A 'Plan B' to Accelerating North Sea Levels

Exploring Future Scenarios of Planned Retreat in the Western Coastal Region of the Netherlands

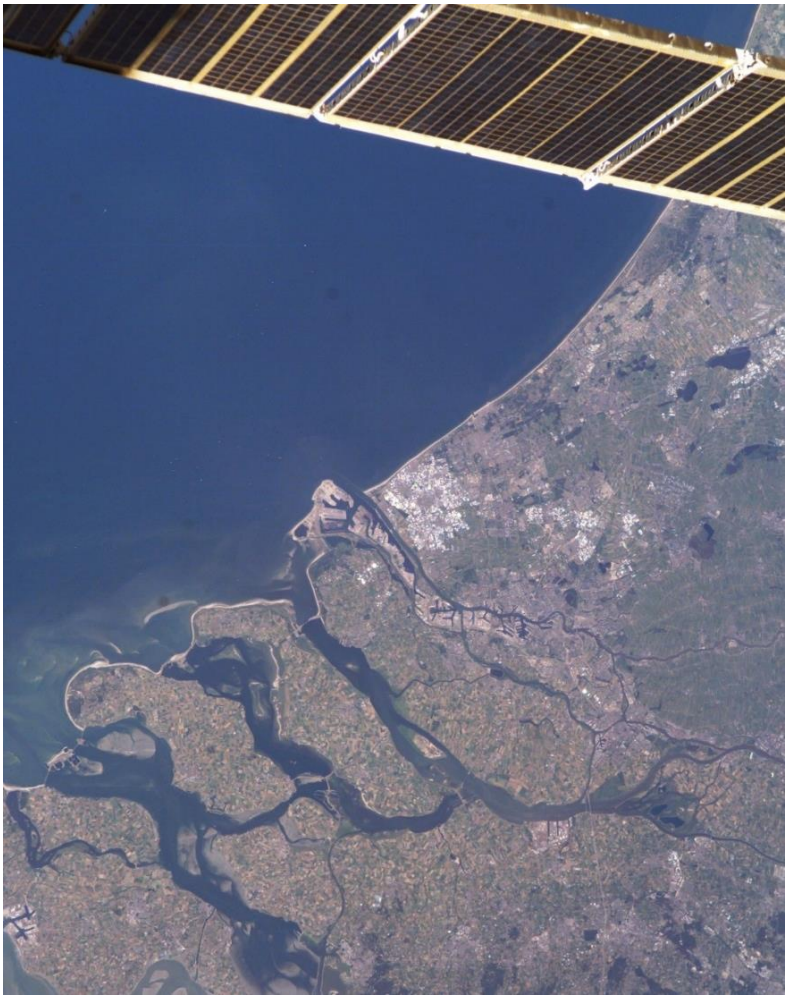

Image: West coast of the Netherlands seen from the International Space Station, www.esa.int

ABSTRACT

This thesis explores the potential and contestations of 'planned retreat' as a solution to sea level rise in the Western coastal region of the Netherlands. The Netherlands, with a long standing history in water management, faces the prospect of sea level rise at an accelerating pace. The Delta Programme has therefore initiated the Knowledge Programme Sea Level Rise (KP ZSS) that explores different solution directions to address these rising waters. One of the potential directions being explored is 'Move Along', which includes the strategy planned retreat. Planned retreat is considered as an anticipatory adaptation option that consists of 'moving to higher grounds', 'living with water', and 'giving room to nature'. Using exploratory scenario development as a methodological tool, this thesis explores four potential futures of the politically sensitive strategy 'planned retreat' under two socio-economic drivers of change. Each scenario illustrates how planned retreat develops differently based on the input from experts in the field. The outcomes of this thesis project, including the underlying assumptions of planned retreat, are critically analysed through the Anticipatory Climate Mobilities lens, which combines elements of anticipatory governance and the climate mobilities scholarship.

Key words: *planned retreat, sea level rise, climate adaptation, water management, scenario development, climate mobility, anticipatory governance, Western coastal region of the Netherlands*

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1. Introduction

According to the IPCC (2022), global mean sea levels will continue to rise throughout the 21st century under all existing climate scenarios. Under the Shared Socioeconomic Pathways (SSP) 1-2.6 and 2-4.5, the global mean sea level is likely to rise between 0.44 to 0.90 metres by the end of this century. However, there are many uncertainties regarding prognoses on sea level rise, as it depends on several factors. In addition to various emission scenarios that affect the extent of sea level rise globally, sea currents, wind direction, and other physical factors also affect sea level rise differently per region (Woodruff, 2016). These factors make it complex to detect regional changes in sea level rise (Steffelbauer et al., 2022).

Until recently, experts believed that the rise of sea levels in the North Sea *lacked behind* the global average, because of the specific sea currents and the wind direction of the North Sea region (KNMI, 2022). However, Steffelbauer et al. (2022) recently found significant evidence that the North Sea is in fact rising at an *accelerating pace*. This means that the sea levels in front of the Dutch coast are rising faster than expected, which shortens both the response time, as well as the solution space to this deal with these rising waters (Haasnoot & Diermanse, 2022). Taking this acceleration into account, the KNMI (2022) – the Royal Netherlands Meteorological Institute – estimates a North Sea level rise of 30 to 110 centimetres in the coming 80 years. In addition to accelerating sea level rise, land subsidence in the Netherlands is expected to continue and further increase flood risks as well (Moel et al., 2011).

One way of dealing with future climate risks such as floods, is through the implementation of adaptation measures. Globally, the solution space for adapting to sea level rise consists of two main directions: 'Protect' by either maintaining the current coastline or moving seaward, and 'moving along with the water' through a combination of accommodating sea level rise and planned retreat (Haasnoot & Diermanse, 2022). 'Moving along with the water' includes building climate resiliently, but also discontinuing to build in high risk areas (Haasnoot & Diermanse, 2022). Moreover, it includes 'planned retreat' as a long term option, in which principles such as 'giving room to nature', 'living with water', and 'moving to higher grounds' are central.

Given the wide range of uncertainties regarding climate change and sea level rise, some experts argue that there is a need to rethink the different ways in which the Netherlands can adapt to these changes (Schra et al., 2022; Van Alphen et al., 2022). Protection mechanisms such as dikes, dunes and seawalls have been implemented to cope with and anticipate to rising waters (van Alphen et al., 2022), but the latest findings show that such measures might not be sufficient on the long term. For example, an increase of several centimetres sea level rise per year could decrease the lifetime of a flood defence mechanism with decades (van Alphen et al., 2022). Experts therefore share consensus that there is a lack of a plan B in case the sea levels accelerate faster than expected (NOS, 2019; Schra et al., 2022).

In the Netherlands, the territory prone to floods from the North Sea, lakes or rivers, is currently inhabited by approximately 60% of the Dutch population (van Alphen et al., 2022). Given the fact

that the Netherlands is a low-lying country threatened by floods from both the sea and rivers, a solid strategy to cope with flood risks is key to guaranteeing the future safety of its citizens. Since battles against (rising) waters are not new in the Netherlands and have been ongoing throughout history (Borg & Ligtendag, 1998), water has been institutionalised in the Netherlands for a long time. This has inter alia led to the establishment of extensive governance strategies to improve water safety (Borg & Ligtendag, 1998). After the Netherlands suffered the Great Flood in 1953, the Dutch government authorised the National Delta Programme to keep the Netherlands safe from water-related risks. Led by the Delta Commissioner, the Programme currently continues to protect against flooding, but also addresses other water-related issues (Ministerie van Infrastructuur & Waterstaat, 2023).

In relation to sea level rise, the National Delta Programme contains a considerable component dedicated to finding solutions that guarantee safety from the rising North Sea. In response to a lack of a plan B in case the sea levels rise more than expected, a separate programme has been initiated to examine different, possible solution directions. These solution directions are presented and researched in the Knowledge Programme Sea Level Rise: 'Kennisprogramma Zeespiegelstijging' (KP ZSS), which started in 2019 and is planned to run until 2025 (Ministerie van Infrastructuur en Waterstaat, 2024b). The proposed solution directions are: Move Along, Protect and Seaward (See Figure 1). The direction 'protect' is in some of the documents subdivided into 'open protection' and 'closed protection' (Haasnoot & Diermanse, 2022), but in Figure 1 presented as one solution direction.

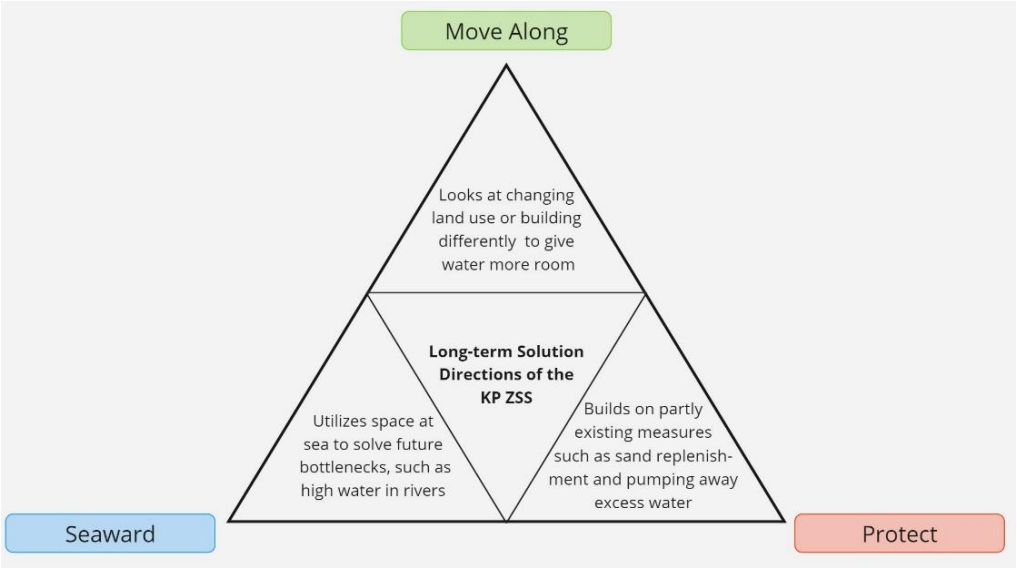

Figure 1. The Three Solution Directions of the KP ZSS

'Move along' is one of the more contested and politically perilous solution directions that the KP ZSS presents, referred to in full as 'moving along with the water'. In spite of the fact that all these solution directions have large consequences, 'move along' is described in the KP ZSS as the direction that requires most adaptation efforts. In addition to land use changes and building resiliently, this solution includes planned retreat.

Due to the complexity and novelty of this response to sea level rise in the Netherlands, this thesis project focuses particularly on the implications of planned retreat in the Dutch context. The focus area of this thesis is specifically the Western North Sea coastline of the Netherlands, including the Southwest Delta, given the acceleration of sea levels found in the North Sea region. This focus area is shown in Figure 2.

Figure 2. Focus Area: Dutch Western Coastline including the Southwest Delta

Critics of planned retreat, however, argue that we should have more faith in the protection mechanisms and technological developments to continue to protect. Water managers in the Netherlands for example state that planning far ahead into the future is pointless due to uncertainties regarding sea level rise (Scheuder, 2022). They furthermore argue that the idea of discontinuing to build houses in coastal regions, or moving Eastwards, will be too costly and will provoke resistance from society (Schreuder, 2022). Moreover, with a long-standing history of water management and working on water safety, the Dutch have an international reputation as water managers with innovative technologies and extensive hydraulic infrastructure (Avoyan & Meijerink, 2020). Some fear that this reputation could be undone by the implementation of a strategy like planned retreat.

Given the wide range of uncertainties in relation to sea level rise in the North Sea, and the concerns and conjecture surrounding ‘planned retreat’ as part of the ‘moving along with the water’-strategy, it is important to explore various approaches to future relocations resulting from climate risk. This thesis project aims to do so by examining if and how planned retreat could develop under different scenarios in the Netherlands. Using scenario development as a methodological tool, this thesis aims to map the main uncertainties in relation to planned retreat in the Netherlands, and in turn explores how those uncertainties could establish a framework from which scenarios of planned retreat can be derived. These scenarios present different futures in which planned retreat is implemented in various ways, depending on the circumstances under which planned retreat unfolds.

Moreover, this thesis project will critically analyse planned retreat and its implications through the lens of 'Anticipating Climate Mobilities'; a perspective further explained in the following chapter. This perspective provides a comprehensive theoretical basis to better grasp the potential impacts of planned retreat on coastal communities and ecosystems, and allows for the critical assessment of the underlying assumptions in this adaptation strategy.

1.1 Research Objective

As previously stated, the level of the North Sea is rising at an accelerating pace. Even though there are several protective and adaptative measures in place, some experts argue that there is a need to examine new approaches. The KP ZSS is currently working on three solution directions to cope with accelerating North Sea levels. One possible, but contested adaptation strategy to increasing flood risks, is moving along with the water in the form of planned retreat. Planned retreat includes a combination of leaving more room for water and nature, a level of accepting 'living with water', and planning the retreat of people living in coastal, high-risk areas. Even though the IPCC (2022) states that planned retreat is the only way to remove all vulnerability to sea level rise, it is still a contested solution, as it can also create new risks such as cultural ties or the disruption of social ties amongst communities that have to move house (Dannenberg et al., 2019). This thesis project aims to examine the main uncertainties related to planned retreat in the Netherlands, develop a scenario framework and derive exploratory scenarios of planned retreat, and critically analyse planned retreat using the 'Anticipating Climate Mobilities' lens.

Through exploratory scenario development, planned retreat is presented in different future pathways and storylines, and is reflected upon in terms of its advantages and disadvantages as a solution to sea level rise in each of the scenarios. In order to establish scenarios of planned retreat in the Netherlands, this thesis uses the input of various experts, existing literature and policy documents. Additionally, to critically analyse planned retreat and its implications, this thesis project uses two theories to establish a theoretical perspective that allows for a critical reflection. It brings together anticipatory governance and climate mobilities into one conceptual lens called 'Anticipating Climate Mobilities'.

1.2 Research Questions

In order to achieve the research objective, this thesis has a main question, examined through five sub-questions:

What does planned retreat in the Western coastal region of the Netherlands look like under the different exploratory scenarios and what are the advantages and disadvantages of planned retreat in each of the scenarios?

- *What theories and concepts can be used to make sense of planned retreat?*
- *What have been key developments in shaping the Dutch approach towards water management over time?*

- *What are the different expert and policy perspectives and understandings of planned retreat as an adaptation strategy for sea level rise in the context of the Netherlands?*
- *What are the socio-economic drivers of change for the development of exploratory scenarios of planned retreat?*
- *What is the influence of the identified exploratory scenarios on the practical outcomes of planned retreat in the Netherlands?*

To answer the research question, the sub questions aim to address essential aspects of gaining a better understanding of planned retreat and how it could develop. This thesis consists of the following chapters: Chapter 2 will explain the conceptual lens that is used to critically analyse planned retreat and its implications. It combines anticipatory governance and the climate mobilities scholarship to establish the 'Anticipating Climate Mobilities' perspective. Chapter 3 further explains the methodology 'Exploratory Scenario Development' that is used to create the scenarios in this thesis project. It also discusses the methods of data collection, analysis, and storage, and the ethical considerations and limitations of this research. Chapter 4 provides a brief description of historic events and turning points in the Dutch water sector. This chapter aims to expand the understanding of how water management has been shaped throughout history, and to provide a comprehensive understanding of the Dutch context of water management using insights from the literature. Chapter 5 discusses the views and perspectives on planned retreat as a strategy in the Netherlands of experts from different fields, using expert interviews, literature and policy documents. This chapter aims to give an overview of the different ways in which planned retreat is envisioned in the Netherlands. Chapter 6 discusses the socio-economic drivers of change in relation to planned retreat as a potential response to sea level rise in the Netherlands. These different uncertainties in relation to planned retreat are explained, and divided into micro-uncertainties, i.e. micro-drivers of change. This chapter also aims to analyse the underlying links and dependencies between the different drivers of change. Chapter 7 in turn presents a scenario framework in which the exploratory scenarios are created under the main drivers of change, building onto Chapters 4, 5 and 6. Based on the expert interviews and an interactive workshop, this chapter examines how planned retreat could unfold in different futures, taking the micro-drivers of change into account. The chapter ends with an analysis of the practical implications of planned retreat in each scenario, including the advantages and disadvantages per scenario. These chapters are followed by a discussion that uses the aforementioned conceptual lens to critically reflect on the results of this thesis, and ends with a conclusion that summarises and concludes the results of this thesis project.

2. Anticipating Climate Mobilities

This thesis explores planned retreat as a potential adaptation solution to accelerating sea level rise in the Western coastal region of the Netherlands. As outlined before, planned retreat consists of multiple components, namely 'moving to higher grounds', 'giving room to nature', and 'living with water'. Considering the sensitivity and underlying complexities of this strategy, this chapter aims to further examine planned retreat. It will discuss the multiple complexities of planned retreat, ranging from its anticipatory nature to its societal implications.

In the concept, the word 'planned' indicates an element of foresight and anticipation. Through the theory of anticipatory governance, this thesis explores how policy-makers and societies can proactively prepare for future challenges, such as sea level rise, through anticipation. It also discusses critical questions that challenge such anticipatory actions. In addition to the anticipatory nature of planned retreat, the word 'retreat' indicates an element of relocation of people and the movement of ecosystems and water. Therefore, the climate mobilities framework is explained in order to critically reflect on planned retreat, as this perspective allows for the examination of climate change-related human and non-human mobilities.

The last section of this chapter integrates these two lenses into the 'Anticipating Climate Mobilities' perspective, which functions as a comprehensive, conceptual lens. This perspective can be used to critically assess the outcomes of this thesis project, as well as analyse the underlying assumptions of planned retreat. In doing so, this chapter aims to explore the first sub question: *What theories and concepts can be used to make sense of planned retreat?*

2.1 Planned Retreat

In light of the so far insufficient adaptation and mitigation efforts to limit climate change, several actors have been considering planned retreat as a potential adaptation strategy (Ajibade & Siders, 2021). Sea level rise, for instance, is increasingly becoming a source of risks due to the increased frequency and magnitude of coastal floods, in combination with the large amount of people living in coastal areas (Gibbs, 2016). Planned retreat is part of one of the possible solution directions to cope with accelerating sea level rise in the Dutch coastal region according to the Knowledge Programme Sea Level Rise (KP ZSS). Haasnoot & Diermanse (2022) argue that it is particularly a solution direction considered for the long term.

Planned retreat is not a new phenomenon; relocation due to climatic factors has been a longstanding global response to environmental changes, whether voluntary or forced, regional or transboundary, and implemented through top-down or bottom-up approaches (Ajibade & Siders, 2021). However, this is the first time that it is mainly used in the context of anthropogenic climate change, increasing the political sensitivity of the approach (Carey, 2020). Planned retreat as an anticipatory approach to gradual changes such as sea level can therefore be seen as a relatively new strategy of the last decade (O'Donnell, 2022).

Planned retreat – also referred to as planned relocation or planned resettlement – and managed retreat are in many literature studies used interchangeably (Ajibade & Siders, 2021), but there are in fact differences between the two. An extensive literature review by O'Donnell (2022) shows that there are differences between *managed* retreat, which already occurs frequently in the US, for instance, and *planned* retreat. Planned retreat, on the one hand, is *anticipatory* in nature (O'Donnell, 2022), as it is a strategy to adapt to gradual changes by retreating people, assets and infrastructure from high risk places (Van Alphen et al., 2022). Managed retreat, on the other hand, is *responsive* in nature, as a reaction to a sudden, environmental disruption, like a wildfire (O'Donnell, 2022). This thesis project is discussing retreat as anticipatory adaptation strategy to sea level rise in the coastal region of the Netherlands, which is a gradual environmental change that will happen on the long term (Haasnoot & Diermanse, 2022), and therefore refers to 'planned retreat'.

Planned retreat is the "pre-emptory process of planning for the eventual retreat from an at-risk location" (O'Donnel, 2022, p. 4), and it is about proactively and systematically relocating people and infrastructure in response to a potential, gradual threat (Ajibade & Siders, 2021). Even though these authors emphasise the relocation of communities in their definitions, Siders et al. (2021) acknowledge that there is an important role for ecosystems in planned retreat as well. When people from coastal areas are relocated, the pressure on coastal ecosystems is alleviated, allowing them to recover. Additionally, Siders et al. (2021) argue that incorporating ecological factors into retreat strategies could alter the human-nature relationship, by shifting the focus from a human-centred adaptation strategy to one where both social and ecological systems are supported. In order words, 'retreat' can encompass more than the movement of people from one area to another. This integrated approach is echoed by Haasnoot & Diermanse (2022), who also refer to the inclusion of the components 'giving room to nature' and 'living with water' in the context of planned retreat in the Netherlands.

2.1.1 Planned Retreat – Contested Strategy or Path to Renewal?

According to Carey (2020) and O'Donnell (2022), planned retreat is often seen as a contested solution that can be politically perilous. There are several examples that demonstrate the difficulties of this strategy. One of these examples is presented by Niven & Bardsley (2012), in their research about small-scale cases of planned retreat in coastal areas of Australia, where the risks of floods and storm surges are ever increasing. Their study shows several challenges in the implementation of retreat as an adaptation strategy. One of the largest issues was the lack of a general culture of risk management in Australia, which makes it difficult for policymakers and communities to implement and accept proactive measures. The political environment is not supportive of proactive or anticipating measures, which retreat strategies often require. Furthermore, retreat is usually the last considered adaptation option, due to the high socio-economic costs and limited resources that these communities have for relocation purposes (Niven & Bardsley, 2012). These factors both play a hindering role in the successful planning and implementation of retreat strategies, thus leaving vulnerable populations exposed to ongoing flood risks. On top of that, announcing the strategy abruptly in the future due to difficulties in *planning* retreat strategies could result in more disruptive consequences for these coastal communities (Ajibade, 2019)

Ajibade & Siders (2021) present examples of retreat cases of Indigenous communities. In their study, Ajibade & Siders (2021) underline the fact that when implementing a retreat strategy, the rights of these communities are often overlooked. As such, relocation efforts exacerbate existing inequalities and further increase the vulnerabilities of groups that are already marginalised. This also leads to injustices, as Indigenous communities are often confronted with the consequences of climate change disproportionally, while having contributed to the issue the least (Green & Raygorodetsky, 2010). Moreover, these communities often have a strong adaptive capacity, because of their traditional knowledge, but this capacity is strongly reduced by socio-economic factors like land dispossession or poverty (Ford, 2012). Hence, retreat strategies can lead to further disempowering these communities and undermining their resilience when failing to account for these factors (Ajibade & Siders, 2021). This is particularly the case when Indigenous rights are ignored and these communities are excluded from decision-making.

A third case, presented by Wiegel et al. (2021), examines a retreat scenario where, despite being faced by an imminent danger of natural hazards, many individuals chose to return to their original homes after relocation. The community in Villa Santa Lucía, Chile, was exposed to a mudslide in 2017. In response to this event, the government decided to evacuate the population, and offered the affected communities social housing in a different area free of these risks. Despite the predictions that these mudslides would happen more frequently in the future, the local community rejected the government's relocation plans, only to come back to their original village. As it turned out, the people in this village did not consider the mudslides – or even the likelihood of more mudslides in the future – a severe enough risk to abandon their lands (Wiegel et al., 2021). This case study emphasises the differences in risk perception and the deep social and cultural ties people have to their homes and lands. In fact, in this case study, Wiegel et al. (2021) show that such factors can outweigh safety concerns, and consequently lead to the failure of retreat scenarios if these aspects are not taken into account.

Conversely, according to Siders et al. (2021), the process of planned retreat can result in not only disempowered, but also in empowered communities. They argue that planned retreat has the transformative potential to create a pathway beneficial for both people *and* ecological systems, which can in turn ultimately alter the relationship between humans and nature into a harmonious and more sustainable coexistence (Siders et al., 2021). Fedele et al. (2019) also highlight that the relocation of people, assets, and infrastructure *can* be a transformative adaptation method that has the potential to reduce the community's exposure and vulnerabilities to floods, while supporting ecological systems to thrive again. A positive example of retreat that Siders et al. (2021) mention, is the Room for the River-project in the Netherlands, which will be further discussed in Chapter 4.

Thus, according to this literature, planned *could* benefit both social and ecological systems in theory, but Fedele et al. (2019) and Siders et al., (2021) acknowledge that it has not often succeeded so far. There are several explanations for this lack of success. As Siders et al., (2021, p. 277) note: "How transformative a retreat or relocation proves to be will depend on why it is deployed, how it is managed, who is involved, and what ecological, social, economic, and normative changes are produced". Ajibade & Siders (2021) underscore that the transformative potential of retreat strategies is largely dependent on the involvement of different stakeholders in the decision-making process.

This literature suggests that there is a need to foster an inclusive cooperation among stakeholders, while the unequal power relations of these stakeholders are acknowledged.

The abovementioned examples all emphasise the difficulties of managing and implementing planned retreat as an adaptation strategy. These complexities include an unsupportive political environment, insufficient resources to the social costs, and the neglect of (cultural) contexts. In spite of the transformative potential that Fedele et al. (2019) and Siders et al. (2021) see in planned retreat, Carey (2020) argues that for each success story, there are many unsuccessful ones.

Planned retreat is thus by many considered as a contested adaptation strategy. This does not mean, however, that it should not be researched (Haasnoot & Diermanse, 2022; O'Donnell, 2022). O'Donnell (2022) for example argues for more reflexive research on planned retreat, asking who is involved and asking the questions, and to what purpose. O'Donnell (2022) furthermore explains the need for a robust knowledge-set, which outlines the trade-offs of implementing planned retreat. This information can help to ensure an inclusive and fair approach that also nurtures ecosystems. Ajibade & Siders (2021) furthermore argue for more questions related to social and environmental justice, such as finding out who has the political or economic power to determine whether communities can stay or should leave.

2.2 Anticipatory Governance in the Field of Climate Change

'Planned retreat' contains the word 'planned', which implicates that this strategy includes an anticipating element. According to Guston (2013), 'anticipatory action' refers to a governing decision in which the quality of the knowledge is in tension, meaning that the available information on which the decision is based might not be fully reliable or certain. Anticipation is about building capacity in the present for something that *could* happen in the future (Foley et al., 2018), taking a degree of uncertainty for granted. In this particular case, for instance, the extent to which the sea levels will rise is an existing uncertainty, which *requires* anticipation, according to some. Thus, in the context of planned retreat, effective governance requires integrating anticipatory actions to address such uncertainties and plan proactively for future threats.

Anticipatory governance consists of two parts: 'Anticipation' and 'governance'. Foley et al. (2018, p. 225) describe governance as "a broad-based societal capacity to make collective decisions". It includes both governmental as well as non-governmental action, and actions that occur in both public and private spheres (Foley et al., 2018). 'Anticipation' can be described as a way of understanding, imagining, preparing for or benefitting from the future (Boyd et al., 2015). Anticipatory governance, therefore, involves both the capacity to make informed decisions collectively as well as the foresight to navigate and shape potential future scenarios. A key tool in anticipatory governance is qualitative scenario development (Vervoort & Gupta, 2018), which this thesis project also employs to better comprehend the possible futures of sea level rise in the Netherlands.

Anticipatory governance has been coherently used since the beginning of the 21st century (Foley et al., 2018), but has more recently become increasingly popular in the field of sustainability and

climate change (Vervoort & Gupta, 2018). Anticipatory governance reemerged in response to the uncertainty that comes with climate change, and the long-term vision and flexible attitude that this problem requires (Quai, 2010). Proponents argue that this mode of governance can in fact be particularly beneficial when dealing with 'wicked problems' such as climate change (Boyd et al., 2009; Fuerth, 2009; Quai, 2010), because it allows for timely responses at earlier stages, rather than waiting until problems escalate (Fuerth, 2009). Critics, on the other hand, emphasise the fact that anticipatory governance also includes a component of deliberately 'steering' or shaping the future (Muiderman et al., 2020), raising questions about the different levels of influence of the stakeholders involved.

In the context of climate change *adaptation*, dealing with predictions is crucial; it involves using current information about climate futures to review the management possibilities (Kwadijk et al., 2010). Adaptation measures can be taken *in response* to a problem that occurs as a result of climate change, in which case it is not a form of anticipatory governance. However, adaptation measures can also be taken to *anticipate* to expected effects of climate change. *Planning to retreat* is an example of an anticipating measure, as it is about planning an action to anticipate and adapt to expected (and perhaps unexpected) sea level rise, without knowing exactly how much sea level rise will occur. Since anticipatory governance acknowledges that any prediction of the future is merely one of the possible outcomes (Quai, 2010), there is a possibility that an anticipatory measure does not necessarily respond adequately to, or is 'fit' for, the future.

Anticipatory governance can thus be best described as a model of decision making that works under high uncertainty. It is often based on foresight, making use of a variety of potential futures to anticipate climate adaptation strategies, which in turn guides the decision-making while monitoring change (Quai, 2010). Apart from foresight methods and tools, anticipatory processes can also make use of scenario planning (Muiderman et al., 2022), in which a wide range of scenarios are developed and analysed (Quai, 2010). In doing so, this approach prepares decision-makers and societies for future uncertainties, enabling them to adapt to the unpredictable effects of climate change. With regard to anticipatory climate adaptation, an adaptation measure is usually selected and implemented in response to an expected climate impact. This process is represented in Figure 3. It shows that climate change can lead to a potential impact (usually within a range of uncertainty), how several options are presented (or not presented) as possible adaptation strategies to tackle this expected problem, and how ultimately one response is selected, making use of tools such as foresight and scenario development.

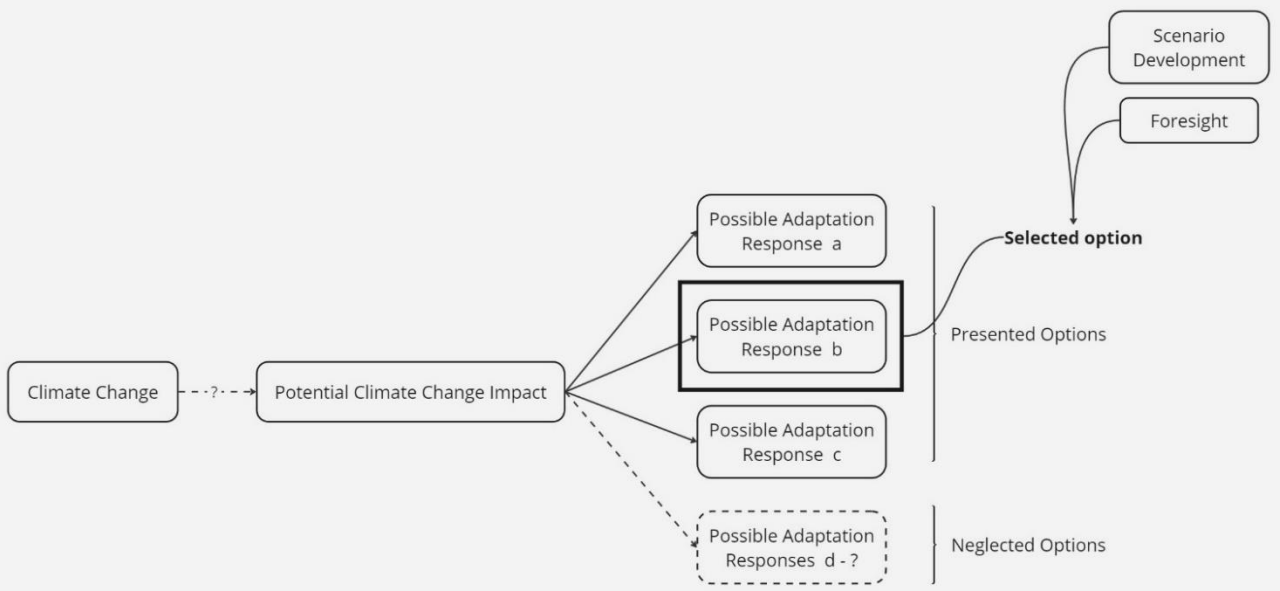

Figure 3. Anticipatory Climate Adaptation Process

2.2.2 Anticipation to Uncertainties in Political Arenas

Yet, there are some concerns with claims about future uncertainties. According to Aykut et al. (2019), anticipatory expertise has become an essential part of governing complex social issues. However, gaining this expertise is not only an epistemic process, it is also a political activity. Vervoort & Gupta (2018) similarly explain that claims about imaginary futures based on foresight are influenced by political choices. Muiderman et al. (2022) similarly argue that futures are not neutral, and anticipation processes are shaped by the political arenas in which they take place. For example, a claim about one certain potential future can be used to justify measures, especially with emergency framings. If something is depicted as a future crisis, certain measures could be pushed through, whereas otherwise they would have been unacceptable. These emergency framings could justify non-democratic decision-making in dealing with alleged emergency situations (Gupta et al., 2020).

Additionally, Vervoort & Gupta (2018) argue that there are some critical questions that emerge in response to anticipatory governance. Whose visions are included in the processes, and whose visions are neglected? What kind of implications do the visions of the future have for actions in the present? Vervoort & Gupta (2018) state that *preparing for* future issues cannot be confused with *knowing* the future. They therefore opt for the critical examination of how assumptions about the future influence current actions. In doing so, one can address existing biases of some perspectives being prioritised over others, uncovering social injustices and unequal power relations.

Muiderman et al. (2020) also argue that anticipatory governance includes an element of 'steering' in the present to shape uncertain futures. Portraying a limited amount of options encourages people to choose for a presented option, while other options are neglected (Jansen & Gupta, 2009). In the case of sea level rise in the Netherlands, one could argue that the KP ZSS, which outlines three solution directions, exemplifies this form of anticipatory governance. It prepares for further increasing and accelerating sea level rise, even though the extent to which sea levels will rise is uncertain, in order to reduce risks in the future by exploring adaptation options. By presenting three

solution directions, the KP ZSS in a way already 'steers' into one of those directions. As sea level rise is presented sea level rise as future looming crisis, the KP ZSS might give the sense that these three directions are the *only* options, and there *must* be a choice for either one of those solutions. Hence, Figure 4 demonstrates the same anticipatory climate adaptation process as Figure 3 does, but includes this political context. The political dimensions and related critical questions are challenging such anticipatory action.

Some argue that it is important to be aware of political contexts and existing power dynamics in which the governance of uncertain futures takes place. Anticipation could justify certain measures based on little evidence, influence or steer present-day politics, or present only limited options, which can be misleading. Other scholars, however, argue that anticipating the future is a more 'attractive' alternative than being blindsided by disruptive events. Either way, critical reflection of whose view is included in decisions and who is not, and how present day assumptions influence decision-making, is a key element to be aware of existing biases.

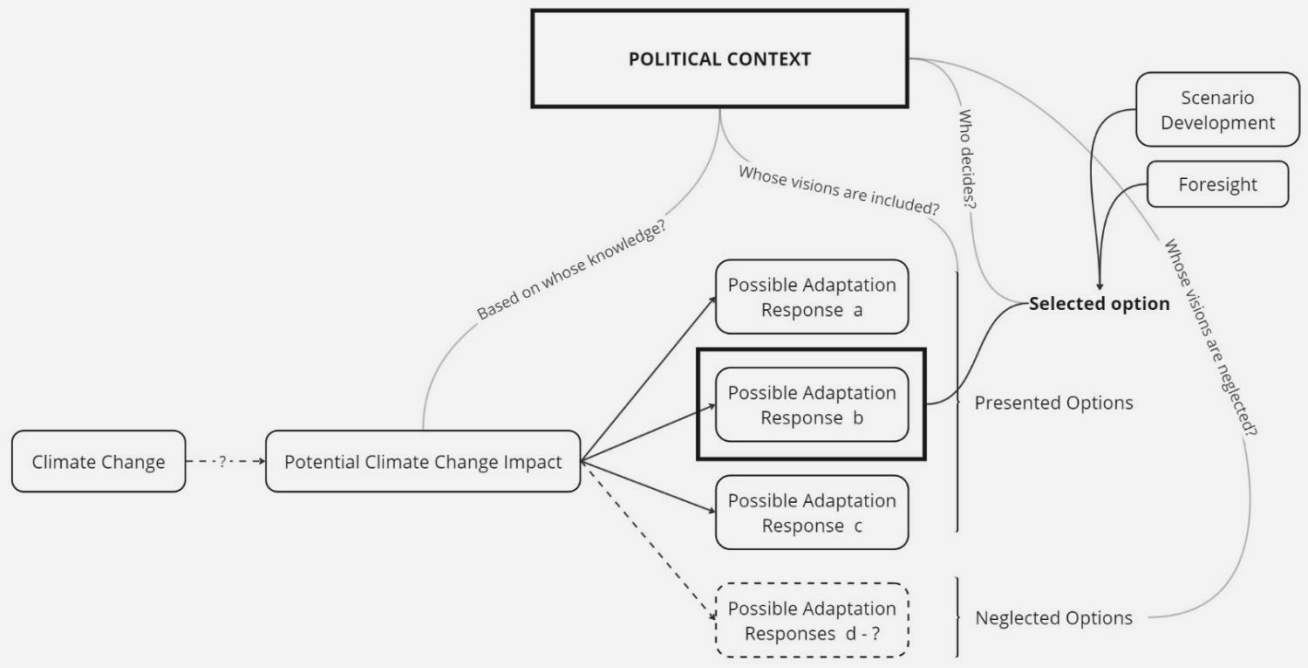

Figure 4. Anticipatory Climate Adaptation Process in Political Arenas

2.3 Climate Mobilities

In the previous paragraphs, Niven & Bardsley (2012), Ajibade & Siders (2021) and Wiegel et al. (2021) reveal several case studies that are illustrative examples for the (often) negative consequences of planned retreat. In some cases, people are *unwilling* to move and therefore stay in high-risk areas due to high social costs, cultural ties to their ancestral lands or differences in risk perception. In other cases, they simply feel that they *cannot* move because their small business cannot survive the transition, for example.

