groen in de omgeving, zonwering, groene gevels en daken, aanbrengen van lichte materialen, isolatie etc.	Interlinked CA EH ET NI Geographical Physical Synergy
160	Regionale Adaptatie Strategie (2024)	Reg. CA	Bij nieuwbouw en herstructureringsopgaven wordt aangeraden om tenminste 50% van alle horizontale en verticale oppervlakten warmtewerend of verkoelend in te richten. Dit wordt bijvoorbeeld gedaan door middel van schaduwvorming (bomen, groene gevels en daken, zonwering) of met een keuze voor lichte stenen/ bestrating.	Interlinked CA EH NI Geographical Physical Synergy

161	Regionale Adaptatie Strategie (2024)	Reg. CA	We zetten vol in op vergroening en passieve koeling van woningen (zie hierboven), en waar actieve koeling in woningen plaatsvindt is dat alleen door bijvoorbeeld Warmte Koude Opslag (WKO) systemen.	Interlinked CA EH ET NI Geographical Physical Synergy
162	Regionale Adaptatie Strategie (2024)	Reg. CA	Vasthouden, bergen, afvoeren – Wateroverlast (en droogte) pakken we aan door een viertrapsstrategie toe te passen: 1. Benutten en Besparen 2. Vasthouden en infiltreren in de bodem (sponswerking) 3. Bergen 4. Afvoeren	Interlinked CA CE Physical Synergy
163	Regionale Adaptatie Strategie (2024)	Reg. CA	We benutten het water waar het valt, en besparen het waterverbruik.	Interlinked CA CE Physical Synergy
164	Regionale Adaptatie Strategie (2024)	Reg. CA	Het beter vasthouden van water biedt ook een oplossing voor droogte problematiek. Daarnaast zetten we in op het (her) gebruiken van het water6, we gaan niet alleen regen water slim gebruiken in de tuin en het huishouden, maar ook grijs water hergebruiken. Bij nieuwbouw is hergebruik van water, zuinig gebruik van drinkwater en verbeteren waterkwaliteit onderdeel van het ontwerp.	Interlinked CA CE Geographical Physical Project-based Synergy
165	Regionale Adaptatie Strategie (2024)	Reg. CA	Passende beplanting – We maken klimaatadaptieve beplantingskeuzes in het openbaar gebied. We kiezen hierbij voor planten die beter bestand zijn in het nieuwe klimaat en beter tegen droogte kunnen.Daarbij kiezen we voor passende maatregelen in en voor de standplaats	Interlinked CA NI Physical Synergy
166	Regionale Adaptatie Strategie (2024)	Reg. CA	Droogtebestendige inrichting – Bij nieuwbouw zijn de verwachte grondwaterstanden en de zoetwater beschikbaarheid tijdens droogte sturend voor de inrichting van het plangebied. Ook in de gebruiksfase stimuleren we minimale grondwateronttrekkingen en gebruik van regenwater.	Interlinked CA CE Geographical Synergy
167	Regionale Adaptatie Strategie (2024)	Reg. CA	Op landelijk niveau wordt er ook gewerkt aan nieuwe wetgeving.De nieuwe waterwet biedt mogelijkheden om waterberging te stimuleren op privaat terrein en is daarmee een waardevol sturings instrument om succesvol uitvoering te geven aan deze stap in onze strategie.	Interlinked CA CE Informational Physical Synergy
168	Regionale Adaptatie Strategie (2024)	Reg. CA	Groenblauwe structuren en de gebiedseigen biodiversiteit worden versterkt	Interlinked CA EH NI Geographical Synergy
169	Regionale Adaptatie Strategie (2024)	Reg. CA	Natuur is kaderstellend en randvoorwaardelijk.	Interlinked CA NI Geographical Synergy
170	Regionale Adaptatie Strategie (2024)	Reg. CA	Ecologische, natuur-gebaseerde oplossingen hebben de voorkeur boven ‘technische’ oplossingen (‘groen, tenzij…’).	Interlinked CA NI Geographical Physical Synergy
171	Regionale Adaptatie Strategie (2024)	Reg. CA	Het horizontale en verticale oppervlak wordt in samenhang met de groenblauwe structuren en ecosystemen in de bredere omgeving ingericht (met minimaal 30% groen op buurtniveau, boomkroonoppervlak telt mee). De maatregelen in/op het gebouw sluiten aan op de maatregelen in de openbare ruimte. Hiermee wordt gezorgd voor een doorlopend ecologisch netwerk.	Interlinked CA EH NI Geographical Synergy
172	Regionale Adaptatie Strategie (2024)	Reg. CA	We verbinden robuuste groenstructuren in de openbare ruimte zoveel moge lijk met andere groenstructuren, richting het buiten gebied, om zo koelte de stad of wijk in te trekken.Deze groenstroken zijn ook plekken voor kinderen om te spelen.	Interlinked CA EH NI Geographical Synergy
173	Regionale Adaptatie Strategie (2024)	Reg. CA	In een natuurinclusieve samenleving worden natuurwaarden vergroot en wordt de positieve kracht van natuur benut. Met onze activiteiten dragen we actief bij aan het versterken van natuurwaarden.We realiseren een goede basiskwaliteit van onze natuur, niet alleen in de natuurgebieden, maar overal: het openbaar groen, tuinen, bermen etc. We kiezen voor ‘Nature based solutions’: oplossingen die de natuur van zichzelf biedt. Bijvoorbeeld de koelende werking van bomen om hitte in de stad tegen te gaan.	Interlinked CA EH NI Geographical Physical Synergy

174	Regionale Adaptatie Strategie (2024)	Reg. CA	Bij nieuwbouw en herstructurering stimuleren we groene daken en gevels. Waar dat niet mogelijk is wordt gebruik gemaakt van andere warmte werende toepassingen.	Interlinked CA EH NI Physical Project-based Synergy
175	Regionale Adaptatie Strategie (2024)	Reg. CA	Bij nieuwbouw of herstructurering creëert het plangebied, afhankelijk van de grootte, een hoog waardige habitat voor verschillende soorten. We specificeren een ambitie voor specifieke doelsoorten waar we prioriteit aan geven (zowel plant, vogel, zoogdier, amfibie als insect).	Interlinked CA NI Geographical Project-based Synergy

