

(Un-)just climate adaptation? Climate justice in adaptation strategies in the Rijnmond-Drechtsteden Region



M.Sc. Thesis by Inge van Beek

Supervisor Chair Group Policy: M.Sc. PhD-candidate Richard Pompoes and Dr. Wieke Pot
Administrative supervisor Chair Group WSG: M.Sc. Keith Williams

Master Urban Environmental Management
Chair Group Water Systems and Global Change

Wageningen University and Research
31 May 2024

Colophon

(Un-)just climate adaptation? Climate justice in adaptation strategies in the Rijnmond-Drechtsteden Region

Master's thesis

Master Urban Environmental Management

Chair Group Water Systems and Global Change

Second Chair Group Policy

Wageningen University and Research

31 May 2024

Around 22.500 words

Author: Inge van Beek (1058226)

Supervisor Chair Group Policy: M.Sc. PhD-candidate Richard Pompoes and Dr. Wieke Pot

Administrative supervisor Chair Group WSG: M.Sc. Keith Williams

Figure front page: (Snazzy Maps, n.d.; adjusted by the Author)

Acknowledgments

I would like to acknowledge my supervisors Richard Pompoes, Wieke Pot, and Keith Williams for their valuable time, inspiring feedback, and discussions about the content of the thesis. I am grateful for all the things I have learned during my thesis. Furthermore, I would want to thank my fellow students whom I have sparred with during my thesis. I was amazed by the openness and willingness of the policy actors who were interviewed and would like to thank them for cooperating in this study. Lastly, I would like to thank my friends and family for their support over the last few months.

Abstract

Climate justice has gained increased attention in the last decades and studies revealed that the unequal distribution of adaptation efforts and influence worsen its impact on vulnerable populations. Currently, studies incorporating the four forms of justice; recognitional justice, distributive justice, procedural justice, and restorative justice, to adaptation policies are under-researched, especially at different government scales. This study is an initial exploration of the current relationships between climate justice considerations for adaptive strategies in the Rijnmond-Drechtsteden region. Eleven adaptation strategies were analyzed using the Adaptation Justice Index and considerations were gathered by conducting semi-structured interviews with thirteen policy actors involved in the development of the strategy. The results reviewed that there is an overall lack of climate justice integration in the analyzed strategies, except for strategies that explicitly mention climate justice. Procedural justice had a relatively high integration and restorative justice had a relatively low integration. There were relatively high differences within the same levels of government identified. Policy actors mentioned the lack of capacity and prioritized raising awareness for climate adaptation rather than focusing on climate justice. Those recognizing climate justice urgency attribute it to adaptation experiences, new insights, and capacity. Lower municipal levels struggle with social domain integration, impacting climate justice integration. Additionally, knowledge gaps about climate justice were identified, such as the diversity of vulnerable populations, and interviewees mentioned a lack of sufficient monitoring which may influence implementation and can lead to overlooking inequalities. The discussion and conclusion highlight climate justice is needed to ensure a livable environment for all citizens. The understanding and urgency of climate justice may be increased by education. Exploring responsibility, integration of policy domains, and implementation across the policy cycle can help with climate justice integration.

Keywords: adaptation strategy, climate justice, recognitional justice, procedural justice, distributive justice, restorative justice, Adaptation Justice Index

Table of Contents

Colophon	I
Acknowledgments	I
Abstract	II
1. Introduction	1
1.1. Climate justice is a pressing societal issue	1
1.2. Academic relevance	2
1.3. Problem statement and research question.....	2
2. Concepts & Theory	3
2.1. Climate adaptation & spatial adaptation.....	3
2.2. Levels of government.....	3
2.3. Climate justice	3
2.4. Specific research questions.....	5
3. Research design	6
3.1. Case study selection.....	6
3.2. Document selection	6
3.3. Study design	7
3.3.1. Phase 1 – Background study	8
3.3.2. Phase 2 – Adaptation Justice Index and content analysis	8
3.3.3. Phase 3 – Semi-structured interviews and thematic analysis.....	11
3.3.4. Limitation and weaknesses methods.....	12
4. Background information	13
4.1. Biophysical characteristics Rijnmond-Drechtsteden.....	13
4.2. Governance background	13
4.2.1. National climate adaptation laws and policies	13
4.2.2. From National policy to provincial and local government policy levels.....	15
4.2.3. Responsibility and tasks public authorities.....	16
4.3. Information analyzed strategies.....	17
5. Adaptation Justice Index applied to climate adaptation strategies	20
5.1. Integration of the four forms of justice	20
5.2. Scores of the strategies	21
5.2.1. Documents that scored relatively low	21
5.2.2. Document that scored relatively average	23
5.2.3. Documents that scored relatively high	26
5.3. Outcome specific indicators.....	28
5.4. Concluding paragraph of results Adaptation Justice Index	29

6. Perspectives and considerations	31
6.1. Definition of climate justice by interviewees	31
6.2. Drive	33
6.3. Capacities & institutional factors	35
6.4. The complexity of climate adaptation and climate justice	37
6.5. Concluding paragraph of results interviews.....	38
7. Discussion	40
7.1. Aspects concerning the integration of climate justice in climate adaptation	41
7.1.1. Who –Actors and responsibilities	41
7.1.2. What – Bridging domains and perspectives.....	42
7.1.3. When – Integration in policy process.....	43
7.2. Limitations and further research.....	44
7.3. Recommendations	46
8. Conclusion	48
References.....	I
Appendix I - Notes Adaptation Justice Index	IX
Appendix II – Overview interviewees policy actors	XIV
Appendix III – Interview guide policy actors	XV
Appendix IV – Result Adaptation Justice Index.....	XVI
Appendix V – Use of AI.....	XVII

1. Introduction

Climate change in the Netherlands is related to longer periods of drought and more extreme precipitation (KNMI, 2023). It has negative consequences for the urban environment and residents such as health issues (IPCC, 2022), real estate damage, and infrastructural damage (Delta Commissioner, 2020). To mitigate climate change damage, adaptation efforts can be implemented by governments.