The word ‘retreat’ suggests a movement from one area to another in response to an (expected) climate risk. This movement is a central topic in discussions around climate mobilities, sometimes referred to as ‘climate migration’ (Wiegel et al., 2019; Boas et al., 2022). The climate mobilities scholarship offers a critical lens to analyse such movements, considering not only the physical relocation but also the complex social, cultural, and economic factors that influence these decisions. Despite the centrality of human mobilities in the previous examples, it is important to recognise that mobility in the context of climate change extends beyond human forms. Albeit limited, the climate mobilities scholarship increasingly includes non-human mobilities such as retreating ecosystems and the movement of natural elements, such as water (Baldwin et al., 2019).

Environmental or climate mobilities discusses mobilities that relate to environmental changes or degradation. These mobilities can consist of ideas, information, technologies materials, and people (Sheller & Urry, 2006), but also of nature, animals and water, for instance (Baldwin et al., 2019). Climate mobilities involve not just the movement of things from point A to point B, but also involve the in-between steps, the ‘in-between-ness’, and the social complexity associated with it (Sheller & Urry, 2006; Boas et al., 2022). In this particular thesis, the planned mobility of people, water and coastal ecosystems are central.

2.3.1 Human and Non-Human Mobilities

Migration of people is often incorrectly seen within artificial dichotomies between ‘forced’ and ‘voluntary’ or ‘mobile’ and ‘immobile’, whereas in fact mobility is more complex than that (Awad & Natarajan, 2018; Zickgraf, 2018). The concept ‘climate mobilities’ pays attention to the multiplicity of climate change-related human mobility, by moving beyond such dichotomies (Boas et al., 2022). This section discusses the climate mobilities scholarship, which steps away from the securitised narrative and the fixed dichotomies surrounding climate change-related human mobility (Boas et al., 2019). It is followed by an exploration of non-human mobilities within this scholarship, which are also increasingly being recognised (Baldwin et al., 2019).

Climate *human* mobility has been increasingly securitised over the past two decades (Boas, 2015). The impacts of climate change on society, in particular climate mobilities, have often been framed as crisis (Hartmann, 2010; Bettini, 2013; Bettini et al., 2016). This alarmist discourse predicts how masses of ‘climate refugees’ will threaten international stability and security (Wiegel et al., 2019; Boas et al., 2022), and uses security concepts such as ‘catastrophe’, ‘waves’, ‘mass flows’ and ‘threats’ to influence the narrative of climate human mobility (Bettini, 2013). In fact, Black et al. (2011), Foresight (2011), and Boas et al. (2019) argue that mobility is multicausal in nature and cannot be pinpointed on a single factor, such as environmental change. There are usually different factors combined that lead to the decision to migrate; socio-economic, political and environmental factors intersect in such a decision (Black et al., 2011; Foresight, 2011).

Secondly, this discourse has the wrong assumption that disruptive environmental changes make people either voluntary or involuntary move, leaving no room for people who either *have to* stay due to limited financial resources and social networks (i.e., involuntary immobility), or *want to* stay for cultural reasons, for example (i.e., voluntary immobility) (Wiegel et al., 2019). The alarmist narrative that is presented by several politicians, academics, media and policy-makers thus neglects

immobility. According to Zickgraf (2018) however, mobility and immobility cannot be seen separate from each other, as they are two sides of the same coin. Farbotko & McMichael (2019) found evidence in Pacific islands of people who are voluntarily immobile, *despite* the effects of climate change and sea level rise. They are voluntarily immobile for reasons as social costs, the loss of self-determination, place attachment and the potential loss of cultural identity.

Another issue with this alarmist narrative is the fact that this discourse only discusses a one-directional mass movement from the Global South to the Global North as a result of climate change (Boas et al., 2019). This sets the stage for privileged actors from the Global North to successfully blame migrants, as 'the problem', disregarding existing power relations and dominant structures (Wiegel et al., 2019). Moreover, there is an imbalance concerning the research in the field of mobility and climate change, which according to Piguet et al. (2018) is due to the fact that the Global North considers the 'victims of climate change' to mainly be people from the Global South. Albeit counterintuitive, the countries likely to experience the most *physical* environmental change in the coming century are the countries surrounding the Alps and the low-lying lands and deltas, which includes the Pacific Islands and Bangladesh, but also the Netherlands, for instance (Mulligan et al., 2013). Many of these countries are in fact located in the Global North, but as a consequence of their high adaptive capacity, these environmental changes are less apparent (Mulligan et al., 2013).

Furthermore, mobility in the form of retreat often comes with a substantial financial cost (Gibbs, 2016), particularly since coastal locations are usually highly valued places for their economic benefits (O'Donnell, 2022). Additionally, if retreat is *planned*, there are also significant costs and in terms of its preparation. According to Gibbs (2016) planned retreat is typically funded directly by the government, which is one of the reasons why it is mostly deployed by relatively wealthy countries in the Global North (Gibbs, 2016; Ajibade & Siders, 2021).

Contrary to the securitised, alarmist narrative, there are also more 'optimistic' voices that consider local and regional mobility as an adaptation strategy to climate change (Wiegel et al., 2019). In this narrative, the idea that mobility is merely a potential consequence of climate impacts has made place for the recognition that mobility can actually be an adaptation strategy to environmental changes. In doing so, this narrative highlights the agency of affected people and their ability to respond to hazards in a proactive way, rather than portraying them as victims (Vinke et al., 2020). Even though this discourse acknowledges the agency of people on the move, it has nevertheless received criticism. A central concern with this discourse is the idea that the responsibility to adapt to environmental changes is entirely placed on individuals, households or communities. This can result in increased vulnerabilities, injustices and inequalities when these individuals or groups fail to adapt properly (Wiegel et al., 2019).

As a result of the criticism that the aforementioned dominant narrative has received, amongst others by Hartmann (2010), Bettini (2013), Bettini et al. (2016), Boas et al. (2019), and Wiegel et al. (2019), the securitised discourse of climate change-related human mobilities is currently beyond its prime (Boas et al., 2022). According to Boas et al. (2022), relations between climate change and human migration are in fact often indirect and small-scale. The climate mobilities framework argues

that climate change has a less prominent role in such mobilities, and instead emphasises the socio-economic, cultural and political context, including existing unequal power relations, in which these mobilities are embedded. It moreover aims to understand the perceptions that people have of climate change effects in relation to their mobility or immobility (Boas et al., 2022).

Even though the climate mobilities scholarship emphasises the social contexts and the centrality of climate induced human mobilities, there is an increasing recognition of non-human mobilities as well. Baldwin et al. (2019) talk about a growing awareness of how the movement of natural elements – such as water and ecological systems – intersects with and influences human mobility. Changes in the earth system, such as climate change, shape both human mobility as well as ecosystems. In other words, not only *people* have been adapting to climate change, but ecological systems as well (Fedele et al., 2019). However, climate change also directly *pressures* ecosystems, leading to depletion or even ecological losses (Zickgraf et al., 2022). The mobility of natural resources, such as the availability and depletion of water and other ecosystem services, can directly shape patterns of human mobilities (Wiederkehr et al., 2019; Zickgraf et al., 2022).

However, this particular thesis not only considers how mobilities of ecosystems can shape human mobilities, but also how human mobilities can shape (the movement of) ecosystems. According to Fedele et al. (2019) and Siders et al. (2021), planned retreat can be transformative if it considers both social *and* ecological systems. Siders et al. (2021) explain that by reducing pressure on ecosystems through the retreat of people, there is an opportunity for ecosystems to thrive again. Hence, this thesis acknowledges that planned retreat includes a component of 'giving room to rising waters and coastal ecosystems' in addition to the retreat of people, further demonstrating the intricate link between the movement of natural resources and human mobilities. Moreover, the component 'living with water' further underscores the link between the movement of water and the mobility (or immobility) of people.

The climate mobilities lens thus provides academics and policy-makers with a more integrated understanding of climate change-related mobilities, as it includes the broader context (Boas et al., 2022), acknowledges that some people feel attached to their lands (Farbotko & McMichael, 2019), and recognises the agency and various vulnerabilities of those affected (Wiegel et al., 2019). It captures the diversity of movement, and recognises that the categorisations of movements are dynamic and not static (Courtoy, 2022). The climate mobilities literature concentrates on the aspirations behind the decision to move or not to move, under what conditions people move, and also considers the wider social, historical, ecological, political and cultural context, all of which are embedded in unequal power relations (Black et al., 2011; Wiegel et al., 2019; Boas et al., 2022; Zickgraf et al., 2022). It acknowledges the fact that decision-making processes relating to climate policies often omit the perspectives, knowledges and ontologies of those most affected or disempowered by such decisions (Farbotko & Campbell, 2022). All of this is captured under the concept of 'climate mobilities', which also includes immobility, temporary mobility, circular mobility, relocation, etc. (Boas et al., 2022). Despite the emphasis on human mobilities, there is also an increasing recognition of non-human mobilities, which includes natural elements and ecosystems. This thesis particularly argues that not only do non-human mobilities – such as rising

waters – shape human mobilities, human mobilities can also stimulate the movement and transformation of ecosystems.

2.3.2 Habitability

A particular aspect of the climate mobilities scholarship discusses the concepts 'habitability' and 'uninhabitability'. According to Farbotko et al. (2023), the current dominant discourse set by international organisations, scientists and journalists, presents the idea that sea level rise will inevitably lead to uninhabitability to for example coastal areas. They argue that this narrative is particularly problematic because it gives the impression of scientific certainty, while closing the consideration of alternate adaptation pathways for those areas.

According to Farbotko & Campell (2022), uninhabitability in the context of sea level rise is open to multiple truths; understanding 'habitability' merely as material phenomenon risks neglecting the social and cultural experiences of this concept. This could lead to policy developments that negatively affects communities who have different notions of what habitability means. Farbotko & Campbell (2022) highlight that communities have different ideas of what is 'acceptable' to live in, and thus, what 'habitability' entails. The question that they put central is: 'Who decides what is habitable?' For instance, Farbotko & Campell (2022) describe the case of Tuvalu, which is a Pacific Island threatened by rising sea levels. As a consequence of these rising sea levels, however the assumption is being made this will ultimately, inevitably lead to uninhabitability, dismissing the option that people might not perceive it that way, want to stay, or that their place of habitat might be saved and protected. Similarly, in the case of a mudslide destroying houses in Villa Santa Lucía, Chile described by Wiegel et al. (2021), the government who offered relocation options to the affected community worked under the assumption that the prediction of more frequent mudslides in the future would ultimately make inhabitants see the place as uninhabitable. Figure 5 below illustrates how the concept of habitability is constructed by not only these biophysical factors, but also by the socio-cultural context in which these take place.

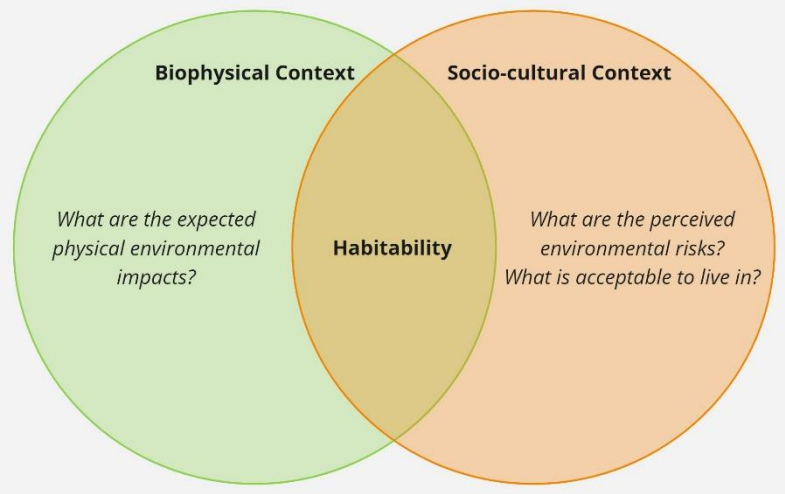

Figure 5. Determining 'Habitability'

According to Farbotko & Campbell (2022), dominant discourses about uninhabitability can have direct negative consequences, due to for example declining investments in such areas. Farbotko &

Campell (2022) look in their research particularly to Pacific atolls, though some of the outcomes of their research could be applicable to the case of planned retreat in the Netherlands. In fact, one of the main concerns described in the KP ZSS (Spoor IV: Meebewegen), is the risk of disinvestments as a result of planned retreat in the Western coastal region of the Netherlands.

Moreover, Farbotko et al. (2023) argue that the dominant narrative of inevitable uninhabitability has particularly been applied in areas in the Global South, rather than the Global North, likely building on colonial, problematic ideas of the superiority of the Global North over the Global South. Ajibade et al. (2020) also observe that discussions related to uninhabitability, such as those about planned retreat, mostly occur for areas in the Global South. In their paper, Farbotko et al. (2023) give an example in which they compare the Netherlands with Pacific atolls to depict this issue. In the Netherlands, 'inevitable uninhabitability' due to sea level rise does not seem to be an everyday concern, as opposed to many Pacific islands, for whom it is depicted as 'existential threat'. This is lack of concern in the Netherlands is partly *justified* by the fact that the Dutch government has employed long-term adaptation strategies that are set out in the Delta Programme, further discussed in Chapter 4, but it could also *explain* why there are no societal discussions yet about planned retreat, in the case of further accelerating sea level rise.

Gini et al. (2024) state that navigating the tensions within planned relocation strategies requires integrating different worldviews and understandings of risk. Gini et al. (2024) explain that the Fijian Government has set an example in this regard, by establishing a vulnerability assessment that includes not only biophysical and climate factors, but also a community-level cultural assessment of perceived risks. In doing so, this government recognises that (un)habitability is not solely determined by the biophysical sphere and the mobility of natural elements and ecosystems, but is also socially and culturally constructed by the *perceived* risks of the community (Gini et al., 2024).

All in all, habitability, and more importantly, who decides habitability, plays a large role in anticipatory decision-making, particularly in relation to planned relocation. In addition to that, it plays a role in ideas about 'living with water', as what is *acceptable* is also socio-culturally constructed, making it a relevant concept to further analyse planned retreat.

2.4 Anticipating Climate Mobilities Perspective

Coastal areas are often subject to anticipatory governance, which aims to anticipate to the uncertainty of sea level rise. Pre-emptive measures, such as planned retreat, are becoming more salient in that regard (Courtoy, 2022). The concepts set out above work together in this thesis project through the conceptual lens of Anticipating Climate Mobilities, providing a perspective that allows for the critical analysis of climate change induced mobilities, of which 'planned retreat' is an example. Planned retreat is considered an anticipatory strategy that includes both human and non-human climate change-related mobilities.

This perspective towards anticipating climate mobilities can be used to address knowledge gaps regarding why people choose to move or stay, as well as to examine which entities (have the power to) make decisions about retreat and why these decisions are being made. It also facilitates the

analysis of how climate (im)mobilities – both human and non-human – shape and influence each other. By considering the broader context in which planned retreat takes place, the conceptual lens Anticipating Climate Mobilities poses critical questions about decision-making processes and stakeholder involvement (see Figure 6). In doing so, it can also reveal underlying power dynamics. The conceptual lens is thus applied to not only look at what 'planned retreat' could solve, but also to what extent it could create new risks.

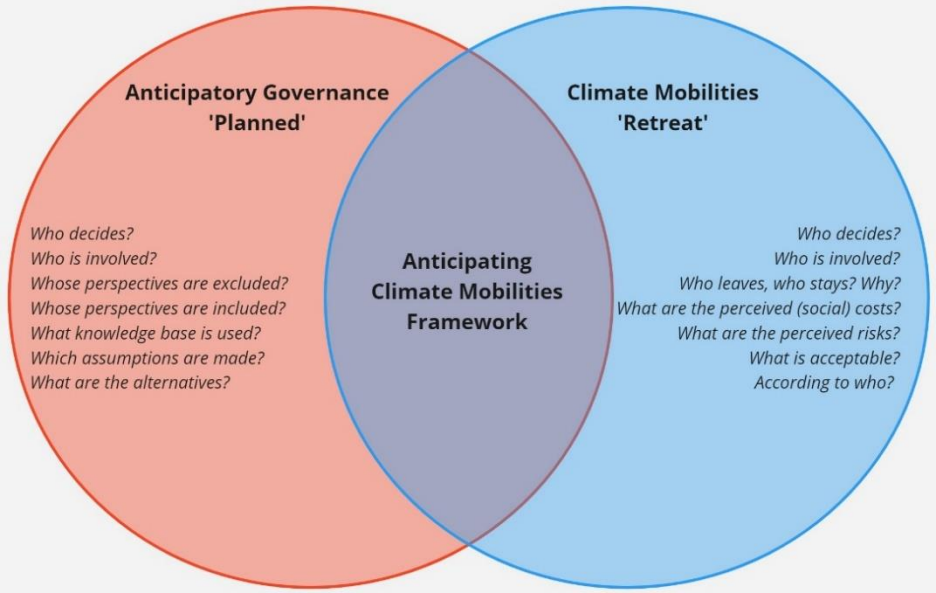

Figure 6. The Anticipating Climate Mobilities Perspective

The overall themes that span this conceptual lens are the political intentions, the socio-cultural context, the existing, unequal power relations and social injustices. This is particularly highlighted in the concept 'uninhabitability' put forward by Farbotko & Campell (2022), which is not only determined by biophysical factors, but also embedded in socio-cultural contexts. Critical questions as 'who determines what is habitability, and from what perspective?' are key in uncovering these complexities. Figure 6 gives an overview of these and some of the other critical questions that emerge from this perspective.

The several case studies of retreat presented in this section are illustrative examples in which these political, cultural, social, economic, historical and ecological aspects were (partly) disregarded. According to Gini et al. (2024), the goal is not to overcome these underlying tensions, but to embrace them, working towards a more sustainable and just form of planned retreat. In that way, according to some, planned retreat could have a transformative potential for both social as well as ecological systems (Fedele et al., 2019; Siders et al., 2021).

However, there are also examples of how the combination of anticipatory governance and the retreat of people have led to negative outcomes. As an example, Paprocki (2018) points to the case of Bangladesh, where coastal areas have been designated for shrimp cultivation to address (expected) increasing salination and flood risks due to sea level rise. Paprocki (2018) refers to this as 'anticipatory ruination': The discursive and material destruction of social and ecological systems in anticipation of real or perceived threats. While shrimp cultivation is promoted as a development strategy, it also exacerbates ecological degradation and leads to the displacement of local farmers.

As a result, these anticipatory measures have created new risks. Moreover, presenting shrimp cultivation as the *only* viable adaptation option marginalises alternative options and strategies (Paprocki, 2018), steering the future without taking local perspectives and risks into account.

All in all, the integration of the theories of climate mobilities and anticipatory governance results into a robust analytical tool to assess planned retreat. Whereas climate mobilities emphasise the climate change-related movement of people, water and ecological systems, anticipatory governance addresses how future uncertainties are governed through pre-emptive measures. Combining the aforementioned theories and concepts into one conceptual lens allows for comprehensive understanding of planned retreat beyond viewing it as a mere solution to gradual environmental change. The critical questions that follow from this perspective enable a deeper exploration of the underlying assumptions of planned retreat, and a critical analysis of the underlying power dynamics in which decisions about retreat are embedded. By embracing and incorporating these contexts and tensions rather than trying to overcome them, some argue that there is a possibility to cooperate towards a sustainable, and perhaps even transformative form of planned retreat, which aims to avoid 'anticipatory ruination'.

3. Methodological Framework

This chapter operationalises this thesis project and explains the methodology 'Exploratory Scenario Development', including the qualitative data collection methods that have been used to generate input for those scenarios. In order to answer the research questions, this thesis project employed qualitative research methods, as such methods allow for a better understanding of societal processes and social phenomena. The methodology applied in this thesis, i.e. exploratory scenario development, particularly gives the opportunity to explore uncertain futures that unfold under uncertain conditions, such as climate change and sea level rise, but also societal developments. The data collection methods that served as input for the development of these exploratory scenarios are expert interviews, literature research, policy-document analysis, and an interactive workshop. The approach of this thesis project has been dynamic and iterative, going back and forth between the retrieved data, the literature, and the established conceptual lens.

3.1 Exploratory Scenario Development

Scenario development is increasingly being used to better inform decision-makers about different plausible futures that are based on key uncertainties, such as climate change (Machiels et al., 2023). There are multiple categories of scenarios and scenario development, but this particular thesis uses exploratory scenario development. Exploratory scenarios start from the present and explore the impacts of various drivers and their interactions from now into the future (Wiebe et al., 2018), usually on a timeline from 20 to 100 years (Rounsevell & Metzger, 2010). Exploratory scenarios can be qualitative, making use of storylines, or quantitative, using models (Van Vliet & Kok, 2013). Whereas models show a certain trend of a scenario in a quantitative manner (Van Vliet & Kok, 2013), storylines describe the different scenarios using words, based on the input of stakeholders and the interpretation of that input (Wiebe et al., 2018). This particular thesis uses the methodology qualitative exploratory scenario development. The qualitative scenarios are therefore presented as *storylines*, and are built on *socio-economic drivers of change*. These concepts will be further elaborated on later in this chapter.

Exploratory scenario development is a qualitative methodology that allows for the analysis of uncertain futures. Scenarios and their storylines are inter alia used to explore uncertainties in environmental changes and the response of society to these changes (Rounsevell & Metzger, 2010). The aim of this method is to identify or test robust policy strategies that can help communities and other stakeholders to cope with different circumstances (Van Vliet & Kok, 2013). Van Vuuren et al. (2012) highlight three main strengths of exploratory scenarios as methodology: It stimulates imagination and creativity, enables policymakers to cope with unstructured problems and their uncertainties, and lastly, it allows for the development of robust solutions. As opposed to 'forecasting', scenario development recognises that the future is not 'controllable', and therefore encourages decision-makers to envision a plurality of plausible futures (Machiels et al., 2023). The policy or solution in question can in turn be tested in each of these plausible futures.

Although scenario storylines aim to stimulate the recognition of different perceptions of our world, storylines are not predictions and cannot be considered as truth. They do not attempt to predict, but rather to provoke and communicate different visions of what our future *could* or *may* be (Börjeson, 2006; Rounsevell & Metzger, 2010; Van Vliet & Kok, 2013). Explorative scenarios attempt to answer the question: *What can happen if we act in a certain way?* In doing so, they are particularly useful in dealing with possible future threats, or to explore the consequences of alternative developments (Börjeson et al., 2006).

This thesis project presents the exploratory scenarios as storylines that describe plausible socioeconomic development pathways. The qualitative assumptions in the storylines are the socio-economic drivers, i.e., a broad category of underlying causes of change (Rounsevell & Metzger, 2010). These storylines describe how different combinations of certain assumptions may lead to different outcomes on the long term. The socio-economic drivers of change are uncertainties that are usually divided into two 'extremes' or 'opposites' describing two alternative future world orientations (Rounsevell & Metzger, 2010). The combination of different extremes of the drivers function as the framework in which the scenarios unfold. Within these different scenarios, the micro-drivers differ based on the circumstances of that scenario, determined by the main drivers. As this is rather abstract, the next section provides a detailed explanation of each step in scenario development, using illustrative figures.

3.2 Steps in Exploratory Scenario Development

According to Rounsevell & Metzger (2010), after the aim of the scenarios has been established, there are usually four steps left in the development of qualitative exploratory scenarios: 1) Identifying the drivers of change (i.e., uncertainties), 2) building the framework of the scenarios based on the *main* or *key* drivers of change, 3) constructing the storylines of each scenario, and 4) analysing the implications for decision-making of each scenario. Prior to the first step, however, this thesis project has also delved into the context of this topic and the understandings of planned retreat. These findings feed into steps three and four, and will thus be explained as part of those steps.

3.2.1 Identifying the Drivers of Change

The first step is to determine what socio-economic drivers of change are underlying causes of change in the context of planned retreat in the Netherlands. In this thesis, the drivers of change were determined based on a literature review, a policy-document analysis, and a set of interviews with a variety of experts in different fields related to this topic, presented in Chapter 6.

There are many uncertainties that impact the way the future could look like, and in turn, the way in which planned retreat could take shape. The literature shows many existing uncertainties in the human dimension in relation to decision-making. Mahmoud et al. (2009) argue that in scenario development, generally four factors play a role: Climate change, socioeconomic factors, threats to natural ecosystems, and technological development, depending on where the emphasis of the scenario lies. In relation to planned retreat specifically, Siders & Ajibade (2021) mention uncertainties such as the economic aspects, i.e. how much will it cost and who will finance it, as

well as socio-cultural aspects, i.e. who will move, where they will move to, how will people react to such a strategy, and how will they be affected.

Considering the transdisciplinary nature of planned retreat in the Netherlands, given that it is driven by uncertainties such as climate change, includes a component of 'giving room to nature', and likely affects people and their habitats, this research used a STEEP analysis to identify and categorise the drivers of change. A STEEP (Societal, Technological, Economic, Environmental, and Political) analysis allows for a comprehensive overview of external factors that may influence the future differently, by looking at societal, technological, economic, environmental and political factors (Szigeti et al., 2011). Rounsevell & Metzger (2010) state that drivers in scenario development are commonly derived from STEEP categories. In this research particularly, the 'environmental' category has been split up in 'climate change and sea level rise', and 'ecological systems'. The STEEP analysis was conducted through expert interviews based on a topic list addressing the different STEEP categories, but tailored to planned retreat in the Netherlands, as shown in Figure 7.

Figure 7. Categories of Drivers of Change

Expert interviews, policy documents, and literature served as input to determine the impacts of this comprehensive set of factors. After the data collection phase, these categories were given substance by filling in the drivers change, discussed in Chapter 6. This first step of scenario development is visualised in Figure 8.

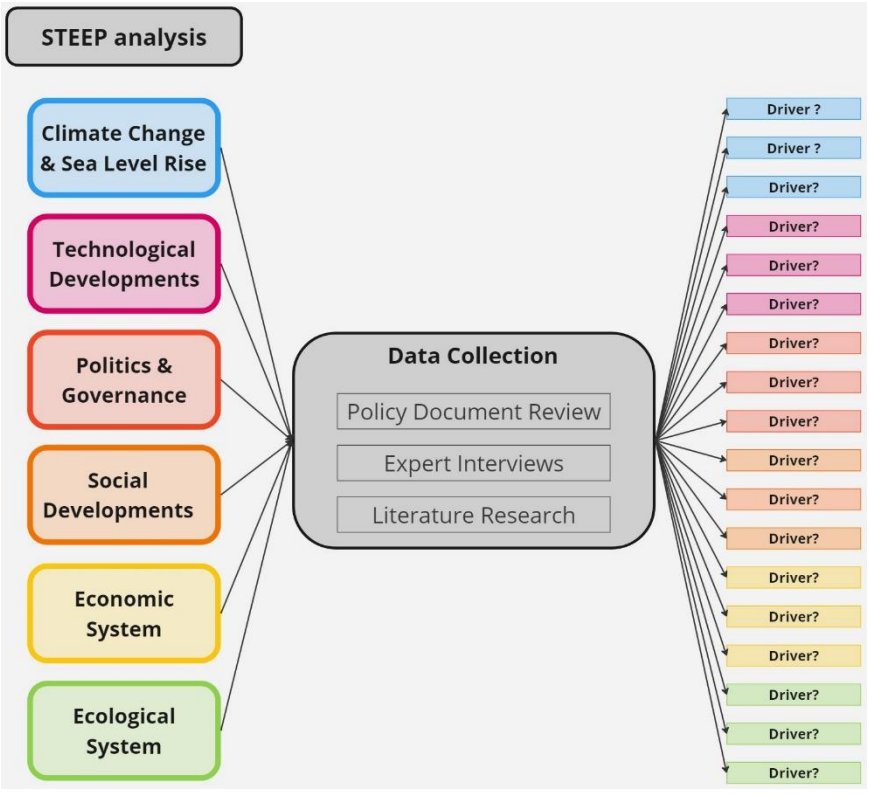

Figure 8. Process of Determining the Drivers of Change

3.2.2 Establishing the Scenario Framework

After determining the factors that play a role in impacting the future of planned retreat in the Netherlands, the key drivers of change can be determined in order to create a framework for scenario development. The data from the literature, policy documents and expert interviews also allow for the determination of the key socio-economic drivers of change, by analysing what is considered the 'main uncertainty', 'main obstacle', or 'determining factor' in designing or implementing planned retreat. Through the integration of different drivers, it becomes visible which drivers are determining for what the future could look like, and which drivers are rather dependent on those key drivers.

When determining the main drivers of change, one key element is to ensure that the drivers are pertinent to the examined *level* of the policy issue (Rounsevell & Metzger, 2010). In order to ensure the relevance of the drivers, they should to some extent be influenceable by for instance policy choices. For example, 'climate change' in itself is an uncertainty that influences the future to a large extent. However, when testing a policy strategy in the Dutch national context, climate change is hardly influenceable on a national scale, given that it is a global issue. When testing a national policy, the framework of the scenario should only consist of drivers that are influenceable on that level. If 'climate change' were to be a main driver of change on a global scale, it could be divided over a future orientation containing two extremes opposites of emission scenarios, e.g., 'RCP2.6' and 'RCP8.5'. The reason to opt for the most 'extreme' ends of the spectrum in scenario development, is to create clear, differentiated scenarios that demonstrate as many outcomes as possible (Rounsevell & Metzger, 2010). To adjust this future orientation to the influence of a national scale, however, it can be reduced to the influence that the Netherlands *could have* nationally. For example, in relation to climate change it could be divided over whether the government makes efforts to mitigate (one 'extreme'), or adapt (the other 'extreme'). The main driver would then not be referred to as 'climate change', but rather as 'government's effort towards climate change'.

Secondly, when determining the *future orientation* on which the driver is divided into two extremes, the future orientations depend on the relevance to the tested policy and context of the scenario (Rounsevell & Metzger, 2010). The future orientation, that includes two extremes of the driver, is determined based on the collected and analysed data. For example, if 'decision-making process' were a driver, it could be divided into 'participatory' versus 'exclusive', but also into 'top-down' versus 'bottom-up'; depending on the context.

Usually, there are *at least* two main drivers of change, but there could also be more main drivers, depending on the case. These drivers of change can in turn be used to complete step two, namely creating a framework for the scenarios. Figure 9 illustrates a scenario framework using the example of scenario development under two main drivers of change.

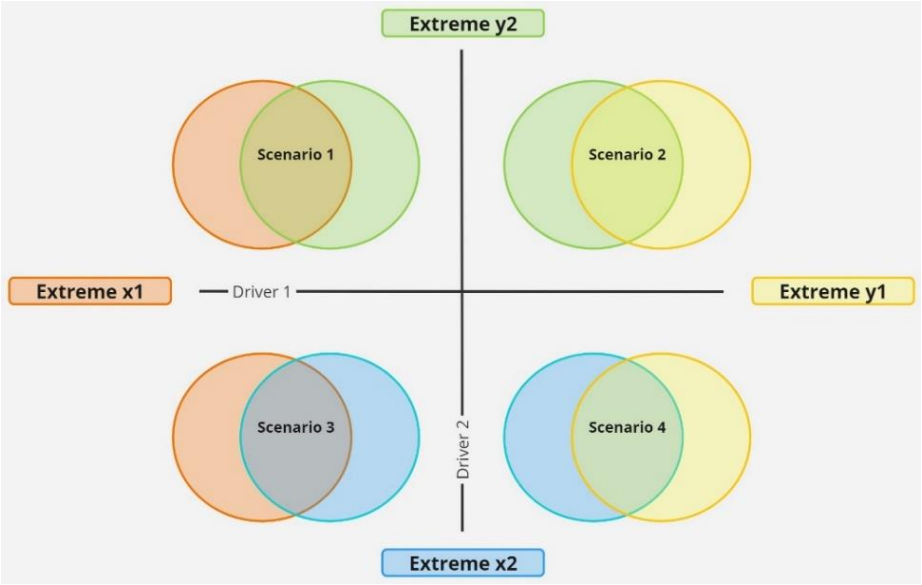

Figure 9. Framework for Exploratory Scenario Development

The drivers are divided over two axes, with one 'extreme' of the future orientation of the key driver on one side of the axis, and the other 'extreme' on the other side. This in turn leads to four different combinations of uncertainties. The assumption in Scenario 1 is that there is a world in which extreme *x* of driver 1, i.e. x^1, is taking place in combination with y^2.

3.2.3 Creating Storylines

In step three, the storylines are created by envisioning a future that combines the two future orientations (extremes) of each driver. Based on these two extremes, the future unfolds in different, plausible ways. In the case of a scenario framework of two key drivers of change, the previously established framework shows four different combinations of extremes, meaning that there would be four different scenario storylines. After establishing the framework of the scenarios, each storyline is also given a title. These titles are meant to give a first idea of what each future will look like, and according to Roberts (2014), these titles are usually creative and empowering.

The storylines presented in Chapter 7 are based on the best available evidence, i.e., the collected data, but also require to some extent creativity and interpretation of the results (Wiebe et al., 2018). One way of gathering input for the development of storylines is through interactive workshops with stakeholders. In this particular research, some of the potential main drivers of change were discussed an interactive workshop with part of the previously interviewed experts. During this workshop, the key drivers and their impacts were discussed one by one, and afterwards the participants of the workshop discussed a series of steps that could be taken in implementing planned retreat. Social learning methods such as participatory workshops can provide saliency and richness to scenario storylines (Rounsevell & Metzger, 2010). The interviews, literature and policy documents also serve as input to create storylines and show how the micro-drivers are unfolding differently under the main drivers. All of these methods can be used to give the storylines more substance.

The results of the aforementioned methods are interpreted by the researcher and translated into storylines that describe the circumstances of each different future on a certain timeline. The timeline of exploratory scenarios is typically 20 to 100 years (Rounsevell & Metzger, 2010). Establishing the storylines includes determining the different future orientations of the micro-drivers of change, i.e., the drivers that are dependent on the future orientations of the main drivers of change. In each storyline, the micro-drivers of change play out differently. Figure 10 illustrates how these micro-drivers can be visualised for one scenario, including their future orientation. In the example of Figure 10 below, the black arrows indicate the extremes of each micro-driver. However, it is important to note that micro-drivers typically exist on a spectrum. For example, in the earlier example of having 'participatory' versus 'exclusive' forms of decision-making, the black arrow could show that the scenario leans more towards participatory, without fully embodying it. In that case, the triangle would be positioned closer to the extreme 'participatory', but completely as shown in Figure 10. In this research, the assessment of each micro-driver is based on the researcher's interpretations of data from the expert interviews and interactive workshop.

Figure 10. Micro-Drivers

3.2.4 Implications for Decision-Making

The last step of scenario development is to analyse the implications of each scenario for decision-making. Policy-makers can make informed decisions about the steps needed to be taken to realise the desirable outcome, if they know the advantages and disadvantages of the tested policy in each scenario. In each plausible future there may be different, additional conditions necessary to increase the acceptance, success and robustness of the presented policy or solution (Börjeson et al., 2006). In this research project, the way planned retreat takes shape differs per scenario, depending on the circumstances. These ideas are based on the different ways in which experts envision planned retreat in the Netherlands. Based on the circumstances and conditions of each scenario, planned retreat could be designed slightly differently in order to be more robust. Even so, each scenario usually presents with unique challenges and opportunities, described in Chapter 7.

For both the creation of storylines as well as for analysing the implications for decision-making (steps 3 and 4), it is helpful to understand the context in which planned retreat takes place, as well as the different ways in which planned retreat could be designed and developed. Therefore, this thesis project includes two chapters prior to the drivers of change, that describe the historical context of water management and water governance in the Netherlands (Chapter 4), and the plurality of definitions and interpretations of planned retreat in the Netherlands (Chapter 5). The content of these chapters also ultimately feed into the storylines, and give a comprehensive overview of both the discussed policy, as well as the context in which it is applied. This information moreover helps in analysing the challenges and opportunities that comes with each form of planned retreat in the different scenarios.

3.3 Data Collection

The successful development of exploratory scenarios in this research requires the input of existing literature and the input of several stakeholders. In order to acquire this information, this section explains the different methods that were used for this specific research: A literature review, a policy document analysis, semi-structured expert interviews and an interactive workshop.

3.3.1 Literature Review

Based on literature about managed retreat, anticipatory governance, climate adaptation and climate mobilities, a conceptual lens was established that illustrates the current debates on anticipatory governance in the context of climate mobilities and helps to analyse the findings of this thesis with a critical perspective. In order to find literature, search engines of the WUR Library and Google Scholar were used, by searching for terms such as: 'Climate mobilit*', 'anticipatory governance', 'climate uncertaint*', 'climate adaptation and migration', 'planned retreat', 'managed retreat', etc. For the results chapters, the literature search focused on topics such as 'Dutch water management', 'Room for the River-project', 'Delta programme', and 'History of water management in the Netherlands'. For the interpretations and the drivers of planned retreat, the literature search had a broader focus than just the Netherlands, and looked at 'planned retreat' globally.

3.3.2 Policy Document Analysis

This research used existing policy documents and reports on planned retreat and sea level rise in the Netherlands, to better grasp the current political landscape of how these issues are dealt with nationally. Moreover, this analysis allowed for identifying existing ideas of the design of planned retreat, and contributing factors to increase the acceptance of this potential solution. The documents were found through a combination of searching through the website of the Ministry of Infrastructure and Water Management and the Delta Committee, and writing down the documents that came up during the interviews. The main documents used are the ones that are part of the Knowledge Programme Sea Level Rise (KP ZSS), as they present planned retreat as part of one of the three solution directions specifically in the Netherlands. The documents within the KP ZSS analysed were either relevant due to their theme ('moving along with the water' or 'decision-making'), or region (Coast of Holland and Southwest Delta). The documents outside of the KP ZSS analysed were

chosen because interviewees referred to them (Waterwet, Kamerbrief Water en Bodem Sturend). For a full overview of the policy documents analysed, see Table 1.

3.3.3 Semi-structured Expert Interviews

In order to collect data as input for the exploratory scenario development, this research project included in-depth semi-structured interviews with experts in from relevant fields. In order to retrieve a good overview of the different perspectives and approaches towards planned retreat, seventeen experts from a variety of backgrounds and organisations were interviewed, including government officials, policy-makers, academics, water managers and representatives of NGOs. Some of the names were found in NRC articles that discussed planned retreat with different experts from the field, and other experts were contacted later as they were mentioned in one or multiple interviews.