C

Project Plan Designs

New Brooklyn plan design

Figure C.1: New Brooklyn plan design

Groot Nooten plan design

Figure C.2: Groot Nooten plan design

Het Nieuwe Dorp plan design

Figure C.3: Het Nieuwe Dorp plan design

Regenboogbuurt renewal design

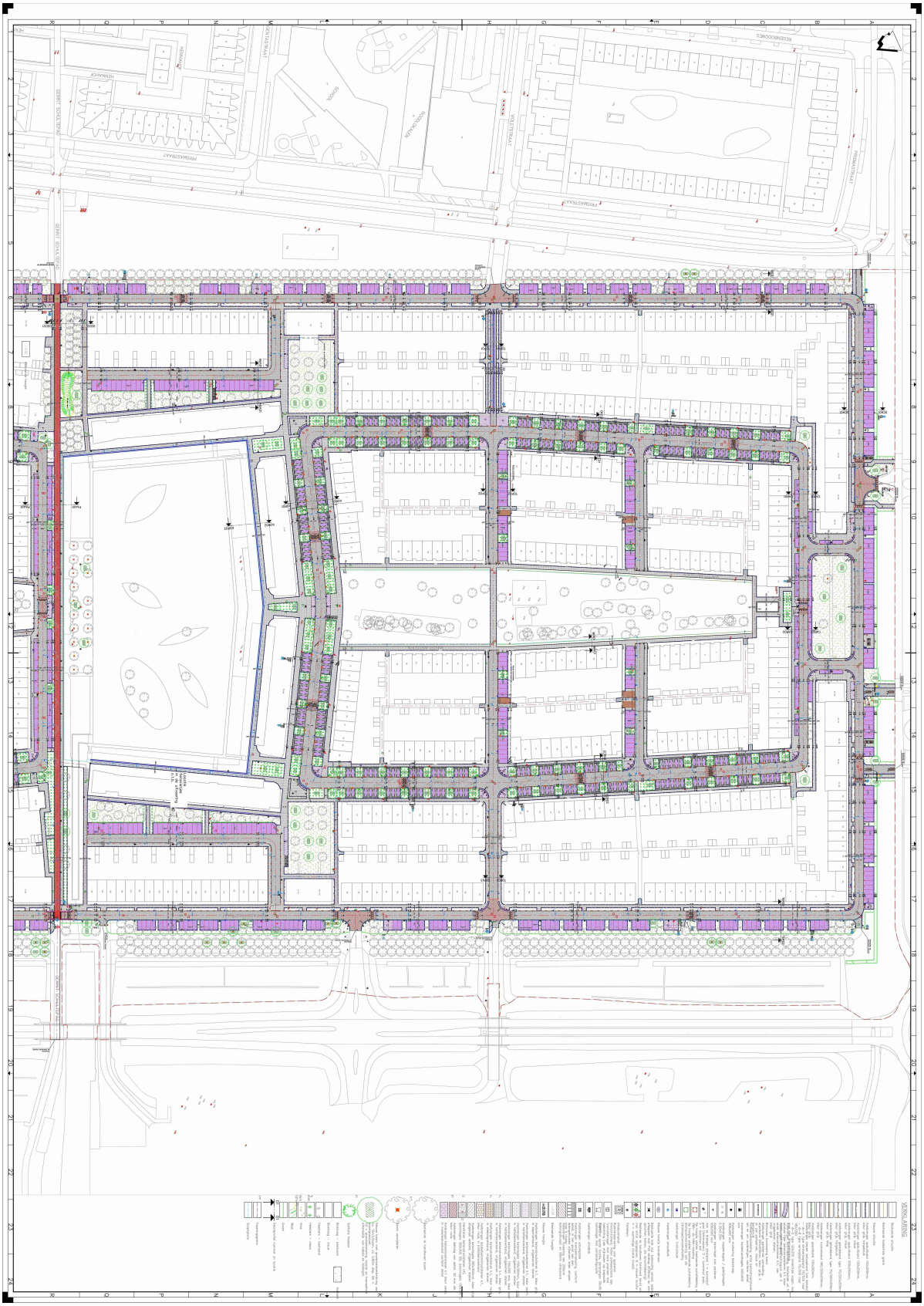

Figure C.4: Regenboogbuurt renewal design

Stationsgebied Oost renewal design

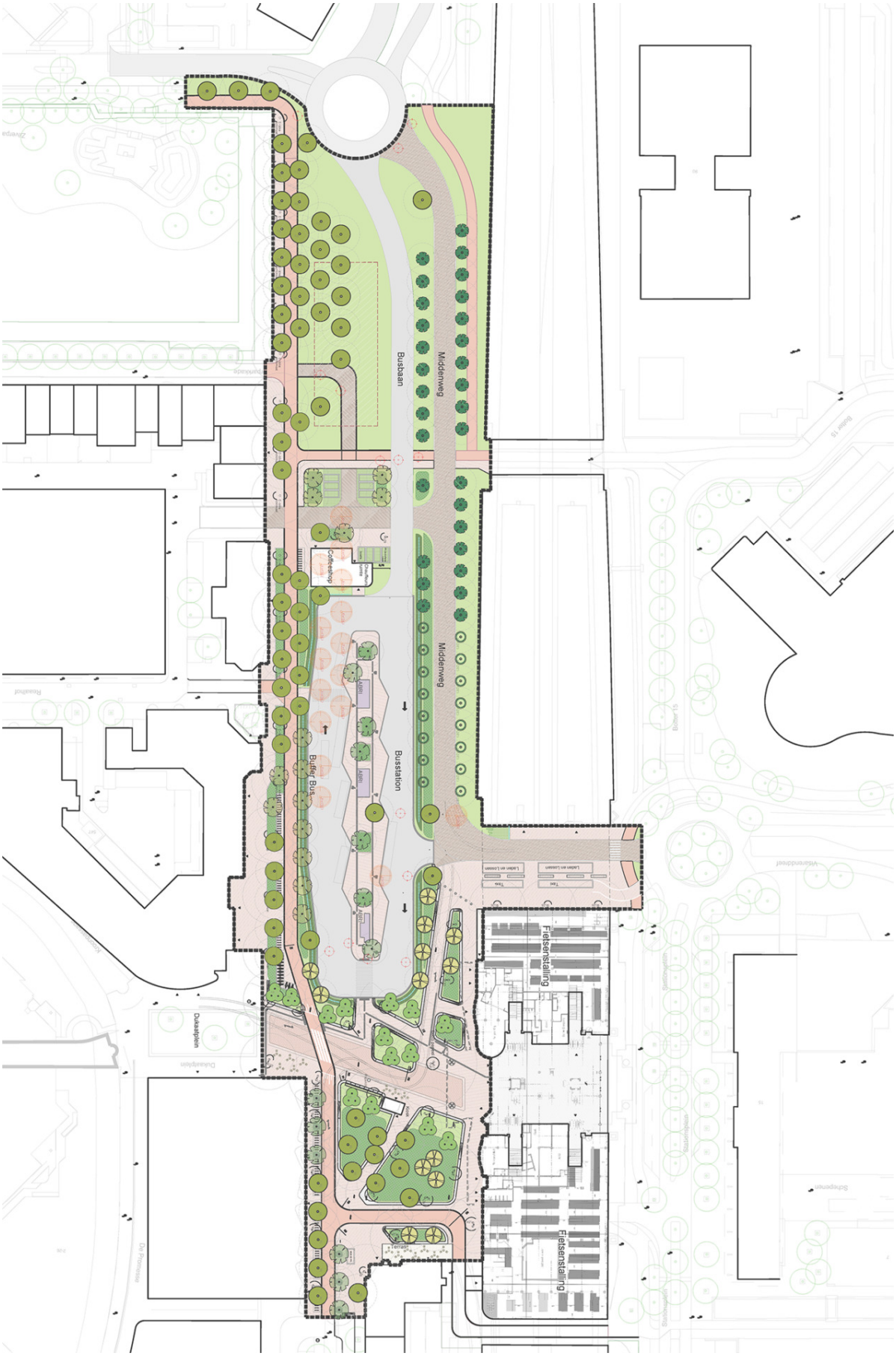

Figure C.5: Stationsgebied Oost renewal design

Molenkamp renewal design

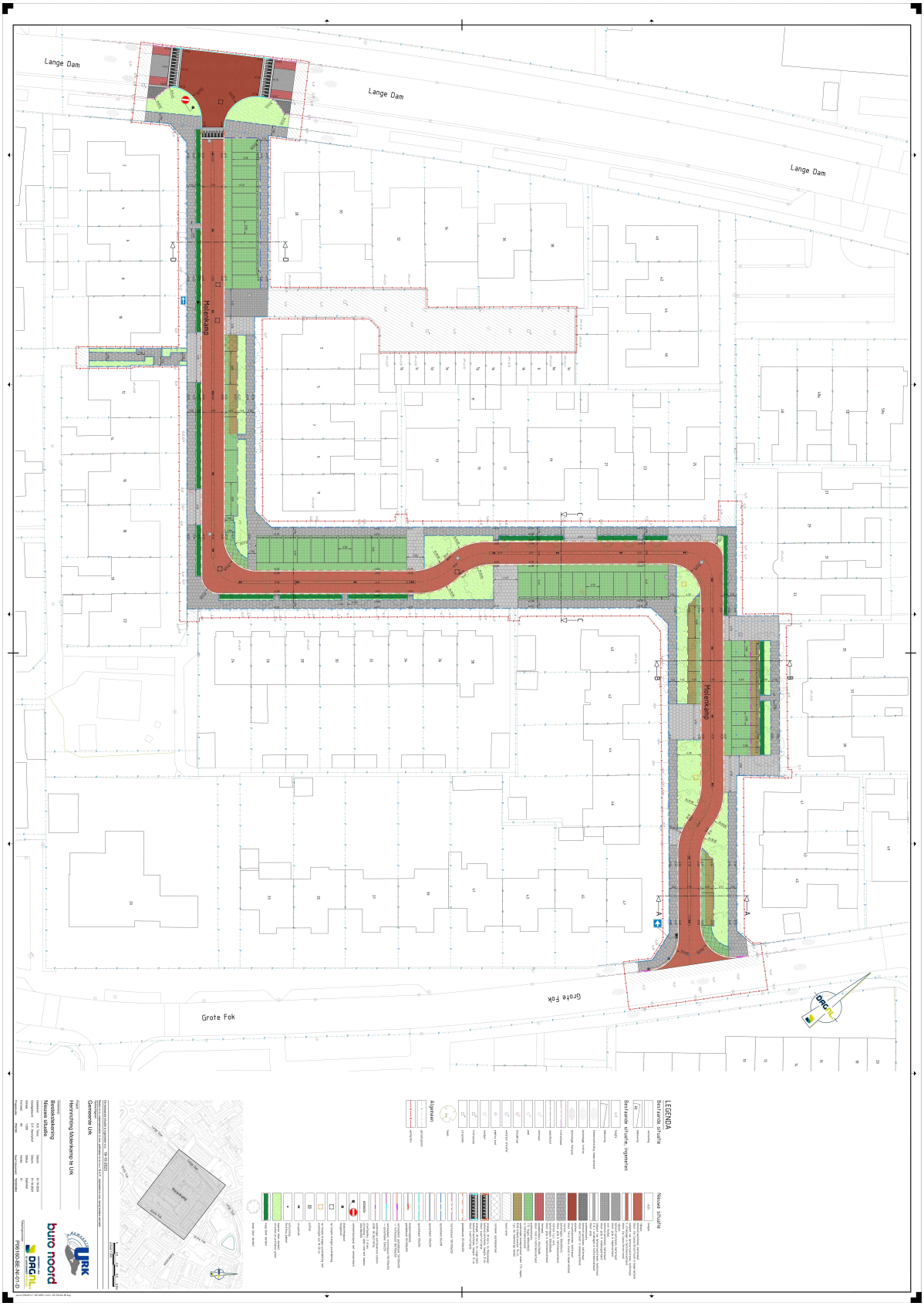

Figure C.6: Molenkamp renewal design

D

Goals and Principles and Reflections

Goals and Principles

Table D.1: Overview of central goals and key principles identified in municipal policy documents and reflected on in the project study.

Item	Trans.	Scope	Document	Goal or core principle
#1	CA, ET, MT, CE, EH, NI	All	*Almere stad met toekomst, Omgevingsvisie Lelystad and -Urk*	Environmental (re)development projects simultaneously address the energy transition, mobility transition, circular economy, health, ecological quality, and climate adaptation.
#2	CA, EH, NI, MT	All	*RAS, LAS Almere and -Lelystad, GWRP Urk*	Blue-green climate adaptive solutions are prioritized over technical solutions.
#3	CA, NI	All	*RAS, LAS Almere and -Lelystad, GWRP Urk*	Climate adaptation and developing ecological quality go hand in hand
#4	CA, CE	All	*RAS, LAS Almere and -Lelystad, GWRP Urk*	Preferential order of water management: 1. Utilize and Save 2. Retain and Infiltrate into the Soil 3. Store 4. Discharge.
#5	CA	Reg., Lel., Urk	*RAS, LAS Lelystad, GWRP Urk*	A precipitation event of 70 mm/hour (T=100, by 2050) should not cause damage to buildings or infrastructure.
#6	CA	Reg.	*RAS*	Where possible, for example in new construction, the standard is increased to 90 mm/hour (T=250 by 2050).
#7	CA	Reg.	*RAS*	Hydrologically neutral new development means that the new water situation in the developed area must remain at least equal to the baseline situation. Where the paved surface increases or paved surface is disconnected, measures must be taken to manage the runoff rainwater.