1.1. Climate justice is a pressing societal issue

According to the IPCC, communities that contribute less to climate change are currently disproportionately affected by climate change (IPCC, 2023). Unequal distribution of resources, opportunities, and influence worsens the impact of climate change including climate adaptation on vulnerable populations (Bulkeley, 2010; Chu et al., 2017; Hughes, 2013; Woroniecki et al., 2019), emphasizing the importance of climate justice. There is not one exact formulation of what climate justice entails. Climate justice focuses on fairness and legitimacy in the processes, distribution, and repair of harms of climate change and adaptation efforts, where vulnerable groups that may have unequal representation are recognized (Hughes & Hoffmann, 2020; McCauley & Heffron, 2018; Scholsberg, 2007). Climate justice also can lead to other positive effects, for example, long-term engagement in adaptation efforts (McCauley & Heffron, 2018). Bulkeley et al. (2014) mentioned that lower government scales play an important role because they often make development decisions that can reproduce or challenge already inequalities. This means that policies that focus on development efforts such as adaptation strategies can play a role in just development (Newman et al., 2009).

Assessing adaptation strategies can be useful to see to what extent climate justice forms are integrated into adaptation planning. Adaptation strategies are developed at different policy levels and may have a difference in the integration of climate justice (Juhola et al. 2022), therefore analyzing strategies at different policy levels gives a broader understanding of the integration of climate justice in adaptation strategies. The IPCC (2014) mentioned that local and regional policy levels are crucial levels for climate adaptation because they are closer to the residents, can better work on local inclusivity, which can lead to a deeper understanding of the local and regional context. A strategy that integrates climate justice does not guarantee the same implementation as described in the strategy. However, it can be argued that it increases the likelihood of being integrated into the implementation compared to a strategy that lacks integration of climate justice aspects because strategies serve as a foundation for guiding and influencing the implementation of climate adaptation efforts (Juhola et al. 2022). It is not clear in what way the four climate justice forms, which are recognitional, distributive-, procedural-, and restorative justice (McCauley and Heffron, 2018; Schlosberg, 2007), are incorporated and considered in different climate adaptation policies in the Netherlands. This is important, because when there is no integration of the four climate justice forms it can negatively affect population groups, especially those who are already vulnerable (Bulkeley, 2010; Chu et al., 2017; Hughes, 2013; Woroniecki et al., 2019).

An interesting region in the delta of the Netherlands is the Rijnmond-Drechtsteden because it is vulnerable to the consequences of climate change, relatively dens populated, and has different land uses (Programme Team Rijnmond-Drechtsteden, 2020). What is most interesting considering climate justice is that there is a relatively high dispersion of socioeconomic status between and within the different municipalities (CBS, 2022), which means that there are socially vulnerable communities in this region. However, low socioeconomic status is not the only vulnerable population group, other factors also contribute to the vulnerability of residents that were mentioned by Tagtachian & Balk (2023) are racial and ethnic minorities, renters, older residents, and non-native speakers (Allen et al., 2021; Bjarnadottir et al., 2011; Chakraborty

et al., 2019; Cutter et al., 2012; National Academies of Sciences, Engineering, and Medicine, 2019) and some factors are may yet be discovered.

1.2. Academic relevance

Mohtat & Khirfan, 2021 conducted a literature review of climate justice literature and noted that the published articles mostly focus on one spatial scale and that there is unequal attention to the different climate justice forms. The different forms of justice that they looked at were recognitional-, distributional-, and procedural justice. But more recently restorative justice has also been recognized as a climate justice form (McCauley and Heffron, 2018). A study was published in 2007 concerning distributional justice in the Rijnmond-Drechtsteden region but it did not specifically focus on climate adaptation for the four different forms of climate justice (Kruize et al., 2007). Aside from this, there is limited knowledge about the connection between justice considerations and climate adaptation strategies (Juhola et al., 2022; Mohtat & Khirfan, 2021). By identifying the considerations and integration of the four climate justice forms the current situation around climate justice in climate adaptation strategies in the Rijnmond-Drechtsteden region can be understood better.

1.3. Problem statement and research question

The urgent issue of climate justice and its implementation and consideration in climate adaptation strategies are currently not known in the Rijnmond-Drechtsteden region in the Netherlands. This study is an initial exploration of the existing connections between climate justice integration and adaptive strategies in the Rijnmond-Drechtsteden region and, therefore, strategies at the national, provincial, regional, and local government levels are incorporated within this study. The local municipalities chosen differ in scale, population size, population density, socioeconomic index, resident age, and migration background, to get a broader insight in possible considerations for climate justice integration. This study aims to contribute to the scientific body of connecting climate adaptation strategies to climate justice. Secondly, it aims to support policy actors and researchers in identifying climate justice considerations and perceptions within climate adaptation strategies at different policy levels. The general research is as follows:

How do climate adaptation strategies from the national to municipal policy level take climate justice forms in the Rijnmond-Drechtsteden region into consideration?