The interviews took place in the Netherlands between December 2022 and January 2023, with one exception; the interview with Henk Ovink took place in April 2023 in New York, as he was there as Water Envoy of the Kingdom of the Netherlands for the UN 2023 Water Conference. Approximately half of the interviews took place in person, and half took place online, depending on the preference and availability of the interviewees. Table 2 shows the list of experts including the position they fulfilled at the time of the interview, though it must be noted that some of the interviewed experts are no longer in that position. The statements made by the experts do not necessarily represent the positions of their organisations, but are based on their individual expertise of their respective fields.

The interviews were semi-structured, and based on a prearranged list of topics in accordance with the STEEP categories. The interview guide with the extensive list of the different topics discussed in the interviews can be found in Appendix I. Aside from using a prearranged list of topics, the interviews allowed for informal conversation and in-depth questions about the topic of the interviewee's expertise. This approach ensured that the interviews sufficiently contributed to answering the research questions, while leaving room to expand on the interviewees' individual expertise, and providing opportunities for unexpected findings. Prior to the interview, each expert approved and signed a form indicating their informed consent, including the request to use their names and expertise in this research. Considering that this research consulted experts with specific roles and backgrounds, anonymising the interviews would have reduced the legitimacy of the statements made.

With the permission of each interviewee, the interviews were recorded for the purpose of a precise transcription and quotation. Experts agreed in the consent form that they would first be asked for permission via email before using their quotes in this research project. This consent form can be found in Appendix II. In the end, one of the interviewees used their right to refuse the use of their direct quotes in the final research project. A few others made some alterations to the quotes, either to improve the translation to English, or to update the quotes based on findings that emerged between the time of the interview and the data analysis phase.

3.3.4 Interactive Workshop

All interviewees were asked at the end of the interview which out of two dates would have their preference, if one at all, to participate in the workshop for the scenario development. Based on the availability of experts, the workshop took place with four experts via MS Teams in the last week of January 2023. In Table 2, the interviewed experts that were present at the workshop are represented in **bolt**.

The workshop consisted of a short presentation after which the experts were asked to discuss the drivers of change that came up most often during the interviews. In the discussion, participants were asked to highlight an advantage and a disadvantage of every potential future orientation within these main drivers. Secondly, the participants were asked to discuss the several steps that need to be taken over time in order to make planned retreat (more) successful in all of the scenarios. The input from the interviews and the workshops served as foundation for the storylines per scenario in Chapter 7.

Table 1. List of policy documents

Reference	Title Policy/Legal Document	Organisation/Author	Year
KP ZSS	Kennisprogramma Zeespiegelstijging (in general)	Ministry of Infrastructure & Water Management and the Delta Commissioner	2019-2025
(Haasnoot & Diermanse, 2022)	Analyse van bouwstenen en adaptatie-paden voor aanpassen aan zeespiegelstijging in Nederland	Deltares, commissioned by staff Delta Commissioner, DG Water and Soil, Rijkswaterstaat WVL	2022
Water en Bodem Sturend	Kamerbrief Water en Bodem Sturend	Ministry of Infrastructure and Water Management	2022
KP ZSS (Spoor V: Besluitvorming)	Kennisprogramma Zeespiegelstijging Spoor V - Ruimtelijke besluitvorming voor een onzekere toekomst	Sweco, commissioned by staff Delta Commissioner, DG Water and Soil, Rijkswaterstaat WVL	2023
KP ZSS (Tussenbalans)	Tussenbalans van het Kennisprogramma Zeespiegelstijging	Commissioned by staff Delta Commissioner, DG Water and Soil, Rijkswaterstaat WVL	2023
KP ZSS (Spoor IV: Zuidwestelijke Delta)	Kennisprogramma Zeespiegelstijging spoor IV - Lange termijn Oplossingsrichtingen zeespiegelstijging Zuidwestelijke delta	Commissioned by the National Delta Programme and the Subarea Delta Programme: Southwest Delta	2023
KP ZSS (Spoor IV: Hollandse Kust)	Kennisprogramma Zeespiegelstijging spoor IV - Lange termijn Oplossingsrichtingen zeespiegelstijging Hollandse kust	Commissioned by the National Delta Programme and the Subarea Delta Programme: Southwest Delta	2023
KP ZSS (Spoor IV: Meebewegen)	Kennisprogramma Zeespiegelstijging Spoor IV -Verkennend Onderzoek Oplossingsrichting Meebewegen (Eindrapportage Oplossingsrichting ‘meebewegen’)	Harm Albert Zanting & Matthijs Bouw, Core team consortium ‘Meebewegen’	2024
Waterwet	Waterwet	National Government	2024

Table 2. List of expert interviewees

Reference nr.	Name Expert	Position at the time of the Interview	Date Interview
1	Jos van Alphen	Senior Policy Advisor Water Management & Flood Protection, Staff Delta Commissioner	12/01/2023
2	**Pieter Bloemen**	Senior Policy Advisor Strategy & Quality, Staff Delta Commissioner	12/01/2023
3	**Dick Butijn**	Water Management Specialist, Butijn Advies	20/12/2022
4	Saskia van Gool	Programme Manager Kennisprogramma Zeespiegelstijging, Rijkswaterstaat	16/01/2023
5	Frederique de Groen	Advisor/Researcher Coastal Migration, Deltares	11/01/2023
6	Marjolijn Haasnoot	Senior Researcher/Consultant Water Management and Environmental Modelling, Deltares	17/01/2023
7	Bas Kolen	Director of Research and Development, HKV Lijn in Water	20/12/2022
8	**Henri van der Meijden**	Senior Policy Advisor Flood Defenses, Water Board (Waterschap) Hollandse Delta	22/12/2022
9	Henk Ovink	Water Envoy of the Kingdom of the Netherlands, Ministry of Infrastructure and Water Management (I&W)	06/04/2023
10	Naomi van Rijn	Rijkstrainee Climate Adaptation, Ministry of Infrastructure and Water Management (I&W)	20/12/2022
11	Jan Gert Rinsema	Senior Policy Officer Water Security, Ministry of Infrastructure and Water Management (I&W)	11/01/2023
12	Annemiek Roeling	Policy Coordinator Long-Term Flood Protection, Ministry of Infrastructure & Water Management (I&W)	20/01/2023
13	Bas Roels	Coordinator Dutch Team, WWF-Netherlands (WNF)	18/01/2023
14	Gerard van der Steenhoven	Director General & Chief Science Officer, Royal Netherlands Meteorological Institute (KNMI)	22/12/2022
15	Jos Timmermans	Researcher Delta Management, Technical University (TU) Delft	13/01/2023
16	**Roderik van de Wal**	Associate Professor Climatology & Glaciology, University of Utrecht (UU)	19/12/2022
17	Jeroen Warner	Associate Professor Crisis & Disaster Studies, Wageningen University & Research (WUR)	18/01/2023

3.4 Data Analysis, Validity & Reliability

With permission of the experts, all interviews were recorded and later transcribed verbatim, after which they were carefully reviewed and analysed. The transcripts have been categorised and coded using the software AtlasTI, ensuring the possibility to compare the views of experts from different backgrounds on similar topics. This program made it possible to systemically analyse the data retrieved from interviews in a consistent manner, contributing to the reliability and validity of the research. Broader themes were identified and given sub-codes of the different topics discussed per theme. Throughout Chapters 5, 6 and 7, the outcomes from the expert interviews were combined with and supported by findings from academic literature and/or policy documents. The workshop, that was conducted via MS Teams with four of the previously interviewed experts, has been summarised into main points. This served as additional input for Chapter 7, in which the scenarios and their storylines are demonstrated.

For the purpose of triangulation, each chapter containing results uses input and data from either two, three or four of the aforementioned data collection methods. Data triangulation by cross-evaluating the data from interviews, the literature, policy documents and the interactive workshop further increases the internal validity of this thesis.

3.5 Ethical Considerations, Data Management & Supporting Tools

This thesis project followed several steps to ensure the ethical responsibility of this research, which is particularly important in this project due to the fact that the expert interviewees have not remained anonymous for the purpose of legitimising their claims. However, in spite of using the experts' names, prior to starting the interview it was made clear to them that in case of using direct quotes, they would be asked for permission before using their statements in this report. Moreover, at the start of the interview, interviewees were assured that they could stop at any point of the interview without an explanation. Though the interviews were recorded with permission of the experts, these recordings were solely used for the purpose of a transcription. Before starting the interview, all interviewees were provided with a form of informed consent, in which all of the above was written.

The retrieved data is stored on the password protected OneDrive. Raw data such as the recordings and the transcripts are only accessible to the researcher and supervisor, but will not be shared with third parties. In accordance with the guidelines of the WUR, the data will be stored for ten years. The final report will be available upon request for those interested, and it will also be shared with WUR students in the Wageningen MSc Thesis Database. As agreed during the interviews, experts who requested a copy of the research project will receive this personally via email.

Some supporting tools were employed to assist with this research project, but there has been no use of generative AI for the creation and generation of content or the paraphrasing of quotes, as the tools were merely supporting and in line with the guidelines of the WUR. The primary applications of these tools include transcribing interviews, translating interview content, and conducting

literature searches. For the interviews that were conducted online via MS Teams, the Dutch transcription tool was enabled, to ensure that Teams already provided a basis for a transcript of each of the online conducted interviews. Considering that these transcripts contained many mistakes, each transcript was critically assessed and adjusted based on the recordings. The interviews that were conducted in person were recorded using a recording device on a smartphone, and transcribed by hand. As the expert interviews were conducted in Dutch, but the quotes and the report are written in English, some translating tools were used for Dutch-English translation, particularly for the quotations. The two tools that were used to translate the Dutch quotes as correctly and directly to English as possible, were Google Translate and DeepL. These translations provided a good foundation, but each quote has also been critically assessed and adjusted by the researcher and/or interviewees to ensure a correct reflection of the thoughts of the expert interviewees. As mentioned before, for the literature search, the WUR Library and Google Scholar were used to find appropriate literature. Lastly, the figures in this thesis have all been created by the researcher using the program Miro.

3.6 Limitations to the Research

As this research projects discusses various uncertainties relating to planned retreat, qualitative exploratory scenario development is a useful methodology to explore different possible futures. It presents the best available evidence to show the potential of planned retreat in different possible futures, which can help decision-makers to come up with strategies for potential future threats. The input gained through literature research, policy documents, expert interviews and the interactive workshop were used to develop exploratory storylines and, in turn, determine what planned retreat could look like in each scenario. However, this research and methodology also present with some limitations.

One of the main limitations to this research is the fact that the interviews took place in December 2022 – January 2023, whereas the data analysis was done in the spring of 2024 due to an internship opportunity. Since planned retreat is a hot topic, specifically in the Netherlands, a large number of documents have been published between conducting the interviews and analysing the data. On the one hand, this means that some of the statements might be outdated, but on the other hand, the policy documents that have been written or updated in the meantime contribute to the validity and reliability of the research. In order to minimise this particular limitation of the research, experts were allowed to alter the quotes used in this research, making their statements more up-to-date.

A second limitation to the research is the fact that only four experts were available to participate in the interactive workshop that feeds into the storylines of the qualitative exploratory scenarios. Even though these participating experts still covered some different backgrounds; water management, policy, and climatology, some perspectives were missing. Therefore, the data from the interviews have also been used to give more substance to the scenarios, in an attempt to cover the various aspects of planned retreat as well as possible in the storylines. Unfortunately, due to time constraints and the limited availability of experts, only one workshop was conducted. Typically, an interactive workshop in scenario development is followed up by second workshop to review and refine the

created storylines, and to correct potential misinterpretations of the researcher. This step was eventually omitted due to a combination of time limitations and the gap between data collection and analysis. Another reason to not follow up the first workshop with a second one was to minimise further impositions on the experts, given that only four experts were able to participate in the first workshop.

Another consequence of time limitations of this research, is the fact that the scope of this thesis is limited and focuses only on planned retreat as a solution to sea level rise. Hence, a third limitation of both this research as well as the methodology, is the fact that they consider only part of one solution direction – planned retreat from the move along strategy – to tackle one issue; the risks of sea level rise. By looking at sea level rise in a silo, this research project seems to overlook the fact that climate change also causes other (water-related) issues. This thesis examines planned retreat as adaptation strategy to increased flood risks from the seaside, while disregarding the possibility that changing precipitation patterns could also lead to floods from the rivers, extreme rainfall, or droughts. It is therefore important to acknowledge that processes such as sea level rise are not happening in isolation. This thesis focuses on planned retreat as potential solution to sea level rise, but does not take into account if and how planned retreat could be a strategy to other consequences of climate change. Since this thesis only includes planned retreat as a possible strategy, it excludes other existing solution directions. Nonetheless, this research can still serve as valuable case study, as it does provide a detailed analysis of the specific adaptation option ‘planned retreat’.

Lastly, there are also some specific limitations that are inherent to exploratory scenario development, also outlined by Wiebe et al. (2018): While scenarios help to envision potential futures and their respective decision-making implications, exploratory scenarios are speculative in nature and not predictions of the future. Their storylines largely depend on assumptions, interpretations of the results, and available data. Therefore, they may present with potential or perceived arbitrariness of the selection of drivers, and may potentially not fully capture all future uncertainties. It is therefore important to recognise that these scenarios are merely meant to enhance decision-making processes by exploring possible outcomes, rather than providing forecasts or presenting the ‘truth’.

4. History of Dutch Water Management

The Netherlands has a longstanding history of coping with water. As low-lying country with several rivers, situated in a delta, and partly surrounded by the North Sea, there has been a constant battle against floods throughout history (Mostert, 2020). These continuing threats, exacerbated by climate change, have also had positive impacts; it triggered technical and institutional developments, making the Dutch pioneers in water management (Van Koningsveld et al., 2008). The Dutch are internationally known for their water management skills and innovative attitude towards riverine and coastal protection (Avoyan & Meijerink, 2020). To this day, large economic sectors such as commerce, transportation and agriculture are in fact dependent on this carefully controlled water flow (Kaijser, 2002). Moreover, according Mostert (2020), the struggle with water throughout history has resulted in the fact that 'water' has simply become part of the Dutch identity.

In order to understand Dutch views on water management, including planned retreat as potential solution to sea level rise, it is important to understand how water management developed in and became part of the Netherlands. This chapter aims to highlight key events that later became known as turning points in Dutch water management. It also aims to show how it has shaped the unique way in which 'water' is ingrained in the governance structure of the Netherlands. In doing so, this chapter addresses the second sub question, namely: *What have been key developments in shaping the Dutch approach towards water management over time?*

4.1 A Brief Overview of Turning Points in Water Management

Van Koningsveld et al. (2008) argue that the battle against water has overall turned out positively, but there have been set-backs in Dutch water management throughout history. These set-backs often triggered a series of events that led to institutional reforms of water management, resulting in the innovative approach that the Dutch government takes today.

4.1.1 History of Institutionalising Water in the Netherlands

'Water' has been institutionalised in the Netherlands for a long time. The Middle Ages mark the earliest attempt to organise society against the numerous water-related challenges. However, the threats from water that these local institutes had to tackle soon proved too challenging and specialised for local authorities. Therefore, local, autonomous water boards were established (Borg & Ligtendag, 1998). From the 12th century onwards, water boards have been responsible for supervising local communities and land owners who were responsible for water management infrastructure. Later, these water boards became responsible for the water management works themselves (Mostert, 2020). Regional and local water boards merged in the 20th century, resulting in the 21 water boards that are left today (Mostert, 2020). The drainage system of entire regions can successfully be maintained because of the establishment of these water boards, and they still play a vital role in water management and water control (Van Koningsveld et al., 2008).

During the 18th century, severe floods occurred due to wrongly placed groynes and sand banks that hampered the river flow. This triggered the improvement of the course of the rivers, which required the cooperation of provinces in the Netherlands. This marked the start of organising water management on a national level, later to be known as Rijkswaterstaat (Borg & Ligtendag, 1998), which is currently the executive organisation of the Ministry of Infrastructure and Water Management in the Netherlands (Ministerie van Infrastructuur en Waterstaat, 2024d). Up to that moment, the organisation of water management was fragmented, but the disastrous floods from the poorly managed riverbeds required a national point of view (Ministerie van Infrastructuur en Waterstaat, 2024d). Rijkswaterstaat became more important and started to carry larger responsibilities from the 19th century onwards, such as doing extensive research, scaling-up water management, and improving hydraulic infrastructure (Borg & Ligtendag, 1998). During the 20th century, accelerating technological developments led to more upscaling of hydraulic infrastructure, and enabled Rijkswaterstaat to tackle complex issues related to tidal and river currents (Ministerie van Infrastructuur en Waterstaat, 2024d).

From the Middle Ages onwards, there have been struggles with land reclamations (Kaijser, 2002). Ever since then, new technologies were developed to ensure the safety of the people, particularly pressing by the end of the 19th century due to the rapid urbanisation of the West of the Netherlands (Borger & Ligtendag, 1998). With improved, multilevel cooperation in water management, the 19th and 20th centuries marked two important achievements in reclaiming the land and protecting the land from the sea. In 1892, the implementation of 'plan Lely' was recommended, which entailed the closure of the Zuiderzee with the Afsluitdijk, and land reclamations of several polders (Kielen, 2009). These plans became reality in the 20th century, leading to the successful reclamation of land. At this point in history, water management in the Netherlands was seen from purely civil engineering perspective, even causing people to use the saying: 'God created the earth, but the Dutch created the Netherlands' (Rijke et al., 2012).

Over time, the approach to water management evolved from a focus solely on engineering solutions to embracing a more holistic perspective (Kielen, 2009). Contemporary issues that have arisen over the past decades, such as climate change, sea level rise, land subsidence and an increased pressure on space, have led to the belief that there is a need for an integrated approach that spans more than just the water sector (Kielen, 2009). Series of so called 'turning points' have changed water management in the Netherlands to a unique, multi-faceted approach spanning multiple sectors, and changing from a reactive to a proactive attitude towards water management (Van der Meulen & Van Zetten, 2014).

4.1.2 The Great Flood of 1953 and the Start of the Delta Programme

The shift from a predominantly technological perspective to a more integrated approach in water management was a gradual process influenced by a series of pivotal events. One of those events was the Great Flood in 1953. In 1953, a storm surge disaster led to a flood that claimed 1835 lives (Van Koningsveld et al., 2008), and severely damaged livestock, houses, buildings and other infrastructure (Ministerie van Infrastructuur en Waterstaat, 2024a). The combination of a spring tide and a storm surge pushed the water in the North Sea to heights that caused multiple dikes to collapse. Large parts of South Holland, Zeeland, West Flanders and North Brabant were flooded

(Ministerie van Infrastructuur en Waterstaat, 2024a). According to Borger & Ligtendag (1998), it was at moments such as during this disaster that the realisation of the Netherlands' vulnerability sunk in. The Great Flood left its mark on the Netherlands, resulting in a series of institutional reforms, including more structural protection measures and the availability of several funds (Borger & Ligtendag, 1998). Among these institutional reforms were the start of the Delta Works. The plans for the Delta Works were established before the Great Flood, but only after this disaster were these plans realised (Van Kielen, 2009).

In 1993 and 1995, close-call flooding incidents further underscored the inadequacies of the existing hydraulic infrastructure, highlighting that the system was approaching its technical and physical limits (Van Kielen, 2009). Different stakeholders in the field argued that there was a need for a change in water management, and these debates were accelerated after New Orleans was hit and flooded by hurricane Katrina in 2005 (Bloemen et al., 2018). This series of events triggered 'new vision' in water management (Van Alphen, 2015).

The National Delta Programme aims to protect the Netherlands from extreme disasters, initially focusing on technical advancements to shorten the coastline and address potentially vulnerable spots (Van Koningsveld et al., 2008). The start of the Delta Works after marked a paradigm shift in the Dutch water management; the focus shifted from reactive governance to a more proactive approach, which included disaster risk reduction, increased resilience and more preparedness (Van der Meulen & Van Zetten, 2014). It moreover laid the groundwork for an interdisciplinary cooperation in water management practices.

Whereas the initial measures taken to protect the Netherlands were focused on the fight *against* water and natural events, the evolving Delta Programme increasingly recognised the importance of working *with* nature rather than against it (Van der Meulen & Van Zetten, 2014). As a result of public pressure, the Netherlands adopted a more integrated approach to water management (Van Koningsveld et al., 2008), that not only focused on protecting the coastline, but also included aspects such as nature conservation (Stańczuk-Gałwiaczek et al., 2018). Rather than 'hard' infrastructure, the Dutch government and water managers started opting for 'building with nature' through soft coastal protection, which included beach nourishment, natural dunes, the sand motor and salt marsh restoration (Van der Meulen & Van Zetten, 2014). As a result of this multidisciplinary, proactive approach to water management, current flood protection measures in the Netherlands have multifunctional purposes, as they also serve agriculture, nature conservation, and recreation (Stańczuk-Gałwiaczek et al., 2018).

4.1.3 Working with Nature and the Room for the River-Project

A primary example of the synergy between Dutch water management, working with nature and proactive long-term thinking, is the Room for the River-project. This project employed an innovative, multidisciplinary long-term approach to better protect the Netherlands from floods from riverine areas, while emphasising the links between ecological, social, and economic aspects of water. The project was triggered by the two near floods in 1993 and 1995 (Van Kielen, 2009). Soon after the occurrence of these high water levels, it was decided that there was a need to give more room to the rivers, rather than improving flood defences, to enhance flood safety (Rijke et al., 2012).

Rethinking water management required overcoming certain discursive hurdles, but the launch of one of the most prominent projects that resulted from the Delta Programme, i.e., the 'Room for the River'-project, ensured that these obstacles were overstepped (Van Buuren et al., 2016). The project was announced as it being in accordance with the paradigm shift towards 'living with water' (Warner & Van Buuren, 2011).

Since 2006, the national and regional governments, in close consultation with residents, have taken measures at 34 locations along the IJssel, Waal, Nederrijn and Lek rivers to improve not only the safety, but also the quality of life in general (Ministerie van Infrastructuur & Waterstaat, 2024c). Part of this project entailed the designation of certain areas as emergency overflow areas; polders designed to empty and accommodate excess water during high water levels (Van Buuren et al., 2016). According to Klijn et al., (2018), in making 'room' for the rivers, this project increased the robustness of the river system while reducing the risks of floods. Additionally, this project contributed to ecological improvements by restoring a more natural river flow. The total cost of this project amounted to 2.3 billion euros, and took about ten years to complete. However, ongoing factors such as climate change continue to affect its status, preventing it from ever being fully 'finished' (Ministerie van Infrastructuur & Waterstaat, 2024c). This multifunctional project is one of the reasons that the Netherlands holds so much international prestige in the water sector, as it showcases the Dutch innovative approach towards integrating different disciplines, through leveraging scientific knowledge and multi-stakeholder engagement (Avoyan & Meijerink, 2020).

As stated before, moving from a civil engineering attitude towards water to building with nature to enhance water management did not happen overnight, and required overcoming certain discursive hurdles. The Room for the River-project required adopting a new governance approach, using a combination of centralised and decentralised decision-making: "The decision frameworks for establishing improved water safety and spatial quality are set by the national government, whilst the plans and designs are formulated and decisions taken by local and regional stakeholders in 39 regional projects" (Rijke et al., 2012, p. 370). Moreover, the project required not only effective cooperation across different levels of governance but also integration across different sectors, including water management, spatial planning, landscape architecture, and ecology (Rijke et al., 2012).

Flood risk management in the Netherlands is not only politically challenging, it is also socially sensitive, equally so for the Room for the River-project, which left people feeling insecure or burdened with the measures (Roth et al., 2017). Moreover, the designated overflow areas, also referred to as 'calamity polders', led to conflicts among citizen groups (Van Buuren et al., 2016). Government actors understood that such flood risk measures required a more interactive and participatory approach to soften the resistance against government plans (Roth et al., 2017). The Overdiepse polder in province Noord-Brabant hosts a successful example of local stakeholder participation in the Room for the River-project, as described by Roth et al. (2017). This polder, at the time mainly consisting of agricultural land, eventually became a designated area for calamity water storage. However, the land was inhabited by nineteen households. After having long, intensive discussions with these inhabitants, the inhabitants decided to not resist the plans but rather serve the public interest of storing floodwater: "Assisted by regional politicians, a farmers'

organisation and the Province of Noord-Brabant, the inhabitants developed a plan in which the residential, agricultural and water storage functions of the polder could be combined" (Roth et al., 2017, p. 56). Even though the Room for the River-project did not result in win-win situations in all cases due to the use of more command-and-control instruments, the participatory, multi-stakeholder approach that was present in the Overdiepse polder led to a successful outcome (Roth et al., 2017). Other important conditions for the inhabitants to agree to moving out of polders designated as calamity polders, were government buy-outs and financial compensation for moving or damage caused by floodings; not only in the Overdiepse polder but also in other areas (Roth & Winnubst, 2014). However, the process did not proceed as smoothly in all polders as it did in the Overdiepse Polder. The Room for the River-project also faced significant societal resistance in relocating dikes and designating overflow areas in other riverine areas (Warner & Van Buuren, 2011).

Nevertheless, the Room for the River-project is regarded an innovative, multifunctional initiative of international prestige. While it has provided significant benefits to nature, enhanced water safety, and improved participatory governance processes, it has also resulted in the displacement of several households. According to Warner & Van Buuren (2011), the project led to a mix of compliance and resistance. They conclude that the project was successful in bringing together water management and spatial planning, but less so in bridging the gap between citizens and civil engineers.

Ultimately, the project consisted of a few components. Aside from the newly arranged government structure and the decision-making processes, the Room for the River-project included a transition from 'fighting against water' to 'living with water' (Warner & Van Buuren, 2011), resulting in the relocation of a number of households (Roth et al., 2017), while creating room for nature and enhancing biodiversity (Rijke et al., 2012). All of these measures were taken for the purpose of improving water safety in the Netherlands in a sustainable manner. These components align with the concept of planned retreat discussed in the first chapter of this research. Consequently, the Room for the River-project could be seen as a form of planned retreat, though it addressed flood risks from rivers rather than sea level rise. Moreover, Siders et al. (2021) also use the Room for the River-project as positive example of planned retreat, and highlight how this project allowed for a redefined relationship between humans and ecological systems.

4.2 Towards Adaptive Pathways

The National Delta Programme in the Netherlands has embarked on a new approach from reacting to (near) disaster, to anticipating future risks. In order to avoid harm in the future, policy-makers have to take the future into account when making decisions and planning solutions (Bloemen et al., 2018). However, the future is highly uncertain. One way in which the Dutch Delta Programme deals with creating such anticipatory measures for uncertain futures, is through the creation of adaptive pathways. At the start of an adaptive pathway, there are already decisions to be made, as these choices will significantly influence the future (Haasnoot & Diermanse, 2022).

An adaptation pathway approach enables policy-makers in their decision-making by including adaptivity in plans to cope with deep uncertainties such as climate change (Werners et al., 2013): "They stimulate planners to include adaptation over time in their plans and to explicitly think about

decision lifetime and taking short-term actions, while keeping options open and avoiding lock-ins" (Werners et al., 2013, p. 337).

According to Van Alphen et al. (2022), these adaptation pathways are in fact connecting and combining different strategies and measures. After potential triggers or turning points are identified, decision-makers can decide to implement a certain measure, or switch strategies. The aim of these pathways is to ensure that lock-ins – which could block future adaptation needs – are avoided, amongst others by choosing low-regret options as long as possible (Van Alphen et al., 2022). These thresholds are identified by looking at a combination of climate impacts and how adequate society deems the government's response to these impacts. At the point where policies are no longer considered sufficient in addressing the impacts, a turning point has been reached, meaning that there is a need for a certain action (Werners et al., 2013).

In other words, the inevitable changes related to in this instance sea level rise, have become part of a process in which (low-regret) actions can be taken when a certain threshold has been reached (Werners et al., 2013). This is to ensure that measures are not taken prematurely. For instance, implementing planned retreat could be seen as a high-regret solution, as the cost of lost infrastructure in combination with the lost foreign investments would have devastating consequences for the Netherlands, if this measure were to be implemented prematurely (KP ZSS (Spoor IV: Meebewegen)). However, to avoid lock-ins, the measures that could be taken in response to a certain turning point should at least leave the option 'planned retreat' open if it turns out to be necessary on the long term.

4.2.1 Pathways of the Knowledge Programme Sea Level Rise

The aforementioned adaptive pathways-strategy is also used to address sea level rise. As explained in the introduction of this thesis, the National Delta Programme contains a considerable component dedicated to finding solutions that guarantee safety from the rising North Sea. These plans are set out in the Knowledge Programme Sea Level Rise (KP ZSS). This programme consists of a significant number of documents that are divided over themes, and most of the themes come with additional documents that make assessments of these themes in different (vulnerable) regions in the Netherlands. The five 'themes' or rather, tracks, of the KP ZSS are the following:

I. Sea Level Rise and Antarctica
II. System Explorations
III. Signalling Methodology
IV. Long-Term Options
V. Implementation Strategy

For this thesis, particularly the fourth and fifth tracks are relevant, as track IV discusses the three different adaptive pathways; 'Protect', 'Seaward', and 'Move Along' (See Figure 1), and track V discusses the decision-making processes and implementation strategies.

In track IV, three research groups each developed a solution direction of how sea level rise can be accommodated in the Netherlands on the long term, assuming a rise in sea levels of two to five metres. KP ZSS (Spoor IV: Meebewegen) presents the pathway 'moving along' as a combination

of accommodating sea level and planned retreat. This direction aims to tackle flood risks resulting from rising sea levels, but also other related issues such as salt intrusion. This policy document favours the idea to protect the economic heart – the Western part of the Netherlands – for as long as possible, but acknowledges that in the low-lying areas, especially the Southwest Delta region, it might be necessary to consider a controlled retreat strategy to adapt to sea level rise (KP ZSS Spoor IV: Meebewegen)). This retreat strategy could in turn allow for more frequent or permanent flooding (KP ZSS (Spoor IV: Meebewegen)), similar to the so-called 'calamity polders' in the Room for the River-project. This document also refers to this controlled form of retreat as 'adaptive migration'.

The 'move along'-pathway includes a component of 'planned retreat', which consists of 'moving to higher grounds', 'giving room to nature', and 'living with water'. 'Accommodating sea level rise', which is also part of this solution direction, refers among other things to building in an innovative, climate resilient way, with for instance floating houses that can cope with floodings. Planned retreat is considered as an anticipatory response to rising sea levels, particularly high-risk coastal areas of the Netherlands. This thesis focuses particularly on planned retreat as a potential solution to sea level rise.

All in all, the institutionalisation of water management in the Netherlands has evolved from a rich history. Whereas Rijkswaterstaat oversees water-related processes of national importance, and manages the larger waters, the local water boards play a vital role in the management of regional waters such as streams, ditches and canals (Ministerie van Infrastructuur en Waterstaat, 2024d). Despite the national water control system that has emerged, the regional water authorities still have a rather high degree of control over the water flows in their region (Kaijser, 2002).

The Dutch Delta Programme is a central to the Dutch water management. Its uniqueness stems from the fact that the programme allows for long-term thinking and a dynamic approach. The Delta Programme aims to tackle multiple issues that result from climate change in the Dutch water management, and continues to evolve and update to fulfil newly established standards (Van Alphen, 2015). A series of (near) floods has triggered a switch in the attitude towards water management from reactive to proactive, and has led to the belief that rather than fighting water, the Dutch can work *with* water. Through the creation of adaptative pathways, the Delta Programme allows for coping with uncertainties, not taking premature actions, and keeping all adaptation options open as long as possible, depending on how (fast) the climate will change and sea levels will rise. It furthermore allows for an adequate response to changes, while ensuring that the measures that are being implemented are low-regret. The KP ZSS works on such adaptive pathways for addressing sea level rise, in which 'move along' is one of the possible pathways that includes 'planned retreat'; the focus of this thesis.

5. Expert Views on Planned Retreat

The Knowledge Programme Sea Level Rise (KP ZSS) contains three solution directions that illustrate different adaptation options to reduce or eliminate the risk to sea level rise in the Netherlands. As explained in Chapter 4, one of the directions is defined as 'move along', which 'planned retreat' is a part of. Planned retreat is considered a contested solution by some, and evokes a wide range of responses. This chapter delves into how planned retreat is perceived and described by relevant experts and policy documents within the Dutch context, exploring both its contestations as well as its potential contribution to future climate adaptation. This chapter furthermore aims to evaluate the practicality of planned retreat within the context of the Netherlands. In doing so, this chapter addresses the third sub question: *What are the different expert and policy perspectives and understandings of planned retreat as an adaptation strategy for sea level rise in the context of the Netherlands?*

5.1 Planned retreat – a Plural Set of Definitions and Interpretations

Experts who contributed to the KP ZSS explain that the 'move along' direction encompasses more than limiting the risk of floods, as it also aims to tackle other issues that emerge from sea level rise.[1;6] One of the experts explains that it was a conscious decision to use the term 'move along', rather than planned retreat alone, when writing the KP ZSS.[1] According to him, keeping this term broad ensures the possibility to give more substance to this solution direction than only looking at planned retreat, thus leaving multiple adaptation options open:

> When we started the Knowledge Programme Sea Level Rise and discussed those four directions, we consciously decided not to call that variant "planned retreat", but to at least keep the option open to adapt vertically, and therefore give it the label "move along".
>
> - Jos van Alphen
> *Staff Delta Commissioner*

In comparison to the other solution directions described in the KP ZSS, 'move along', and specifically the 'planned retreat'-component, seems to be more complex. The alternatives often contain either sticking to the current system, or engineering and adjusting it in innovative ways, whilst still more or less keeping the system in place. 'Move along', on the other hand, requires to steer away from the status quo of our landscape structure.[12] According to one expert, 'move along' is less tangible than the other options, since there are many different ways in which it can be designed.[12] In particular the potential prospect of planning to retreat – the main focus of this thesis – evokes a wide range of responses.

When defining planned retreat in the Dutch context, some experts state that planned retreat encompasses, or should encompass a lot more than simply a solution to a problem; it is about having a "vision".[9;15] Experts argue that planned retreat should not be one solution to tackle an isolated problem, but should provide society with a vision of what we want the future in the Netherlands to

look like.[9;15] Moreover, according to some, planned retreat is not limited to water security, but also related to spatial planning.[9;14] They argue that planned retreat is about planning the organisation of the country, keeping in mind the climate-related issues that the future most likely holds.[9] In this sense, planned retreat is by some considered as a set of transitions, or a broader, societal transformation:

> If it contains one thing, planned retreat, it is the word "planned". That actually does not have much to do with water, but much more: How am I going to offer a future perspective for our society?
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

5.1.1 Giving Up or Giving Back? – a Human or Nature Perspective

As explained in Chapter 2, literature shows that the climate mobilities lens used to reflect on planned retreat puts emphasis on both human and non-human aspects of climate mobilities. Siders & Ajibade (2021, p. 287), on the other hand, refer to planned retreat as: "The purposeful, planned, and coordinated movement of people away from hazardous areas or areas of extreme environmental degradation," demonstrating the centrality of humans in this narrative. Even though Siders et al. (2021) and O'Donnell (2022) also emphasise this human component of planned retreat, they also acknowledge that it could be seen as a 'nature-based solution'. In relation to this context, for instance, the Room for the River-project as described in Chapter 4 shows that earlier forms of planned retreat in the Netherlands included both a human as well as a non-human, or, a nature component.

The expert interviewees show a division between a nature-oriented approach to planned retreat, in which the preservation of the biodiversity, and thus the ecological system is central, versus an approach in which the social dimension of planned retreat is central.

When asked how experts see planned retreat, one expert opts very concretely for a limited form of planned retreat in which the *preservation of coastal biodiversity* is a key component:

> We [WWF] are one of the few that really give substance to that concept in the policy debate about it [planned retreat] with our ideas. At least we strongly advocate for it and we also give substance to it. Although, there are different images, right? I mean, some people really think that with a planned retreat you are giving up parts of the Netherlands completely, but for us it is much more about just riparian zones. So you actually give a large zone along the [riverine or coastal] banks, so to speak, back to nature, and turn it into a natural water barrier. And then with Paris Climate Scenario you can continue to live in the Netherlands until the end of time. But it shouldn't get any worse than that, then you'll have another story.
>
> - Bas Roels
> *World Wildlife Fund*

The Dutch WWF advocates for a limited form of planned retreat, in which some people will have to leave their homes, but in general the villages and cities can remain where they are located now.[13] According to this expert, the main motivation for this form of planned retreat is the fact that it can both contribute to nature conservation and biodiversity preservation, while improving water safety

with ‘soft’ soltuions.[13] The idea that planned retreat could be very beneficial in preserving a specific ecosystem is also shared by other experts.[8;9;15]

However, there are also expert who envision a different form of planned retreat, for example putting more emphasis on ‘moving to higher grounds’, or ‘living with water’, rather than ‘giving room to nature’. Another existing idea, for instance, involves creating protective barriers around larger cities, effectively turning them into isolated islands, while moving smaller villages.[6]

Going beyond a technical definition of planned retreat, an expert in the field of disaster studies discusses the inclusion of a social aspect in the term, as planned retreat would also have a large societal impact.[17] Hence, similar to what Siders & Ajibade (2021) argue, this expert states that planned retreat comes with a *component of justice and fairness*:

> Well, it sounds technical, but at the end of the day, of course, it’s often about getting people out of areas, which you then flood, because they are no longer defensible, or because it becomes too expensive or too complicated for people to live there. That suggests that the plans are shared with the people who are affected, and that is often not the case. It’s often a top-down idea, like: This is just not a good place, how do we get people out? And then we get an issue of environmental justice, […] about, what is fair? What can you ask of people?
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

A number of other interviewees also touch upon the fact that this societal component cannot be neglected in defining or designing planned retreat.[1;2;5;10;12;17]

What comes across from the interviews, is the fact that experts have different associations with planned retreat, that can be roughly divided into a nature-oriented approach versus a human-oriented approach. For instance, despite being given the same definition of planned retreat at the start of each interview, five interviewees strongly associate planned retreat with “giving up a part of the West”:[2;4;7;12;16]

> Look, retreating is like giving up the Netherlands, as it were, while what we are looking at is maintaining a liveable Netherlands with different strategies. To me retreat really sounds like: We leave everything behind, we pack up and we move to the other side of the country and everything that was here, that’s just lost. In the best case you break it down, and in the worst case it will become an artificial reef. That is useful if you want a lot of media attention, but it is not yet necessary and it may never be. There is something that comes before that, so to speak.
>
> - Annemiek Roeling
> *Ministry of Infrastructure & Water Management*

On the other hand, rather than talking about “giving up land”, four other experts refer to “giving land back” to nature.[6;10;13;15] KP ZSS (Spoor IV: Meebewegen) describes a combination of giving land back to the sea, e.g., by allowing certain areas to flood, and the retreat of people.