#8	CA	Reg.	*RAS*	Prolonged drought, with a 300 mm precipitation deficit every 10 years, should not damage buildings, infrastructure, or greenery
#9	CA, EH, NI, MT, ET	Alm., Lel.	*RAS, LAS Almere and -Lelystad*	The 3-30-300 rule of thumb is applied.
#10	CA, EH, NI, MT, ET	Reg., Lel.	*RAS, LAS Lelystad*	Ensure 40% shade in high-traffic areas, near retirement homes, and on central slow-traffic routes.
#11	CA, ET	Reg.	*RAS*	In new construction and restructuring projects, at least 50% of horizontal and vertical surfaces should be heat-reflective or cooling.
#12	CA, ET	Reg.	*RAS*	In new construction and restructuring projects, buildings should be positioned to optimize street ventilation and reduce direct sunlight in homes.
#13	ET	All	*TVW Almere, -Lelystad and -Urk*	Apply Trias Energetica approach.
#14	ET	All	*TVW Almere, -Lelystad and -Urk*	Achieve a 49% reduction in greenhouse gas emissions by 2030 and a 95% reduction by 2050.
#15	ET	All	*TVW Almere, -Lelystad and -Urk*	Phase out the use of natural gas for heating buildings by 2050. All new buildings will be natural gas-free.
#16	MT, ET	All	*Mobiliteitsvisie Almere and -Lelystad, GVVP Urk*	Increase walking and biking by encouraging improvements in cycling and walking infrastructure, routing, and safety rather than through enforcement.
#17	MT, ET	Lel.	*Mobiliteitsvisie Lelystad*	Achieve a 10% reduction in car traffic and a 10% increase in bicycles and e-bikes on the local road network by 2025.
#18	MT	Lel.	*Mobiliteitsvisie Lelystad*	Trends in mobility and demand are monitored, and where possible, infrastructure and parking facilities are reduced or downgraded.
#19	MT, CA, EH, NI	Alm., Urk	*Mobiliteitsvisie Almere, Woonvisie Urk*	In (re)development projects, parking facilities can be reduced if necessary to prioritize the quality of public space, green areas, and meeting and play spaces.
#20	CE	All	*Duurzaamheidsagenda Almere, Duurzaamheidsvisie Urk*	50% reduction in the use of primary resources by 2030