2. Concepts & Theory

I looked at the considerations of climate justice in climate adaptation strategies at different policy levels in the Rijnmond-Drechtsteden region. Therefore, theory and definitions of climate adaptation & spatial adaptation, levels of government, and climate justice are described in this chapter.

2.1. Climate adaptation & spatial adaptation

Different definitions of climate adaptation are used in the literature. The term is used in different fields such as urban planning, water resource management, and public health (Sietsma et al., 2021). The definition of climate adaptation adopted in this study is the definition of the IPCC “[...] the process of adjustment to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities” (2018: 542). Within this research, the focus will be on spatial adaptation policies. Spatial adaptation is focused on adapting the design of spatial areas to the impacts of climate change (Kennisportaal Klimaatadaptatie, n.d-a). The different risks included within spatial adaptation in the Netherlands are water nuisance, consequences of floods, drought, and heat stress. The consequences of floods are also related to water safety. The whole topic of water safety is often addressed as a separate topic from spatial adaptation and will therefore not be included in this research (Delta Commissaris, 2017).

2.2. Levels of government

The governmental levels relevant to this research are the local, regional, provincial, and national levels and each level has its own climate adaptation strategy in the Netherlands. Actors from different levels of government interact with each other to help formulate policies on different levels of government. Actors on the same level of government can also interact with each other. This is multilevel governance and is visualized in Figure 1 (Hooghe & Marks, 2001). Within this study, the complexity and interrelatedness of the policy actors and policy documents are recognized, however, the assessed adaptation strategies are divided between different levels of government, because local and regional strategies have a unique position when it comes to climate adaptation (IPCC, 2014) and the higher government levels also share patterns and differences which makes it interesting to assess (Juhola et al. 2022).

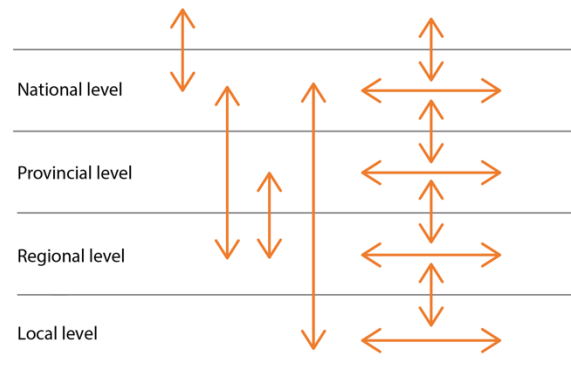


Figure 1 Multilevel governance scope within the scope of the thesis (Author's own)

2.3. Climate justice

Climate justice and environmental justice are based on different subjects such as social justice, participation, accountability, and ecological sustainability. Climate and environmental justice have had an influence on each other; they are similar in the way that they both express the importance of the relationship between climate change and its effect on residents and the environment (Schlosberg & Collins, 2014). Climate justice is largely based on environmental justice forms which include procedural justice and recognitional justice (Schlosberg & Collins, 2014) and distributive justice (Rawls, 1971). The understanding of justice is an evolving process and within the climate justice movement it has developed over the past decades starting with the focus on climate mitigation and climate justice research

incorporated into climate adaptation (Schlosberg & Collins, 2014). Considering the scope of this research, the focus will be on climate adaptation in the context of climate justice.

There are different theories about how different justice aspects and what this entail. A common theory about climate justice is that there should be *procedural justice, distributive justice, and recognition*. This model is called the tripartite model of justice (Schlosberg, 2012). Climate adaptation is considered unjust by Schlosberg (2001) and Fraser (2008) when one of the forms of justice is not considered and integrated. There has been critique on this model because it is missing important justice concepts or simplifying it and therefore does not portray the whole picture of justice in climate change adoption efforts (Cañizares et al., 2023) To overcome this, this research includes *restorative justice*. Which is a relatively new climate justice form that has been recently added to the climate justice debate (McCauley and Heffron, 2018).

Recognitional justice refers to acknowledging that societal system outcomes can affect certain populations unfairly by favoring others, which may lead to unequal representation for certain groups (Hughes and Hoffmann, 2020). There are different definitions of recognitional justice, but within this research, the definition of Meerow et al, (2019) is used. They outline elements for achieving recognitional justice, in their case equity, and include the acknowledgment of diverse identities of populations and communities, acknowledging the historical context and the effect on climate vulnerability, and having respect for different populations and groups. Bulkerey et al. (2014) argue that recognition is a basis or starting point for climate justice.

For *distributive justice*, in the context of climate justice, the concerns lay with a fair distribution of the costs and benefits of climate impacts and the effect of climate adaptation efforts on population groups (Hughes and Hoffmann, 2020). It is also about what perspectives there are about what is considered a fair distribution of costs and benefits, this can be linked to different distribution options (WRR, 2023). For this research, the definition of Chu and Cannon (2021) is used. They define distributive justice when that the distribution of the resources, opportunities, and risks of climate-related hazards are fairly distributed across different communities and populations. But before this even can be argued there has to be an insight into the distribution of costs and benefits across different population groups.

Procedural justice is a concept that focuses on the importance of fairness and legitimacy in the processes where decisions take place (Hughes, 2013; Schlosberg, 2007; Wenta et al., 2019). Schlosberg (2012) argues that people need to have the opportunity to decide for themselves what capabilities they need for climate change adaptation projects and policy. Therefore, it will depend on the norms of its inhabitants when something is considered procedurally just (Schlosberg, 2012). Different aspects that are associated with procedural justice are transparency, accountability, letting people's voices be heard, and openness to different viewpoints (Chu and Cannon, 2021; Wenta et al., 2019). Within this research the adaptation strategy is considered just when there is diverse collaborative participation in different phases of the policy process, there are measures to enable the participation of vulnerable populations, and there are assigned responsibilities to adaptation measures (Juhola et al., 2022).