There are also experts that integrate planned retreat as part of the broader sustainability agenda, which includes both an environmental, as well as a socio-economic component. These argue that

planned retreat could in fact be a way to build back better, talking about "opportunity" rather than "giving up":[9;14]

> There is a lot of infrastructure in the Netherlands that requires regular maintenance and repairs, which you would like to carry out in a sustainable fashion. However, instead of short-distance flights, you would actually want high-speed train lines that provide fast connections. Instead of refurbishing fifty year old real estate, that cannot be properly insulated, you would prefer to build energy-positive houses from scratch. Hence, there are arguments in favour of a kind of reset.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

The argumentation here is that if you decide to retreat and leave parts of the West, in a way planned retreat can serve as a reset button strategy that accelerates the sustainability transition.[9;14] Measures that have to be implemented at some point anyway, such as insulating houses, providing green energy and improving public transfer, can be immediately included and implemented as a part of planned retreat:

> Planned retreat actually provides a kind of reset. If you build a new city somewhere, you will never build a house that is not energy positive. If you build new railway lines, you can design them in such a way that you immediately allow for good international connections, e.g. to Berlin and Copenhagen. If you organise the country-side differently, you create regenerative plant-based farming and move away from the present unsustainable farming methods. So planned retreat has the advantage of doing things right from the start. Technically and budget wise that may be attractive, but the social implications are enormous, obviously.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

5.1.2 Sensitivity of Planned Retreat

Not everyone sees the concept 'planned retreat' as a new strategy. For example, six interviewees compare planned retreat as solution to sea level rise with the Room for the River-project.[6;7;9;11;13;17] One expert uses this comparison as argument that planned retreat is not a new concept, but a fact of life:

> But look, there are dike reinforcements, also in the river area, of course it happens every day, right? That people are being evicted from their home because it is being demolished. And whole neighbourhoods are being demolished in cities in the name of urban renewal. It is a fact of life, though. It's not fun, it is part of it.
>
> - Bas Roels
> *World Wildlife Fund*

Despite the fact that planned retreat may not be new, arguably particularly not in the Dutch context, the inclusion of climate change as a potential trigger of planned retreat has made the topic sensitive and politically perilous (O'Donnell, 2022). Five interviewees explicitly expressed that this sensitivity also exists the Netherlands:[1;2;5;6;15]

> The specific part of managing retreat has my special attention, because I believe that it paints a picture that can be discussed in the research world, but which is not yet accepted seriously at a political level.
>
> - Pieter Bloemen
> *Staff Delta Commissioner*

> It would be nice if it [planned retreat] becomes a topic for discussion, so that it becomes a bit more normal and no longer that sensitive to talk about.
>
> - Frederique de Groen
> *Deltares*

According to some, even a limited form of planned retreat, such as the one put forward by WWF, could be very sensitive to discuss.[11;13]

Part of the reason for the sensitivity towards planned retreat is the fact that some people associate the term with "giving up".[6] Not only the media use those words, there are also academics that keep referring to planned retreat and giving up as if they are one and the same:

> I was talking to someone the other day, who was I talking to? I forgot, I don't remember who it was, but it was someone who was genuinely interested in planned retreat. Oh yeah, I remember, it was someone from National Geographic. He wanted to make a good story out of it but he also used those kinds of words, so I said, it will never come across well if you talk about giving up the country. […] If you want to talk about it, you have to make it attractive.
>
> - Marjolijn Haasnoot
> *Deltares*

According to some experts, this perception of planned retreat might be one of the largest obstacles in the general attitude towards this strategy.[1;2;6;9] Perceiving planned retreat as giving up seems to tie strongly together with the sensitivity of the topic, making it more difficult to openly discuss. Experts also argue that this sensitivity makes it complex to make a decision with regard to planned retreat:

> But of course we cannot, at least at the moment it is an unmentionable topic, "give up the West of the Netherlands" and give it back to the waves. So we will still try for a very long time to continue living there with all kinds of coastal measures, local flood defences, adapting new buildings, higher water levels and so on.
>
> - Jos van Alphen
> *Staff Delta Commissioner*

Other interviews also associated planned retreat with giving up, reflecting similar perceptions. For example, planned retreat was referred to as "last resort option",[5;16] or even as "failing".[15] To facilitate discussions about this topic, some experts prefer that these references are not used in relation to planned retreat:[2;6]

> I would want to make it discussable anyway, to put it on the agenda, but in a specific way. So not as the ultimate failure of government. So you first have the greenhouse gas story, you started doing mitigation, but not enough, so climate change. You can do adaptation on that, but apparently you don't do that enough either, because it leads to really big problems. And the

> ultimate defeat is you have to admit that you can't control it and pieces of the Netherlands are being given up. If you frame it that way, you won't get anyone on board.
>
> - Pieter Bloemen
> *Staff Delta Commissioner*

All in all, the definition of planned retreat and how planned retreat is *perceived* among experts is related to whether they see humans, nature, or the broader sustainability agenda as central to this issue, as well as whether they consider retreat strategies as form of 'giving up', 'giving back' or an 'opportunity'. The associations that experts in the field have with 'planned retreat' also relates to the *sensitivity* of this strategy.

5.2 Planned Retreat – Reasonable Solution or Academic Exercise?

Despite the fact that internationally, planned retreat is an existing solution to natural hazards and climatic change, this section discusses whether experts think that this solution could also be a realistic strategy in the Dutch context. When experts were asked about whether planned retreat is a realistic solution for the Netherlands, their views differed. Some of the interviewees acknowledge that it should be researched at in theory, but is unlikely to happen in the Netherlands in practice, whereas others do think that on the long term this is a feasible solution to sea level rise. Six interviewees believe that planned retreat will most likely not happen in the Netherlands, or they could not picture it.[3;7;11;12;15;16] Seven interviewees believe that in the long term (one to two hundred years) it will or could be an option, depending on how much the climate will change.[1;2;8;9;10;14;17] Two experts believe some form of planned retreat realistic and even necessary,[6;13] and two other experts did not give a clear statement on whether they think planned retreat is a realistic solution, but indicated instead that it should be researched.[4;5]

It must be acknowledged, however, that there is to a certain extent a link between how planned retreat is perceived, and how likely experts deem its implementation. Experts that referred to planned retreat as "giving up" during the interviews, in most cases also believe that the solution is not realistic in the Dutch context, whereas for instance those who referred to a more limited form of planned retreat *do* think it is a realistic solution to existing problems.[6;8;13]

Experts who believe that planned retreat is unlikely to occur, see different kinds of obstacles, which are amongst others politically, economically and societally:

> I don't see it happening at all, given the worst case situation we have to consider… I would disregard this assignment then. I wouldn't know who would want to take on such a task.
>
> - Dick Butijn
> *Water Management Specialist*

> I don't think there's going to be a government anywhere, certainly not in the Netherlands, that's going to make the decision that we're going to retreat.
>
> - Jos Timmermans
> *Technical University Delft (Delta Management)*

Others, on the other hand, can imagine that certain forms of planned retreat are realistic in the future, albeit in a limited manner:

> We also need more room for the rivers at some point, so some form of moving along with the water and planned retreat will always be necessary. Even if, say, with the whole technical thing, we keep all the water out and pump the rivers out, we will also need space to be able to pump and drain those rivers out and to raise and widen our levees.
>
> - Marjolijn Haasnoot
> *Deltares*

> I could imagine that we are going to give some more room to the water so that the river discharge can drain away, and the sea can penetrate a little further into the land. That could be an incentive for planned retreat. But you can also hear my hesitation in that. I think it will be a long time before we are on that track.
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

One expert who generally does not see planned retreat as a viable solution, does considers a limited form of planned retreat at least more feasible than "moving entire villages":

> What I can see happening in a sense, that in certain places space is needed just to ensure sufficient safety, but also for nature, for example. Those kinds of preconditions are very important, and we also think they are very important. Then it may indeed be that it comes at the expense of a number of houses, and then it may also be that it comes at the expense of agricultural land. Or whatever else is there, maybe industry. But I don't think that you will move entire villages, that is again a little bit the limit right now, you know?
>
> - Jan Gert Rinsema
> *Ministry of Infrastructure and Water Management*

Additionally, experts who believe that for this solution to gain acceptance, an external incentive, such as a disaster, may be necessary.[1;2;5;10;17] Others however argue that these external impulses are already happening around the world, and are thus not necessary in convincing people to implement this strategy, as this strategy is in fact meant to *prevent* such disasters from happening.[9;14;15]

One expert responds to those who do not see the option as a realistic solution to sea level rise by also including the timeline on which planned retreat would take place:

> Yes, but I think the time aspect is not included in that. Because that suggests that suddenly you're two hundred years ahead in time, and the water is so high that you're saying, you have to leave now, and we're going to evacuate half of the Netherlands now and we're going to offer you all, all those seven million people who live in the Randstad, a little house on the Veluwe. Yes, that's really not going to happen, of course not, that's true.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

This quote highlights that planned retreat is not likely something that happens overnight. Experts emphasise that it is a deliberate and strategic approach, meaning there will probably not be a sudden

decision to retreat.[9;11;2] One expert explains that it is a gradual process that will occur over time, driven not only by sea level rise but also by the broader sustainability agenda.[9]

According to some experts, however, by the time people living in high risk areas need to retreat due to sea level rise, there might already be more dire effects of climate change that require attention:

> What you do at a certain point is decouple sea level rise from climate change. By the time these kinds of measures are necessary, large parts of Africa, Southern Europe, India, will be completely uninhabitable. So there are many bigger problems at stake than keeping the Netherlands dry. And also on a much shorter time scale. If you do not curb climate change and the global temperature rises to 4.5 degrees, in one or two hundred years you will see problems that are so big that this is no longer the biggest problem we have to solve. In that sense, I think it actually remains more of an academic exercise in many places such as the Netherlands.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

This expert furthermore states that looking at planned retreat in isolation is to some extent short-sighted:

> To just isolate climate change in a Dutch context is short-sighted, I think. We as the Dutch are of course hugely biased in the sense that climate change means sea level rise for us and of course there has to be a solution to that, but climate change is a much bigger problem than that.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

Even though experts agree with the fact that planned retreat should not be seen as a silver bullet solution to one particular problem, i.e., sea level rise, one expert uses that argument to advocate for a more encompassing and holistic form of planned retreat:

> If we really have to leave the Netherlands, the world will look so different. Then the Netherlands is no place at all where you want to be anymore. We might be West China, the earth will have warmed up so much by then that the whole biodiversity might completely collapsed. So sea level rise is part of a lot of other things. And if you don't factor that in, in how you deal with it, then it becomes a stupid approach. Because then you are back in that modernist approach: There is only one problem, sea level rise, I am going to come up with one solution for that, planned retreat. If the sea has risen one and a half metres, then the Netherlands really is a totally different place: Parched, we no longer have water in our rivers, biodiversity is ruined, the poles have already collapsed. Maybe it is actually already a graveyard. Or not, I don't know. But you have to take everything into account; the geopolitics, the politics of Europe and local politics, the whole biodiversity, our environment, our economic situation, and that crazy sea going back and forth.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

Partly due to other climate effects that will arise or are already present, some experts do not see the immediate need to plan ahead for a long-term issue as sea level rise,[16;17] as that will most likely not occur for another century:

> Then I speak from my disaster studies perspective, and I think, why are you worried about something than might happen a hundred years from now, when there are all these disasters

> happening now that are not even related to climate change, but to very poor planning, like people living near a volcano, or getting very poor protection from floods or heat waves. So why worry about the end of the century when people are worried about whether they are going to make it to the end of the month?
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

On the other hand, some argue that what makes Dutch water governance distinctive is in fact its long-term planning, extending far into the future.[9] That does not happen for any other sector, as a result of the longstanding history in which the Dutch has to deal with water. The proactive attitude towards the water sector in combination with the ability of long-term planning is what makes the Dutch water sector innovative and of international prestige.[9]

In accordance with this, one could also argue that it does make sense to plan ahead for sea level rise, especially since more experts argue that many problems result from poor planning or mismanagement, rather than climate change:

> There are some areas that are already acutely suffering from sea level rise, the areas where subsidence is very high, land subsidence, so relative sea level rise is very high. So that is not caused by climate change, it is caused by mismanagement, areas like Jakarta. Tokyo also suffered from it, and they solved it.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

If it turns out that the higher emission scenarios become reality and there is no anticipation to sea level rise, floods may become yet another result or poor planning, making a case for at least further investigating planned retreat as potential solution to sea level rise, also in the Netherlands.

Despite different views on whether planned retreat is a realistic scenario for the Netherlands, experts do acknowledge that planned retreat is more likely – and already happening – on an international scale. However, since experts believe that the Netherlands has the technological and financial means to keep protecting for as long as it takes,[3;7] and already in a way have created a certain "lock-in" with the technology-focused approach,[12] experts think it is less likely to happen in the Netherlands.

As stated before, regardless of the different perspectives on planned retreat, all seventeen experts do agree that the option should at least be further researched. Even one of the experts who shows more criticism towards planned retreat, strongly opposing the idea of "moving everyone out of the West", and arguing that the problem of sea level rise is way too small to implement anticipating measures for, agrees that it should at least be examined.[7]

When asked if and why planned retreat should be examined, it was said that, partly because planned retreat is not clearly defined, it is important to gain a better understanding of this approach.[12] Others also stated that even if it is "the last desirable option" to adapt to sea level rise, it is still important to look into in case it might ultimately be necessary:[5;16]

> I approach it [planned retreat] as one of the possible options for adapting to sea level rise. And I think it is important to explore the full range of possible solutions and on that basis you can also look at what are short-term measures, what are planned long-term options. And then planned retreat or making room for water, for example, can be implemented at different scales. And then in a strategy of more protection, making more space for water would also be part of that, so to speak.
>
> - Marjolijn Haasnoot
> *Deltares*

Another expert underlines a different important factor to determine whether planned retreat is realistic or not. If it is ever going to be implemented, planned retreat needs to serve as a solution to a particular issue:

> But then the question is still, for what problem is it a solution? It also has to be a solution to a problem. And the problem may be, the cost [of technology] is getting too high, so this is the best option. Well, that could be an argument. But as long as it's not, well…
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

In conclusion, the perspectives and interpretations of planned retreat differ among experts, yet in spite of the sensitivity of the topic, experts share consensus that it merits further exploration. Whether planned retreat is deemed a realistic solution to adapt to sea level rise also varies among the experts, though there seems to be a correlation between how radical experts perceive the solution and how realistic they consider its implementation.

6. Socio-Economic Drivers of Change

There are many uncertainties that impact the way the future could look like, and in turn, the way in which planned retreat could take shape, provided it ever will. The literature shows many existing uncertainties in the human dimension in relation to decision-making (Isendahl et al., 2009). As explained in Chapter 3, these broader types of uncertainties can be divided into the STEEP categories: Societal, Technological, Environmental, Economic, and Political. Due to the large role of climate change in this particular research, the category 'Environmental' has been divided into 'Climate Change and Sea Level Rise' and 'Ecological Systems'.

Through conducting seventeen expert interviews, the different uncertainties within these domains have become more apparent, specifically for the context of planned retreat in the Netherlands. This chapter discusses these uncertainties, i.e., drivers of change, that will later serve as the foundation of the exploratory scenarios. In doing so, this chapter will address the fourth sub question: *What are the socio-economic drivers of change for the development of exploratory scenarios of planned retreat?*

Each paragraph in this chapter is dedicated to one of the STEEP categories, but tailored to the concept 'planned retreat', as shown in Figure 11. They discuss the way experts perceive the different drivers within these categories. The chapter ends with a figure that shows how these factors are also interlinked.

Figure 11. Categories of Drivers of Change

6.1 Climate Change and Sea Level Rise

Perhaps one of the most prominent and obvious uncertainties regarding the future concerns the extent to which the sea level will rise. Whereas emission scenarios are quite similar in the coming fifty years,[12] the RCPs after that time period diverge. Under the more extreme warming scenarios, we might experience a sea level rise of five metres in 2150 compared to the present (Van Alphen et al., 2022). Given the fact that sea level rise has a rather slow response time, several studies have already pinpointed the minimum sea level rise that we can expect. However, how much we are able to reduce emissions and mitigate climate change is uncertain, as are the tipping points.[16] This significantly impacts the timeline on which adaptation measures such as planned retreat might be implemented (Haasnoot & Diermanse, 2022), but also plays part in how likely experts deem the implementation of planned retreat in the Netherlands to begin with.

The uncertainty in sea level rise plays an important role in the idea and possible design and implementation of planned retreat. One expert explains that this is also the case for the National Delta Programme in the Netherlands:

> From the perspective of the Delta Programme, we look at: Suppose the sea level rise is faster and more serious than we can handle with the current policy, with the current strategies, what type of solutions should we think of? And then moving along with the water is one of the solution directions that comes up and is further examined.
>
> - Jos van Alphen
> *Staff Delta Commissioner*

On the one hand, some experts say that uncertainty regarding sea level rise and climate change is in certain instances used as an excuse for inaction and indecisiveness.[10;15] On the other hand, doing more research about future sea level rise might not give more certainty, and even if it does, more certainty regarding sea level rise might not necessarily help in decision-making.[10;12]

One way of getting more certainty is if at some point, the lower emission scenarios have to be disregarded. Preferably, however, experts say that option should be kept open as long as possible, resulting in a wider range of uncertainty:

> When I joined the Knowledge Programme Sea Level Rise, […] one of the goals was to reduce uncertainty about sea level rise. I concluded this wasn't a proper goal. We have to contribute to this kind of studies, but it is not our Knowledge Programme that is going to reduce that huge uncertainty the whole world is studying on. It is quite possible that in the future we will know better what to expect. But the most probable reduction of uncertainty on the shorter term might be abandoning the lower emission-scenario. Of course that would be disappointing. Personally I want to be able to believe in those lower scenarios for as long as possible.
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

There are several factors that play a role in future sea level rise that contribute to the range of uncertainty. Based on the seventeen expert interviews, the main two contributing factors to the uncertainty of sea level rise are firstly how much we are able to mitigate, and secondly whether an ice sheet Antarctica breaks off. What is known, however, is the fact that even if we manage to cut emissions today, sea levels will continue to rise for a very long time due to their slow response time (Meehl et al., 2012).

6.1.1 Mitigation

The extent of sea level rise beyond the next fifty years remains uncertain due to the unknown effectiveness of our mitigation efforts. Successful climate mitigation is not in the hands of one country; emissions are not limited to borders, so nor is mitigation. Hence, this uncertainty lies beyond what the Dutch government can do, making it a global issue.[12;16] Whether we as the world are able to successfully mitigate climate change largely determines the emission pathway that we will embark upon (Meehl et al., 2012), and therefore how much sea level rise we will likely experience in the coming centuries. To what extent we are able to mitigate in turn might determine whether planned retreat is going to be an option at all, some experts argue.[12;16] Climate adaptation remains necessary, but this task will be significantly reduced if mitigation is successful:[12;16]

> The Netherlands can still adapt to sea level rise in the coming century. Things could go wrong in the longer term, if the temperature change is bigger. There is uncertainty about how big that is, but it actually means that you have to focus more heavily on mitigation to limit those risks, and thus buy yourself more time to adapt.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

This uncertainty is thus also seen by some experts as an incentive to invest more in mitigation, to limit the increasing need for adaptation options, such as planned retreat. The KP ZSS (Tussenbalans) acknowledges this as well, confirming that it will be the initial focus of the Dutch government. However, how much we are able to mitigate to climate change and therefore reduce sea level rise is still uncertain. This uncertainty around mitigation also influences whether experts consider planned retreat a realistic solution:

> My answer to your question, whether I think it is realistic, has a lot to do with: Imagine that it will be fifteen metres in 2300, so to speak, or 2400? Well, at a certain point it is of course not illogical that there are parts of the Netherlands where you think, that dike, we are no longer going to maintain it, because that is simply no longer possible. Then we have to focus our efforts elsewhere. That could just be possible. But, now we don't know if it will ever be fifteen metres and we don't know if it will be, when that would happen. In that sense I find it very difficult to say. I actually hope that as a world we will succeed in reducing greenhouse gas emissions. Perhaps they can also be recaptured. That we will also succeed in limiting sea level rise.
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

Moreover, one expert argues that mitigation itself might be a reason not to put a lot of effort into further reducing uncertainties regarding climate change:

> We can calculate climate change, but it might as well be that in ten years we will have found a way to remove CO_2 from the atmosphere without using fossil fuels. It could be that much of the climate change problem will then disappear like snow in the sun. That's mainly in limiting climate change through mitigation.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

In other words, this quote highlights that rather than reducing uncertainties, it might be more useful to invest in technologies that can enhance mitigation and therefore reduce climate change altogether.[16] Others, on the other hand, do not believe that it would be desirable to follow a path of mitigation in which geoengineering is involved. They consider that the limit of *desirable* mitigation.[2;17]

Some experts are hesitant or sceptical towards implementing preparatory or anticipating measures as part of planned retreat as long as those low emission scenarios are still within reach:[4;12;17]

> Well, if I think for a moment about Zeeland, so that in two centuries it will no longer be possible to live wise because of rising sea levels... look, it can also turn out to be not so bad, right? That's always the problem with this kind of scenario. […] It has often been in the news with very extreme scenarios, but who knows, it might all stay reasonably within limits, and then of course Zeeland doesn't have to be emptied.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

> There is a scenario possible, if we really stop CO_2 emissions very quickly, then it is a conceivable scenario that we will stay under the two, three metre sea level rise. And then for many hundreds of years. So then that curve will flatten after a few metres. If that were to become reality, I would think, it isn't necessary to accommodate sea level rise by accepting more flooding. However, this scenario is becoming very unlikely.
>
> - Saskia van Gool
> *Rijkswaterstaat*

Another expert however, believes that limited planned retreat should be an option, even if emissions are limited to the two degrees Celsius that were agreed upon during the Paris Agreement.[13] He states that if the temperature rises beyond that, the limited form of planned retreat that WWF proposes will not be an option anymore, as there will be a need for a large scale form of planned retreat.[13] There are thus different opinions on how the extent to which we are able to mitigate climate change contributes to the plans of planned retreat.

Not all experts that were interviewed consider the uncertainty around mitigation as a direct reason for implementing or not implementing planned retreat.[9;14] For instance, someone also opts for the idea to include mitigation in the design of planned retreat itself:

> A proactive planned retreat can also be a mitigation component. And then it becomes much more part of a layered approach in which you say, hey, what kind of future do I want to live in? What does that one look like? And how am I going to try to achieve those two degrees Celsius as much as possible? And can I use planned retreat as a tool to contribute to not only adaptation, but also mitigation?
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

In any case, how much mitigation will occur in the next years will partly determine how much sea level rise is expected, given that tipping points are not already reached. More certainty in this regard does not have to be a positive thing, as it might mean that the lower emission scenarios are no longer within reach. After all, according to Meehl et al. (2012), strong and timely mitigation measures can eventually stabilise global temperatures, but sea level rise will continue for centuries either way.

6.1.2 The Role of Antarctica

According to Tol et al. (2006), there is an unknown probability that the West Antarctic ice sheet will break off due to climate change, which in turn could cause an additional five or six metres global sea level rise within centuries. If and when this tipping point might be reached, or whether it may already have been reached, is unknown, but there is a significant chance that Antarctica will contribute to sea level rise in the higher climate scenarios:

> And given the progress on that [mitigation], I think we have to be honest that it's not out of the question that this climate change is going to be too big. It's all still a long time away though, so you can say that it [sea level rise] is not the biggest problem we have in the short term, but on the other hand, this is a problem that won't just go off the table either. We are very uncertain about how big the temperature change has to be to destabilise Antarctica: there are people who argue that that's actually already going on, but there are also people who say, you need really solid climate change for that.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

One expert says that reducing uncertainty in this regard will give an indication on whether we are moving in a positive or negative direction, which in turn gives an idea about the likelihood of each solution direction.[8] It might not give more certainty about sea level rise, but it does give more certainty about how likely it is that the scenarios are becoming more extreme, and therefore what the remaining adaptation possibilities are. Gaining more certainty most likely implicates that the lower emission scenarios have to be disregarded, which experts do not consider desirable.[12]

If an Antarctic ice sheet collapses in the second part of this century, however, it is possible to calculate the expected sea level rise, as it is still a relatively slow process compared to other climate change impacts (Meehl et al., 2012). It means that in approximately one hundred years, the sea level will rise with ten metres, which in turn gives you one century to implement measures accordingly.[14] One expert explains that the rate on which the sea level will rise will in that case increase with factor ten, or even more, compared to the current rate.[1] Some argue that this will play a large role in whether planned retreat is going to be necessary:

> When listening to all the climate scenarios people sometimes get scared. They feel uncertain about the future. However, if you carefully look at those scenarios, a different picture emerges. Provided that no large ice sheet breaks off from West-Antarctica before the end of the century, the sea-level rise will be limited to less than a hundred centimetres at worst. This can be handled with – albeit expensive – engineering solutions, implying that we can live safely in the Netherlands for another century.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Whereas some experts consider the Antarctic icesheet to be a determining factor for the *timeline* on which planned retreat is implemented,[14] others are hesitant about taking such anticipating measures before this uncertainty is further reduced.[12] One expert for example warns that until we have more information, implementing measures could prove to be premature.[12]

From the interviews it is evident that regarding sea level rise and its uncertainty, experts are quite divided on how this influences planned retreat. Whereas some seem to be in favour of proactive measures because of this uncertainty,[1;9;10;13;14;15;17] others advocate for waiting with such measures until it turns out that these higher emission scenarios are more likely to happen.[4;11;12;16] According to KP ZSS (Spoor V: Besluitvorming), what makes this issue even more complex, is the fact that sea level rise and its effects are usually considered in the broader sense, but it is unclear how that

translates to consequences on the regional scale. Hence, the applicability of each solution direction per region, depends on the (expected) effects per region, but those are difficult to determine.

Based on the expert interviews, the largest contributors to sea level rise and its uncertainty are the extent to which we are able to mitigate, and whether an icesheet of Antarctica breaks off. Considering the fact that the Knowledge Programme Sea Level Rise (KP ZSS) has dedicated one of the five tracks to the role of Antarctica, it is evident that several knowledge institutes and the government also consider this an important contributor to the uncertainty of sea level rise. However, there are different views on how uncertainty about climate change and sea level rise contributes to planned retreat. Whereas some experts consider the amount of sea level rise to be a determining factor for the *timeline* and *scale* on which planned retreat might be implemented,[13;14] others argue that this should be a *precondition* of whether we need to implement anticipating policies to prepare for planned retreat at all.[4;12;17] Figure 12 summarises the drivers discussed within the category of Climate Change & Sea Level Rise.

Figure 12. Drivers of Change within the First Category

6.2 Technology and Hydraulic Infrastructure

Strongly related to the previous driver of change, this part discusses the technological aspects of planned retreat. According to Van Alphen et al. (2022), the water management sector is not only challenged by the extent of sea level rise, but also the annual rate of rise, as this significantly impacts the life expectancy of existing hydraulic infrastructure. There is a lot of disagreement on what the limits of technology are with respect to hydraulic protection mechanisms. Experts differ on how much sea level rise our current system of strengthening dikes can endure, but there is a general consensus that two to three metres sea level rise should be manageable with the current system. After that, the experts diverge both on what is achievable, but also on what is desirable.

6.2.1 Technological Limitations

When asked what the limits of technological developments are, the experts' responses varied widely. There is consensus among experts that the Netherlands can be protected against two or three metres sea level rise, by continuing to strengthen the existing hydraulic infrastructure. Experts in the field of water management mainly argue that with technological developments it is possible continue to protect the Netherlands for centuries, even with a sea level rise of ten metres:[3;7;8]

> I also have a very strong faith in technology. That even with heavy dikes and technical aids we can protect the Netherlands for a very long time. I certainly have confidence that we can maintain the Netherlands up to at least ten metres that way, or even further.
>
> - Dick Butijn
> *Water Management Specialist*

The majority of experts expect that the technological limitations become apparent at three to five metres sea level rise. Remarkably, one expert argues that we have already reached a limit, in the sense that due to that sea levels will continue to rise regardless of our emission levels, it would be a waste of money to continue to invest in technological solutions.[13] This limit could be seen as an economic limit rather than a technological one, but it regardless plays a role in the desirability of further investing in technological developments. Another expert agrees that though technologically there are still many possibilities, it might be more of a limit to what is desirable rather than what is possible, also in economic terms:

> But what's a very important catch, which may actually bring those [technological] limits much closer, is that as the sea level continues to rise, the rate at which that sea level is rising also continues to increase. And at the moment it's two, three millimetres a year. But the expectation is that if the warming continues, and if Antarctica starts melting and starts participating in sea level rise, then by the end of the century the rate of sea level rise could increase by factor ten, or maybe more. So then it's no longer two millimetres per year, but two centimetres per year. And in absolute terms, maybe we can still technically handle a sea level of five, six metres. Because you can raise those flood defences, they can still be five, six metres higher. But what's going to be a problem is to adapt, build, replace all those flood defences and all those pumps and all those other things that you need, every time in such a short time, everywhere. So it is probably the rate at which sea levels are going to rise that is going to be more of a problem to keep up with it all, than the technology itself.
>
> - Jos van Alphen
> *Staff Delta Commissioner*

Thus, it could be argued that purely technologically speaking, experts do not see limits to what is possible, particularly not until a two to three metre increase. However, some experts do not believe the technological opportunities to be limitless, as they see problems far ahead into the future:

> Fifteen meres is not feasible. But then I also say, you won't get that fifteen metres in 2100. But in 2300 it's not out of the question, so to speak.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

Either way, the interviews indicate that technologically speaking there are still many possibilities, especially in the Netherlands. Experts argue that it is rather about what is still *desirable*, both economically and aesthetically speaking.

For the Southwest Delta region however, government actors and stakeholders in the region generally only look at one metre sea level rise, according to KP ZSS (Spoor IV: Zuidwestelijke Delta). For plans in the future, a time horizon until 2050 is considered, but it is unclear what happens after that, and what happens if sea level rise becomes more than one metre. Considering the context

of the Delta, technological limitations might occur sooner than elsewhere, according to KP ZSS (Spoor IV: Zuidwestelijke Delta).

6.2.2 Technological Opportunities

When asked about the existing technological opportunities related to water security, water managers are particularly convinced that there are still many possibilities. Some say it has been proved "a thousand times"[7] already that building sufficient hydraulic infrastructure is still possible; both economically as well as technologically.[7] Others agree that there are some challenges, but that they can be easily overcome with innovative developments:

> So you can raise the dike, one of the things is going up. Our deep polders are six and a half metres deep. Look at the dike at the Hollandse IJssel, for example. I've always been amazed at how narrow that dike is and how high, but that dike still holds it up. There are huge dikes in the Netherlands, but people just live along them and they don't have any problems with it at all. If a twelve metre dike is possible, then you can raise that dike several metres more. That's one. Two, is that you hear about the seepage water leaking underneath. You can raise that dike, but the water will pass underneath. But it doesn't have to, because you have engineering interventions there, too, like building a loam frame, also called: Seepage screen. […] So you have that under control as well. Technically, I don't see any problems there.
>
> - Dick Butijn
> *Water Management Specialist*

There are also some other experts who acknowledge that these possibilities of endless technological innovations to improve water security do exist.[14;15]

However, the aforementioned discussion focuses more on the current possibilities rather than on the potential technological opportunities that planned retreat might yield. Not many experts explicitly refer to particular technological opportunities that might result from planned retreat, but experts do see some technological solutions to additionally emerging problems from sea level rise.[3] Some experts identify opportunities where technological innovations could complement improvements to the hydraulic infrastructure. For instance, they think that the expected salinisation of the land could also lead to different opportunities in the agricultural sector.[8;15] By shifting to saline cultivation or repurposing the land for other uses, such as nature conservation, these issues can be diminished.[8] In fact, one expert suggests that technological innovations could work in synergy with nature:

> It can go very well side by side: The technical and nature. They don't have to bite each other. I actually see a lot of opportunities for nature in this, compared with continuing the present method, like rivers in open connection with the sea, in which case a lot of nature will be inundated, amongst which most of the floodplains alongside the main rivers.
>
> - Dick Butijn
> *Water Management Specialist*

He argues that by maintaining the system in place, the remaining nature in the Netherlands can be protected.[3] Other than that, not many (technological) opportunities were mentioned in relation to planned retreat.

6.2.3 Maintaining the Current System

As explained in Chapter 4, the Netherlands has a longstanding history of innovations in hydraulic infrastructure. The need to protect the low-lying lands over centuries has made the Dutch masters of coastal and riverine protection, as a result of allocated funds and fast technological developments. In accordance with Article 2.12 of the national Water Act (Waterwet), the system in place is under review every twelve years, with a report on the general hydraulic condition of the primary water barrier – which protects the Netherlands from floods from the sea – to the Minister. Mandatory by law, the hydraulic infrastructure has to be updated accordance with the existing norms, for instance, norms related to the maximum allowed flood probability, in line with Article 2.3.

As stated in previous sections, according to water managers, the technological possibilities are not exhausted yet in theory. With regard to continuing to protect the coast the old-fashioned way, however, experts are hesitant about whether it is desirable to keep the system in place, and to keep improving and updating the existing infrastructure.

One expert argues that we already moved beyond the point on which it is desirable to maintain the current system.[13] When asked at what point it is no longer desirable to strengthen dikes further and use hard infrastructure, he states:

> Oh, that is already not the case anymore, no. It is a waste of money. Because you are destroying nature, it is more expensive than other solutions, and it does not improve the quality of life. We need to stop this immediately.
>
> - Bas Roels
> *World Wildlife Fund*

There are more experts who question to what extent it is desirable to maintain the system of further strengthening an raising dikes:[11;14;15]

> I honestly think that in itself you can stretch that [two, three metres sea level rise] further, only you end up with very large social consequences, as well as consequences for everything else. The higher you make the dike, the more space you need. And in certain areas that space is simply not there right now. And I also think that with technical solutions, that is, those that take up much less space, so just constructions, we can continue for a very long time. But at some point the question is, do you still want that? Do you want to build a wall five metres high and continue to live behind it? I don't know.
>
> - Jan Gert Rinsema
> *Ministry of Infrastructure and Water Management*

Some experts mainly see a problem in relation to the sustainability of continuing with hydraulic infrastructure, such as the earlier mentioned dam of twenty-five metres:[1;14]

> An alternative to planned retreat is the construction of a huge dam surrounding the Netherlands. The height of such a dam will be twenty-five centimetres or so, and hence such a project will require a lot of money. Now such an expense could be defended, in view of the very large industrial, financial and social infrastructure in the West of the Netherlands. However, there is an issue of sustainability. Is it possible to construct such an enormous infrastructure without CO_2-

> emissions? What kind of energy source is needed to pump the river outflows upwards towards the North Sea through the new dam? This may require nuclear power plants.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Moreover, some experts argue that the accelerated sea level rise will cause the need to improve or replace the existing hydraulic infrastructure by a faster pace, potentially leading to an unsustainable and cost-inefficient cycle.[1;16]

The KP ZSS also acknowledges the role of Antarctica in their programme, including the fact that higher emission scenarios will lead to additional sea level rise. However, there remains uncertainty as to how exactly sea level rise will affect the existing hydraulic infrastructure and the pace at which the infrastructure will experience degradation, and it also differs across regions. Whereas some experts argue that this does not cause any problems, or is easily solvable through technology[3;7;8], others do not rule out the possibility that it is not sustainable to continue down this path, inter alia due to other related problems that might occur, such as salinisation as a result of salt intrusion.[1;12;13;15;16] Moreover, the majority of experts questions the desirability of maintaining the current system at a higher amount of sea level rise if it means that people are living behind dikes that are elevated frequently.

In KP ZSS (Spoor IV: Hollandse Kust), one option described under the 'Move Along' strategy for the Western coast involves maintaining the current *existing* infrastructure, while shifting from building more hard infrastructure to a more dynamic coastal management approach. This strategy emphasises mitigating the consequences of floods rather than solely focusing on preventing them.

All in all, even though there is consensus among experts that through improving the current hydraulic system, the Netherlands can cope with two to three metres sea level rise, experts differ on whether we can go further than that. The majority of experts is seriously questioning the desirability of continuing to build higher and broader dikes. Generally, experts do not see purely technological limitations, but rather limitations on other aspects such as costs, energy, nature, aesthetics, and sustainability. Experts on the water management side oppose this by arguing that at least economically, it is not an issue to continue with the current strategy.[3;7;8] Whether it is desirable to keep the current system in place is thus also dependent on other factors; how much climate change we will experience, how much financial means are needed to maintain the infrastructure including the space it will require with different amounts of sea level rise, but also how people feel about the aesthetic aspects of the bigger infrastructure. Figure 13 illustrates a summary of the drivers discussed so far, including Technological Developments.