#21	CE, CA	Alm.	*Waterplan Almere*	10% of stormwater falling on roofs is used as gray water.
#22	CE	Alm.	*Waterplan Almere*	By 2030, 50% of biomass originating from the management of public open waters will be reused in a high-quality manner
#23	EH, CA, MT, NI	All	*Sportvisie Almere, Sport- en Beweegvisie Lelystad, Omgevingsvisie Urk*	Ensure high-quality green spaces that invite relaxation, play, physical activity, and social interaction
#24	EH, CA, NI	Alm., Lel.	*Visie samen op avontuur, Sport- en Beweegvisie Lelystad*	The playgrounds are diverse, encourage engagement, and preferably consist of natural elements and greenery.
#25	EH	Lel.	*Sport-en Beweegvisie Lelystad*	Increase play spaces to 5% of built-up areas, ensuring every child has access to a neighborhood facility within 200 meters.
#26	NI	Reg.	*RAS, LAS Lelystad*	When planting new greenery, consideration is given to biodiversity value and climate resilience

New Brooklyn

Table D.2: Reflection on the development project New Brooklyn in Almere Poort.

Item	Pr.[1,2]	Discussion
#1	1	All transitions, except for the circular economy transition, are recognized in the New Brooklyn project documents.
#2	1	Stormwater drainage relies on a sewer system rather than blue-green infrastructure. However, parks, trees, green roofs, and permeable parking spaces are designed to facilitate a pleasant microclimate.
#3	2	The vegetation is diverse, with varying levels of maintenance designed to support insects and animals. Nature-friendly water banks and tree-lined edges create blue-green belts around and within New Brooklyn.
#4	1	Stormwater is collected in sewers and drained into local waterways, where weirs manage storage or discharge excess water into the Noorderplassen, ensuring sufficient capacity to prevent inundation.
#5	0	The *Leidraad Riolering* and more extreme precipitation events were applied as normative events, but no further details were provided.
#6	0	See above.
#7	0	Compensation for water storage is achieved outside the development area.
#8	x	Water enters Almere Poort solely via seepage and precipitation. No pumps transfer water into the system.
#9	1	Plans include 550 public trees, providing each home with a view of approximately three trees. Upon maturity, tree canopies are estimated to cover 10–17% of the area. All homes are within 300 m of a 1.5 ha green space due to the central park, with additional green zones on the neighborhood's edges.
#10	2	A slow-traffic route on the neighborhood's western side, parallel to the train line, is shaded by tall trees on both sides, providing ample shade as they mature. Central park is fitted with large trees that should provide ample shade.
#11	1	Green roofs and vegetation prevent overheating. Analysis of design plans reveals that about 50% of the plan's surface is covered by pavement or roofs excluding pavement in gardens. On municipal grounds, 40% of the surface is water, vegetation, or permeable pavement.
#12	1	East-west oriented streets reduce building overheating. South-facing building façades are shaded by trees.
#13	2	New construction in Almere Poort complies with BENG (Bijna Energieneutraal Gebouw) standards, ensuring low heating demand.
#14	1	Almere Poort and New Brooklyn are connected to a heat network powered by a gas-fueled combined heat and power plant.
#15	2	Buildings are constructed without gas connections.
#16	2	A main cycling route passes through New Brooklyn on the western side, parallel to the railroad. It offers wide, safe, illuminated, and separated paths to the city center and across the Hollandse Brug towards Het Gooi.
#17	x	Not applicable. However, active mobility or public transport is well supported, but the effects are not assessable from the available project documents.
#18	1	New tighter parking norms were applied (see below). One-way road infrastructure allowed for narrower roads.
#19	2	Parking norms from 2020 classify the area as highly urban (second-lowest category) due to the proximity of the train station and neighborhood center. The neighborhood will have 1,830 spaces (1.3 per house) of which half are placed on the edges of the neighborhood. This allows for trees in the streets and a central park.
#20	0	No information on circular economy provided in project documents.
#21	0	The goal concerns policy of Almere but not encountered in project documents.
#22	0	Not mentioned in documents.
#23	2	New Brooklyn features diverse parks and play areas. The central park includes walking paths, benches, playgrounds, and a pavilion. A green zone along the railroad zone is labeled as "*Speel groen*" (green play zone). The primary school has a green schoolyard. The main bike route is lined with trees and vegetation.
#24	2	Play areas are diverse, including natural elements in the central park and a facility for young children. The green zone along the railroad supports "*natuurlijk spelen*" (natural play).
#25	2	Formal and informal play spaces in green zones ensure the 5% play area target is met.
#26	2	Plant and tree species enhance resilience and biodiversity. Designs include 20 tree species. Tree beds and parks are sown with flower mixtures. Maintenance intensity varies by area.
Tot.	28	

[1] *Abbreviation*: Pr., Presence
[2] x=Not applicable or not assessed, 0=Not present, 1=Partially evident, 2=Clearly present

Groot Nooten

Table D.3: Reflection on the development project Groot Nooten in Warande.