Restorative justice as a justice form that is new within climate justice, therefore it is also the least developed form of justice in the context of climate adaptation (Juhola et al., 2022). This concept originated in the scientific field of criminal law where the focus is confrontation and questioning of the offender by the victim (McAlinden, 2011; Welton et al., 2015). It focuses on the damage done to a person, instead of just concentrating on punishing the person who caused it (McCauley and Heffron, 2018). Within the adaptation context, the definition has shifted, restorative justice is now part of the conversation about loss and damage (Boyd et al. 2017), which focuses on the loss and damages caused by climate change

(McCauley and Heffron, 2018). Often, people who are socially vulnerable experience a more significant impact from the adverse effects of climate change (Hughes, 2013). Within this research aspects associated with restorative justice are, recognizing the harm caused, acknowledging injustices, identifying those responsible and those affected, and then determining appropriate forms of compensation and ongoing remedies (Robinson and Carlson, 2021). This research is limited to the context of spatial adaptation which does not take the responsibilities of climate change into account. However, adaptation measures themselves can also possibly cause harm and this is therefore also part of restorative justice.

For this research, climate justice in adaptation will be defined as “adaptation planning and implementation, which; 1) recognizes past and current disadvantages in society (recognitional justice), 2) identify the potential unequal way in which climate impacts and costs and benefits of adaptation measures are distributed (distributional justice), 3) is based on inclusive processes throughout planning, implementation, monitoring, and evaluation (procedural justice), 4) restores past inequalities through adaptation (restorative justice)” (Juhola et al., 2022). The reason for this is that it incorporates the four forms of climate justice in the definition.

This conceptualization of justice incorporating the four forms of justice was selected for its nuanced approach, avoiding the oversimplification of climate justice. The four forms of justice are quite well recognized in climate justice, environmental justice, and social justice literature. Furthermore, it is a comprehensive approach because of the use of the four forms of climate justice. Using this conceptual model minimized the risk of overlooking crucial aspects, ensuring a comprehensive understanding of climate justice within climate adaptation strategies.

2.4. Specific research questions

With the help of the theory, sub-questions are developed to answer the general research question: *how do climate adaptation strategies from the national to municipal policy consider climate justice forms in the Rijnmond-Drechtsteden region into consideration?* The sub-questions are described below.

SRQ1: To what extent are justice forms integrated into the climate adaptation strategies at different policy levels in the Rijnmond-Drechtsteden region?

SRQ 2: How do policy actors consider and perceive climate justice forms in climate adaptation strategies in the Rijnmond-Drechtsteden region?

While both questions revolve around justice and policymaking in the Rijnmond-Drechtsteden region, SRQ1 is concerned with the extent of the integration of various justice forms into adoption strategies, whereas SRQ2 focuses on the policy actors' perspectives and considerations of climate justice integration within adaptation strategies. By analyzing the perceptions and considerations of policy actors, we can understand better why policy actors include or consider forms of climate justice and integrate this in the climate adaptation strategies. This means that the second sub-question is explanatory to the answer of the first sub-question.

3. Research design

3.1. Case study selection

The case study for this research is the Rijnmond-Drechtsteden located in a part of the Delta of the Netherlands. Within a national document, called the National Delta programme, this region has a separate adaptation strategy because it is vulnerable to flooding, has a high economic value, and is a densely populated area (Programme Team Rijnmond-Drechtsteden, 2020). The governmental authorities Rijkswaterstaat, the province of South Holland, and municipalities have their spatial adaptation strategy and collaborate in (DPRA) working regions for spatial adaptation facilitated by the Delta Programme, which also has a separate climate adaptation strategy (Kennisportaal Klimaatadaptatie, n.d.-b). The three regional water authorities in this region are involved in the working regions but were not included in this study because they do not have an adaptation strategy for their organization.

This region was selected for its diverse socioeconomic distribution within some local levels as well as within the region (CBS, 2022), indicating the existence of vulnerable and non-vulnerable populations. However, socioeconomic status is not the only indicator for vulnerable populations. Additionally, the presence of a research program focusing on this area enhances the research utilization in this area.

3.2. Document selection

This study focuses on spatial adaptation strategies, referred to as climate adaptation strategies throughout. The National Delta Programme guides climate adaptation strategies in the Netherlands, one of its focus topics is spatial climate adaptation, aiming for climate resilience by 2050 (Delta Commissioner, 2023). This document is not a strategy; however, it is included due to its relevance. Documents like the Delta Programme 2023 and 2018, along with the National Adaptation Strategy 2016 and Implemental Programme NAS 2023, incorporate evolving insights and are therefore included within this research. Spatial adaptation policy can be included in climate adaptation strategies and the Environmental Strategy (Omgevingsvisie) (Kennisportaal Klimaatadaptatie, n.d.-c). The spatial adaptation strategies are good documents to analyze because these policies are more detailed when it comes to climate adaptation than the Environmental Strategy, as referred to in the strategies themselves. Spatial adaptation strategies commonly involve collaboration among governmental organizations across various governmental levels. Most of the time there is a governmental organization who is the initiator as described in Table 1.