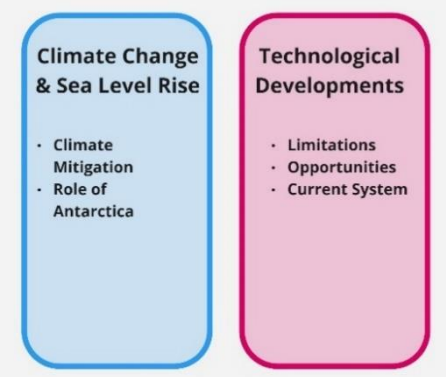

Figure 13. Drivers of Change within the First Two Categories

6.3 Politics and Governance

6.3.1 Political Responsibilities and Decision-making Processes

From the interviews it is evident that in relation to planned retreat, there are several responsibilities that the national government carries. Experts share consensus that the national government (Rijksoverheid) is mainly responsible for all decisions related to spatial planning, such as planned retreat. They agree that this is a broad issue requiring national government intervention. Given its impact across multiple policy domains, while the primary responsibility would rest with the Ministry of Infrastructure and Water Management, the scope of planned retreat requires collaboration among multiple ministries. The majority of experts immediately referred to the national government when asked who carries the responsibility for a plan such as planned retreat, or they referred to the Water Authorities and the Delta Committee.[1;3;5;6;8;9;10;11;12;13;14;16;17]

Another expert does not only refer to the responsibility to *make a decision* as government, but to also *take on a proactive role* in this regard:

> So that's the reactive responsibility, you also have a proactive responsibility, that you say, I don't actually need that disaster. We already have those [disasters], so I have to deal with that, but I really want to start preventing the bigger disasters that are coming. What am I going to do about that? How am I going to use the capital I have, in terms of knowledge, money and people and nature, to work on that future?
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

The comparison with the current nitrogen crisis in the Netherlands is also made often in relation to this; even it is clear from a scientific point of view what needs to be done, it does not always mean that the government will act on that.[9;14;17] This also works the other way around. As long as knowledge institutes cannot present a certain finding, for instance, that sea level rise is accelerating significantly in front of the Dutch coast, government actors can "close their eyes" for such a problem.[15] Several experts therefore also refer to the political will, or the political feasibility of such a strategy as potential obstacle.[3;14;15;16;17]

Generally, not many other parties were mentioned in relation to taking the lead in designing and executing this plan, though, experts shared consensus that if this strategy were to be carried out, there should be involvement of other stakeholders as well. Concerning the decision-making process, as stated before, most experts think that the national government is responsible for any decision in relation to planned retreat. Experts agree that employing a strategy like planned retreat should mainly be dealt with on a national scale. However, a number of experts do not believe that a decision to retreat will *suddenly* happen, or even that there will be some sort of movement by society from one day to another:[4;8;9;11;12;15;17]

> When you talk about sea level rise, it's a tricky threat in the sense that there's not going to be two metres added to that sea level tomorrow. That's a long-term process. So I don't think there will be one moment anytime soon where people say: "Hey, now we're all leaving".
>
> - Jan Gert Rinsema
> *Ministry of Infrastructure and Water Management*

Regarding the responsibility to make a decision in relation to planned retreat, one expert sees more of a *reactive role* for the government, rather than a proactive one:

> In my opinion, from my perspective, usually society leads the way and politics follow. So I do see a possibility that when society moves in that direction, that the government does start supporting that, and not inhibit it. When we look at a lot of the problems we have now, and of course nitrogen is one of them, the government actually plays an inhibiting role. They didn't solve the problem, they just allowed the problem to continue. And if you start doing the same here, it will remain the same.
>
> - Jos Timmermans
> *Technical University Delft (Delta Management)*

He states that the responsibility of the government is *supporting* the direction in which society wants to go, rather than *initiating* it. Some other experts also advocate for a supporting role from the government, if there would be a voluntary collective that for instance wants to move Eastwards.[4;12;15]

In the Netherlands, the government and its executive organisations are currently responsible for the protection of its citizens under national law, and they also carry the responsibility of updating the infrastructure. The national Water Act (Waterwet) contains certain norms which require the hydraulic system to be updated in accordance with those norms. It is not only the *obligation* of the government to take on a challenge such as sea level rise and protect the citizens in the Netherlands, one expert explains that people also *assume* this role and expect that they are in charge of this:

> The government is responsible for people's safety, unlike in North America. So we also assume the government will solve it, and the government assumes that role. We pay our water taxes for that, so we will continue in that trend as well. If you ask people, they say: "Yes, it is important, but "they" have to solve that." And people also have a rock-solid trust that the government will solve it. The government also knows that trust is there, so they won't easily give that up either.
>
> - Dick Butijn
> *Water Management Specialist*

In addition to *guaranteeing the safety of citizens*, interviewees also see other of responsibilities for the government in designing and implementing planned retreat. If there is ever going to be a decision to anticipate to sea level rise through planned retreat, there are several steps and tasks that the government should take. Not only is the government responsible for *making the decision* to plan to retreat, it also carries the responsibility to *make funds available for adaptation options* such as this one:[1;5;17]

> Yes, much more money is being released all over the world – finally – for adaptation, where before it was mainly for mitigation. But yes, I think that has to happen more in the Netherlands as well.
>
> - Frederique de Groen
> *Deltares*

Another aspect that was mentioned by four experts, is the fact that it is important to be transparent and clear towards citizens that are affected by such plans. The government carries the responsibility

to provide citizens with *clear and timely information* regarding the effects of the chosen strategy. Unclarity and insecurity is the last thing that citizens need to deal with the consequences of potential planned retreat:[9;11;13;17]

> Look, the worst thing with that kind of thing is that people sit in uncertainty for a long time. So the very best thing for those people is if they were to hear immediately: Yes, sorry, you are screwed, or not, the moment they actually get notice of such a plan. It has to be immediately clear when and how. That is difficult, because in our country plans are made up to twenty years, and then you have another fourteen years of participation procedures up to the Supreme Court. And then people spend half a lifetime in uncertainty. Just look at the gas extraction crisis, for example, in Groningen. So the worst thing, I think, is that you leave people too long dangling in uncertainty. So you would really have to do something about that with an emergency law or something.
>
> - Bas Roels
> *World Wildlife Fund*

> So in that sense, it remains a difficult game for governments to push things through, but if you start as early as possible and don't start with search areas, but say very concretely, this is what is going to happen in your neighbourhood, just as you hear that fiberglass is being laid and the street is opening up, you can also say to people: We are going to talk now about the fact that we know that in twenty years we won't all be able to live here anymore, so we are going to discuss what opportunities and possibilities there are to still make something beautiful out of it. Don't let it come out of the blue, but communicate very well and smartly, because sometimes people do put a cloth over their heads and hope it doesn't happen. In a manner of speaking. So you also have to make it inevitable for people to know about it and talk about it.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

As pointed out by these experts, regardless of whether it is a very difficult thing to hear that your house might have to be relocated, it is important to know what to expect.[13;17] However, one expert notes that people might be resistant to or in denial about such issues, so the government must not only communicate clearly but also repeatedly emphasise the message, especially for such long-term measures.[17] The argument is that the government is responsible for providing this certainty to both affected and non-affected people.

Other experts also argue that the government is responsible for providing clear, transparent, and timely information about future developments – not only to affected citizens but to the public at large:[4;6;9;10;11;12;13;17]

> You can make much more policy on at least not planning the Netherlands to be fuller and to inform those people who then knowingly go to live somewhere that is link very well, and have very good plans so that there are no extra deaths, cattle drowning, important infrastructure being flooded...
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

Experts argue that the government needs to provide citizens with comprehensive information, not only in relation to 'living with water', but also with regard to other aspects of planned retreat. Four

experts speak mostly of informing citizens well about the risks and *creating more awareness*.[4;6;10;17] They argue that there needs to be more awareness about the risks that sea level rise impose on people living in lower areas, but also about the risks that come with preventative or anticipating measures that might be taken as preparation for or part of planned retreat.[4;6;10;17] They further state that is important that the government informs citizens about when and why which measures will be taken:[4;6;13;17]

> The sea level is rising, even if it will go faster, fortunately it is still rising slowly, but of course if something goes wrong once, a flood is immediately a major disaster. So I think, if you decide not to take the next step in protecting, you have to slowly make it clear that the risks are increasing. And with that you can also slowly start a movement by involving society, by saying: We as a government can cover risks up to a certain level, but if you still want to live in this deep polder or outside the dikes, then you have to make sure you are safe or accept the risk. That will already result in a change.
>
> - Saskia van Gool
> *Rijkswaterstaat*

In being transparent about the decisions and the process, however, experts argue that the government should avoid causing panic reactions among citizens, and prevent a complete exodus from the West in which people are selling their houses *en masse*:[4;6;12;13]

> It's a diabolical dilemma, you have to start something like this well in advance. But yes, you also don't want to cause unnecessary panic and hassle.
>
> - Bas Roels
> *World Wildlife Fund*

Aside from offering clear and timely information on what will happen and how citizens will be affected by the plans, six experts also talked about *offering a perspective*.[1;6;9;11;12;17] For example, as one expert point out, farmers in the Western part of the Netherlands currently possess the most fertile soils, so they need a perspective to continue or alter their business if planned retreat is implemented.[12] Offering alternatives, or "a perspective", also has to do with framing; you can make retreat strategies "fun" or "attractive":[6;9;17]

> So if you offer people an alternative, it's not planned retreat; it's moving. Retreat means going away. And so that's very much perceived as a negative: I have to leave. If you deploy it as: "I'm going somewhere, where am I going?", you have a very different perspective. Then you say: "Where do you want to go in the context of this future?", and you start planning for that.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

Therefore, if the government can offer those who would have to leave with a perspective, or an attractive alternative, it might not lead to as much resistance.[9;17] One expert argues that it is particularly important to emphasise that it does not have to happen tomorrow.[17]

Experts also argue that the government is responsible to make sure that people who are affected by such plans are offered something other than a *perspective*; something more tangible, such as *financial compensation* in addition to the timely and clear information:[6;14;15;17]

> You also think about okay, you can buy a house here, but only for thirty years. So in this area for so many years, means that you really have to look ahead. You can live there for decades, but after that the risk will really increase. And then at some point people really have to leave, for example. Or be bought out. And you also make sure that people have somewhere to go, that they have possibility to go somewhere and also have the financial means.
>
> - Marjolijn Haasnoot
> *Deltares*

However, experts also acknowledge that in the case of larger movements it might be harder to finance buy-outs:[14;17]

> To further illustrate the previous point, it is good to realise that such a massive replacement of people and infrastructure will require enormous compensation packages. Your property will disappear below sea-level, and you have to rebuild everything from scratch in the Eastern part of the country. The legal consequences are large. And since the pockets of the government are finite as well, I have doubts whether this option can be realised.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

On top of that, it is more than just compensation that is needed, as it also impacts people's entire lifestyle:

> They will say, yes I don't just want to be compensated, but I need to change my life plan. So for them it's more than just money.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies*)

Lastly, from a more critical point of view, one expert argues that when taking a decision in this regard, decision-makers have to ask themselves the question: "Is this really going to make people happy? Are there no better alternatives?"[7] In other words, the government needs to critically assess all alternatives as well, before 'jumping' to a solution like planned retreat.[3;4;7;12]

All in all, the government carries several responsibilities in this regard according to experts. They firstly have to make the decision *if* they will into the direction of planned retreat or to start taking certain measures to retreat, even though it might not be a conscious decision at a certain point in time, but rather a slow process. The government simultaneously carries the responsibility to ensure the safety of Dutch citizens. Moreover, experts argue that the government has to inform citizens well about which measures are taken at what point and why, and they have to be transparent about the effects of those measures on people living in high risk areas. On top of that, they have to ensure that there are sufficient funds to realise the strategy, including financial compensation for those who have to relocate. Lastly, aside from informing citizens well and offering compensation, the government also needs to provide a broader perspective or attractive alternatives, which in turn could also increase the public support.[6;13;17] Experts state that the government has to provide both a carrot and a stick to enable this process.

6.3.2 Designing Planned Retreat

Experts differ considerably in their visions of how planned retreat could or should be designed, but experts generally agree on the importance of involving multiple stakeholders in its development. Ideas about planned retreat vary from creating an extra buffer zone by moving the dikes a few metres, to abandoning larger part of the Western Netherlands, to protecting the larger cities by surrounding new dikes, like islands.

The interviews indicate that the scope of what planned retreat entails or should entail is not set in stone or strictly defined. For example, nine experts argue that it could include anticipating or preventative measures such as investing in higher grounds like the Eastern part of the Netherlands, or stop building in lower, high-risk areas,[1;5;6;9;10;13;14;15;17] whereas four experts argue that there is no reason (yet) to focus on such anticipating measures, as in fact, they could be harmful.[4;7;11;12] These different visions impact the timeline on which the government might start implementing measures related to planned retreat. Moreover, it not only begs the question whether anticipating measures that indirectly relate to either 'giving more room to nature', 'moving to higher grounds', and 'living with water' should be implemented, it is also unclear whether those measures can be considered part of planned retreat. However, as the concept planned retreat includes the word 'planned', it is evident that this strategy includes a component of planning and anticipation. Several experts also strongly express their preference for long-term planning by the government in this regard.[2;4;6;9;14]

Experts arguing in favour of such preventative measures have varying ideas. For instance, some experts talk about putting a stop to building houses in the lowest parts of the Netherlands and in flood plains, in line with what is advised in Water en Bodem Sturend, as it would not be a climate proof investment:[5;9;10;17]

> In short, there is a huge need to take up that spatial planning in concert with those other aspects. Interesting in that light is that this cabinet did manage to send a letter to the parliament in December. And everyone agrees that 'Water en Bodem Sturend' should guide the planning of the Netherlands. You can take that further. Also in the light of planned retreat, what does that really mean in the long term; 'Water en Bodem Sturend'? And how does that affect the layout of the country, the living environment, our economy, up to and including, where do we invest and where do we invest less or not at all?
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

Other experts talk about investing in the Eastern part of the Netherlands, to create a voluntary movement of people moving Eastwards:[4;6;8;10;12;14;15;17]

> If we first make it attractive to go East, then there may already be a natural movement. And if we see that happening, maybe we can encourage that movement even further. So a gradual natural movement , rather than a sudden decision.
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

Aside from investing in more job opportunities, infrastructure and houses in the East, there are also other incentives to make the East more attractive:

> But having said that, I also know that two percent of Dutch people move every year, so of course, if you have the time, you can make it attractive to move out of certain areas. Like the English have done with insurance incentives: That you get less insurance, or that you have to pay a penalty if you want to live somewhere, that you no longer get compensation if there is a flood.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

As stated earlier, the majority of the experts do agree that anticipating and preventative measures are needed as part of planned retreat. The ones that argue that such measures can be harmful in the present, do not rule out these measures completely on the longer run. For example, some experts do not necessarily oppose investing in Eastern parts of the Netherlands, as long as it does not (yet) lead to disinvestments in the West.[4;11;12;13]

Another expert also points out that such measures might not be initiated by the government, but rather taken in response to a societal movement. In that sense, the 'planned' part of retreat does not completely apply to this strategy, according to some:[11;15]

> I have some difficulty with the word "planned," because I think these kinds of developments are not "planned." So you get a social development, where a new idea becomes attractive. Thus it takes more of a pull than a push. And I think it's important that we take advantage of that pull, and not wait for the push to force us.
>
> - Jos Timmermans
> *Technical University Delft (Delta Management)*

This quote highlights that it would come down to a societal movement in which politics follow, rather than the other way around.[15] The KP ZSS (Spoor IV: Meebewegen, p.182) also states that it is important to first determine the following: "Do jobs follow people or do people follow jobs?". According to this document, the source of the incentive for designating a region is crucial in determining the success of an adaptive migration strategy, as it influences the effectiveness of planned retreat. The majority of experts, however, believe that political decisions have can steer society.

Someone else argues that there is no need yet to look at the design of planned retreat, as it is still so far ahead of us.[16] Others however argue that the 'planned' part of planned retreat is in fact essential to ensure a smooth process and implementation.[4;6;9;14] For instance, some state that in the design of planned retreat it is important to take into account what supporting environment is needed to ensure the successful implementation. One expert says that there are important questions to answer in this regard, such as: Which measures should be taken, what and how to communicate to the public, what legislation is needed, which institutions should be involved, what financial means are necessary, etcetera.[6] Another expert also argues that it takes "guts"[14] to make such long-term decisions and long-term investments, but it is necessary in order to create a sustainable solution.[14]

Two experts in particular emphasised the need to take small steps in this regard.[4;12] In line with the 'adaptive pathways' described in Chapter 4, these experts argue for low-regret steps that do not necessarily work towards planned retreat, but do not exclude it as an option either. Each change leads to new measures, among which could be measures to retreat or anticipate to retreat, but most

importantly, the measures that are taken should not create a lock-in, as also argued by Werners et al. (2013). They argue that the design of planned retreat should be a dynamic, looking at next steps but without working towards a specific end goal, as lock-ins are to be avoided:[4;12]

> Also when you retreat, you have to ask, do you retreat all at once, and to what extent? Or is it going gradually? What does accommodate to sea level rise mean? Is that increasing the probability of flooding and then having to reinforce again on other things? So do you have to move your levees to more critical economic structures? There are all kinds of things you can think of and steps you can take in that, slowly moving towards a different design of the Netherlands.
>
> - Saskia van Gool
> *Rijkswaterstaat*

Experts share generally think that this strategy, if executed on a larger scale, will not happen at all, or far into the future; after the coming one or two centuries. The KP ZSS (Spoor V: Besluitvorming) however indicates that the time horizon that is considered is until 2050. Considering the fact that emission scenarios do not deviate much in the coming thirty years, the real uncertainties with regard to climate change and sea level rise lie beyond that point. Based on the uncertainties shown in the literature and in the interviews, the government could therefore include a longer term perspective in planning for the future as well, to be better prepared for when these uncertainties occur.

All in all are there many different ideas with regard to designing planned retreat; whether it should already include certain anticipating and preventive measures, climate proof investments, and whether that could lead to a voluntary movement, or if it is not (yet) the time to as a government steer in that direction, as it is potentially harmful to for instance the economy. Some experts believe that through merely informing about risks and creating more awareness, there might already be a change in how society will make decisions in this regard. In contrast, others advocate for more proactive government intervention to ensure voluntary relocation and facilitating planned retreat on the long term. The current strategy is to take small steps that leave the option of planned retreat open, but do not create a lock-in, in case for example sea level rises less than initially thought. However, all of this cannot be done if the government only looks ahead until 2050, as the real issues regarding sea level rise will only become apparent after that point.

6.3.3 Political Process and Implementation of Planned Retreat

As stated in the previous paragraph, for the design phase of planned retreat to be successful, experts argue that more stakeholders should be involved to deliver input. This section discusses who should be involved according to experts, and what the process of planned retreat requires.

Experts argue that there are multiple sectors that should be involved in designing this strategy, as they all have interests in how this strategy plays out. According to them, the agricultural sector, nature organisations, but also the transport and industrial sectors have something at stake.[8;13] Other parties that were mentioned in this regard were also for example spatial planners and landscape archtects:[3;6;9]

> All the parties have to be involved in that: Urban planners, landscape architects, executors like Boskalis and Van Oord, all the contractors in the Netherlands, all hands on deck. They may not take the lead, but they should be involved in the design.
>
> - Dick Butijn
> *Water Management Specialist*

Aside from involving parties who have something particular at stake, experts also believe that the story of how planned retreat could be and how it can be more attractive, is also important.[6] One expert explains that there is a need for involving certain people in this regard as well:

> I also think of landscape architects, but for example also artists or journalists, who just also help tell the story of how it could be.
>
> - Marjolijn Haasnoot
> *Deltares*

In addition to local government entities, lobby organisations from different sectors, executive organisations and spatial planners, experts also argue for the involvement of the people or communities that might be affected by these plans.[5;9;10;12;13;14;16;17] Successful participation of affected communities with a strategy like planned retreat, can result in positive, creative and innovative outcomes, as Roth et al. (2017) also demonstrate in the process around the Room for the River-project in the Overdiepse Polder.

One expert proposes to approach planned retreat from both a bottom-up as well as a top-down perspective, in which the government actively involves stakeholders, including potentially affected citizens, in brainstorming about this process.[5] Many experts believe that planned retreat simply cannot work if the potentially affected people are not involved:[5;9;10;12;17]

> These are such tricky social processes, of which you can't say, well these are the rules, you should have read it more carefully. So this is not a blame game. And of course, you can hinder such a process, which is why it is very important that the rules of the game are crystal clear, that everyone knows where they stand, and if you say; "I'm going to blow up the process because I'm against it anyway", then yes, you have to make room for that in the discussion. But it should not be that you can't participate because of that. Everyone should be able to participate.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

Another expert, on the other hand, thinks that creating such a broad public debate with potential affected communities in a specific strategy like planned retreat will *not* be beneficial to the decision-making process.[15] Others argue that it does not matter to have a participatory process or not; once affected communities understand that there are also alternatives presented in the KP ZSS, they will never accept this option.[3;7]

For the implementation phase of planned retreat, most experts point to the government; national, provincial and local municipalities, and its executive institutions, to take on the job:[1;2;4;5;6;8;10;11;14;16]

> I think it is mainly the national government that makes a decision. But when it comes to implementation, the provinces, the Water Boards, Rijkswaterstaat and the municipalities are very important.
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

The above is generally in line with the recommendations given in KP ZSS (Spoor V: Besluitvorming) that is dedicated to a communication and participation strategy. KP ZSS (Spoor V: Besluitvorming) argues that the key to successful communication is to enhance knowledge transfers to local civil servants from the provinces, municipalities, and the water boards. The document states that this information can subsequently be used to communicate to other stakeholders.

Regarding the implementation of retreat strategies, experts also point to the involvement of affected communities.[5;9;10;12;17] What the participatory process around decision-making and implementation of solutions to sea level rise should look like, and how it can be successful like in the case of the Room for the River-project as described by Roth et al. (2017), is not concrete from KP ZSS (Spoor V: Besluitvorming). Even though the document acknowledges that the sense of 'ownership' among residents and farmers of potentially affected regions is lacking, it primarily emphasises participation and knowledge transfer among local civil servants rather than directly engaging the affected communities.

When asked what should be taken into account when looking at the implementation phase, experts point out several obstacles. For instance, it is unclear how to deal with the infrastructure, what is left in abandoned areas, but also the need to improve infrastructure in the East, for example.[3;8] One expert also pointed out the need for sufficient fresh water provision if parts of the West are no longer habitable.[3] Moreover, in order to make this process work, there might be a need for a revision of the current legislation to create an enabling environment in which planned retreat fulfils the requirements imposed by the law.[3;6]

In conclusion, experts generally agree on a wide range of stakeholders that should be able to express their concerns and ideas both in the designing of planned retreat in the Netherlands as well as in the implementation phase. However, other than stating that the process is subject to lots of changes, little was said about how to organise such a process. The policy documents analysed similarly offered few concrete ideas on how to make this process successful. Figure 14 below gives an overview of the discussed drivers of change per category so far.

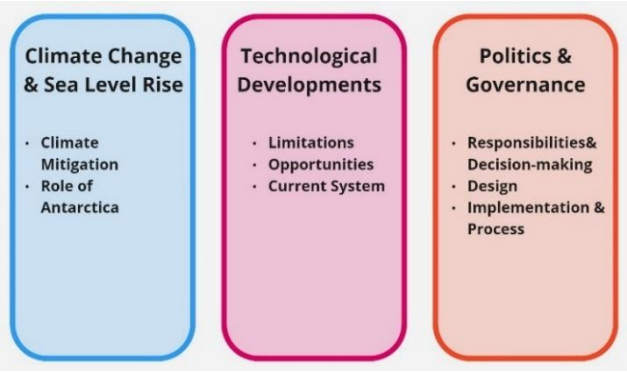

Figure 14. Drivers of Change within the First Three Categories

6.4 Social Developments

Societal developments are very difficult to predict and are generally seen as an important driver of uncertainty in exploratory scenario development (Mahmoud et al., 2009). From the interviews it is evident that almost every other driver of change affects how society will react, develop, and be affected in this regard. Political processes do not determine, but do affect the public support for this strategy, for example. In fourteen interviewees stated that the attitude of society towards this plan could be one of the largest obstacles of planned retreat, and most of these experts agreed that this is influenceable to a (limited) extent. This section therefore discusses the several drivers of change related to societal developments, but also some conditions to reduce existing social obstacles.

6.4.1 Obstacles and Opportunities in Public Support

Experts generally agree that a strategy like planned retreat comes with many obstacles and affects communities significantly:

> This affects people in their whole being; everyone has to move. The whole foundation is taken out from under you. It is compulsory moving.
>
> - Bas Kolen
> *HKV Lijn in Water*

One of the words that was used frequently throughout the interviews was the word "resistance", when asking about the expected responses to planned retreat of the public.[1;3;4;5;7;8;9;10;11;12;13;15;16;17] Experts refer to the fact that it might disrupt entire communities:[13;16]

> What I think you have to consider most is that you are disrupting communities, that you are damaging people emotionally. That it will have an emotional and psychological of unprecedented impact. And you have to think very carefully about how to do that kind of as much as you can humanely and with as little impact as possible.
>
> - Bas Roels
> *World Wildlife Fund*

Despite the fact that in a limited form of planned retreat this is likely much less the case, it is still a factor that plays a role, experts say.[11;13] Due to the fact that people feel attached to their land, livelihood and communities, experts believe that communities are probably not willing to "give that up", especially if their families have lived there for generations:[5;6;8;10;12;13;15;16;17]

> People also just live in a community and you don't want to just move away from all your loved ones. And maybe the cultural history as well. For some people it can also feel like giving up.
>
> - Marjolijn Haasnoot
> *Deltares*

Aside from potential difficulties in generating public support among citizens, one expert argues there could also be difficulties with local governments:

> It will be very difficult to generate political support for planned retreat. Even if a democratically elected government has agreed to develop such a plan, many regional, democratically elected governments might object. This not only applies to city councils, but also to provinces and regional water authorities. In a country like ours it will be difficult to generate support in all those bodies.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Aside from the expected response among affected people and local governments, experts also expressed some concerns with regard to the receiving communities, in the East of the Netherlands for example. They argue that the people currently living in the East are not necessarily waiting for "large groups of Westerners" to arrive:[1;5;8;10;12;13;14;15;16;17]

> That could also be researched. So indeed not only the leaving side but also the receiving side: How they see it, if many people suddenly come to live there. Because they are also there for a reason, maybe because it is a bit quieter there. And in the Netherlands, of course, you only have limited space, it's not the case that we are so spread out that people are not going to notice it.
>
> - Frederique de Groen
> *Deltares*

However, most of the experts who expressed similar concerns believe that as long as it is spread out over a large time period, and not *suddenly* announced, it will not be a problem, or might not even get noticed.[1;6;8;10;12;13;14;16] Moreover, it might not be an issue at all, if smaller groups move Eastwards, like e.g. with a limited form of retreat.[11;13]

Another thing that plays a role in inducing resistance against such government plans is if there is 'suddenly' a decision to retreat. A number of experts therefore argue that taking the time and slowly working towards it with little steps already helps in reducing that resistance.[5;6;9;14;17] Since the Dutch are living in a free society, one expert explains that transitions are simply slower, as a strategy has to be societally supported first.[14] Since some argue that regardless of the process there will always be a small group resisting until the end,[13;14;16] two experts believe that there might be need for an element of coercion in the strategy, which is difficult in a democratic society:[14;17]

> In fact, if you are serious about planned retreat, first a common risk framework needs to be developed that is accepted throughout society. Only when such a framework is accepted, and people have confidence that planned retreat is the best approach, you may generate sufficient public support. Otherwise you will not escape from forced relocation procedures. As the plan is not going to work if citizens are allowed to say: "I'm going to stay in in my village" while the planning has that village being hat village flooded. In fact, as it is unlikely that unanimity on such decisions will be reached, an element of coercion is unavoidable in a planned retreat approach.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Many experts also make the comparison with the current nitrogen crisis in this regard, using this example to illustrate how *not* to approach a problem. [5;9;12;14;15;17] They point out that the issue was

ignored for too long,[12] and the government began involving and communicating with affected people far too late in the process.[9;14;17]

According to some, regardless of how the process is designed, there will be a lot of resistance and there will be groups who simply will not accept these plans, as long as there are alternatives.[3;7;15] One expert argues that first, society's way of thinking needs to change before the government can introduce such plans.[15] Someone else however states that these changes in the way of thinking are already visible. She sees an ongoing trend of people being more and more aware of issues related to climate change and the environment.[12] If that growing societal support continues, it might affect political decision-making on the longer term.[12] Many experts therefore also see planned retreat as a societal transition.[9;12;14;15;17]

Supporting the earlier statement of an expert's observation of the increasing consciousness of climate change, another expert provides a concrete example of this awareness is growing among residents in the Delta region:

> A survey happened to be conducted in our area [Hollandse Delta], in cooperation with the Flood Protection Programme. It showed that 11% of those surveyed are considering moving out of the Western part of the country, due to ever-increasing flood risks.
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

This expert had no exact details on this research and it was unclear if the respondents were participating in this survey on a voluntary basis, which would impact the results, but he indicated that he was still surprised that the topic apparently already does carry weight among inhabitants.[8]

More experts generally believe that if a process like planned retreat is spread over a long time period, people are more likely to be supportive or cooperative.[6;9;11;14;16;17] It already helps to assure people that these plans will not be realised tomorrow.[4;12] One expert argues that regardless of what the process will look like, people will indeed be unhappy, but you can make people *less* unhappy.[10]

The majority of experts argue, in line with the previous section, that the most important way of generating support is indeed to include people in the process:[5;8;9;10;12;13;14;16;17]

> I think that [involving affected people] is really justified and I also do sincerely believe that if you're going to work with residents, or if you really want to achieve a big change in an area... Look, people have different images of what all that environment should bring. And not everything fits within the goals you have as a government, but I do think that plans become better if you think together about what an area should do, and should facilitate, and how you could experience it. Yes, I do really believe in that.
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

Another expert who worked in a similar project, in which managed retreat and buy-outs were taking place after Hurricane Sandy in the US, argues that we have to embrace the fact that we are dealing with a wicked problem. It is going to be emotional for many people and will require long-term thinking, but according to him we have to accept the differences and take on this challenge anyway:

> So of course it's going to be a party. Of course everyone in imagining, designing, developing, realising and managing the solutions that we come up with, including planned retreat, will have stomach aches, and sorrows, and will find it difficult. But exactly that, to give space for that, to pay attention to that, and to secure a place in that process, is critically important. If you're afraid of that, you're not fit for the job.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

He argues that in order to generate public support, there is a need for long-term thinking, transparency, clarity, an inclusive, participatory process, a space to express concerns and criticism, dialogues, and flexibility to change the process in accordance with the societal dynamics.[9]

Another obstacle that is mentioned by experts in generating public support for planned retreat, is the fact that climate change slow process, which makes it less tangible and urgent for people:[5;17]

> But the tricky thing about climate change is that it is usually not a short event, but it is all gradual. Like frogs in a pan gradually getting warmer and warmer, and before one jumps out, it's usually too late. So I think something really intense has to happen before people are willing to move out of a very beautiful area.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

He continues to explain that people are usually not very susceptible to longer term problems, so unless a plan is not responding to an immediate danger or effect, people are less likely to support it.[17] In that sense, some experts argue that a disaster can help[5;14;17] or might even be necessary in increasing both awareness and willingness to look at more "extreme" solutions.[1;2;10] It is true that people are inclined to accept more after a disaster, but one expert explains that the sense of urgency that people get also does not last very long.[17]

Lastly, to gain public support, some experts see a role for insurance companies to incentivise people to no longer live in, or move to areas where risks are higher, which could also help in creating a voluntary movement:[8;10;15;17]

> I'm not really up to speed on those insurance companies, but I don't think that's covered in a severe flood either. It could well be that that will come into play. Then from another point of view you get a kind of natural movement. If the risks just increase and people don't get insurance anymore, that could be an argument for leaving. And people who think about buying a new house also think: We'd be better off doing that in the East.
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

This approach thus offers an alternative means of encouraging a voluntary movement Eastwards through private sector initiatives, rather than the aforementioned government decisions to drive such movement, such as investing in the Eastern part of the country.

All in all, there are many social obstacles in realising planned retreat, but according to the majority of experts there are several ways to reduce resistance, and to gain more public support for a strategy

like planned retreat. One of the most determining factors mentioned in this regard is the time given to realise a strategy, the extent to which affected citizens are able to participate, and the information provision. Experts suggest that the longer the process is spread out, the greater the likelihood of societal acceptance of such plans.

6.4.2 Risk perception and Trust in the Government

The longstanding history of Dutch water management has resulted in the fact that people generally have a lot of faith in the government when it comes to water safety.[3;4;5;10;11;17] One expert particularly points out that considering the government as trustworthy and reliable is the basis for dealing with complex problems, but it has to be earned:

> I think the basis for these kinds of very complex problems is reliability, and that starts with the three C's: Consistency, continuity and commitment.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

Others agree that this reliability of the government is of utmost importance when it comes to decision-making about planned retreat, and that there is a need for transparent information sharing and showing citizens what the government is doing and why:[4;12]

> People should be able to trust that the government is thinking about the right things and making the right decisions, and that those decisions are being made based on information and knowledge. This to the extent that you have to make decisions now. And the same goes for not taking a decision yet on the very long term, then that has to be substantiated as well. So it is really important to have a knowledge base. You're not a reliable government if you withhold things, or if you don't figure things out and just choose a direction. You need to have information in order to do so.
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

Despite the fact that people consider the Dutch government less trustworthy in general,[4] according to experts this does not apply to the water sector.[3;4;5;9;10;11] However, this also means that people typically have a lower risk perception when it comes to water safety, despite living in a low, relatively high risk environment:[4;5;10]

> Of course we have a government that is less trusted, because on a lot of points things have not gone so well, and the government has not always proved to be reliable. But precisely in the area of water safety, for which we also have a separate Delta Commissioner, we are too economically dependent not to do that well. But that also means that because of that, some people fall asleep and no longer understand that if things do go wrong, the consequences can be enormous.
>
> - Saskia van Gool
> *Rijkswaterstaat*

Related to this, some experts argue that *because* of this trust in combination with the low risk perception, the Dutch population will continue to believe that the government will "fix it" by technological means and is thus less inclined to support planned retreat.[3;5;10;11] Some experts warn that introducing a strategy like planned retreat might even undermine this reliability:[1;2;10]

> It [planned retreat] polarises very much. You get people who are saying, I don't believe in government anymore.
>
> - Pieter Bloemen
> *Staff Delta Commissioner*

6.4.3 Social Justice and Inequalities

Following this, another component mentioned by experts and described by Siders & Ajibade (2021), is the fact that planned retreat also comes with a justice component.[17] One expert points out that there is a need to critically asses what you can ask of people, what is *fair* in this regard.[17]

Experts explain that if you include a component of 'living with water' in planned retreat, and designate areas that are going to experience higher risks of flooding, higher income groups will probably move elsewhere, whereas the lower income groups might (be forced to) stay.[1;2;10;17] Experts furthermore point out that there is a risk that these areas are emptied except for only a few people remain, meaning that the public facilities in the area will also disappear, pauperising the area even further:[1;2]

> Yes, the happy few go to the Gooi and to the Veluwe, high and dry. And the poor workers stay in the Vinex neighbourhoods in the Western Netherlands.
>
> - Jos van Alphen
> *Staff Delta Commissioner*

This strategy could in that way widen the gap between the rich and the poor.[2;10] Nonetheless, KP ZSS (Spoor IV: Zuidwestelijke Delta) and KP ZSS (Spoor IV: Hollandse Kust) both emphasise the component 'living with water' in the 'Move Along' strategy, which means reducing the *consequences* of floods rather than floods themselves. Following the argumentation of these experts, there might thus be a need to pay extra attention to this inequality aspect of implementing 'living with water'. These inequalities could further exacerbate when incentives to move Eastwards are initiated by the private sector, such as the previous examples that discussed the role of insurances.[3;8]

Some of the experts thus point out that social justice and social inequalities have to be taken into account when orchestrating planned retreat, as steering towards a 'voluntary' movement, or accepting 'living with water' as part of the strategy might simultaneously have consequences such as increase inequalities and injustices. These injustices might be reduced if the decision-making process is not completely top-down, and includes a bottom-up component.[5;17] KP ZSS (Spoor IV: Meebewegen) also acknowledges that social inequality and the risk of an uneven distribution of wealth among the richer and poorer population groups as a potential result of planned retreat within the Netherlands is an important factor to take into consideration.

6.4.4 Societal Debate and the Media

Lastly, what is pointed out by a number of experts, is the fact that the media often depict the more extreme climate scenarios, and usually present the more extreme solutions, such as planned retreat:[3;4;7;9;12;17]

> It is important to be clear in communication. Sea level is rising, but there is no need at all to start moving to the East of the country. I'm already starting to get a little bit of an uncanny feeling at say all the headlines in the paper saying: "Help sea level rise, need to leave now!", because that's not the issue.
>
> - Saskia van Gool
> *Rijkswaterstaat*

Some experts warn that the exaggerations in the media about sea level rise, by only portraying the doom scenarios, might lead to panic or fear.[3;4;6;7] Others agree that the media can paint a misleading image, but also believe that showing some urgency creates awareness and in turn influences people's decision-making, steering towards a voluntary or natural movement, for example.[5;6;8;10;17]

Experts do think that it is important that the media portray this discussion in a nuanced way, and ensures a space in which people can talk about planned retreat without them being depicted as "too extreme".[15] As stated in Chapter 5, the topic is still very sensitive to talk about. The media can aggravate or alleviate this sensitivity, depending on how they continue to portray sea level rise and planned retreat. KP ZSS (Spoor V: Besluitvorming) also underlines the importance of an effective communication strategy. Either way, experts encourage the start of a healthy, informed societal debate about this topic, to at least make it discussable.[2;4;5;6;9;12;15] Figure 15 provides an overview of the discussed drivers of change so far.