Item	Pr.[1,2]	Discussion
#1	2	All transitions are acknowledged in Groot Nooten's plans.
#2	1	Storwater drainage relies on a seperate sewer system. The central green zone in Groot Nooten is to be fitted with wadis, draining part of the neighborhood's stormwater. Streets and main roads are lined with trees and vegetation.
#3	2	Stormwater is drained on newly created, large open water bodies that retain clean (rain)water, supporting quality with nature-friendly banks and submerged plants. Green zones include wadis and diverse tree species.
#4	1	Stormwater is primarily stored in the open surface water within Warande's new water level section, with discharge limited to 1.5 l/s/ha.
#5	x	Warande has separate stormwater sewers but no normative design event is mentioned.
#6	x	See above
#7	2	Warande's closed water system minimizes external water exchange, maintaining natural levels (NAP -5.5 to NAP -5.2) for reduced intake and ecological health. Added water bodies provide storage to prevent flooding and meet discharge standards.
#8	x	Water levels may drop to NAP -5.5, allowing intake from another section. Water Board Zuiderzeeland can source from the external water bodies if needed.
#9	1	The plan for Groot Nooten shows 186 public trees; visually, each home can see three, with 8% to 13% crown coverage upon tree maturity. All homes are within 300m of >1 ha green areas due to two large parks and a connecting green corridor.
#10	2	The slow-traffic route in the green zone provides shade from both buildings and trees, with coverage likely reaching 40% once fully grown.
#11	1	Homes have light-painted wooden facades and green roofs; red concrete tiles replace black asphalt, with light gray living streets.
#12	x	Further analysis needed.
#13	2	New construction in Groot Nooten must meet BENG (Bijna Energieneutraal Gebouw) standards, ensuring minimal heating demand.
#14	2	Heating is from a biomass plant using pruning waste, with potential future geothermal replacement.
#15	2	No gas connections.
#16	2	A cycling route connects the city and neighborhood centers via the central green zone.
#17	x	Active mobility and public transport is well supported, but the effects are not assessable from the available project documents.
#18	0	Conventional high parking norms are applied (see below).
#19	0	Parking norms from the 2009 policy are followed without modification. Total of 561 (average 1.93 per house) of which half located on public terrain.
#20	1	Builders are encouraged to minimize waste and prioritize material reuse.
#21	0	Policy outside project scope.
#22	0	Policy outside project scope. However, banks and waters offer circular use or energy opportunities.
#23	2	In Groot Nooten, the central green zone includes a biking route, exercise and play facilities. The water course features a public jetty.
#24	2	The central green zone in Groot Nooten has one playground. Three others are in adjacent parks, including a larger playground and a soccer field. Parks and park woodlands serve as informal play areas.
#25	2	Including informal play space in the green zone, the 5% target for play within Groot Nooten areas is met. The main playground and adjacent parks meet remaining requirements.
#26	2	Diverse plant and tree species are included to enhance resilience and biodiversity. No further details are available.
Tot.	29	

[1] *Abbreviation*: Pr., Presence
[2] x=Not applicable or not assessed, 0=Not present, 1=Partially evident, 2=Clearly present

Het Nieuwe Dorp

Table D.4: Reflection on the development project Het Nieuwe Dorp in Zeeheldenwijk

Item	Pr.[1,2]	Discussion
#1	2	All transitions are addressed in the design plans.
#2	1	Stormwater is primarily collected via a sewer and drained on open water bodies. The design guidelines limit paved areas to 80% of the non-built area of building plots, with exceptions only if compensated by green roofs. Green spaces and water bodies are facilitated in and around the neighborhood.
#3	2	Open water bodies retain clean rainwater and are fitted with eco-friendly banks. Small green areas are within Het Nieuwe Dorp, and larger green zones are nearby. The Zeeheldenwijk Masterplan emphasizes biodiversity-focused green zones and ecological maintenance in parts of the neighborhoods.
#4	1	Stormwater is predominantly collected via stormwater sewers and discharged on open waters present throughout the Zeeheldenwijk. Green, unpaved spaces in both public and private areas facilitate some stormwater infiltration.
#5	0	Other normative events were adressed in project documents: The stormwater drainage system prevents street flooding during Bui09 (29mm in 60 minutes), minimizes nuisance during Bui10 (35.7mm in 45 minutes), and protects property from water damage during extreme rainfall (*Klimaatbui*) of 90mm in 2 hours.
#6	0	See above
#7	1	Additional impervious surfaces and the dampening of ditches are compensated by creating water storage in new watercourses and a new water, both with an open connection to the Urkervaart.
#8	1	The Zuidermeertocht and Urkervaart, bordering the Zeeheldenwijk to the West and North, form a unified water system, with water levels in Zeeheldenwijk fluctuating accordingly. During dry periods, levels can drop by 20 cm. In extreme drought, water is added through the Vissering pumping station at Urk.
#9	x	Amount of visual trees from homes and canopy coverage cannot be evaluated due to lack of planting details. Entire Het Nieuwe Dorp is within 300 meter of a park or green area based on the conceptual designs Figure 5.11.
#10	x	Cannot be evaluated due to lack of planting details. However, slow traffic route align with green spatial structures that can provide shade.
#11	x	Cannot be evaluated due to lacking planting details.
#12	x	Detailed analysis needed.
#13	2	New construction must meet BENG (Bijna Energieneutraal Gebouw) standards, ensuring minimal heating demand.
#14	2	A collective heat network will use residual heat from the adjacent industrial area.
#15	2	In 2018, the government decided new houses would no longer receive a natural gas connection.
#16	2	Separate walking and cycling connections are provided throughout the Zeeheldenwijk, aligned with water and green spaces. Bike streets (*fietsstraten*) will be implemented.
#17	x	Not applicable. However, active mobility and public transport is well supported, but the effects are not assessable from the available project documents.
#18	0	Conventional high parking norms are applied (see below).
#19	0	Parking standards, as outlined in the parking regulations (*Beleidsregel parkeren Urk, 2021*), are followed. Het Nieuwe Dorp features 625 parking spaces (1.95 per home on average) in line with 2021 parking norms, with 369 located on municipal grounds.
#20	1	In the project documents it is addressed that the municipality of Urk aims to minimize primary raw material use. However, material guidelines in the Building Code (*bouwbesluit*) allow limited flexibility. Developers are encouraged to use removable, modular construction and document materials.
#21	0	Outside the scope, and not recognized in project documents.
#22	0	Outside the scope, and not recognized in project documents.
#23	2	Green areas in and around Het Nieuwe Dorp provide space for play and interaction. Two larger parks and green areas are located within 300 of the neighborhood.
#24	1	In Het Nieuwe Dorp, three green playing fields will be created. The design is unknown.
#25	1	Based on a quick calculation, these fields will cover 3,800 m², about 3.5% of the total neighborhood area.
#26	2	Biodiversity is considered, but no further details are provided.
Tot.	23	

[1] *Abbreviation*: Pr., Presence
[2] x=Not applicable or not assessed, 0=Not present, 1=Partially evident, 2=Clearly present

Regenboogbuurt Noord, Regenboogbuurt

Table D.5: Reflection on the renewal project Regenboogbuurt, with a more detailed analysis of Regenboogbuurt Noord.