Table 1 Overview of strategic spatial adaptation policies at different policy levels (Author's own)

Policy level	Governmental institution	Documents	Publication year
National	Ministry of I&W	National adaptation strategy (NAS)	2016
		Implementation programme NAS	2023
	Staff delta commissioner	Delta Programme 2018 (DPRA)	2018
Provincial	Zuid-Holland	Delta Programme 2024 (DP)	2023
		Weather resilient South-Holland 2020 (RAS)	2019
Regional (DP)	Rijnmond-Drechtsteden	Preference strategy Delta Programme	2020
Working region (DPRA)	Rotterdam	Rijnmond-Drechtsteden	
	Hoekse Waard	Rotterdams weather reply 2030 (Rotterdams Weerwoord 2030)	2023
Municipal	Gouda	Implementation programme climate adaptation	2021
		Adaptation strategy and implementation program	2020

Krimpenerwaard	Climate adaptation strategy municipality Krimpenerwaard	2021
Hardinxveld-Giessendam	Local adaptation strategy 1.0	2022

Three municipal and two working regions' spatial adaptation strategies have been analyzed in this research (Figure 2). The DPRA working regions in this are also municipalities, but this is not always the case for the DPRA working regions. Multiple strategies with differences in the criteria were examined to create a broader view of different contexts and potential considerations for climate justice integration within the Rijnmond-Drechtsteden region. Selected criteria include scale, population size, population density, socioeconomic index, resident age, and migration background (CBS, 2022; CBS, 2023; Centrum Volksgezondheid, Zorg en Maatschappij, 2023).

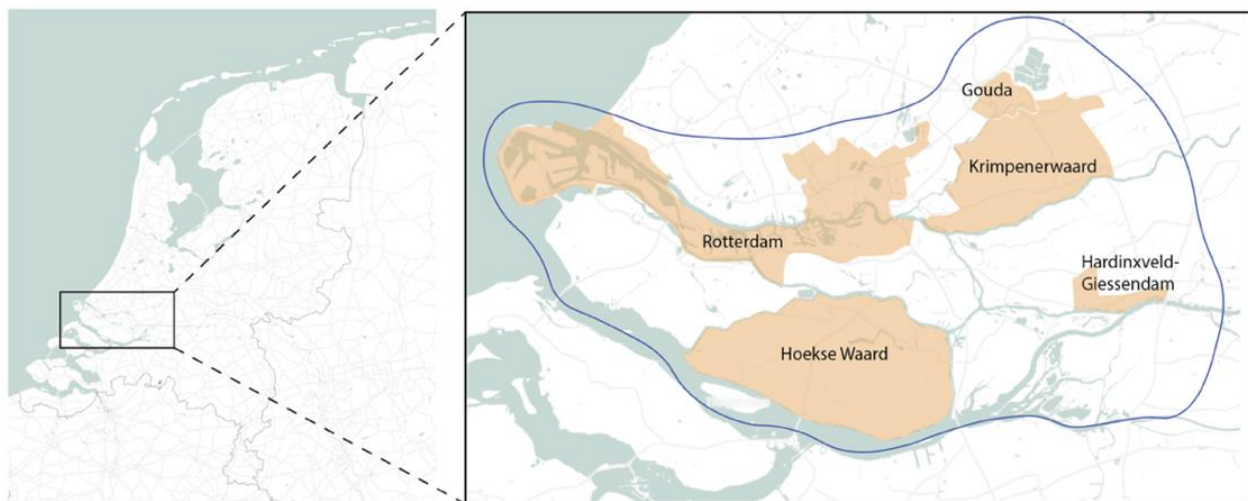


Figure 2 Rijnmond-Region and target local municipalities (Author's own)

3.3. Study design

This research consists of three phases: background study on Rijnmond-Drechtsteden and Dutch policy development, ascribing numerical values for the extent of integration of climate justice in adaptation policies by using the Adaptation Justice Index (phase 2 and SRQ1), and analysis of climate justice considerations of policy actors via semi-structured interviews and inductive coding (phase 3 and SRQ2) as visualized in Figure 3. The research questions are both qualitative.

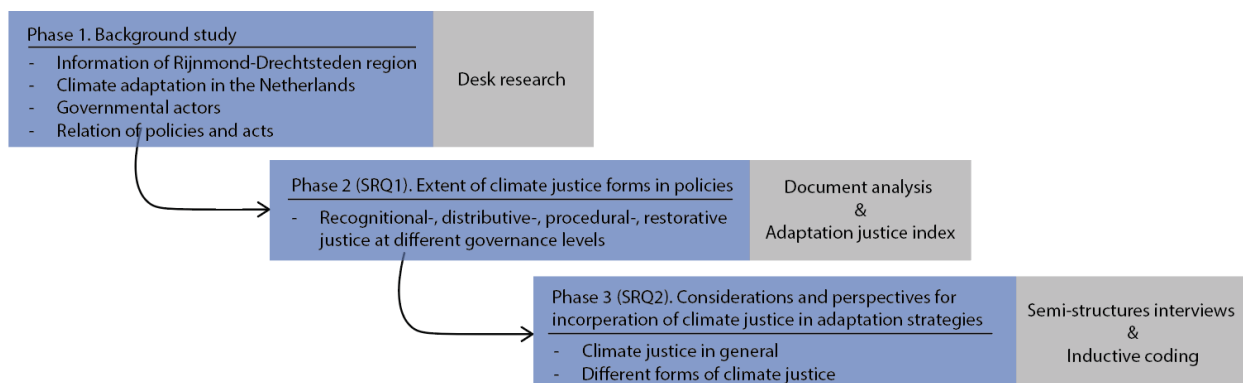


Figure 3 Study design Procedural climate justice in Rijnmond-Drechtsteden region (Astor's own)

3.3.1. Phase 1 – Background study

The desk research was conducted in the first phase of the research, the background study. The type of literature used is grey literature from municipality documents, news articles, and informative websites. This phase includes the subjects; socio-physical background, laws, government organization, involvement of actors, etc.