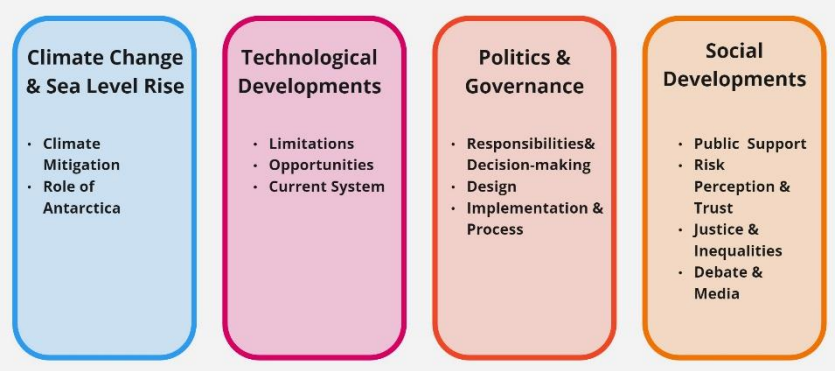

Figure 15. Drivers of Change within the First Four Categories

6.5 Economic Developments

According to KP ZSS (Spoor IV: Meebewegen), the solution direction 'moving along with the water' including planned retreat potentially has large economic consequences. However, these consequences are dependent on when adjustments become urgent, and when certain steps need to be taken. Therefore, there are uncertainties about the costs and benefits that might result from this strategy. This section discusses how experts perceive the costs and the benefits related to planned retreat.

6.5.1 Costs

When experts were asked about the costs that they expected would result from planned retreat, responses varied, but there was general agreement that this solution will be very costly. Even though experts were not able to mention an exact number, most of them expect this strategy to costs billions

of euros. A few other experts acknowledged, however, that the alternatives or doing nothing, could eventually be more costly.[5;9;12;13;16]

The costs associated with planned retreat are expected in different domains. Since the Western Netherlands is the economic centre of the Netherlands, experts express concerns about the value of the area that is left behind, both in terms of material costs related to the buildings and infrastructure, but also in terms of immaterial costs, like the historical value and cultural heritage that is left behind.[3;10;12;14]

Four of the experts also mention how planned retreat could make the Netherlands unattractive for foreign investments:[3;10;11;12]

> Another point of order is that if we are going to give up a large part of the Netherlands, it may deter foreign investors, whereas now we are an attractive country to invest in; we have a favourable tax system, excellent infrastructure. Well, that whole infrastructure in the West is going to disappear, the Netherlands is going to change, and that will deter investors, is my expectation.
>
> - Dick Butijn
> *Water Management Specialist*

Experts in the field of policy-making agree that this could be a major economic risk to the Netherlands, and argue that this is a reason to not actively steer policy in disinvesting in the Western part of the Netherlands:[11;12]

> Well, it has to do of course with just the interest you pay as the Netherlands, but also the companies that come here. And therefore there won't be an active policy over a longer term set up there. You mainly want to indicate, at least that is the current commitment, that we have good water safety system, that we can continue to live just fine where we live. And that it is therefore safe for the investments there. Because those investments, those are made for about fifty years, so to speak. And that period is then still feasible.
>
> - Jan Gert Rinsema
> *Ministry of Infrastructure and Water Management*

Someone else even indicates that announcing a strategy like planned retreat to the rest of the world might even threaten the economic survival of the Netherlands, as announcing retreat could undermine the Netherlands' own economy, but also scare off foreign investors.[12] These same economic risks are also highlighted in KP ZSS (Spoor IV: Meebewegen). Particularly for the Western coastal region, which is the economic heart of the Netherlands, there is a need for a careful analysis on no-regret options to prevent unnecessary economic losses as a result of planned retreat (KP ZSS (Spoor IV: Hollandse Kust)).

However, there are also eight experts that do believe that it is possible to start investing in higher grounds in the South and the East of the Netherlands, rather than continuing to invest in the West, as a form of preparing for potential planned retreat.[1;5;6;9;10;14;15;17] They argue that this makes more sense anyway, given the expected sea level rise:

> Yes, I do think that you can and perhaps must combine the planned retreat with more socio-economic developments. And there you can think, if you have to build so many million houses anyway, that you already think, okay, I'm going to do that in the East of the Netherlands as well.
>
> - Marjolijn Haasnoot
> *Deltares*

Some experts do not take a clear stance, but do state that before making such investments in the West, one needs to at least think about: "How long are we going to be able to enjoy this investment?".[4]

A third source of costs that is mentioned in relation to planned retreat is the need to build new infrastructure and housing in the East.[1;2;3;5;8;14;17] For instance, rebuilding all the necessary infrastructure and housing in the East might cause the largest expenses,[3;5] and the increased pressure on the East could lead to friction and higher costs.[17] Interestingly, when talking about the costs, many experts refer to a large-scale form of planned retreat, in which "ten million people"[3] have to move. Experts refer to billions of euros:[14;17]

> In my opinion, this will cost hundreds of billions. Maybe thousands. Businesses have to be relocated. You have to rebuild everything again. And you have to start buying land, so that land in the East that suddenly becomes more expensive. Again, that's going to cost a lot of money. The only ones who benefit are the landowners in the East. I see a lot of costs arising. We have now released twenty-five billion to buy out farmers, which is already a lot of money, but this is a lot more. And infrastructure too: Shipping lanes, pipelines…
>
> - Dick Butijn
> *Water Management Specialist*

Some, on the other hand, argue that the costs of adaptation will increase due to climate change regardless. For instance, as the costs of maintaining and improving hydraulic infrastructure will accelerate when climate change continues, the investment will become increasingly unsustainable.[1;13] Other experts also comment that the accelerating pace at which the technology will need adjustments due to accelerating sea level rise will be costly.[1;2;5;14;16;17]

There are also experts who do not agree with these arguments, stating that in fact the costs of new techniques and the energy that it requires to pump the water out does not have to be that high.[3;7;8;15] These experts acknowledge that for instance pumping the water out will be much more costly in the future, but they also expect that these technological solutions will still outweigh the costs of planned retreat for a long time:[3; 8]

> We do have to pump the water out. To do that, we have to build heavier and heavier pumps. Well, that's a matter of engineering. That has to be done in a number of steps: It is not logical to pump the water up ten metres in one go, you do that in five steps of two metres, for example. We then have to think about the energy costs of that: If we pump up two metres, the entire flow, that costs fifteen euros per Dutch person per year, with current energy prices. If we then have to pump up ten metres, that costs five times as much. That's seventy-five euros per Dutch person per year.
>
> - Dick Butijn
> *Water Management Specialist*

On the other hand, as one expert argues, the people who want to stay in the high risk areas will eventually burden the rest of the society with their decision, as it will probably need to be paid for by the larger collective:

> Be aware of the fact that as soon as people suffer damages due to relocation, the government is expected to arrange for compensation. This is the way society works. Even if an individual takes a large risk, as soon as a disaster occurs the government steps in. The question of course is, whether this approach will remain unchanged. This is probably unlikely.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Another major cost that came up during the interviews is the financial compensation that the government might have to provide to those who have to relocate.[14;17] This can be compared to the buy-outs that have already happened in the US, though, some experts expect that in this case it might be more costly as it concerns larger amounts of people.[3;15;17] One expert states that it is unrealistic to do these buy-outs if it concerns millions of people, but that in principle there is money to buy-out a few people in the high risk areas, like behind the dike.[17] An obstacle in that sense would be more a lack of political willingness to provide such compensation.

When asked about the costs that he expected in relation to planned retreat, experts generally mention high amounts, but one expert also indicates that there might be a need to approach these costs differently:

> It is good to be reminded of the fact that the flood of 1953, which hit the Southwest of the Netherlands and let to more than 1800 casualties, caused damages which are estimated to be roughly equivalent to six percent of the Gross National Product. The cost associated to planned retreat will be much larger, as it concerns the most densely occupied part of the country. Consequently, there will be big trade-offs. How do the expected damages due to sea level rise compare to the costs of the operation. What will be the effect on the national economy? What new opportunities might emerge, which business will not survive, and how many people and businesses will leave the country?
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Other experts also add to the argument of the *prevented costs* that could result from planned retreat:[1;5;8;10;13;14]

> If things threaten to go wrong and we have to evacuate people en masse from the West to the East, will that work? Will we not then face enormous problems, that there will still be thousands of casualties?
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

However, others argue that there is not yet a need to worry about these enormous expenses and disinvestments, as a strategy like planned retreat is not going to happen all of a sudden.[4;9;12] The argument is that there will be small steps, rather than a sudden move Eastwards, so these costs can be spread over a very long period of time.[1]

Experts are thus divided regarding the costs that planned retreat will bring. In most of the experts' statements on large expected expenses, experts refer to a very large scale form of planned retreat in which the Western part of the Netherlands has to move to the East. In the form of planned retreat that is proposed by the Dutch WWF, for instance, this does not necessarily apply.[13]

According to the KP ZSS (Spoor IV: Meebewegen, p. 182), the economic aspects are a difficult issue, as timing is everything: "The Netherlands has invested heavily in infrastructure in its vulnerable regions, and early retreat could make some of this infrastructure redundant. This would lead to losses because costs incurred would not be recovered, as the infrastructure would no longer be used to its full potential before it is fully depreciated". In this document, the argument is made that in order to prevent these economic losses, it is crucial not to make a 'rash' decision with regard to planned retreat.

6.5.2 Benefits

When it comes to potential benefits, experts find it difficult to identify clear economic advantages of planned retreat. They suggest that the benefits are more likely to be found in terms of cost prevention or in non-monetary gains, such as nature conservation. Some experts, for example, can only think of benefits if the risk of floods in the area are so high that people risk their life, simply by living in that region,[7;12;17] and one expert even adds that it is very unlikely that such a scenario will ever become true.[7]

When asked about the economic benefits that could be gained from planned retreat, five experts mention *prevented damage* as an important benefit. Not only damage to human lives, but also to buildings, housing and infrastructure, if executed correctly.[1;5;8;10;13;14] Another expert adds to that that *not having to worry* could also be considered a benefit of planned retreat that is difficult to express in monetary terms.[8]

One expert argues that the land in the coastal region is mostly agricultural land, which is subject to degradation due to sea level rise either way. The argument here is that since salt intrusion and the salinisation will only get worse, the land can still be given a different function if the strategy is well planned now.[13] This could result in more value of the land, in terms of nature.[13] Some experts even state that such benefits to the natural environment are in fact the main advantages of planned retreat.[8;13]

Some experts believe that there could also be a positive effect of planned retreat on the economy, especially with regard to the sustainability agenda.[1;9;14] For example, some experts argue that it is a lot cheaper to develop climate resilient building, than to make existing buildings more resilient and sustainable.[1;2;14] Others also argue that planned retreat could also be like a *reset button* in which the sustainability aspects are immediately taken into account rather than having to make many existing buildings future-proof:[9;14]

> That you really say, we are going to revisit that planning and look at how we are going to build towards the future after this disaster. And if you do that smartly, then you are not just looking at resilience; can I handle future misery, but also sustainability, inclusiveness and equity, and economic opportunity. And then you say hey, but then it is much more convenient to do it this way, because then I'm enhancing nature, I'm giving space to water, I'm preparing for drought,

> I'm providing water quality, a healthier environment, I'm creating jobs, I'm making infrastructure more accessible, and so on. And then you think, oh, I'm not just working on a dam or a dike, no, I'm working on that whole full agenda of sustainability, equity, resilience and prosperity.
>
> - Henk Ovink
> *Water Envoy of the Kingdom of the Netherlands*

Moreover, there could also be profits from new activities in the East and new sources of income could emerge from planned retreat:

> Planned retreat will also have positive effects for the regions that are expected to host people migrating from the West to the East (and North and South) of the country. Provinces like Friesland, Drenthe, and (the Eastern parts of) Overijssel and Gelderland, have been faced with a considerable depopulation in the past decades. When companies and public agencies move into those areas, new schools and hospitals will be opened, which were closed down in the recent past. It may also accelerate the agricultural transition, as farmland has to be transformed in to urban areas. Clearly one should try to avoid using any land in natural reserves.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

However, there are still six experts that explicitly state that they believe that the costs of planned retreat will absolutely outweigh the benefits:[3;7;8;12;16;17]

> I think at the point where you're looking at the costs and benefits, it's a very unattractive scenario while there's still another way. It would be very difficult to make a decision about planned retreat before it's clear that you can't do anything else.
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

They also indicate that in their perception of what planned retreat entails, planned retreat will not come positively out of a cost-benefit analysis. Only one expert explicitly indicated that the benefits outweigh the costs – that is, in his particular idea of planned retreat.[13] When looking at the broader sustainability agenda, another expert also believes that this plan will gain more benefits, as the costs of not doing something about this sustainability agenda will eventually be higher.[9]

All in all, the main benefits that were mentioned are benefits to nature, making this driver strongly related to the next paragraph, but also prevented costs. How much these prevented costs are, however, also strongly relates to mitigating measures. For instance, if the world manages to mitigate a lot in the coming years, and the lower emission scenarios are in reach, prevented costs of e.g. floods are much lower in scenarios RCP2.6 or 4.5, than in RCP6 or RCP8.5. A study by Yamamoto et al. (2021) found that in Japan, another developed country that has a technologically advanced water protection system, flood damage costs will be reduced by 28% by the end of the 20th century if we follow RCP2.6. In that sense, the *prevented costs*, and thus the benefits, would be lower. In the higher emission scenarios, the opposite would be true. This in turn shows that the extent to which the climate will change, also has a significant impact on how much benefits the solution direction 'planned retreat' will yield, as is also stated in KP ZSS (Spoor IV: Meebewegen). In

addition to that, the costs and benefits of this direction also plays an important role in how much public support this solution will gain. With regard to the economic category of drivers, Figure 16 illustrates the drivers discussed so far.

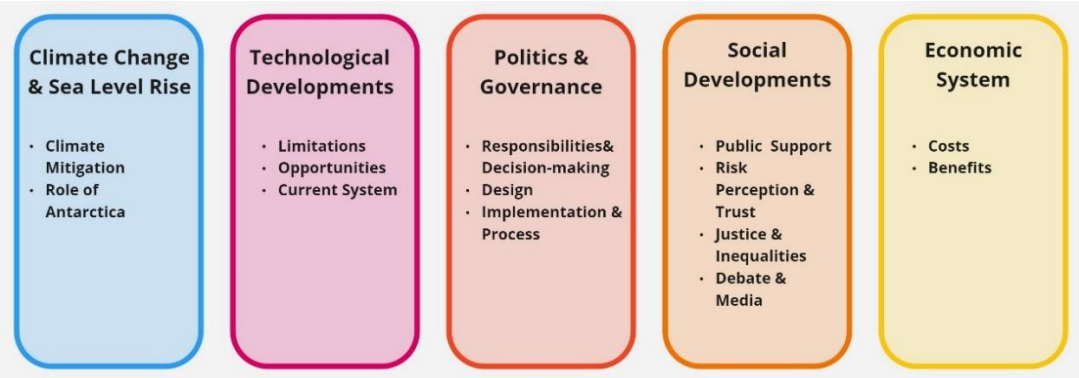

Figure 16. Drivers of Change of the First Five Categories

6.6 Ecological System

With regard to the ecological circumstances, there are also plenty of uncertainties about what will happen to the natural environment if we do or do not (plan to) retreat. This section discusses the risks and opportunities for nature that the experts mentioned. The way in which the risks and benefits to nature are perceived by experts again seems in some cases also linked to how the experts perceive planned retreat to begin with.

6.6.1 Benefits to Nature

When asked if planned retreat could have any benefits to nature, ten experts indicated that there will be some positive aspects to nature with the implementation of planned retreat,[1;5;6;8;9;10;12;13;15;17] whereas seven experts could not immediately think of benefits to the ecological system, or believe that it is not necessarily a direct effect of planned retreat.[2;3;4;7;11;14;16] The main upsides to the natural environment that were mentioned is the possibility to have a natural delta again, and the contribution to biodiversity preservation, depending on how planned retreat is designed and executed:

> Yes, that broad definition you just gave, I think as long as you allow dynamics and natural processes, whether they are natural processes that have to do with siltation and erosion, more in the morphological angle, or whether you just let succession take its course and nature can grow, et cetera. A more living with water approach is obviously more promising. You are fixing something if you go with concrete and clay, then you don't have the best boundary conditions [for nature]. So I do think that a Nature Based approach and allowing dynamics, creates more opportunities for nature.
>
> - Annemiek Roeling
> *Ministry of Infrastructure and Water Management*

Two experts believe that giving land back to the sea might lead to the first "wild piece of nature" in the Netherlands again.[5;8] One expert even states that in fact the benefits to nature are the main benefits that the strategy planned retreat will yield:

> If you give the delta much more space and remove the storm surge barrier, then you do have a natural transition again between salt and fresh, and for nature that is very good. I think that

> contributes very positively to nature in the delta area. I think that is where the opportunity lies, if this strategy is chosen. I have understood that the freshwater-saline transition also creates very special nature, so that could be very positive.
>
> - Henri van der Meijden
> *Water Board Hollandse Delta*

Another expert agrees that planned retreat can indeed lead to positive effects on the natural environment, and would in fact be in favour of having a natural delta in the Netherlands, because of its uniqueness:

> As for me... Look, I would trade the Veluwe for a more natural delta. Because I think, yes, we still have a few hundred of those Veluwe's in Germany.
>
> - Jos Timmermans
> *Technical University Delft (Delta Management)*

However, he immediately adds that he is aware that saying that is also an absolute "no go",[15] underlining another aspect of the sensitivity of planned retreat.

Planned retreat could certainly be beneficial for biodiversity preservation, according to some.[6;8;12;13] For example, one expert argues that there are many upsides to the limited form of planned retreat put forward by WWF.[13] He argues that in order to preserve the ecological systems in delta regions, this form of planned retreat is necessary regardless of the extent to which the climate will change:

> I think, if you just look at nature conservation and ambitions to preserve and restore nature, then in order to preserve tidal nature in the Netherlands, so salt marshes, salt marshes, mud flats, sand and silt flats you will have to do it even without sea level rise.
>
> - Bas Roels
> *World Wildlife Fund*

He continues by stating that separately from the water safety issue, you would already have to do something with retreat or land change in order to maintain the current ecosystems.[13]

However, some experts are more hesitant in arguing that planned retreat will lead to preferable conditions for current ecosystems. They underline that there are certain aspects that need to be taken into account:

> Well, not a priori. That does require attention. Because you might have contaminated land on which the water will enter. What does that do to water resources? So whether it would be more beneficial, I don't really know. I'm not a biologist or an agronomist, but it's not obvious that it is.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

He is not the only expert that underlines a condition to ensure that the ecosystem will thrive when using this strategy. Two other experts also argue that the current soil pollution might impose further risks rather than improve the ecosystems.[3;5] The nitrogen crisis in the Netherlands is also mentioned

in this regard, including the fact that the contaminated soil has to be dealt with first, before flooding an area.[5]

Aside from how planned retreat might affect the natural environment in a positive way, experts also commented on how the potential positive effects on nature could affect the perception of and support for planned retreat. The idea to include positive natural aspects in climate resilient plans is not new, and has been successful in the past, such as during the Room for the River-project.[17] However, one expert emphasises that for nature conservation to gain public support, a crucial condition must be met:

> Well, the climate buffers that are already being planned are of course already planned from that point of view. Especially areas that can take a beating, so that in case of flooding they don't go completely flat, but regenerate. So if you could indeed keep areas empty, and with some legitimacy from the people around them, so as was done with the Green Heart, that gives added value. But you also have to ensure that people are allowed in. That is the classic dilemma of nature conservation: If you really want to do it very well like Natuurmonumenten, then you are not allowed to walk in the breeding season either. That makes people cranky. So people do like nature, but you have to be able to access it. Not the kind of nature you know is there but you're only allowed to go in for a few months.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

This combination of nature conservation and the need for multiple purposes, such as recreation, is underlined by others as well.[5;17] One expert argues that due to the limited amount of space in the Netherlands, there is a need to find these symbioses that benefit both nature, but also agriculture for example. This can be achieved by repurposing the area, for example, by establishing ecological mussel farms that simultaneously promote nature restoration.[5]

Other experts are sceptical that the potential positive effects on nature will increase the support for planned retreat. Some experts, for instance, do not believe that the potential positive effects on nature are or should be the main opportunity of planned retreat, as it is not going to convince people of this plan, they say:[12;17]

> I don't think people think, oh how nice that we no longer live there so that we have all these beautiful primeval forests.
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

These experts consider the idea of positive aspects to nature more as an opportunity for synergy; if planned retreat is going to happen, it might as well be in a way that benefits nature.[17] More experts advocate for the inclusion of nature and sustainability in the design and implementation of planned retreat.[9;14]

An expert with a background in biology gives a side note to this question of whether planned retreat would contribute positively or negatively to ecosystems. She explains that there are many other climate factors that will have an effect on nature before sea level rise comes into play:

> Well I happen to be a biologist. That's very coincidental, because it's not very obvious to be in a place on flood risk management [Rijskwaterstaat] as a biologist. Nature is going to be affected by sea level rise, but we happen to have report on that already. Within the Knowledge Programme we have already made a kind of advance on: What are the consequences of sea level rise up to several metres for nature? And when we started doing that, someone raised his finger and said: Yes, but of course you shouldn't just do that for sea level rise, you should also do that for other climate factors. And then you come to the conclusion that if you are talking about the Netherlands and the future and nature, that there is also the temperature rise, the precipitation pattern, floods, drought, the heat waves... There are so many climate factors that are having a much faster and much more significant impact on nature as it is now. Nature, will start to change enormously due to those factors. The impact of sea level rise, which is very gradual, will come much later.
>
> - Saskia van Gool
> *Rijkswaterstaat*

In other words, the ecological system is dynamic in nature, and thus it will change regardless of the plans, as a result of climate change.[4;16] This perspective is shared by another expert, using this argumentation to not actively steer policy towards planned retreat for ecological benefits only:

> Look, it creates more space. But when I think about it now, I would say, yes, you shouldn't necessarily pursue an active policy on that, because then again, just like now with the Natura 2000 targets, you are trying to maintain something that is unsustainable at some point.
>
> - Jan Gert Rinsema
> *Ministry of Infrastructure and Water Management*

Some experts thus state the effects of climate change, sea level rise, and potentially planned retreat will absolutely affect nature. They argue that nature is always affected by human interventions, but this is not necessarily negative.[4;16] In that sense, it seems inevitable that the natural environment will change. However, experts differ on whether that is necessarily positive or negative. Some experts opt for including the aspect of nature and sustainability in the design of planned retreat.

6.6.2 Risk to Nature

When asked whether there could also be risks to nature in the Netherlands as a result from planned retreat, two aspects mainly came up. One concern that was expressed, is the increased pressure on nature in the Eastern Netherlands, due to the need for more housing, infrastructure, and facilities:[3;7;10;11;12;14;17]

> Then you clearly see a negative aspect. Because the current nature reserves […] it would become too crowded for that in the East. Then we would have to build up large parts, such as Twente, the Achterhoek. That would be at the expense of existing nature, no doubt. So I don't really understand why the nature movements are so much in favour of this scenario.
>
> - Dick Butijn
> *Water Management Specialist*

This point was often made by experts that considered planned retreat to be more large scale. With a limited form of planned retreat, this might not drastically increase the pressure on other parts of the Netherlands. However, with regard to nature, one expert also sees another challenge in this regard:

> A further complication of planned retreat is that according to the 2022 Montreal Protocol, at least thirty percent of the land area should be reserved for natural parks or natural reserves. This is crucial in order to not further reduce the biodiversity. As the same population, including all the commercial and public activities moves to a smaller part of the country, land use and allocation of land areas for cities, industry, nature and infrastructure will be highly complex. All of this needs to be considered when analysing a plan like planned retreat.
>
> - Gerard van der Steenhoven
> *Royal Netherlands Meteorological Institute*

Even if there is an increased pressure on the space in the Eastern Netherlands, there is a counter argument, stating that such risks to nature can be easily prevented:

> Well, it depends on how we realise it. In the Eastern part of the Netherlands about sixty percent of the land use is agricultural. So there is plenty of room to build on that. And our rule of thumb is: Look, wherever you build from now on, you have to make sure that the same amount of land use for buildings, including gardens and infrastructure, is dedicated to create nature around it, because the people who are going to live there also want to be in nature. And we need more nature, we need to store CO_2 with nature et cetera. And, that is perfectly possible in the Eastern Netherlands.
>
> - Bas Roels
> *World Wildlife Fund*

Some experts agree that it is possible to reduce or eliminate the increased pressure on natural areas in Eastern Netherlands, by giving up agricultural land rather than nature reserves. In that sense, they do make the agricultural transition part of planned retreat.[9;13;14] Another expert acknowledges that there might be an increased risk to nature due to more pressure on the Eastern Netherlands, but also thinks that this could be balanced with the nature gained in the delta region.[8]

The second concern that was mentioned by experts was the fact that if you do choose to give land back to the sea, there is a risk of more pollution if the land is not cleared first:[3;5;15;16]

> We also pretend, in the idea of planned retreat and returning part of the Netherlands under water, as if that's at all possible. If we put this under water, then we actually just have an ecological disaster. There is rubbish everywhere, so in fact you then have to clean up the soil of the whole lower Netherlands.
>
> - Jos Timmermans
> *Technical University Delft (Delta Management)*

For example, if you "give up" cities like The Hague, there is still a lot of infrastructure and buildings that need to be removed. If these are not removed, the dirt and pollution might flow into the sea and cause major pollution.[3;15;16] This depends on the scale of planned retreat, but also its preparation:

> I do tend to think that the negative effects play a more important role: Imagine having to give up The Hague ... that's almost unimaginable. Then a lot of garbage would end up in the sea, and you would have to invest enormously to remove it all. You can't just let that asphalt disappear into the sea. That brings a lot of pollution.
>
> - Roderik van de Wal
> *University of Utrecht (Climatology & Glaciology)*

These risks can be reduced by properly emptying the land that is given back to the sea. It should be noted, however, that it might be very costly to do so. Again, an alternative perspective on this matter exists:

> Well there's not going to be a natural disaster there, no. No, look at those coastal ecosystems, they are quite different from freshwater ecosystems. That such a very high nutrient lead, if it's in stagnant brackish water or something, then you can still get huge algal blooms and all the enormous problems. But in dynamic water with that tidal flow, which is always mixing and draining, that's not going to lead to natural disasters.
>
> - Bas Roels
> *World Wildlife Fund*

This expert talks mostly about the risks to nature if the limited from of planned retreat is *not* implemented, and the goals of the Paris Agreement are *not* achieved:

> Well, those [stakes] are all or nothing. By 2080 or 2090, we no longer have a Wadden Sea. And no more Oosterschelde and Westerschelde with tidal flats and salt marshes. And then also no more bottom life with cockles, mussels, mud piers, and so no more black-tailed godwits, no more curlews, no more avocets, and so no more nursery where you can find bids, sprat, or herring, so *that's* going to be a catastrophe [emphasis added].
>
> - Bas Roels
> *World Wildlife Fund*

Again, some experts are not arguing that the effects of climate change, sea level rise and planned retreat are negative or positive per se. Some argue that we can try to preserve the ecosystems that we have, but it is not viable.[4;16] One expert for instance says that there is a need to accept that the natural environment will change regardless of how planned retreat is implemented:

> It depends on your definition of nature. If you want to keep what is there now, then you score negative on the disappearance. But it was going to change, even without sea level rise. You know, nature has never been static for as long as it's been around, so you can't preserve nature exactly the way it is now. You have to look for nature that will have space again to fill in its biodiversity in a new way, different way. And I think that with "accommodating to sea level rise" you get flooded areas, so more sea and less diversity of habitats, that's a loss. But the whole world will look different then. There will be deltas developing in other places. It's not sustainable to hold nature static as it is, so I think it is a very difficult discussion about degradation.
>
> - Saskia van Gool
> *Rijkswaterstaat*

Figure 17 gives an overview of all the drivers within the categories discussed.

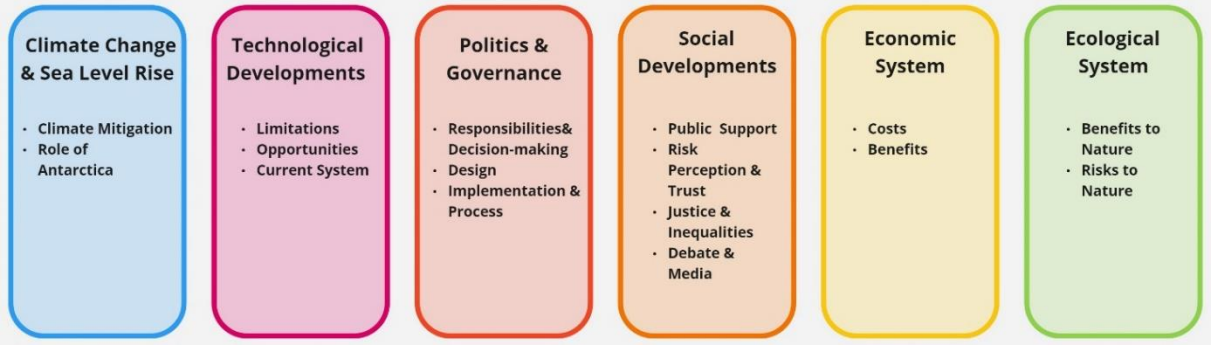

Figure 17. Drivers of Change of All Categories

6.7 Integrating the Drivers of Change

The previous sections have shown many factors of uncertainty that play a role in what the future could look like, and how planned retreat could or could not fit into that. Within all STEEP categories, several drivers were discussed by experts. Figure 17 illustrates an overview of the broader themes discussed in each category. Table 3 shows an overview of the discussed 'extremes' or 'future orientations' belonging to each driver.

Table 3. Overview of Future Orientations in each Driver Category

Climate Change & Sea Level Rise	Technological Developments	Politics & Governance	Social Developments	Economic System	Ecological System
Mitigation vs. Adaptation	Technological solutions have limits vs. no limits	Leading role vs. Following role	Communication to the public active vs. more passive	Investing to protect vs. investing in sustainable alternatives	Conserve current ecosystems vs. forego current ecosystems
Ice sheet Antarctica breaks off vs. does not break off (little to no influence)	Maintaining the current system vs. Look ahead to new solutions (could also be seen as political decision)	'Sudden' decision-making vs. gradual decision-making	Low public acceptance vs. (relatively) high public acceptance	Short-term (relatively lower) costs vs. long-term (relatively higher) costs	
		Limited participation options vs. fully participatory process	Resistance on the short term vs. Resistance on the long term	Focus on monetary benefits vs. focus on non-monetary benefits (such as nature)	
		Long-term process vs. (relatively short-term process	Incentive from public sector vs. private sector		
		Large-scale planned retreat vs. small-scale planned retreat			

In addition to discussing the drivers and their future orientations, the experts also explored various conditions necessary to enhance the success of planned retreat or to prevent its failure, acknowledging that its success may be relative. These conditions, along with the entities responsible for adhering to them, are presented in Table 4.

Table 4. Conditions for Planned Retreat

Responsibilities Government	**Responsibilities Media**
Offering the affected citizens with a perspective, e.g. through financial compensation Make funds available to adapt Provide potentially affected citizens with clear and timely information Communicate reasons for chosen strategy to public at large Guaranteeing the safety of citizens Process should include to some extent a form of participation	Avoid coverage of *only* sea level rise 'extremes' leading to distorted perspectives and panic

Whereas some factors play a more determining role, according to experts, other drivers are rather dependent on those main factors. This chapter has aimed to also show these interdependencies and links between drivers. Figure 18 illustrates how the categories of drivers of change are interdependent and linked to each other.

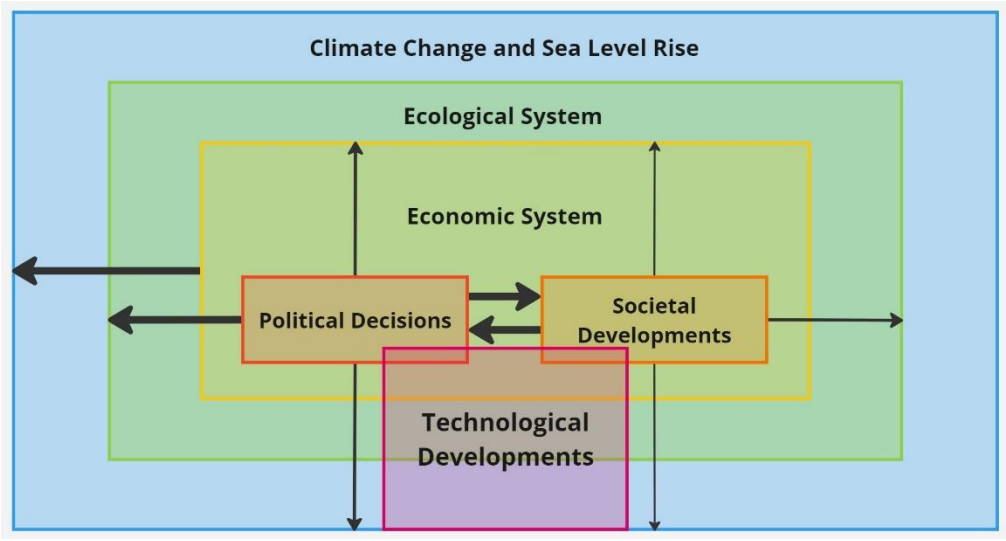

Figure 18. Integrating the Drivers of Change

The figure illustrates the complex interplay between the different drivers that have been discussed in this chapter. It depicts ecological, economic, political, societal, and technological drivers within the broader context of climate change and sea level rise. The arrows indicate how the drivers

influence each other. Despite the fact that the some drivers – represented by the smaller boxes – operate within the constraints and circumstances of the 'wider' systems (i.e., the larger boxes), to a certain degree they also have the capacity to influence the broader context in which they take place.

The largest box is the one depicting climate change and sea level rise, as that is the context in which everything else takes place. The interviews demonstrate that all factors are subject to climate change, and in this specific instance, sea level rise. Climate change and sea level rise are thus the broader context in which all the other developments take place, but at the same time, climate change is influenced by the current economic system, political decisions, and societal behaviour. However, this box is outside of national control; despite the fact that mitigation could reduce the extent to which the climate will change, the Dutch government by itself has a limited influence on that.

The smaller boxes are situated within the context of the larger boxes, with arrows indicating the direct influence between factors. The thickness of each arrow corresponds to the magnitude of that influence. The box containing technological developments is a bit different, as technological developments are influenced by all these factors, but simultaneously determine the way in which we *deal with* the other factors. The figure shows that political decisions are influenced by all the other drivers, but also have an impact on all of the drivers to a certain extent. Social developments are influenced by everything as well, but also directly influence the outer boxes. The assumption here is that political decisions are driving change slightly more than societal developments, particularly in the Netherlands, as governments have the ability to enforce regulations and shape societal behaviour. A leading role of the government, or a lack thereof, can either enable or hinder adaptive strategies for climate change and sea level rise.

7. Exploratory Scenarios of Planned Retreat

Chapter 5 has shown the different ideas that experts in the field have regarding what planned retreat could look like, while Chapter 6 has delved into the different drivers of change, making use of the STEEP categories. Within each section, both *drivers of change*, as well as *conditions for planned retreat* were discussed. Table 3 gives an overview of the different 'future orientations' of drivers that came up in each section, Table 4 provides an overview of the conditions for planned retreat that experts referred to, and Figure 18 illustrates how the different socio-economic drivers of change are dependent on or related to each other with regard to the future of planned retreat.

Based on the aforementioned results, this chapter aims to examine in what ways 'planned retreat' could develop under different future pathways. This chapter presents four possible scenarios based on the interactive workshop, expert interviews, and the findings from the literature and policy documents. These scenarios will describe four different futures of planned retreat under two main drivers of change. These scenarios are no predictions; they rather paint a picture of what the future *could* look like if certain decisions are taken or not, what the future *could* be like if we move in a certain direction or not, and in turn, what planned retreat looks like in each of these possible futures. In doing so, this chapter aims to answer the last sub question: *What is the influence of the identified exploratory scenarios on the practical outcomes of planned retreat in the Netherlands?*

7.1 Framework of the Four Exploratory Scenarios

After identifying the drivers of change, the next step is to determine which of these are the *main* drivers of change, in order to proceed with the scenario framework. Figure 18 in Chapter 6 illustrates how all aspects of planned retreat are situated in the context of climate change and sea level rise. Based on the expert interviews, the literature, and the fact that the Knowledge Programme Sea Level Rise (KP ZSS) dedicated a whole track to the uncertainty around Antarctica, it can be concluded that whether and when Antarctica breaks off or not, is a determining factor for the future of planned retreat. It impacts the rate at which the sea levels will rise significantly (Tol et al., 2006), the timeline on which measures have to be influenced, and in turn affects the conditions of the existing hydraulic infrastructure (Van Alphen et al., 2022). It is uncertain when that tipping point will be reached, and it also cannot be ruled out completely that that tipping point has already been reached. Given that planned retreat in this thesis project is viewed as a potential solution direction specifically for sea level rise, only the effects of climate change related to sea level rise are considered.

On the one hand, the role of Antarctica is beyond the control of the Netherlands alone. The Dutch government can focus on mitigation efforts, but in order to limit and reduce climate change, there is a need for the rest of the world to cooperate. However, the Netherlands does have some influence, in fact particularly through its commitment to mitigation efforts. Therefore, since this is likely to be a key factor in shaping the future of planned retreat, the *commitment of the government* with a future orientation on mitigation, and one on adaptation, is considered the first *main* driver of change. This corresponds with the largest box of Figure 18, but is scaled down to the limited influence that the Netherlands has on a national scale.

Another important determining factor discussed in Chapter 6, is whether the government decides to maintain the current system, trusting the technology, or whether the government decides to look ahead and implement more anticipating measures. This strongly relates to whether the government takes on a leading, proactive role or a following, reactive role. This political decision influences what planned retreat looks like, the public acceptance, the investments, etc. Also based on the interactive workshop, it was concluded that whether the technology is trusted enough to continue to maintain the current approach, or to move away from the status quo, is determining for the future (of planned retreat). This second driver is also illustrated of the smallest boxes in Figure 18, portrayed in the broader category 'political decisions'. Based on an analysis of the findings in Chapter 6 and during the interactive workshop, the second main driver is thus the *governance approach in policy-decisions*. One future orientation focusses on maintaining the current system as long as possible, which includes a hesitant, reactive approach towards the implementation of anticipating measures, whereas the other future orientation is to look ahead, in which the approach is more proactive, including the implementation of for example anticipating measures.