Item	Pr.[1,2]	Discussion
#1	1	In the Regenboogbuurt renewal project, all transitions are acknowledged to some extent, but the connection to the energy transition is marginal.
#2	2	Wadis, permeable parking spaces, green areas, and lowered green spaces increase water storage. Impermeable surfaces are reduced by 30% according to Kennisportaal Klimaatadaptatie, and additional trees are planted.
#3	2	Nature-friendly banks are created in water bodies, and the flow-through of ponds is improved by enhancing connections managed by the water board. As in the rest of Almere, mowing management is diversified. Additional greenery provides habitat for animals and insects.
#4	1	The Regenboogbuurt was originally equipped with an improved separate sewer system (*verbeterd gescheiden riolering*). This led to excessive rainwater discharge to the WWTP, which has since been minimized. The new climate adaptation measures aim to increase rainwater storage. Discharge to the receiving water system is not constrained by norms.
#5	0	The standard for the project is that a precipitation event of 60 mm in one hour should not cause water nuisance, with water levels on streets limited to 10 cm or less.
#6	0	Not applicable.
#7	2	The renewal project reduces discharge into the water system.
#8	1	Infiltration capacity in Regenboogbuurt is increased and water can be introduced from the adjacent water system if necessary.
#9	2	In Regenboogbuurt Noord, three trees can be seen from every house. A total of 636 trees were counted. Based on canopy sizes of 50 to 80 m², a canopy coverage of 22% to 35% is achieved. The centrally located Stadspark is within 300 meters of all areas in Regenboogbuurt.
#10	2	The separate biking roads and walking paths through and around the Regenboogbuurt follow green structures, achieving up to 40% shade coverage.
#11	x	More detailed analysis needed.
#12	x	Not applicable.
#13	1	During the renewal project, 10% of parking spaces were designated for electric vehicle charging, with further implementation depending on demand. However, requests from residents to remove large trees blocking sunlight for solar panels were not granted.
#14	0	No significant measures related to the energy transition were incorporated into the renewal project.
#15	2	The houses still have gas connections, as they were built in the 1990s. There is no heat network in place, nor is it considered a suitable solution for the neighborhood. The heat transition vision identifies individual and small collective heating solutions as more appropriate.
#16	2	As part of the renewal project, the bike path through Regenboogbuurt was integrated into Almere's major biking network. The width of the bike lane was expanded, and its routing was clarified.
#17	x	Not applicable. However, active mobility and public transport is well supported, but the effects are not assessable from the available project documents.
#18	2	There was no reduction in parking spaces (see below), but by rearranging parking spaces and roads, space for greenery was created.
#19	0	A minor increase in parking spaces was made at the request of residents. In Phase 4b, 734 public parking spaces were provided for 508 houses, resulting in an average of 1.44 parking spaces per household. All parking spaces are located on public land.
#20	2	Old paving stones are reused. Leftover paving stones were used as granulate for the concrete in the ongoing biking road.
#21	0	Not recognized in project documents.
#22	0	Not recognized in project documents.
#23	2	The centrally located Stadspark in Regenboogbuurt, spanning 6 hectares, receives a major overhaul. The new park includes walking routes, play areas for different age groups, sports fields and facilities, an urban climate arboretum, and wetland areas. Smaller green areas are scattered throughout and around Regenboogbuurt.
#24	2	Play areas are diverse and integrated into greenery. The outdoor classroom (*Buitenlokaal*) of the adjacent primary school Spectrum is potentially realized in Stadspark.
#25	1	Eight play areas are counted throughout Regenboogbuurt. Including informal play areas such as parks, the 5% target is easily achieved.
#26	1	Regenboogbuurt was originally planted with a wide variety of trees matching the colors of different parts of the neighborhood. During the renewal project, the Stadspark, in particular, reflects careful alignment with natural values.
Tot.	28	

[1] *Abbreviation*: Pr., Presence
[2] x=Not applicable or not assessed, 0=Not present, 1=Partially evident, 2=Clearly present

Stationsgebied Oost

Table D.6: Reflection on the redevelopment project of Stationsgebied Oost in Lelystad

Item	Pr.[1,2]	Discussion
#1	1	In the Stationsgebied Oost renewal project, all transitions except for the energy transition and circular economy transition were recognized in the project documents.
#2	1	Impermeable pavement in the area is reduced. Freed-up space is used for additional green areas and trees to reduce heat stress. Stormwater drains on a stormwater sewer.
#3	2	A variation of trees and vegetation is implemented in the freed-up space to cater to animals and insects.
#4	2	Unpaved area is increased, resulting in a higher amount of infiltrated and stored water. Remaining stormwater drains on stormwater sewer.
#5	x	Not recognized in project documents.
#6	x	Not recognized in project documents.
#7	2	Paved surface is reduced, storage capacity is increased, and the development is thus hydrologically positive.
#8	2	Open water is present nearby. The water level is maintained relatively constant throughout the year, and water can be provided from adjacent water bodies if necessary.
#9	1	The rule only applies to residential areas. Nonetheless, the 173 trees in the complete plan design provide canopy coverage of 35% with an average canopy size of 50 m^2, or 56% with an average canopy size of 80 m^2. Currently, there is no sufficiently large park with adequate shade within 300 meters, but one is planned on the west side of the station.
#10	2	The square is a busy slow-traffic area. There are 31 trees with a canopy coverage of 55%, assuming a canopy size of 50 m^2, providing ample shade. An ongoing biking route is lined with trees.
#11	2	Based on the plan view, paved surfaces account for 56%, while tree canopy coverage and grass make up 44%. Considering the underestimated tree sizes in the plan view, a vegetation coverage exceeding 50% is not unlikely.
#12	x	Not applicable to project.
#13	1	Heat stress reduction decreases the need for active cooling.
#14	0	No significant links to energy transitions are recognized in project documents.
#15	0	There are no houses in the case study area. The project documents do not include infrastructure alterations for energy transitions.
#16	2	All modalities are addressed in the plans. The bus station is transformed into an island station with 10 stops, up from the previous 7. Bus routing around the station is improved, resulting in shorter travel times. Bus traffic is separated from car traffic, improving the flow of both. Relocating the car road (Middenweg) allows for the widening of the bicycle lane to 4 meters. Outside the project scope but relevant, bicycle parking spaces in the station are adjusted and increased. Bicycle lanes are rerouted, and pedestrian connections from the station to the city are enhanced.
#17	x	Infrastructure for public transport, biking, and pedestrians is clearly prioritized over car traffic. This could contribute to a reduction in car traffic, but further future analysis is needed.
#18	2	Reduction in parking spaces (see below). Middenweg was transformed from a through road into a local destination road and was narrowed.
#19	2	In the old situation, there were 23 public parking spaces and 8 additional parking spaces next to the coffee shop for customers and employees. In the new design, there are 10 short-term parking spaces next to the coffee shop.
#20	0	Some current trees are removed, stored, and replanted for future use. No further reuse of materials is mentioned in the documents.
#21	0	Outside the scope.
#22	0	Outside the scope.
#23	2	Vegetation contributes to the appeal of the station square. There are sitting facilities on the edges of plant beds and a kiosk with a small terrace, all in close proximity to diverse vegetation and trees.
#24	x	There are no playgrounds in the area.
#25	x	There are no playgrounds in the area.
#26	2	The selected trees and vegetation are diverse and, according to documents, contribute to biodiversity.
Tot.	26	

[1] *Abbreviation*: Pr., Presence
[2] x=Not applicable or not assessed, 0=Not present, 1=Partially evident, 2=Clearly present

Molenkamp

Table D.7: Reflection on the renewal project of the residential street Molenkamp in Urk.