3.3.2. Phase 2 – Adaptation Justice Index and content analysis

In the second phase, the first sub-research question has been answered: *To what extent are justice forms integrated into the adoption strategies at different policy levels in the Rijnmond-Drechtsteden region?*

This question is answered by doing document analysis, involving the reviewing and evaluation of documents. Document analysis can produce additional data that can be used for formulating interview questions. While it lacks interaction with actors which minimizes a deeper understanding of its context (Bowen, 2003), this approach enables researchers to analyze original materials without external influence which makes it a stable approach that is suitable for repeated reviews (Bowen, 2003; Merriam, 1988).

In this research, the Adaptation Justice Index (AJI) was used to assess spatial adaptation documents. The AJI encompasses the dimensions of recognitional, distributive, procedural, and restorative justice. Each dimension involved specific indicators, informed by climate justice literature. Four different scales are attached ranging from the scale 0 to 3 for each indicator. I will explain how the AJI works by taking the first indicator of recognitional justice form, described in Table 3, as an example. For instance, at the lowest end (0), there is no acknowledgment, and the climate adaptation strategy might only acknowledge the needs of the population in general. A step further (1), might recognize that adaptation needs differ among groups. Another step further (2) involves considering different needs based on expert review and the highest score (3) requires identifying diverse needs possibly by surveys involving various social, economic, and marginalized groups. After I ascribed the scores to the indicators, I divided the scores into the maximum score and made it a percentage. For example $(1+1+0)/9 = 0,22 = 22\%$. It is noteworthy to mention that I have ascribed the scores for the AJI and that is therefore a qualitative, interpretive approach.

Table 3 Indicators for recognitional justice (Juhola et al., 2022)

1. Recognitional justice	
Indicator	Scale and value
1.1. The strategy acknowledges that adaptation needs are different across groups in society	(0) No acknowledgement (1) The strategy states that adaptation needs are different (2) The strategy considers different adaptation needs based on expert review (3) The strategy is built on different groups identifying their adaptation needs
1.2. The strategy acknowledges the impact of existing societal structures on vulnerable groups in adapting to the impacts of climate change	(0) No acknowledgement (1) The existence of structures is mentioned in a general matter (2) There are measures to decrease the impact of structures (3) There is a structures plan to assess the impact of societal structures on vulnerability
1.3. The strategy acknowledges adaptation as a way to secure basic human rights	(0) No acknowledgement (1) Adaptation as a way to secure basic right is mentioned (2) The strategy describes how adaptation can secure basic rights in general (3) The strategy has measures to secure basic human rights

The other forms of justice within the AJI which are procedural justice, distributive justice, and restorative justice follow a similar approach as recognitional justice. However, the indicators and the number of indicators differ. Distributive justice has five indicators; the existence of a risk mapping or assessment, identification of vulnerable populations, existence of an assessment of the distribution of benefits adaptation, existence of an assessment of division of costs, and existence of an assessment of the negative distribution of adaptation measures (Juhola et al., 2022). These five different indicators have their own scale and value attached to them as visualized in Table 4.

Table 4 Indicators of distributive justice (Juhola et al., 2022)

2. Distributive justice	
Indicator	Scale and value
2.1. A risk mapping/assessment is conducted	(0) No assessment (1) Yes, risk assessment is mentioned but results are not used (2) Yes, risk assessment is conducted, and measures are identified for some risks (3) Risks assessment is conducted, and measures are identified for all risks
2.2. There is a process for identifying vulnerable groups	(0) No process (1) Vulnerable groups are identified (2) There is a vulnerability assessment that will be updated (3) Vulnerability assessment is connected to adaptation planning and monitoring
2.3. there is a process that assesses the distribution of benefits from adaptation	(0) No process (1) The strategy identifies the distribution of benefits of adaptation measures in general (2) Distribution of benefits is assessed as part of the strategy process (3) Distribution of benefits is monitored continuously
2.4. There is a process that assesses how costs of adaptation are divided	(0) No process (1) The strategy identifies the distribution of costs of adaptation measures in general (2) Distribution of costs is assessed as part of the strategy process (3) Distribution of costs is monitored continuously
2.5. The strategy identifies the possibility of the distribution of negative impacts, i.e., maladaptation, of adaptation measures	(0) No identification (1) The strategy identifies (at least implicitly) the distribution of negative impacts of adaptation measures in general (2) Distribution of negative impacts of some adaptation measures are identified (3) Distribution of negative impacts of all adaptation measures are identified

Procedural justice has five indicators; implementation of participation process in the development of the strategy, participation process in different phases of the policy process (different phases within this research are agenda setting, policy formulation, decision-making, policy implementation, and policy evaluation) (Lasswell, 1956), adaptation strategies allocate responsibilities for adaptation, participation

plan for the implementation, participation plan for the implementation and evaluation (Juhola et al., 2022). These five different indicators have their own scale and value attached to them as visualized in Table 5.