As described in Chapter 3, the scenario framework typically presents with *at least*, but not necessarily limited to two main drivers of change. In this particular case, an analysis of the interview results in combination with the interactive workshop revealed that the other drivers to some extent rely on the aforementioned *main* drivers, being 'climate commitment of the government' and 'governance approach in policy-decisions'. As a result, it can be concluded that this scenario framework effectively relies on only two axes.

In order to establish the framework, the drivers including the opposite future orientations represented on the axes; with *commitment of the government* on the y-axe, and *governance approach in policy-decisions* on the x-axe. The ends of both axes show the different future orientations. Based on the combination of future orientations per scenario, Figure 19 illustrates the scenario framework including the scenario titles that best depict the different futures in a creative manner: Steady Shores, Room for the North Sea, Sandcastle Strategy, and Retreat Ready. These titles, created by the researcher based on the input from the workshop, serve as starting point for the storyline of each scenario.

As shown in Figure 19, 'Steady Shores' relies on a dual strategy that combines keeping the status quo with mitigation efforts, in an attempt to protect and preserve the current coastline. As the mitigation measures aim to protect the coastline, the title 'Steady Shores' was chosen. The second scenario, 'Room for the North Sea', combines a proactive approach of looking ahead with mitigation efforts. Considering the resemblance with the Room for the River-project, relying strongly on nature-based solutions, this scenario was assigned a title similar to that project. In 'Sandcastle Strategy', the strategy to maintain is combined with adaptation measures. Just as a sandcastle requires constant adjustments to stay intact, this approach involves sustaining the current system through reactive changes rather than pursuing system change, which explains the title of this scenario. The fourth scenario, 'Retreat Ready', combines a governance approach of looking ahead and adaptation efforts. As proactive forms of retreat are part of this strategy, the title given to this scenario illustrates a readiness to adapt to future challenges rather than clinging to the status quo.

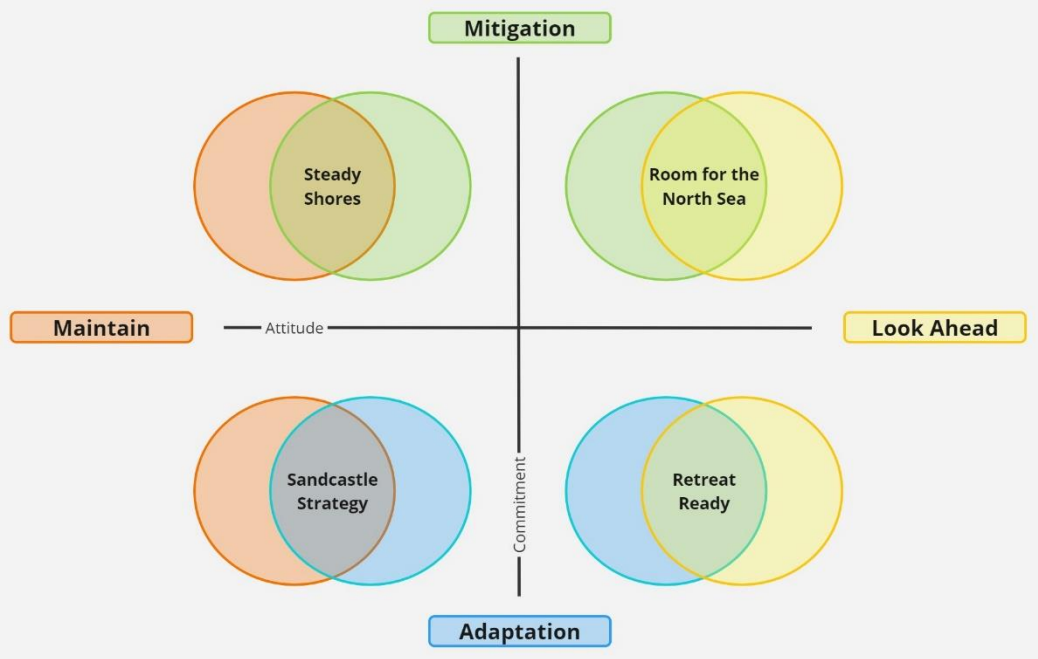

Figure 19. Framework of the Exploratory Scenarios of Planned Retreat

7.1.1 Micro-Drivers of Change

In addition to the main drivers of change, that are determining for what the future (of planned retreat) looks like, there are also micro-drivers that vary depending on how the future orientations of the main drivers interact. These micro-drivers are often interrelated and partly dependent on each other. Based on the findings in Chapter 6, including Table 3, Figure 20 presents the list of micro-drivers of change, which will also be used to develop the scenario storylines.

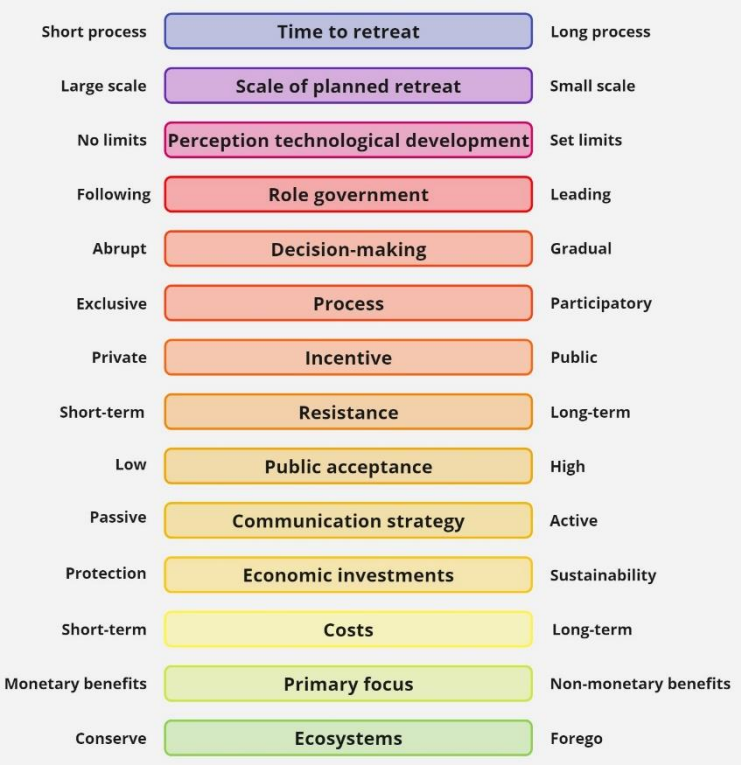

Figure 20. Micro-drivers of Change in Planned Retreat

The list of micro-drivers of change presented in Figure 20 may not include all factors that have been identified and discussed in Chapter 6. There are four possible reasons to explain the fact that some of these factors are omitted:

1) Some of the drivers are out of the 'national' control (e.g., whether Antarctica breaks off)
2) Some are dependent on one of those out-of-control drivers (e.g., benefits in terms of prevented costs depends on the extent to which the climate will change)
3) Some are very much related to one of the other micro-drivers and are excluded from the list to prevent duplicity, but will still be discussed in the storylines (e.g. whether implemented measures are anticipating or not depends on the role of the government)
4) Some factors are conditions rather than drivers, that can be included regardless of the scenario, though it is acknowledged that some scenarios could make it easier to fulfil these conditions than others (e.g., providing financial compensation, preventing an increase in socio-economic inequalities, etc.)

7.2 Storylines

Figure 21 shows again the two axes with the four scenarios, including the micro-drivers of change. During the workshop, the main drivers were established and discussed, including how they would generally affect the micro-drivers. Additionally, the interviews revealed correlations between certain decisions and their effects on the micro-drivers. These micro-drivers therefore play out differently in each of the scenarios, illustrated by Figure 21. As explained in Chapter 3 and supported by the literature of Wiebe et al. (2018), how these micro-drivers are presented in each scenario is based on the researcher's interpretations of the interviews and workshop. Figure 21 also forms the foundation of the storylines.

The storylines depict the different futures per scenario: Steady Shores, Room for the North Sea, Sandcastle Strategy, and Retreat Ready. Despite the fact that in the interviewees suggested timelines of 100-200 years for planned retreat, this thesis project has opted for a timeline until 2100 for two reasons: Firstly, as was also pointed out in the interviews, it is difficult or even impossible to imagine what the Netherlands would look like in 200 years. Secondly, other scenarios usually employ a similar timeline until 2075 or 2100, also due to the even further increasing uncertainties beyond that point (Rounsevell & Metzger, 2010). Each of the storylines describe the situation until 2100, showing the in-between steps that have been taken, and showing what planned retreat could look like in each of these scenarios. These in-between steps have been discussed in the interactive workshops, while the different forms of planned retreat are based on the results in Chapter 5.

These storylines are thus primarily derived from the interactive workshop and the interviews. Based on discussions during the workshop, and the interviews prior to the workshop, these storylines have been developed by the researcher. It is important to emphasise once again that these storylines are not predictions for the future, but rather show what the future could look like if we act a certain way. They are meant to stimulate the creativity and imagination of decision-makers by looking at a plurality of potential future pathways. The intention is for these scenarios to be neutral, meaning there is no inherent preference for any particular scenario, as each presents with its own set of

advantages and disadvantages. These advantages and disadvantages can to a certain extent be deduced from the storylines, but will also be discussed separately in more detail in a subsequent section.

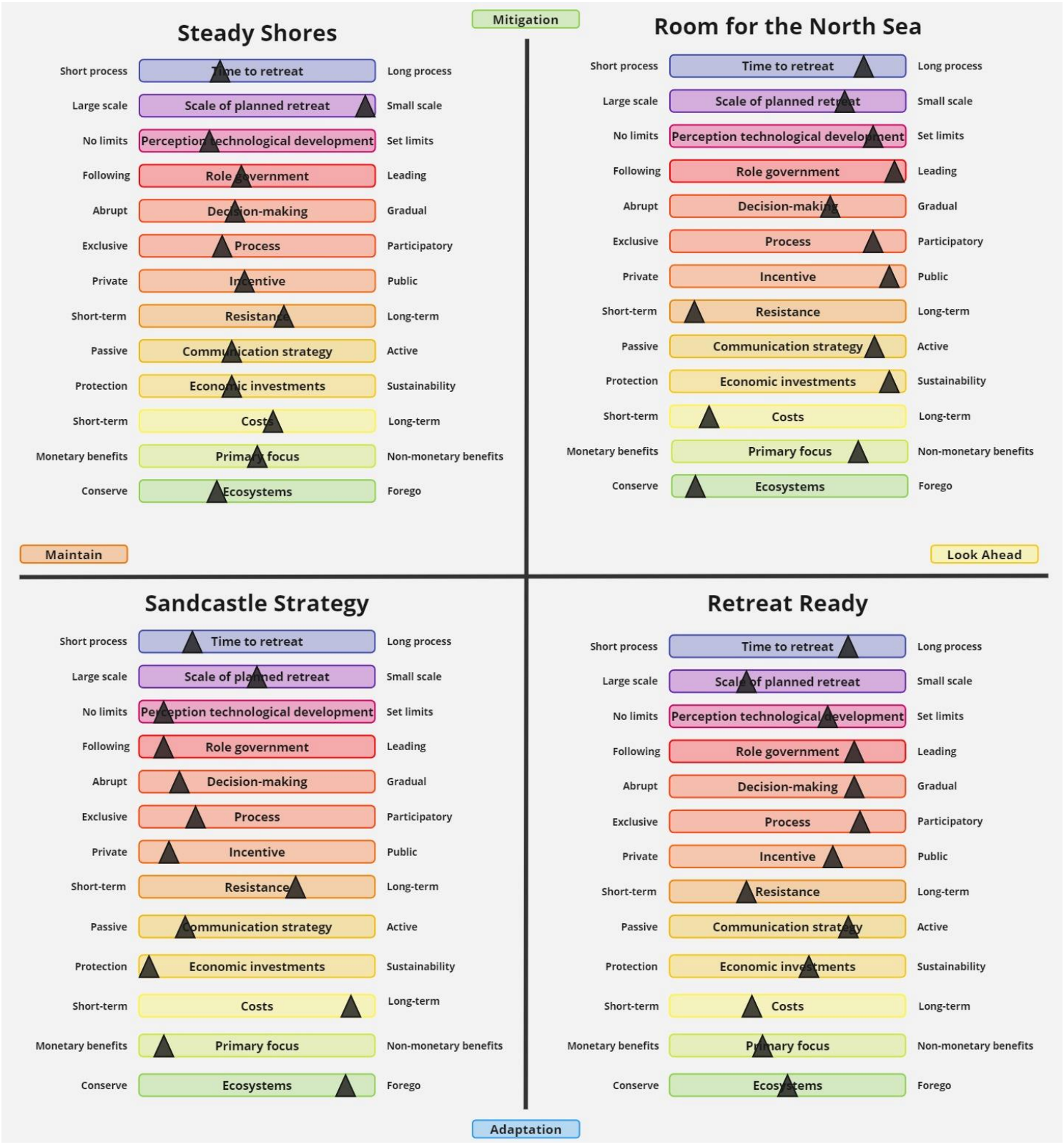

Figure 21. Representation of Micro-Drivers in Each Scenario

7.2.1 Scenario 1: Steady Shores

It is the year 2100. The Netherlands has adopted a dual strategy to cope with sea level rise; a combination of strong mitigation efforts alongside investing in robust hydraulic infrastructure to protect the original coastline from 2024. This includes improving and elevating the dikes to protect the economic heart of the country, enabling the Netherlands to flourish. The emphasis has been on protecting the economic system and enabling people to continue living in coastal areas, by leveraging technological advancements, to some extent complemented by nature-based solutions. There is a strong belief that there are no limits to technological innovations when it comes to water safety. Given that mitigation is another important component in the employed strategy, the technological developments also focus on mitigation efforts such as creating green energy resources. As a result of the Netherlands' efforts in climate mitigation, other countries feel inclined to make similar choices.

During the first decades following 2024, the government is making substantial investments in both mitigation and infrastructure. This includes minor adaptations to the hydraulic infrastructure, the integration of more solar, wind and tidal energy, while also aiming to include some nature-based, carbon-storing elements. Campaigns and communication strategies to create public awareness are limited, though there is a focus on potential long-term problems caused by climate change, and in turn, the benefits of mitigation efforts. The goal of these campaigns is to ensure that people are supportive of these efforts, since they require significant investments. In spite of the campaigns there are still certain groups, such as climate sceptics, who remain resistant.

The government continues to permit building in low-lying, flood-prone areas, driven by their popularity and economic benefits. To offset emissions, these houses are built in a climate-resilient, energy-neutral way. Despite the mitigation efforts, however, the sea levels continue to rise, which over the course of the 21st century is leading to slowly but steadily increasing costs of updating the hydraulic protection mechanisms. Nevertheless, the strong belief in technological fixes combined with mitigation efforts persists.

By around 2070, the increasing sea levels are forcing the government to respond with somewhat heavier technological measures. In addition to the rising costs of these investments, the hydraulic infrastructure and the large pumps to pump the riverine water out, take up an increasing amount of space. Affected residents near dikes face relocation as more infrastructure is required, thus resulting into a relatively small-scale form of planned retreat.

As the initial goal was to keep the status quo with small, technological adaptation needs, the relocation of these few people may feel a bit 'sudden'. However, the relatively slow pace of sea level rise allows for some room for public participation. This helps in the process of generating public support, though the people who have to move due to the expanding infrastructure are putting up some resistance.

As the century progresses, societal resistance grows due to the increasing costs and perceived unsustainability of ongoing investments. Moreover, some people living in coastal areas feel that the increasing hydraulic infrastructure is unappealing to live behind. On the other hand, the economic

centre of the Netherlands is protected, which allows most people to continue to live and work in the Western part of the Netherlands.

By the end of the 21st century, some insurance companies begin to consider taking matters in their own hands, as they recognise the inefficiency and potential long-term ineffectiveness of the current approach taken by the government. They plan to gradually stop providing insurance for homes located in high-risk, low-lying areas that are not built climate-resiliently. These private sector incentives cause an increasing amount of people to buy their next house in a different area, but forces some financially vulnerable people to stay behind.

With fewer residents and higher infrastructure costs in the coastal region, the Netherlands may need to shift towards a 'living with water' approach, potentially leading to more resistance and challenges. Nonetheless, the hope remains that as a result of the extensive mitigation efforts, it will not get to that point. Consequently, the government continues to take a relatively 'following' role, hoping that existing measures will suffice.

7.2.2 Scenario 2: Room for the North Sea

It is the year 2100. The Netherlands has embraced a strategy that focuses on strong mitigation measures, while looking ahead to address sea level rise proactively. The government prioritises the protection of existing ecological coastal systems, acknowledging that in order to conserve those unique areas, there are certain limits to what technology can 'fix'. Hence, the government has taken on a leading role in creating an innovative approach to coastal management, focusing mostly on nature-based solutions. In addition to that, investments are mostly made from a sustainability perspective. Following the advisement of Kamerbrief Water & Bodem Sturend, the government no longer allows construction to continue in high-risk areas. This proactive attitude towards climate mitigation has inspired other countries to make similar mitigation efforts.

In the first decades after 2024, the Netherlands embarks on an innovative approach to planned retreat. This approach aims to keep the economic heart of the Netherlands alive, while ensuring the successful conservation of coastal ecosystems. The plan exists of creating an extra zone between the existing dikes and the sea, which gives the North Sea more room, while accommodating unique ecosystems in brackish water. The implementation of this plan requires people living in that zone to relocate, leading to a very small-scale, controlled, but impactful form of planned retreat. Given that this strategy is designed to protect ecosystems and anticipate to rising sea levels – which are not yet tangible problems – public resistance is expected.

To mitigate this resistance, the government has proactively rolled out campaigns that inform the public about the retreat plans in advance, and create more awareness about its benefits. Due to the many necessary steps in this form of planned retreat, the process is spread out over a longer period of time. This allows for the large-scale involvement of affected communities, similar to the Room for the River-project. While resistance is expected in the early years, the goal is to minimise it on the longer term through effective communication and inclusive participation.

By around 2070, the plans for the zone are realised, successfully preserving coastal ecosystems in the Netherlands, at least for as long as the rest of the world also complies with the Paris Agreement.

This particular form of planned retreat also comes with a large mitigation-component, as the extra zone for nature conservation leads to more carbon uptake and storage. The mitigation efforts of the Dutch government align with the goals of the Paris Agreement, but the government is dependent on what the rest of the world will do.

This small-scale form of planned retreat however results in substantial costs on the short term, as hydraulic infrastructure needs to be moved, and people have to relocate, supported by financial compensations by the government. On the other hand, the economic heart in the West of the Netherlands can be preserved, allowing for economic activities to continue in that area. In the long term, there are benefits expected that consist of ecosystem services and can therefore not be expressed in monetary terms.

By the end of the 21st century, it is still not entirely clear if this buffer zone will be enough for the longer term, as sea level rise continues in all existing climate scenarios. However, the proactive approach taken by the government has led to a strong social-ecological system in which both communities and nature can thrive, while water safety is guaranteed, provided that global temperatures remain below 2ºC. Moreover, the decision to stop building in high-risk areas is a facilitating factor in further small-scale retreat, if would be necessary in the future. However, the hope is that the realisation of mitigation efforts so far will prevent the need for further measures in the future.

7.2.3 Scenario 3: Sandcastle Strategy

It is the year 2100, and the Netherlands has committed itself to a strategy that focuses on adaptation measures, rather than mitigation efforts. Furthermore, the Dutch government has dedicated itself to protect and maintain the coastline from 2024, by strengthening and elevating the hydraulic infrastructure. The main goal is to safeguard the economic centre of the Netherlands: The Randstad. This approach reflects the strong belief that technological opportunities are endless and can keep up with the rising sea levels. As a consequence of the Netherlands' strong focus on adaptation, some other countries feel inclined to focus their policies on adaptation, rather than mitigation, too.

In the first decades after 2024, the strategy of protecting the coastline resembles a 'business as usual'-scenario. It allows for necessary adjustments to the infrastructure that ensure the safety of Dutch citizens, while the public hardly notices changes in their daily lives. Economic investments are mainly directed towards hydraulic protection, and aimed at securing economic growth. There is no active communication to create awareness of potential effects and side-effects of sea level rise, as the government assumes that everything can be dealt with through adapting the existing infrastructure with technological innovations. Instead of planning ahead with anticipatory measures, the government makes a decision to disregard the principles of Kamerbrief Water & Bodem Sturend, and continues to allow building houses in low-lying areas. The motivation for this course of action is the high demand for housing and the expected economic gains that it can yield.

This approach faces limited resistance from the public at large, who are generally supportive of the expected economic growth and infrastructure maintenance. In fact, since the government follows a business-as-usual strategy, the majority of the population hardly notices a change. However, the amount of climate and nature activists is growing, and they are becoming more vocal in their

criticism. These activists start protesting actions, including climate litigation to block construction in vulnerable areas and increase the government's mitigation efforts.

In spite of the increasing risks and growing group of concerned citizens, the government does not feel the need to prevent houses and buildings from being built in high-risk, low-lying areas on the longer term. As infrastructure is further expanding to keep up with the rising sea levels, however, more space is needed to for the technological solutions that ensure water safety. Therefore, some people are forced to move away from coastal areas, though it concerns a relatively small number of households. Due to the passive role of the government, however, the urgency of the expansion of hydraulic infrastructure makes the decision that these people have to move quite abrupt, leaving little room for a societal discussion and participation. After all, it is about sacrificing a relatively small group for the benefit of the rest of the Dutch society. In other words, this strategy relies on the idea that there is solidarity amongst the Dutch citizens.

By around 2070, the increased occurrence of intense climatic events, such as storm surges, forces the government to respond with even heavier measures. Costly investments are needed to keep up with the established obligations and flood frequency norms. In spite of these efforts, the private sector no longer feels secure enough to continue to invest in the Western part of the Netherlands. As a result, insurance companies take it upon themselves to no longer insure houses in high-risk areas, and banks do no longer give mortgages on houses built in high-risk, low-lying areas. This causes a larger movement from the West to the higher parts of the Netherlands.

By the end of the 21st century, the private incentives are causing an increasing amount of people to move, often losing their investments in the process, as the houses in the West are decreasing in worth. This also leads to social injustices, as the people who cannot afford to move are staying behind. The government, in their following role, sees the need to respond to these developments by altering their strategy. They shift the focus to 'living with water', designating 'flooding areas' to cope with the rising sea levels. These areas need to be emptied, leading to the retreat of people in a controlled manner. However, the urgency of these measures does not allow for public participation, leading to a lot of resistance from the affected community, though it does enable the government to perform a controlled, fast form of planned retreat. The government hopes that the mitigation efforts of other countries are sufficient to limit climate change and sea level rise on the longer term, meaning they do not (yet) feel the need to take further action.

7.2.4 Scenario 4: Retreat Ready

It is the year 2100, and the Netherlands has adhered to a strategy that focuses on making adaptation efforts, while looking ahead, in order to anticipate to sea level rise. The focus of the Dutch government is to protect the Dutch citizens through adaptation measures, and preventative, generally sustainable investments. The government has therefore taken a leading role in creating a more sustainable way of spatial planning with long-term benefits. However, due to the fact that the Netherlands seem to focus most of its attention on adaptation rather than mitigation, some other countries might feel inclined to do the same.

In the first decades after 2024, the government has taken proactive measures to ensure that planned retreat is a feasible solution to sea level rise on the long term. For instance, the government has

stimulated economic activities in the East, has prevented infrastructure from being built in high-risk areas in line with the Kamerbrief Water & Bodem Sturend, and has proactively communicated to society about the risks of climate change, and the timeline and scale of planned retreat. The idea is not to 'give up' the Western Netherlands, but to stimulate a slow but steady movement Eastwards. Planned retreat is implemented to allow certain regions, like the Delta region, and other less populated parts, to be occasionally flooded in the case of storm surges. On the other hand, the more densely populated areas, including the economic heart in the West, are protected through hydraulic infrastructure enhancements. The general idea is that a combination of technological fixes and planned retreat is the best way forward.

Prior to the realisation of these plans, the government employs an active strategy to communicate the plans and create public awareness of the risks of climate change and the need to adapt. As a result of the proactive attitude of the government, there is time for a long, participatory process in which the concerns of people can be heard. These communication and participation strategies are meant to reduce the social resistance, but this form of planned retreat still faces resistance from affected communities who live in areas designated as 'flood areas'.

Around 2070, the plans for 'calamity areas' have almost been realised, though some communities are still struggling with it. The project requires substantial financial investments, which is partly going to compensation for communities, but also to updating the hydraulic infrastructure in the West. Luckily, the previous investments in the East, combined with the preventative measures, are making this process easier as the Netherlands have gained new economic centres. Moreover, the overflow areas are resulting in a more natural delta, allowing the coastal ecosystems to thrive.

By the end of the 21st century, the plans are fully implemented. As parts of the hydraulic infrastructure no longer has to be maintained, the costs in that aspect are reduced. However, the Netherlands is still economically suffering from the economic hit it took by realising this project and by maintaining the existing hydraulic infrastructure along the middle of the Western coast. Despite allocating some overflow areas, the economic heart of the Netherlands in the West still exists, though around Eindhoven and in the Eastern part of the Netherlands, new economic centres are emerging. The hope is that over the course of the next century, the benefits of these investments will pay off, though the threat of continuing sea level rise still persists, potentially leading to further planned retreat in the future.

7.3 Challenges and Opportunities per Scenario

All the abovementioned scenarios of planned retreat in the Netherlands in 2100 present with different and unique challenges and opportunities. Steady Shores has the advantage of emphasising the strength of technological developments, while also investing in climate mitigating measures that contribute to the energy transition. The mitigation efforts in this scenario could also generate goodwill worldwide, potentially causing other countries to make similar efforts. Moreover, the small-scale planned retreat needed for the expansion of hydraulic infrastructure and technical mitigation infrastructure, possibly leads to the least societal resistance on the short term. These measures, particularly related to mitigation, do require some effort on the short term – mainly

politically, socially and economically – but seem manageable. However, disadvantages of this scenario are the prospect of possible increasing long-term costs and resistance, depending on which climate scenario becomes reality. If a part of Antarctica breaks off, the measures taken might not be sufficient, leading to more costs on the long term. However, if no part of Antarctica breaks off and climate change remains limited, this scenario will have more benefits; both socially as well as economically.

The scenario Room for the North Sea has the advantage of long-term sustainability, by taking a proactive planning approach. It emphasises a leadership role of the government, by daring to take measures that the Netherlands could possibly benefit from on the very long term. This scenario furthermore tries to balance social and ecological ecosystems. Moreover, similar to Steady Shores, the mitigation efforts in this scenario could encourage other states to do the same. However, the motivation behind the form of planned retreat in this scenario combined with the large costs of this project, will in all likelihood also lead to quite some societal resistance on the short term. One of the main disadvantages of this scenario is the short-term large investments that have to be made to realise these plans. On the one hand, realising this form of planned retreat will require time, capital and (political) effort, but on the other hand it requires only a relatively small group to relocate compared to the next two scenarios. The advantage of this proactive approach is also the fact that it can be done in a controlled way, with participatory processes and extensive communication before taking action. As a result, this scenario is expected to have less social resistance on the longer term, as well as increased benefits from ecosystem services. If a part of Antarctica breaks off, these measures might not be sufficient, but certain preventative measures will make it easier to implement further measures. If no part of Antarctica breaks off, this scenario mainly yields non-monetary benefits, specifically from ecosystem services. On the other hand, in the case of a limited climate scenario, some might argue that some measures taken were premature and cannot be justified.

In the Sandcastle Strategy, the main advantage lies in the fact that the coming decades, there is the possibility to continue with an almost ‘business-as-usual’-strategy, leading to little short-term costs, large short-term benefits, and little to no resistance from society. It also does not require a lot of political effort to realise this strategy. Others, however, might argue that this strategy is like burying one’s head in the sand and ignoring the long-term problems. Moreover, as the Netherlands is focusing mostly on adaptation rather than mitigation, there is a risk that other countries feel inclined to do the same, potentially further exacerbating climate change. The disadvantages of this scenario are the expected long-term costs, as the accelerating sea level rise might lead to more necessary updates in hydraulic infrastructure, which might become more costly and eventually an unsustainable investment. Another risk is the fact that there might be side effects of sea level rise that are not prevented by the hydraulic infrastructure. Moreover, the fact that the incentive to move away from high-risk areas comes from the private sector, rather than the government, could result in more socio-economic inequalities. ‘Sudden’ government responses and in turn, ‘abrupt’ decision-making could furthermore increase societal resistance due to limited participating opportunities. Lastly, this scenario poses the largest risks to coastal ecosystems. However, another advantage of this scenario is the fact that the costs will be very low if it turns out that no part of Antarctica breaks off. However, if Antarctica does partly break off, the hydraulic infrastructure might be untenable,

and there could be a risk of a more unplanned, large scale planned retreat, leading to higher costs and less faith in the government.

Retreat Ready has the advantage of balancing both social and ecological needs through proactively approaching sea level rise. On the long term, this strategy makes it easier to start with the retreat of people, as many anticipatory measures have already been taken. It moreover encourages long-term sustainability and ensures a leading role for the government. On the one hand, since the focus is mainly on adaptation rather than mitigation, some other countries might feel inclined to do the same, potentially further exacerbating climate change. On the other hand, the Netherlands will be well-prepared, if that is the case. Disadvantages of this scenario are the fact that it also requires a lot of political, social and economic efforts to implement these preventative and anticipatory measures. It requires substantial resources and a lot of time to realise a supporting environment for planned retreat. Investing in new activities has large financial costs on the short term, and in all likelihood it will take time before these investments will pay off. Moreover, there will probably also be social resistance to these plans of affected communities, who might not understand the government's choices to assign these medium-scale areas for flooding and relocating communities. Even though the designated areas are not densely populated, the number of people needing to relocate still amounts to a significant group, which has a large societal impact. These concerns can however be accommodated because of the long period that is allocated to realise the plans, enabling residents to participate in the process and express concerns. On the long term, there might be benefits from new, sustainable economic activities. If Antarctica partly breaks off, this scenario ensures that the Netherlands is well prepared to take measures without gigantic economic losses. If a part of Antarctica does not break off, one could argue that measures were premature and have costed a lot both financially as well as socially.

All in all, the four scenario storylines describe what planned retreat could look like under different drivers of change, and each scenario presents with its own set of challenges and opportunities. If a voluntary movement Eastwards is stimulated by the private sector, in case the government takes a too 'following' role, there is likely a higher risk of creating socio-economic injustices and inequalities. If there is such a movement, the government can prevent these obstacles by stepping in and ensuring that people from smaller income households are also compensated. Secondly, in the scenarios, whether a part of Antarctica breaks off or not seems to be partly determining for the 'prevented costs' (and thus the benefits) as well as the cost of each scenario. Lastly, the conditions necessary to enhance planned retreat, as outlined in Table 4 of Chapter 6, are easier to implement in some scenarios than in others.

8. Discussion and Reflection

This thesis project aimed to examine how planned retreat could develop as potential anticipatory adaptation strategy to accelerating sea level rise in the Netherlands. It has done so by using exploratory scenario development as methodological tool to explore the different futures of planned retreat. Additionally, Chapter 2 has presented a conceptual lens that combines elements of anticipatory governance and the climate mobilities scholarship into one perspective that can be used to analyse planned retreat; both its implications and its underlying assumptions. This lens allows for critical questions that can be posed to reveal underlying power dynamics, potential injustices, and to analyse the context in which planned retreat is embedded. In this chapter, the outcomes of the research are interpreted and discussed through the application of this conceptual lens, addressing key insights and applications.

8.1 Interpretation of the Results

One finding that stood out of results, is the fact that there is quite a clear division between the perspectives of the interviewed experts. Despite the fact that almost all interviewees agreed that the solution 'planned retreat' should at least be looked into, the group of experts can generally be divided in 'opponents' and 'proponents' of planned retreat. All experts were given the same definition of planned retreat at the start of the interview (a threefold solution), yet, these two groups spoke very differently about planned retreat throughout the interview.

Opponents of the solution planned retreat often talked in extremes, referring to planned retreat as "giving up" and "moving half of the population Eastwards". These experts, who were more critical or even sceptical towards planned retreat, strongly doubted the feasibility of this strategy. They argued that they deemed it unlikely that a government would ever make the decision to retreat. They underlined that there would in all likelihood not be a "sudden" announcement to inform the population that we would give up the West of the Netherlands. The findings within this group are consistent with arguments made by Carey (2020) and O'Donnell (2022), who underscore the sensitivity of this topic.

Proponents of planned retreat, on the other hand, expressed more nuances in their view on planned retreat. They often referred to relatively small changes, and preventative measures that could be taken. They also referred more to the opportunities that could result from planned retreat, such as benefits for nature and sustainable housing. Moreover, they acknowledged that such a process would not happen "overnight", but *could* happen over time. Their arguments are generally in line with the transformative potential identified by Siders et al. (2021), who perceive planned retreat as a strategy that can be beneficial to both social and ecological systems.

Interestingly, the first group seemed to narrow down the definition of planned retreat by just referring to "giving up", whereas the other group broadened the definition of planned retreat by including other anticipatory measures, such as discontinuing to build in high risk areas, and investing in the East of the Netherlands. A potential explanation for this could be the different

disciplines of the interviewed experts. Those critical of planned retreat were approaching the problem from a more technical perspective, whereas the more optimistic experts of planned retreat typically included a socio-economic perspective. The latter group posed questions, such as: Is it desirable to build dikes over ten metres high? Is it sustainable to keep investing in hydraulic infrastructure? These questions were addressing economic costs, aesthetical aspects, sustainability issues, and potential loss of biodiversity and ecosystem services.

These different perceptions show the need for more open and interdisciplinary discussions, not only with society and policy-makers, but also between experts. The interviews revealed assumptions made about others' positions on planned retreat that seemed to lack a strong foundation. Whereas water managers sometimes expressed a lack of understanding of why environmental advocates would be in favour of 'giving up the west', the advocates for planned retreat in fact proposed a very small-scale approach, that only involved giving up a small, barely inhabited coastal zone. These findings indicate that not only the media play a role in exaggerating planned retreat, experts themselves also contribute to this narrative. Based on the interviews, it can be concluded that no one is in favour of 'giving up the West'. This illustrates a need to move beyond this harmful framing of the term 'planned retreat'.

Another key observation that was particularly interesting for planned retreat in the Netherlands, is the fact that experts and the policy documents expressed worries regarding the viability of the Dutch economy if planned retreat were to be implemented. Some experts pointed out that it could be perceived by foreign investors as 'giving up', scaring them off to continue to invest in the Netherlands. This could have serious repercussions for the Dutch economy, particularly if major companies located in the Randstad decide to move their operations elsewhere. One expert explicitly argued that announcing planned retreat – specifically if it is announced too 'recklessly' – could threaten the "economic survival of the Netherlands".[12]

However, if the Room for the River-project can be classified as a form of planned retreat – which this thesis project also aimed to demonstrate – the Netherlands have in fact gained international prestige with a similar approach before. Instead of damaging the Netherlands' international reputation, the Room for the River-project enhanced it. The innovative, multi-sectoral approach has in fact positioned the Netherlands as *leader* in water management and climate adaptation. This demonstrates that a strategy like 'planned retreat' does not *have to* lead to economic losses, depending on how it is being framed:

> He [journalist] wanted to make a good story out of it [planned retreat], but he also used those kinds of words, so I said, it will never come across well if you talk about giving up the country. […] If you want to talk about it, you have to make it attractive.
>
> - Marjolijn Haasnoot
> *Deltares*

This quote further underscores the fact that framing matters. If planned retreat is announced as 'giving up', it will likely scare off investors, as stated by both experts as well as KP ZSS (Spoor IV: Meebewegen). However, if the solution is presented as an innovative approach that fosters both the

conservation of coastal ecosystems and the safety of Dutch citizens, it could also enhance the image of the Dutch water sector even more, as illustrated by the Room for the River-project.

This empirical analysis suggests that the way planned retreat is both discussed and implemented in the Netherlands will play a key role in its outcomes. A shift in the framing of planned retreat, as well as embracing the complexities of this strategy – for example presented by the Anticipating Climate Mobilities perspective – could transform planned retreat into an opportunity to work on sustainability, protect ecosystems, and demonstrate the innovative leadership of the Dutch government.

8.2 Theoretical Analysis of Planned Retreat

8.2.1 Context – Inevitable Mobility and Uninhabitability in the Netherlands?

The concept 'habitability' as described in Chapter 2 and visualised in Figure 4, demonstrates that habitability is not solely based on the biophysical factors that influence the landscape, but also the socio-cultural meaning that people give to habitability. The question, 'what is acceptable to live in?', can be answered in different ways, depending on who is answering in what context. Scholars such as Farbotko & Campbell (2022), Wiegel et al. (2021) and others present evidence of regions in which increasing environmental risks are not perceived by residents as 'severe enough' to relocate. This is often due to differences in human-nature relationships that shape perceptions of risk and habitability.

The Netherlands, on the other hand, presents a unique case, as the concept 'habitability' has been standardised by a fixed notion of the term. The definition that is used is in fact driven by biophysical factors. Experts explain that this concept is determined by law, which prescribes the 'allowed' frequency of floods, and obligates the government to guarantee that these norms are upheld and fulfilled. In doing so, the law has set out a framework in which habitability is defined based on objective criteria, rather than perceived risks.

This technical approach towards habitability seems to be ingrained in the Dutch culture, or the Western culture as a whole, addressing physical problems through engineering solutions. Despite the fact that the technocratic attitude of the Dutch water management sector has changed towards a more nature-inclusive approach, the norms related to flood risks have not changed. As shown in the literature and expressed by several experts, the long history of effective water management and governance in the Netherlands has resulted in a high degree of trust in the government's ability to protect citizens from water-related threats.[3;4;7;11;12] Moreover, the Dutch population also assumes that the government takes this role; they expect the government to protect habitability at all costs, by elevating and broadening dikes.