Item	Pr.[1,2]	Discussion
#1	1	In the Molenkamp renewal project, all transitions except for the energy transition and circular economy were recognized.
#2	1	Stormwater is detached from the combined sewer system. Climate adaptation measures are implemented in the form of an IT-sewer, sub-surface retention-infiltration facilities, permeable pavement, the removal of pavement, and the planting of trees and vegetation.
#3	2	Implementation of trees and shrubs in the freed-up space is selected to cater towards animals and insects.
#4	2	Rainwater drains on Rockwool retention-infiltration facilities, which are embedded in a layer of drainage sand. The overflow is attached to an IT-sewer system, which transports remaining stormwater to open waters.
#5	0	Design precipitation event is not provided.
#6	0	See above.
#7	1	Retention and infiltration are increased, and stormwater is disconnected from the combined sewer system. Specifics regarding discharge to open waters are not specified in documents.
#8	x	Infiltration capacity is increased.
#9	2	In the renewal plans, each house will have a view of three public trees. The number of on-street public trees increases from 3 to 31. Using https://www.atlasleefomgeving.nl, it was calculated that the tree canopy coverage in the De Top neighborhood is approximately 11%. The impact of the renewal project on this neighborhood-wide percentage is negligible. However, within the street itself, tree canopy coverage increases from 4% to 23%. Assuming an average canopy size of 50 m², 44% of the street surface area will be covered by tree canopies.
#10	x	Such areas are not found in the Molenkamp area.
#11	0	In the renewal plans, roughly 60% of the street is covered by pavement. The rest consists of permeable pavement and vegetation. No alterations to vertical surfaces are included.
#12	x	Not applicable to project.
#13	1	Heat stress reduction decreases the need for active cooling.
#14	0	No significant direct links to the energy transition are recognized.
#15	0	Houses have a gas connection, as they were built in the 1970s. A heat network is not present. It is yet to be determined whether the neighborhood Top should be heated by a heat network or by individual and collective solutions, as written in the Heat Transitions Vision.
#16	2	The old two-way road is turned into a one-way road. As a result, road width can be decreased. The assumption is that this increases traffic safety.
#17	x	Not applicable. Little effect on municipalities' modalities is expected from a project of this modest scale.
#18	2	Reduction of parking spaces (see below). The road was reduced from two-way to one-way, allowing for a narrower design.
#19	2	The number of formal parking spaces remains roughly equal (51 in the new situation vs. 49 in the old situation). However, 23 informal on-street parking spaces are removed, as the new road width (3.9 meters vs. the former 6 meters) does not allow for on-street parking.
#20	0	No mention of reuse of materials is included in documents.
#21	0	Policy outside project scope.
#22	x	No applicable as there is no open water in the project area.
#23	1	Vegetation contributes to the appeal and microclimate of the street. No other amenities, such as benches or play facilities, are included.
#24	x	Not applicable as there are no playgrounds added and outside the scope.
#25	x	Not applicable as there are no playgrounds added and outside the scope.
#26	2	New shrubs and trees are selected to cater to indigenous biodiversity.
Tot.	19	

[1] *Abbreviation*: Pr., Presence
[2] x=Not applicable or not assessed, 0=Not present, 1=Partially evident, 2=Clearly present

Project results summarized

Table D.8: Reflections of all projects summarized

Item	Pr.[1]	% [2]	Discussion
#1	8	67%	Most transitions are acknowledged across projects, but the energy transition is largely absent in renewal projects. With some exceptions, the circular economy transition is not well recognized in the project documents.
#2	7	58%	The projects feature a mix of blue-green and gray solutions. All rely on separate stormwater sewer systems, with gray infrastructure draining water to local storage or, in the Molenkamp, to gray infiltration facilities. Blue-green infrastructure such as parks, open water, trees, green roofs, and permeable surfaces are also integrated, enhancing the microclimate, infiltration, and reducing runoff.
#3	12	100%	All projects show clear integration of climate adaptation and ecological quality. Green spaces are designed with climate resilience, biodiversity, and ecological robustness in mind. Mowing management is diversified for ecological benefits. Blue spaces are fed with clean rainwater and equipped with nature-friendly banks.
#4	8	67%	All projects demonstrate efforts to follow the principle. While local storage for utilization was not clearly observed, efforts in retention and infiltration were made through permeable parking spaces, infiltration facilities, wadis, green roofs, and a reduction in impermeable pavement. In the new development projects, storage was created in water bodies, two of which are located within the projects themselves.
#5	0	0%	The project documents mention a range of normative events and stress tests, though not for all projects, and in some cases, the specific precipitation events were not explicitly stated. Notably, the 70 mm/hour event was not explicitly mentioned for any of the projects.
#6	0	0%	Same as above.The 90 mm/hour event was not explicitly mentioned for any of the projects.
#7	8	67%	The principle of hydrologically neutral development is followed. In new development projects, extra discharge is compensated by creating open water bodies, two of which are created locally. In Groot Nooten and Warande, a separate water section with a dynamic water level enhances compensation. For renewal projects, the strain on the water system is alleviated by consistently reducing paved surfaces, thereby decreasing stormwater runoff and discharge.
#8	6	50%	The goal is not quantitatively assessed in the project documents. However, all projects show efforts to improve local infiltration and retention, as discussed above.
#9	7	58%	For all applicable projects with planting details available, three public trees are visible from each home. Upon tree maturity (with an assumed average canopy size of 50m²), canopy coverage ranges from 8% to 35%. Assuming an average canopy of 50m² results in 20% coverage, while assuming an 80m² canopy, the coverage is 31%. Generally, the projects are located within 300m of a park.
#10	8	67%	Five of the six projects include major slow-traffic routes, four of which are lined with trees. While shading was not quantitatively assessed, achieving 40% shading in the future seems realistic. High-traffic areas, such as the station square in Lelystad and play areas, already show considerable tree shading, with 40% shading likely.
#11	4	33%	The analysis carried out shows that impervious horizontal surface coverage by buildings and streets ranges from 40-60%, excluding gardens and not accounting for pervious parking spaces. Due to time constraints, the assessment was limited, and a more thorough analysis would require additional time.
#12	1	8%	Only recognized in New Brooklyn.
#13	9	75%	The new development projects met the BENG (Bijna Energieneutraal Gebouw) requirements. In the renewal projects, the simultaneous implementation of EV charging stations and the increase in trees and vegetation contribute to reducing the need for active cooling.
#14	5	42%	New development projects are all equipped with heat networks, powered by a mix of sustainable and less sustainable heat sources. However, in renewal projects, no significant energy transition interventions have been noted.
#15	8	67%	See above. Houses have been built without gas connections since 2021.
#16	12	100%	New development projects focus on creating safe and inviting cycling and walking infrastructure aligned with blue and green spaces, integrated into the existing biking network rather than prioritizing car infrastructure. Redevelopment projects, already equipped with separate biking infrastructure, have widened paths and improved routing to enhance accessibility and safety.
#17	0	0%	This goal was set only by the municipality of Lelystad. However all projects show considerable attention to car alternatives, but the impact on modality shares is yet to be seen.
#18	7	58%	Only one of the new development projects applied stricter parking norms than the conventional high norms used in most of the municipality due to its high level of urbanity. All redevelopment projects showed a decrease in car infrastructure by making road infrastructure more space-efficient, converting two-way roads to one-way, downgrading roads, and reducing the number of parking spaces.
#19	6	50%	As stated above, only one new development project included novel lower parking norms due to its high urbanity, allowing for green space and trees within the neighborhood tissue. The redevelopment projects focused less on reducing formal parking spaces compared to other car infrastructure interventions (see above).
#20	4	33%	New development projects show minor intentions to minimize waste and prioritize material reuse but provide no concrete examples. Redevelopment projects, however, include some concrete examples.
#21	0	0%	Gray water use was not observed in any of the projects.
#22	0	0%	Ambition not recognized in any of the project documents.
#23	11	92%	All projects contribute to high-quality green spaces, though with varying degrees of functionality and amenities. Parks and green spaces in the new development projects and Regenboogbuurt offer the most diverse environments, integrating play, sports, social spaces, and various natural elements. The station square stands out for its strong focus on microclimate, aesthetics, and its role as a public waiting and meeting area. Street greenery, such as in Molenkamp and other neighborhood projects, is primarily oriented toward aesthetics, microclimate, and nature.
#24	7	58%	The ambition is clearly evident in projects that include new parks and play areas, particularly when the designs are available.
#25	6	50%	The goal was met for two of the new development areas, but not for Het Nieuwe Dorp.
#26	11	92%	Each project demonstrates the intention to select trees and vegetation that promote diversity and support indigenous biodiversity. Additionally, diversified maintenance to support biodiversity was recognized in two of the new development projects.