Table 5 indicators of procedural justice (Juhola et al., 2022)

3. Procedural justice	
Indicators	Scale and value
3.1. Adaptation strategy details who participate the strategy process	(0) No participation outside the public sector (1) Participation though invitation for experts, private sector (2) Participation of experts and citizens though open invitation (3) Participation and measures to enable participation of vulnerable groups
3.2. The adaptation strategy has involved participation during different phases of the process	(0) No participation (1) The strategy has involved information provision about adaptation (at least once during the process before the final output publication) (2) The strategy process has involved consultation (3) The participation in the strategy process has been collaborative and continuous
3.3. The strategy allocates responsibilities related to adaptation	(0) No allocation (1) Responsibilities are mentioned (2) Responsibilities for some adaptation measures are allocated (3) Responsibilities for all adaptation measures are allocated
3.4. The adaptation strategy has a structured plan for participation in the implementation.	(0) No participation in the implementation plan (1) The implementation plan involved informing different stakeholders (2) The implementation plan involves stakeholder consultation (3) The implementation plan involves stakeholder participation in a collaborative and continuous manner
3.5. The adaptation strategy has a plan for updating and evaluating the strategy	(0) No plan (1) The strategy involves a plan for updating, but evaluation is not described (2) The strategy involves a plan for updating and describes how progress will be evaluated (3) The strategy involves an update an evaluation plan that includes stakeholder participation

Restorative justice has three indicators; acknowledgement of the need to compensate for negatively affected groups of adaptation measures, mentioning of compensation measures for maladaptation in the adaptation in the strategy, and a strategy and or description of compensation of unequal distribution by compensated redistribution (Juhola et al., 2022). These three different indicators have their own scale and value attached to them as visualized in Table 6.

Table 6 Indicators of restorative justice (Juhola et al., 2022)

4. Restorative justice	
Indicators	Scale and value

4.1. The strategy acknowledges the need to compensate for the diverging impacts of climate change	(0) No acknowledgement (1) The strategy acknowledges the need to compensate (2) The strategy has compensation measures for some impacts of climate change (3) The strategy has compensation measures for all relevant impacts of climate change
4.2. The strategy has compensation measures to deal with maladaptation	(0) No mention of the need to compensate (1) The need to compensate is mentioned (2) There are compensation measures for some maladaptation (3) There are measures to compensate for all groups
4.3. The unequal distribution of resources for adaptation is compensated by redistribution	(0) No mention of unequal distribution (1) The need for reallocation of resources for adaptation is acknowledged (at least partially) (2) There are measures for reallocation of adaptation resources (3) There are measures for the reallocation of adaptation resources to develop adaptive capacity

The AJI was utilized as follows: each aspect mentioned in the indicator and scale needed to be referenced at least once to be considered for inclusion in the index and the amount of one indicator mentioned does not affect the score ascribed to it because it is about the described context. Because the AJI does not have strict boundaries notes about the use of the AJI indicators are in Appendix. However, there will always be some bias because I am the only researcher who did the document analysis.

This method was chosen because the different adaptation strategies at the different government levels can be compared when using this method, as well as the different forms of justice within one strategy (Juhola et al. 2022). The AJI was developed in 2022, therefore it has recent information about climate justice. The method is also formed by different literature from different scholars and therefore does not portray a one-sided picture of what climate justice entails and the subjects incorporated in the index (Juhola et al. 2022). This is important because climate justice definitions are constantly developing.

3.3.3. Phase 3 – Semi-structured interviews and thematic analysis

In the third phase, the second sub-research question has been answered: *How do policy actors consider and perceive climate justice forms in climate adaptation strategies in the Rijnmond-Drechtsteden region?* Data was collected through semi-structured interviews with policy actors involved in the development of the analyzed adaptation strategies. Thirteen interviews (Appendix II) were conducted, with participants contacted via email or LinkedIn. No interview for the climate adaptation strategy of Hoekse Waard because they were not available to give an interview within the timeframe of this research. Interviewees are not addressed by their name but by their function/ type of actor to ensure some anonymity without hindering the usability and readability of the results. The interview guide detailed in Appendix III, was made to explore the different forms of justice and was adjusted based on the results of the AJI to ensure relevant questions. Semi-structured interviews were chosen because they give people space to talk about the context and can give a deeper understanding of the context. There is flexibility for the participant to talk about content that the researcher did not anticipate (Clarke & Braun, 2013). Analysis was conducted using Atlas.ti software and employing inductive coding to cluster considerations and perspectives of policy actors. This method allows the researcher to gain insight into why and how policy actors integrate the four climate justice forms into adaptation strategies. It is also a method can is easy to use for less

experienced researchers (Clarke & Braun, 2013). The AJI operationalization of climate justice forms were used to increase consistency within this research.

3.3.4. Limitation and weaknesses methods

In the second phase, numerical values were ascribed to climate justice forms, this lacks depth because it does not take underlying motivations into account. To address this, semi-structured interviews are also implemented in this research. The AJI has weaknesses, it is a qualitative method despite using quantitative scores which can cause different interpretations of values and therefore different score outcomes. To mitigate this, the researcher has made notes in Appendix I about how AJI is used within this research. However, the personal bias of the researcher could have influenced the scores. To mitigate this, other documents that use the AJI are reviewed by the research to see how they ascribed the scores. Additionally, I compared the results of the different strategies to each other to see if the scores were consistent with each other. Moreover, the diverse interpretations of climate justice present a challenge because choices of aspects within the AJI were made which can lead to overlooking climate justice aspects. But the AJI was chosen because it is recently published and combined with different scientific literature. Additionally, it is important to acknowledge the complexity of the concept of climate justice throughout the research and especially in the discussion.