Consequently, risk perception of for example sea level rise among citizens is relatively low, reinforcing the idea that biophysical factors mainly determine the habitability of coastal regions in the Netherlands. Therefore, to move towards a new approach such as planned retreat, and particularly the 'living with water' component, there would be a need to reconceptualise

‘habitability’. For the strategy ‘living with water’ to be implemented and accepted, there is a *literal* need to change the law, but that might also lead to less trust in the government.

Moreover, experts pointed out that for the Netherlands, there will always be a (small) group of people who will resist relocation plans and prefer to remain *immobile*. One expert even pointed out that in order to make planned retreat work, there might be a need for “an element of coercion”[14] in implementing planned retreat, which is particularly difficult in a democratic society. This, however, also illustrates a potential willingness to redefine ‘habitability’, accepting a form of ‘living with water’, as people might rather want to *live with* water than relocate. This furthermore underscores the need to move beyond viewing planned retreat solely as the inevitable mobility of *people*, by also looking into the other components of planned retreat. This aligns with the broader climate mobilities scholarship, which encourages rethinking how climate change-related human and non-human mobility, immobility, and habitability intersect and are embedded in broader, socio-cultural contexts.

The Netherlands also presents a unique case with regard to climate change-related mobilities. Farbotko et al. (2023) describe an example in which they compare the Netherlands with Pacific atolls. They argue that in the Netherlands, ‘inevitable uninhabitability’ due to sea level rise does not seem to be an everyday concern, as opposed to many Pacific Islands, for whom it is depicted as ‘existential threat’. This is lack of concern in the Netherlands is partly *justified* by the long-term, extensive adaptation strategies that exist, but it also *explains* why there are limited to no societal discussions yet about retreat strategies. In Pacific Islands, on the other hand, ‘retreat’ or ‘mobility’ of people is portrayed as inevitable consequence of climate change.

As pointed out by Gibbs (2016) however, ‘planned retreat’ and ‘managed retreat’ are strategies that are typically adopted in the Global North, due to the large financial and social cost associated with it. Even though this can be categorised as a form of ‘climate mobility’, the climate mobility literature primarily concentrates on (human) climate change-related mobilities in the Global South. This thesis also found that experts generally see planned retreat as a solution more applicable to the Global South. Planned retreat is seen as ‘controversial’, ‘sensitive’, and often discussed in extremes, like ‘giving up the West’. Additionally, the majority of experts do not see the necessity of planned retreat in the Netherlands, since, so they say, the Netherlands have the technological and financial means to keep protecting for as long as it takes.

Farbotko et al. (2023) point out that this emphasis on climate mobilities in the Global South is due to problematic (post)colonial thinking that is still present in today’s (scientific) literature: The Global South is portrayed as ‘inevitable uninhabitable’, whereas these concerns are less present in the Global North. This narrative reaffirms problematic ideas of the superiority of the Global North over the Global South. Siders et al. (2021) echo this approach, also arguing that the strategies employed in the Global North might be too techno-optimistic to continue to deal with sea level rise. This techno-optimism was also evident in some of the interviews of this thesis. Some experts expressed their strong belief in the almost endless possibilities of hydraulic infrastructure and innovations in the water sector.

In this particular thesis project, experts did acknowledge that planned retreat is a strategy used in the Global North, however, the majority specifically does not believe it will (or can) apply to the Netherlands. They argued that there is both a cultural and institutional difference between the Netherlands and for instance the United States or England, where retreat strategies have frequently been employed. Whereas in the Netherlands the government carries the responsibility to protect its citizens, these responsibilities lie elsewhere in other Global Northern countries:

> In America, I know there's a cultural difference with people here and there. When people there talk about a flood, it is very quickly about whether you have insured your house well or not. Insurance plays a role there. So people have to take care of their own safety, much more than here, and since people can't pay for that themselves, they get insurance. Here we have solved that collectively with our water boards, so people here look to the government. The government is responsible for people's safety, unlike in North America. So we also assume the government will solve it, and the government takes on that role.
>
> - Dick Butijn
> *Water Management Specialist*

This quote highlights the unique position of the Netherlands in the climate mobility debate. Unlike in other countries where retreat is seen as either an individual responsibility, or is driven by private incentives, the Dutch approach is collective and government-led. In addition to that, the clearly defined standards of 'habitability' combined with the techno-optimistic approach could explain why there is no active societal debate on this topic, in spite of the vulnerable location of the Netherlands. These factors thus make the Netherlands a distinctive case in the climate mobilities discourse.

8.2.2 Anticipatory Decision-Making in Relation to Planned Retreat

Decision-making related to planned retreat is inherently a form of anticipatory governance, as it involves making decisions in the present to mitigate uncertain future risks (Foley et al., 2018). In response to the uncertainty of the timing and magnitude of sea level rise, the Knowledge Programme Sea Level Rise (KP ZSS) puts forward several adaptive pathways. Planned retreat is part of one of these pathways. As outlined in Chapter 2, however, such anticipatory actions are challenged by critical questions about who is involved in decision-making processes, and what the underlying power dynamics are.

One key critique of anticipatory governance is the potential for anticipatory steering – presenting a limited set of options that narrow the range of potential responses (Muiderman et al., 2020). As an example, this thesis presents scenarios that exclusively discuss planned retreat as solution to sea level rise. In doing so, the scenarios may implicate that there exists an underlying assumption that planned retreat will at some point inevitably take place. While the aim of this methodology is to encourage creative thinking of policymakers by envisioning a plurality of futures in which planned retreat could occur, it risks presenting a distorted image of planned retreat being the only possible response to sea level rise. Similarly, the KP ZSS presents three adaptive pathways. At first sight, one could thus argue that this programme already 'steers' into one of these directions, potentially neglecting other existing solutions. In doing so, certain futures can be prioritised over others, which often occurs when there is a lack of participatory decision-making processes (Muiderman et al., 2020).

However, in this thesis, experts – particularly the ones working for the government – in fact expressed their strong support for participatory processes. The Room for the River-project already illustrates an example of an inclusive decision-making process with participating opportunities, highlighting the fact that the Netherlands has already embraced this important aspect in the past. The KP ZSS also dedicates one track, i.e. KP ZSS (Spoor V: Besluitvorming), to the decision-making process. This track acknowledges the importance of information provision, knowledge sharing, and participation opportunities.

Given the fact that this programme lays out the groundwork for future decision-making on addressing sea level rise, it could be argued that it is reasonable to involve the different stakeholders in this initial process as well. For stakeholders – including potentially affected communities – to be meaningfully engaged in a process, they need to be included from the start, rather than consulted in the middle. Encouragingly, the KP ZSS has already taken steps in this regard, by organising several discussions with civil society (organisations). The minutes of these meetings are publicly available online, showing that there is also some form of transparency. This openness to dialogue and engagement with civil society signals a positive move to ensuring that anticipatory governance in the Netherlands embodies a wide range of perspectives. In that regard, the adaptive pathways in the KP ZSS in all likelihood already incorporates a variety of ideas about how to adapt to sea level rise.

In spite of the positive examples of participatory processes in decision-making in the Netherlands, one expert did point out that the presentation of these pathways as vertices ('hoekpunten') risks polarisation. Since these options are presented as different pathways, the possibility to let the pathways complement each other is disregarded:

> So those [vertices] have a difficult function now; they are strongly polarising. So it is about, at least in the beginning it was about: Which pathway should we choose? But that's a completely peculiar idea of course, to make such a decision in such an early stage.
>
> - Jos Timmermans
> *University of Delft (Delta Management)*

This quote highlights potential competition between the pathways, and is illustrative for the fact that the possibility of the pathways being complementary to one another is neglected. This polarisation *could* thus be seen as a form of anticipatory steering, where the framing of adaption options in the form of vertices influences the present discourse by limiting the perceived range of adaptation options. One could therefore conclude that even though the solutions presented in the KP ZSS *do* incorporate a wide range of perspectives, the way in which the adaptive pathways are presented as 'mutually exclusive' *could* be a form of anticipatory steering.

8.2.3 Planned Retreat – Anticipatory Ruination or Transformative Adaptation?

By bringing together anticipatory governance and the climate mobilities scholarship into the conceptual lens 'Anticipating Climate Mobilities', critical questions can be posed to challenge planned retreat as a potential adaptation strategy to sea level rise. One concept that combines these theories is 'anticipatory ruination', put forward by Paprocki (2018), who refers to the case of shrimp cultivation in Bangladesh. Anticipatory ruination offers a critical lens through which the current

decision-making processes around planned retreat can be looked at. It refers to the unintended consequences of making a premature decision about the future that ultimately ruins more than it solves, such as in the coastal area of Bangladesh. Planned retreat *could* be an example of this, according to some, because it risks increasing inequalities, exacerbating injustices, and causing economic losses.

However, the 'Anticipating Climate Mobilities' lens also makes it possible for planned retreat to function as a transformative adaptation strategy. The conceptual lens allows for critical questions to address underlying tensions, unequal power relations, potential inequalities and injustices, and the possibility of human *and* non-human (im)mobilities. Provided these underlying issues are dealt with, acknowledged, or addressed, some see planned retreat as potential transformative strategy, that works towards the broader sustainability agenda (Fedele et al., 2019; Siders et al., 2021). The transformative potential of this strategy, so this literature suggests, lies in its ability to balance both social *and* ecological systems, while acknowledging differences in socio-cultural contexts.

As the empirical analysis of the first section in this chapter shows, the perspectives of interviewees on planned retreat in the Netherlands reflect these theoretical tensions of viewing planned retreat as 'anticipatory ruination' or 'transformative strategy'. The perspectives of the interviewees on planned retreat in the Netherlands can be divided into experts who are opposed to or in favour of planned retreat. The first group mainly expressed concerns, referring to planned retreat as 'giving up', and warning for gigantic socio-economic and cultural losses and societal resistance, whereas the latter group of experts saw opportunities to address the sustainability agenda through the realisation of planned retreat.

The approach taken by the Delta Committee at first sight seems to be an appropriate way to address the risk of 'anticipatory ruination'. Through the use of adaptation pathways, the government can take proactive measures, while maintaining flexibility to keep options open, and investing in low-regret, in-between steps. This approach allows for a careful assessment of the appropriate course of action in response to climate impacts, while preventing premature measures or lock-ins (Van Alphen et al., 2022). Certain 'turning points' are set when a threshold is surpassed. These thresholds are based on a combination of 'climate impacts' and 'what is acceptable to society', and in turn trigger a course of action (Werners et al., 2013). Aside from the fact that it would be interesting to explore how dissatisfaction within society towards perceived 'inadequate' policies is measured, the adaptation pathway approach also raises other questions.

While this approach aims to avoid premature measures being implemented, it also combines the government's proactive attitude with a rather reactive stance in terms of climate actions. According to some interviewed experts, a process such as planned retreat requires a lot of time and preparation, especially if its transformative potential is to be realised.[9;14] Measures to prepare for planned retreat, such as investments in the Eastern part of the Netherlands and meaningfully engaging affected communities in the process, are quite significant. The low-regret approach of the adaptation pathway framework could therefore potentially delay the actions needed in the present to at least ensure the *possibility* of realising planned retreat in the future, should it become necessary at one point. One could argue that focussing *too much* on preventing anticipatory ruination may hinder the

opportunity to implement a transformative form of planned retreat, particularly if there no sufficient time and resources are dedicated to preparatory measures of planned retreat. It is thus important to find a balance between avoiding anticipatory ruination and aiming for a transformative adaptation strategy.

Lastly, the conceptual 'Anticipating Climate Mobilities' lens also poses other questions that challenge the underlying assumptions of planned retreat, particularly questions related to justice and power dynamics. Some experts also pointed out that these are important issues to address in implementing a strategy like planned retreat:

> It's often a top-down idea, like: This is just not a good place, how do we get people out? And then we get an issue of environmental justice, […] about, what is fair? What can you ask of people?
>
> - Jeroen Warner
> *Wageningen University (Disaster Studies)*

This reflection underscores that planned retreat is more than an adaptation strategy that can be implemented to address sea level rise. It implies a political and socio-cultural process, which is why the critical questions that emerge from the conceptual lens 'Anticipating Climate Mobilities' are valuable questions to further analyse this strategy. Posing the questions put forward by this conceptual lens can reveal existing power dynamics, contested meanings of habitability, and social justice concerns embedded in decisions about who moves, who stays, and why. This perspective furthermore allows for balancing 'avoiding anticipatory ruination' with 'realising planned retreat's transformative potential'. However, as also pointed out by several experts, doing so might require a transformation in society's way of thinking, as (some forms of) planned retreat require to move away from the status quo towards system change.

8.3 Recommendations for Future Research

This thesis has mainly focused on the potential and contestations of planned retreat as seen by experts in the field, and how they envision or reject this strategy in the future of the Netherlands. There are several ways to build onto this research, either to gain a better understanding of planned retreat in the Netherlands, or to compare planned retreat with other adaptation options to sea level rise.

For future research on this strategy, it would be useful to gain more insights into the perceived risks of the communities living in high-risk coastal areas of the western part of the Netherlands. Understanding how these residents perceive planned retreat, as well as what they feel towards this solution direction, would be valuable information to further assess the adequacy of a retreat strategy. This research could shed a light on what people deem acceptable to live in, what people are willing to do, and what their needs are in case the risks are progressing. This would for example lead to a better understanding of what potentially affected people consider to be 'habitable'. These findings could in turn be analysed with the conceptual lens 'Anticipating Climate Mobilities' outlined in this thesis. It could give more insights into the needs of communities that are facing the prospect of

accelerating sea level rise, and these insights can in turn be used to tailor the desirable adaptation strategy better to the specific context in which it is implemented.

Another recommendation for future research would be to integrate other climate effects into the exploratory scenarios of planned retreat. Evaluating how planned retreat – or the 'move along'-pathway as a whole – could be implemented not only as an adaptation strategy to sea level rise but also in response to other climate effects, e.g. river flooding, droughts, or extreme precipitation, may offer valuable insights into designing more comprehensive approaches to planned retreat. Moreover, integrating a broader set of climate impacts in the scenarios could also demonstrate the limitations and obstacles of planned retreat as an adaptation strategy when used to tackle climate issues other than sea level rise. Further research in this regard is helpful in looking into the possibilities of (re)designing planned retreat in a way that it either tackles multiple climate change effects, or avoids creating additional harmful effects.

A third recommendation for future research would be to further examine the other presented adaptive pathways presented in the KP ZSS that anticipate to sea level rise. Research in this regard could be useful for decision-makers to better compare the different solution directions in their trade-offs, outcomes, and long-term implications. This could be done through the development of exploratory scenarios for each identified solution direction. These exploratory scenarios could demonstrate what preparatory steps are needed per strategy of the KP ZSS, which measures should be implemented to enhance their success, and how robust each strategy is. Lastly, they could also assist in examining the ways in which the different adaptive pathways are potentially complementary to each other. Considering the fact that experts pointed out the polarising nature of the way in which the solution directions are presented as vertices by the KP ZSS, this would allow the KP ZSS to present the different strategies as an integrated approach to address sea level rise more holistically.

9. Conclusion and Recommendations

The overall objective of this thesis was to explore the potential and contestations of 'planned retreat' as part of the 'move along' pathway described in the Delta Committee's Knowledge Programme Sea Level Rise (KP ZSS). 'Move along' is one of the three presented directions to address accelerating sea level rise in front of the Dutch coast, which includes planned retreat. Planned retreat has been defined in this thesis as a combination of 'moving to higher grounds', 'giving room to nature' and 'living with water'. This thesis has aimed to answer the following research question*: What does planned retreat in the Western coastal region of the Netherlands look like under the different exploratory scenarios and what are the advantages and disadvantages of planned retreat in each of the scenarios?*

9.1 Key Conclusions

The main research question has been addressed by identifying theories to make sense of planned retreat, exploring the history of Dutch water management and governance to gain a better understanding of the context, examining the different perspectives and understandings of planned retreat, determining the socio-economic drivers of change that shape the future of planned retreat, and in turn, examining the practical implications of how planned retreat develops in each of the four exploratory scenarios under the main drivers of change.

What theories and concepts can be used to make sense of planned retreat?

'Planned retreat' is increasingly considered as a potential adaptation strategy to address sea level rise. Whereas some experts in the field focus on the contestations of planned retreat, illustrated by examples in which retreat strategies were not successful (Niven & Bardsley, 2012; Ajibade & Siders, 2021; Wiegel et al., 2021), others view planned retreat as a potential transformative strategy that can positively alter both social and ecological systems (Fedele et al., 2019; Siders et al., 2021). The strategy itself combines an anticipatory element, i.e. 'planned', and an element that indicates a climate change-related movement, i.e. 'retreat'. Hence, by combining the lenses of anticipatory governance and climate change-related human and non-human mobilities, planned retreat can be critically analysed. Particularly the conceptual lens 'Anticipating Climate Mobilities', which poses questions to challenge the underlying assumptions of planned retreat, is useful in analysing this adaptation strategy.

What have been key developments in shaping the Dutch approach towards water management over time?

As a result of the longstanding history of water management in the Netherlands, the Dutch have developed an innovative approach in coping with water. Starting from a mostly technocratic and engineering approach, the Dutch have gradually moved towards a strategy that integrates multiple perspectives, which includes 'building with nature'. An example of this relatively new approach to water management is the Room for the River-project, which has gained international prestige.

Siders et al. (2021) refer to this project as an example of a transformative form of planned retreat that contributes positively to both people and nature. The literature shows that success stories within this large-scale project included a participatory process in which the affected communities were able to express their concerns and ideas.

Aside from this dynamic approach, another unique aspect of Dutch water management is the use of adaptive pathways. This approach, adopted by the Delta Committee, allows for long-term thinking, embracing uncertainties, and exploring multiple possibilities, while maintaining flexibility and investing in low-regret measures. The solution directions 'Protect', 'Seaward' and 'Move Along' – the pathway that includes planned retreat – presented in the KP ZSS are examples of such adaptive pathways, aimed at addressing sea level rise.

What are the different expert and policy perspectives and understandings of planned retreat in the context of the Netherlands?

With regard to the perceptions of planned retreat, there are noticeable differences in how planned retreat is perceived as strategy by experts and the literature. The interviewed experts can be broadly categorised into two groups: The first group considered planned retreat as 'giving up' land, putting the relocations of humans and giving room to water central in this narrative, whereas the other (smaller) group perceived planned retreat as 'giving back' land, recognising its positive contribution to nature and biodiversity. Within the latter group, some experts saw planned retreat as opportunity to work more holistically towards the sustainability agenda.

Despite being given the same definition at the start of the interview, and despite some experts considering the Room for the River-project as an existing example of planned retreat in the Netherlands, the majority of experts does not believe that planned retreat is a realistic solution for the (near) future. However, this view largely depends on the scale on which planned retreat would be implemented. Those who pictured planned retreat as 'giving up the West' were less likely to believe that planned retreat is going to be implemented in the Netherlands. The other group, on the other hand, believed that it could or will eventually be realised in the future, acknowledging that such a process requires a lot of time. In spite of these differences, experts shared consensus that planned retreat should at least be further researched.

What are the socio-economic drivers of change for the development of exploratory scenarios?

In order to determine the drivers of change with regard to planned retreat, this thesis has employed a STEEP-analysis that examined the different uncertainties within the STEEP (Societal, Technological, Economic, Environmental, and Political) categories. This thesis has identified several drivers of change within the categories: Climate Change & Sea Level Rise, Technological Developments, Politics & Governance, Social Developments, Economic System, and Ecological System. Within each category, experts, literature and policy documents pointed out significant drivers of change, i.e., uncertainties, as well as conditions to enhance the success of planned retreat (or prevent its failure).

- Regarding climate change and sea level rise, this thesis found that Antarctica plays an important role; whether the West Antarctic ice sheet breaks off was considered a determining factor for the amount as well as the pace of sea level rise in the coming centuries. Similarly, the extent to which we can enhance climate mitigation efforts is also a significant determining factor for the future.
- Regarding technological developments in hydraulic infrastructure, experts share consensus that one to three metres sea level rise is manageable with the current technology, but after that opinions differ on the technological possibilities. Whereas some believe the technological opportunities to be endless, others argue that at some point it is no longer viable to protect the land with the current system. The latter group mostly questioned the desirability and sustainability of continuing to build higher and broader dikes.
- Regarding politics and governance, experts mostly discussed responsibilities of the national government, pointing out conditions to support the implementation of planned retreat or to prevent its failure. These conditions are discussed under 'Recommendations for Policy-Makers'. Experts differed on whether the government should take on a leading role, making proactive decisions, or rather a following role, moving along with society's wishes.
- With regard to societal developments, experts expect social resistance to every form of planned retreat, but do believe that this resistance can be managed. The factors mentioned in this regard were also mostly conditions to enhance planned retreat, discussed later. This section furthermore delved into the role of communication in shaping society's perceptions of planned retreat. Whereas one expert group believed that active and/or extreme communication can create awareness, the other group warned for potential panic reactions.
- Regarding economic developments, the several costs and benefits were debated. Experts seemed to be certain that planned retreat will be very costly, but some experts argued that not doing it might eventually be more costly. This perspective was not shared by water managers, who argued that technological solutions will be less expensive. In terms of benefits, experts mainly discussed 'prevented costs', i.e., prevented damages from floods. Another – non-monetary – benefit that was mentioned in relation to planned retreat was the restoration and preservation of coastal ecosystems and biodiversity.
- With regard to the ecological system, several risks and benefits of planned retreat were identified. Whereas some believe that ecosystems can flourish as a result of planned retreat, others fear that 'giving room to water' will lead to increased pollution from the soils that will be flooded. Another risk that was mentioned was the potential increased pressure on ecosystems in the East due to a large movement of people Eastwards. Some argued that planned retreat could support ecosystems, e.g. by allowing for a natural delta.

The main drivers of change that were identified based on the interviews and the workshop, were the 'commitment of the government', divided over future orientations 'mitigation' versus 'adaptation', and the 'governance approach in policy-decisions', divided over future orientations 'maintain' and 'look ahead'. The micro-drivers of change within the scenarios are presented in Table 3 and Figure 20, Chapter 6. The micro-drivers are mostly dependent on one of the main drivers of change, and interconnected with other micro-drivers.

What is the influence of the identified exploratory scenarios on the practical outcomes of planned retreat in the Netherlands?

The scenario framework that followed illustrated four combinations of the future orientations of the main drivers of change, resulting in the following storylines: Steady Shores, Room for the North Sea, Sandcastle Strategy, and Retreat Ready. These scenario storylines describe how planned retreat develops differently, based on the future orientations of the different drivers of change. In scenarios that take a more reactive governance approach in which the government focuses on maintaining the system, the retreat process tends to be limited, 'last resort' with a relatively short-term process. Retreat of people in these scenarios mainly occurs in response to a lack of space for technological innovations. In the scenarios with a proactive governance approach focusing on looking ahead, on the other hand, the retreat processes are medium-scale, with more emphasis on 'giving room to nature'. The scenarios in which the government makes mostly efforts to adapt, 'moving to higher grounds' is typically combined with a 'living with water' component, whereas the mitigation scenarios focus more on a combination of 'moving to higher grounds' and 'giving room to nature' (or technology). The latter also included an aspect of 'building with nature'. One of the main take-aways from the scenarios, is that each scenario presents with its own set of challenges and opportunities. This means that in some scenarios it is more difficult to implement certain identified conditions to enhance planned retreat than it is in others. It shows for instance that it is more likely to create social injustices and inequalities if the private sector takes the lead rather than the government. Another important factor is whether a part of Antarctica breaks off or not. This is a high uncertainty that seems to be determining for the 'prevented costs' (and thus the benefits) as well as the cost of each scenario.

Overall Conclusion

To answer the main research question of this thesis project, based on insights from the literature, policy documents, expert interviews and interactive workshop, the following overall conclusions can be made:

Considering the findings of this thesis, it could be argued that there is a need to move away from the extreme narratives that surround the notion of planned retreat as an adaptation strategy, and to bring more nuance to the debate. In this thesis, planned retreat develops differently in each scenario, largely depending on whether the government commits to adapt or to mitigate, and whether the chosen governance approach is to maintain the system in place or to look ahead. In spite of what some of the experts feared, none of the storylines that emerged from the scenarios demonstrate a large-scale form of planned retreat that requires 'millions of people to move Eastward'.

Each storyline presents with its own set of advantages and disadvantages, revealing complexities and trade-offs unique to each scenario of planned retreat in the Netherlands until 2100. Scenarios like Retreat Ready and Room for the North Sea emphasise a leading, proactive role of the government focusing on looking ahead and sustainable investments, but these approaches demand substantial costs on the short term and risk short-term resistance. Steady Shores and Sandcastle Strategy, on the other hand, result into short-term economic benefits and lower societal resistance,

but risks long-term resistance, higher costs and socio-economic inequalities of the private sector takes the lead. Retreat Ready and Room for the North Sea balance the needs of both ecological as well as social systems, but require immense political, social, and economic effort upfront. Hence, if climate change impacts remain limited, people might wonder if these efforts and investments are justified. However, if climate change does exacerbate further, the Steady Shores and Sandcastle Strategy scenarios risk implementing a lack of sufficient measures to tackle the consequences of sea level rise. In that regard one could argue that the 'maintain' scenarios generally employ a form of planned retreat within the existing system, whereas planned retreat in the 'look ahead' scenarios is more transformative in nature. The role of Antarctica pivotal in determining the costs and benefits of each scenario. Anticipating future developments to some extent is thus important to ensure that the Netherlands is adequately prepared once more certainty about climate scenarios is available.

This thesis found furthermore that unlike in other countries where retreat is seen as either an individual responsibility, or is driven by private incentives, the Dutch approach is government-led. This also means that ideas about 'habitability', which is currently a fixed notion determined by law, needs to transform to be able to implement the 'living with water'-component of planned retreat. These factors make the Netherlands a distinctive case in the climate mobilities discourse.

Even though this thesis presents four scenarios in which planned retreat seems to inevitably occur, it does not argue that planned retreat is the only possible solution to sea level rise. It merely aims to demonstrate in what ways it could be employed *if* it were ever chosen as desirable solution. More importantly, it aims to examine what could be taken into account to enhance the success of this strategy. Acknowledging and embracing existing power dynamics, differences in risk perception, and other context-specific tensions – rather than attempting to overcome or neglect them – plays a key role in this regard.

9.2 Recommendations for Policy-Makers

The outcomes of this research present valuable insights for both experts in the field of water management, as well as policy-makers involved in decision-making processes regarding planned retreat and sea level rise. The first part of this thesis sets out the different theories that can be used to analyse planned retreat, and explores the perspectives and understandings that experts have of planned retreat in the context of the Netherlands. This part is therefore useful in establishing a better understanding of the planned retreat as an adaptation strategy, as well as the contestations around it. By acknowledging and the existence of these complexities and contestations, decision-makers can prepare themselves better *if* a form planned retreat were ever to be realised in the Netherlands.

The second part of this thesis presents exploratory scenarios of planned retreat as potential solution to sea level rise in the Western coastal region of the Netherlands. The storylines describe in what ways planned retreat *could* develop under different circumstances. They aim to stimulate decision-makers into imaging different plausible futures, which in turn enhances decision-making processes confronted with deep uncertainties. The scenarios present storylines that consist of unique challenges and opportunities, and can help decision-makers to move into the desirable direction.

Conditions for Implementing Planned Retreat

As previously mentioned, the interviews and literature presented some conditions that could be helpful in enhancing the decision-making and implementation process of planned retreat. These conditions translate quite literally to policy recommendations for the preparation and implementation of planned retreat, if this strategy were to be chosen.

These conditions, presented in Table 4, included offering a perspective or financial support, providing clear and timely information to citizens, ensuring a participatory, inclusive decision-making process, and guaranteeing the safety of citizens. Some experts also opted for the stimulation of a voluntary movement Eastwards, by investing in job opportunities, infrastructure and housing in the East, though most experts also emphasised that this should not lead to disinvestments in the West. Experts furthermore warned for potential inequalities and injustices that could result from planned retreat, if there is no solid plan from the government to ensure that everyone in an affected region has the (financial) means to relocate, if need be.

Another condition to enhance planned retreat is a communication strategy that creates awareness and reduces societal resistance, but prevents panic reactions that cause mass movements to the East. The latter would risk devaluation of the Western part of the Netherlands. According to experts, the media also play a role here, by not only covering the extreme scenarios, but bringing more nuance into the debate. Overall, experts agreed that there is a general lack of nuanced discussion about this planned retreat. Stimulating such a societal debate has the potential to reduce both the sensitivity of the topic, as well as the resistance towards planned retreat on the long term.

Lastly, literature and experts both pointed out that some of the underlying tensions – also presented by the conceptual lens 'Anticipating Climate Mobilities' – as well as the uncertainties with regard to the future, are inevitable. Instead of trying to overcome or eliminate these tensions and uncertainties, the findings of this thesis suggest, similar to the argument made by Gini et al. (2024), that there is a need to embrace them. By acknowledging and accepting the existence of these tensions and uncertainties, allowing the possibility for mobility and immobility, and by ensuring a participatory, inclusive, and iterative process, it could become possible to cooperate towards a sustainable form of climate adaptation that suits the particular context of this thesis – the Western coastal region of the Netherlands – best.

All in all, moving forward, policy-makers can build on both the findings of this thesis project, as well as the lessons learned from past successes and failures, for example within the Room for the River-project. This thesis argues that embracing and acknowledging the tensions that underlie planned retreat, which includes taking the context-specific factors into account, could in theory enable decision-makers to work towards a sustainable form of planned retreat. Without arguing that planned retreat *should* be implemented, this thesis outlines factors and critical questions that can enhance and challenge a planned retreat strategy in the Western coastal region of the Netherlands. Furthermore, this thesis explains the importance of continuing to assess uncertainties with high impacts on the one hand, such as the developments in Antarctica, but also embracing these inevitable uncertainties on the other hand. This allows decision-makers to avoid *anticipatory ruination*, while still leaving room to realise *transformative climate adaptation*.

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Appendix I. Interview Guide – Topic List

Kritische factor	Operationalisatie	Vragen
Introductie		Voor het interview eerst een korte introductie van de interviewer en de interviewee, over de thesis en over gepland terugtrekken (als drievoudige oplossing: verhuizen, ruimte voor de natuur leven met water). Eventueel de term ‘meebewegen’ gebruiken.
Algemeen		Wat vindt u van de term ‘gepland terugtrekken’?
		Wat vindt u van de oplossing ‘gepland terugtrekken’?
		Denkt u dat ‘gepland terugtrekken’ op een gegeven moment nodig zal zijn in Nederland? Waarom wel/niet?
		Wat voor gevoel roept ‘gepland terugtrekken’ bij u op?
Sociaal	Verantwoordelijkheid	Wie zou volgens u het voortouw moeten nemen in het vormgeven van ‘gepland terugtrekken’?
		Wie is/zijn er uiteindelijk verantwoordelijk voor het proces van ‘gepland terugtrekken?
	Participatie	Wie moeten er volgens u betrokken worden in het vormgeven van ‘gepland terugtrekken’?
		Wie moeten er volgens u betrokken worden in de implementatie van ‘gepland terugtrekken’?
		Waarom is het belangrijk dat juist die groepen worden betrokken?
		Wat voor reacties verwacht u als deze groepen niet allemaal worden betrokken bij de vormgeving of implementatie?
	Organisatie	Hoe zou de organisatie van ‘gepland terugtrekken’ er idealiter uit moeten zien?
	Impacts	Wat voor reacties verwacht u van de gemeenschappen in de westerse kustregio die uiteindelijk gepland zullen terugtrekken?
		Wat voor andere impact heeft ‘gepland terugtrekken’ op deze zogenaamde ‘vertrekkende gemeenschappen’?
		Wat voor reacties verwacht u van de gemeenschappen die mensen uit de westerse kustregio ontvangen vanwege het ‘gepland terugtrekken’?
		Wat voor andere impact heeft ‘gepland terugtrekken’ op deze zogenaamde ontvangende gemeenschappen?
Ecologisch	Kansen	Op wat voor manier kan ‘gepland terugtrekken’ bijdragen aan natuurherstel aan de kust?
		Wat voor andere kansen voor de natuur biedt ‘gepland terugtrekken’ volgens u?
	Risico’s	Wat zijn de risico’s voor de natuur die ‘gepland terugtrekken’ met zich meebrengt?
		Wat voor impact heeft het op de natuur in Nederland waar mensen naartoe trekken?
		Denkt u dat de kansen die ‘gepland terugtrekken’ biedt voor de natuur opwegen tegen de risico’s?

Politiek/Beleid	Besluitvorming	Op wat voor niveau moet de besluitvorming over ‘gepland terugtrekken’ plaatsvinden? Wie zouden er volgens u allemaal betrokken moeten zijn in de besluitvorming omtrent ‘gepland terugtrekken’? Wie heeft er volgens u het meeste zeggenschap over ‘gepland terugtrekken’?
	Vormgeving	Waar moet er specifiek rekening mee worden gehouden in de vormgeving van ‘gepland terugtrekken’? Wat voor obstakels verwacht u tijdens de vormgeving van ‘gepland terugtrekken’?
	Implementatie	Waar moet specifiek rekening mee worden gehouden in de implementatie van ‘gepland terugtrekken’? Wat voor obstakels verwacht u tijdens de implementatie van ‘gepland terugtrekken’?
Economie	Kosten	Wat voor korte termijn kosten verwacht u van ‘gepland terugtrekken’? En wat voor lange termijn kosten verwacht u van deze oplossing?
	Baten	Wat denkt u dat de korte termijn baten zijn van ‘gepland terugtrekken’? En wat voor lange termijn baten verwacht u van deze oplossing? Wegen deze eerder genoemde kosten en baten tegen elkaar op, op zowel de korte als de lange termijn?
Technologisch	Mogelijkheden	Wat ligt er nog binnen de technische mogelijkheden van kustbescherming met de huidige voorspellingen over zeespiegelstijging? Wat voor andere technische mogelijkheden ziet u om ‘gepland terugtrekken’ uit te stellen of te voorkomen? Is het volgens u wenselijk om dat te doen?
	Kansen	Wat voor technologische kansen voor de bescherming van de westerse kustregio tegen zeespiegelstijging verwacht u in de nabije toekomst?
	Limieten	Waar liggen de grenzen van de technische infrastructuur ter bescherming tegen zeespiegelstijging? Kijkend naar de technologische grenzen aan kustbescherming, op wat voor termijn zou ‘gepland terugtrekken’ in uw mening plaats moeten vinden, als dat al het geval is?
Afsltuiting		Zijn er nog andere dingen die u kwijt wil over ‘gepland terugtrekken’, of klimaatadaptatie in het algemeen?

Appendix II. Informed Consent Form

Verklaring van geïnformeerde toestemming

Onderzoekstitel: A 'Plan B' to Accelerating North Sea Levels: *Exploring the Potential and Robustness of Planned Retreat*
Naam onderzoeker: Isa van Malenstein
Namen begeleiders: Ingrid Boas en Astrid Hendriksen

Beschrijving van het onderzoek
U bent gevraagd deel te nemen aan een onderzoek. Dit onderzoek gaat over de oplossing 'gepland terugtrekken' in de Nederland.

U bent gevraagd deel te nemen aan een interview. Het zal ongeveer 45-60 minuten duren. Lees dit formulier en stel gerust vragen voor het ondertekenen van dit formulier.

Risico's en voordelen van het deelnemen aan dit onderzoek
Deze studie vormt weinig risico voor u. U kunt op elk moment stoppen met deelname en het beantwoorden van de vragen. Er zijn voor u geen directe voordelen verbonden aan deelname aan het onderzoek. Uw input zal belangrijk zijn voor onderzoeksprojecten en publicaties door de kennis van 'gepland terugtrekken' als potentiële oplossing tegen zeespiegelstijging te verbeteren. In principe is dit interview niet anoniem, tenzij anders aangegeven. Voor directe citaten wordt nog een keer om uw toestemming gevraagd. De informatie uit dit project wordt gedeeld met de Wageningen Universiteit.

Vertrouwelijkheid
• De gegevens uit dit onderzoek kunnen worden gebruikt in onderwijs, studentenprojecten en gepubliceerd in wetenschappelijke tijdschriftartikelen, maar u wordt niet persoonlijk geïdentificeerd zonder uw toestemming.
• Van dit interview wordt een audio of video opname gemaakt. Deze worden alleen gebruikt ter ondersteuning van het onderzoek en worden niet met anderen gedeeld. Er zijn geen foto's gemaakt.

Vrijwillige aard van de studie
Ik dank u hartelijk voor uw deelname. Uw beslissing om deel te nemen is volledig vrijwillig. U kunt ervoor kiezen om geen antwoord te geven op elk deel van het interview, of om op elk moment te stoppen met deelname, zonder enige consequenties voor u.

Recht op vernietiging
Ik begrijp dat ik het recht heb om de bovengenoemde informatie op mijn verzoek te laten vernietigen, zowel tijdens het onderzoek als tijdens opslag, in overeenstemming met het recht op verwijdering van de AVG. ☐

Contact en vragen
Voor vragen of opmerkingen kunt u contact opnemen met Isa van Malenstein, isa.vanmalenstein@wur.nl. Voor aanvullende vragen over uw rechten als onderzoeksdeelnemer kunt u contact opnemen met de Commissie Wetenschappelijke Integriteit Wageningen University en Research via cwi@wur.nl .

_____ Ja, ik geef mijn toestemming om deel te nemen aan dit onderzoek

_____ Nee, ik geef geen toestemming om deel te nemen aan dit onderzoek

Naam:

_____

Datum:

_____

Handtekening:

_____

Toestemming Opname
Er is mij verteld dat er tijdens mijn deelname audio- en video-opnamen kunnen worden gemaakt, maar dat deze opnamen in geen enkel formaat voor publicatie bestemd zijn. Ik heb vernomen dat ik op elk moment kan vragen de opname uit te schakelen.

Ik ga ermee akkoord audio/video opgenomen te zijn onder de hierboven vermelde voorwaarden.
____ Ja

____ Nee

Handtekening

_____

In te vullen door de onderzoeker die toestemming registreert:

Datum:

Handtekening:

_____