[1] *Abbreviation*: Pr., Presence

[2] The presence score was summed for all projects, divided by the maximum potential score (12), and then multiplied by 100% to achieve the percentage.

E

Interview Guide

Introduction

- As you might be aware, I am conducting my master thesis as part of the Water Management track of the MSc in Civil Engineering at the TU Delft. My research focuses on the relationship between climate adaptation and other urban transitions, specifically the energy transition, mobility transition, circular economy, environmental health transition, and the nature inclusiveness transition.
- I have already conducted a literature study, as well as policy and project studies as part of a multiple case study of the municipalities Almere, Lelystad, and Urk. For your municipality, I analyzed projects X and X. The purpose of this interview is to gain insights and perspectives from professionals active in these fields. Additionally, I aim to reflect on both general and case-specific findings.
- Please note that the results of this interview will be processed anonymously, without mentioning names or specific roles. The interview will be recorded for analysis purposes. A paraphrased summary of the key points I intend to include in my thesis will be sent to you for confirmation, allowing you to adjust or clarify as needed.
- The interview will take about 30 minutes to an hour. I will pose questions categorized by themes, and you are welcome to share any relevant experiences or perspectives that arise.

Warm-Up Question

- Can you tell me about your role in the organization?

Core Questions

Theme 1: Climate Adaptation

- How would you define climate adaptation in your professional context?
- How is climate adaptation policy translated into concrete measures in your municipality?
- What has been your involvement in climate adaptation and sustainability projects?
- How urgent do you think climate adaptation is for your municipality, considering future climate change projections?
- Do you think climate adaptation is sufficiently addressed in new development and renewal projects?

Theme 2: Relationships with Other Transitions

We will now discuss your experiences and perspectives regarding the relationships between climate adaptation and other urban transitions.

Energy Transition

The energy transition, in this study, refers to reducing greenhouse gas emissions.

- How does climate adaptation interact with the energy transition in your experience? Are there synergies or conflicts that stand out?
- Based on my analysis of projects X and X in your municipality, I found X and X. Can you confirm or elaborate on this?
- Are there other connections between the energy transition and climate adaptation in these projects that I may have missed?
- How do you see the future relationship between the energy transition and climate adaptation? Are there more opportunities or conflicts?

Mobility Transition

The mobility transition, in this study, centers around reducing car dependency and supporting active mobility such as biking or walking, as well as public transport.

- How does climate adaptation interact with the mobility transition in your experience? Are there synergies or conflicts that stand out?
- Based on my analysis of projects X and X in your municipality, I found X and X. Can you confirm or elaborate on this?
- Are there other connections between the mobility transition and climate adaptation in these projects that I may have missed?
- How do you see the future relationship between the mobility transition and climate adaptation? Are there more opportunities or conflicts?

Circular Economy Transition

The circular economy transition focuses on reducing the use of raw materials and increasing their circular reuse.

- How does climate adaptation interact with the circular economy transition in your experience? Are there synergies or conflicts that stand out?
- Based on my analysis of projects X and X in your municipality, I found X and X. Can you confirm or elaborate on this?
- Are there other connections between the circular economy transition and climate adaptation in these projects that I may have missed?
- How do you see the future relationship between the circular economy transition and climate adaptation? Are there more opportunities or conflicts?

Environmental Health Transition

The environmental health transition aims to enhance living environments to improve (mental) health, such as encouraging physical activity, relaxation, and socializing.

- How does climate adaptation interact with the environmental health transition in your experience? Are there synergies or conflicts that stand out?
- Based on my analysis of projects X and X in your municipality, I found X and X. Can you confirm or elaborate on this?
- Are there other connections between the environmental health transition and climate adaptation in these projects that I may have missed?
- How do you see the future relationship between the environmental health transition and climate adaptation? Are there more opportunities or conflicts?

Nature Inclusiveness Transition

The nature inclusiveness transition aims to enhance biodiversity and nature values, such as through urban greening or providing habitats for flora and fauna.

- How does climate adaptation interact with the nature inclusiveness transition in your experience? Are there synergies or conflicts that stand out?
- Based on my analysis of projects X and X in your municipality, I found X and X. Can you confirm or elaborate on this?

- Are there other connections between the nature inclusiveness transition and climate adaptation in these projects that I may have missed?
- How do you see the future relationship between the nature inclusiveness transition and climate adaptation? Are there more opportunities or conflicts?

Theme 3: Implementation Challenges

- What are the main barriers to integrating climate adaptation with other urban transitions in your projects?
- How does your organization address competing priorities between different urban transitions?
- Are there specific strategies or approaches that have been particularly effective in overcoming these challenges?

Reflection and Closing

- Is there anything else you'd like to add that we haven't covered?
- Do you have any specific recommendations based on your experiences?