In the third phase, semi-structured interviews and thematic analyses were employed. A weakness of semi-structured interviews is that they require extensive resources such as a wide network connection to find and contact interviewees (Clarke & Braun, 2013). The resources of the Red&Blue program, which is a research program about resilience in Deltas with a focus on research in the Dutch delta, were utilized where possible (Red&Blue, n.d.). However, not all interviewees could be accessed through this program, and the availability of interviewees also presented a challenge. Additionally, the researcher's limited experience may impact data quality, but this is mitigated by conducting a trial interview. A weakness of inductive coding is that it is not theoretically driven and therefore can be seen that this method lacks substance. However, from another perspective, it can also be said that it has more open-ended research which enables us to see what might be hidden in a more theoretical framework.

The researcher selected the methods because they are fitting for this research and their strengths, as detailed in the preceding paragraphs, outweigh their weaknesses. Moreover, various strategies mentioned in the paragraph can be employed to address or mitigate the identified weaknesses. Furthermore, the methods are fitting for an early career researcher.

4. Background information

This chapter presents background information about the biophysical characteristics and the governance structure of the Rijnmond-Drechtsteden region, and the Netherlands is described. This should deepen the understanding of climate adaptation policies and government practices.

4.1. Biophysical characteristics Rijnmond-Drechtsteden

The Rijnmond-Drechtsteden region in the Delta of the Netherlands. The boundaries of the Rijnmond-Drechtsteden region are visualized in Figure 4. Several rivers surround the region and are branches of the Rhine and the Meuse. The region is currently protected by dikes and water barriers. The type of soil differs, but it is mostly clay and peat (Brus et al., 2009). The region has many different functions and different land uses such as a harbor, nature areas, residential areas with high population density, and agricultural areas which consist of greenhouses, and arable and livestock farming (Ministerie I&W, 2023-a). Overall, there is a relatively high population density in the Rijnmond-Drechtsteden region compared to the rest of the Netherlands and therefore the risk is also high. (Programme Team Rijnmond-Drechtsteden, 2020). Additionally, there is a relatively high dispersion of socioeconomic status between and within local municipalities (CBS, 2022).

Water comes from the sea, the rivers, precipitation, and soil seepage, making it vulnerable to floods (Ministerie I&W, 2023-a). Other climate risks are heat stress, which is intensified in urban areas (Oke, 1982), and drought. Heat stress is expected to be more intense in the future (KNMI, 2023). Drought has negative effects such on subjects such as freshwater availability, biodiversity, and human health. It also increases the chances of subsidence and problems with housing foundations (Kennisportaal Klimaatadaptatie, n.d.-d). Subsidence, often a consequence of human interference combined with peat soil, is a concern in the Netherlands. Moreover, the weight of the houses and roads may exacerbate subsidence (Parsons et al., 2023). Subsidence increases the risk of floods (Navarro-Hernández et al., 2023).



Figure 4 Rijnmond-Drechtsteden region (Author's own)

4.2. Governance background

4.2.1. National climate adaptation laws and policies

There are two programs in the Netherlands to make the Netherlands climate-proof and climate-resilient: the National Delta Programme (NDP) and the National Adaptation Strategy (NAS). The goal of these

different programs is to be climate resilient by 2050 (Iplo, n.d.-a). A new development is the steering water and soil policy. The aim of this policy is that water and soil should be a starting point and basis for decision-making in spatial planning, and it has a long perspective as a focus (Climate-ADAPT, 2023). Aside from these programs, there will be a new Act implemented in 2024 called the Environment and Planning Act (Omgevingswet) (Iplo, n.d.-b). The National Strategy on Spatial Planning and the Environment (Nationale omgevingsvisie – NOVI), which is part of the Environmental law, is a vision that describes the perspective on the living environment which consists of both the built and natural environment (Ministerie BZK, 2020). The National Delta Programme (NDP), National Adaptation Strategy (NAS), the Environment and Planning Act (Omgevingswet), and National Strategy on Spatial Planning and the Environment (NOVI) are described in this paragraph.

National Delta Programme (NDP)

The Water Act (Waterwet) contains the NDP in Article 4.10(1) (Ministerie I&W, 2023-b). The Water Act is a law that consists of responsibilities and rules considering water management in the Netherlands (Ministerie I&W, n.d.). The NDP consists of the Delta Decisions, which sets out a national guidance document for water resilience and climate-proof areas and is re-assessed and adjusted every six years. The NDP has three pillars; flood risk management, freshwater supply, and spatial adaptation, each addressed separately within the NDP and in the Delta Plan. For spatial adaptation the Delta Plan is called the Delta Plan for Spatial Adaptation (DPRA), which focuses on specific measurements and the implementation of the national programme described in the Delta Decision (Iplo, n.d.-c.). Different public and private organizations participate in the development of the Programme, but the Delta commissioner is the one who gives the eventual advice. Within this Programme, there has been made a subdivision for different regions with their preference strategy, one of which is Rijnmond-Drechtsteden (Programme Team Rijnmond-Drechtsteden, 2020).

National Adaptation Strategy (NAS)

The European Commission declared that every member state must establish their National Climate Strategy by 2017. The NAS is based on the most urgent risks in the Netherlands which they describe as resilience against rising temperature, increased and extreme precipitation, longer drought periods, and sea level rise. What makes this strategy differ from the National Delta Programme is that it covers aspects that were not covered in the National Delta Programme and that it also complements the National Delta Programme (Ministry I&W, 2016). This program was published in 2016 but was reassessed and adjusted with a new perspective for the future in 2022 (Ministerie I&W, 2023-c).

Environment law and National Strategy on Spatial Planning and the Environment (NOVI)

In the Netherlands, there are various Acts governing different environmental aspects like soil, water, buildings, nature, climate adaptation, etc. From 2024 onwards the Environment and Planning Act (Omgevingswet), will combine these into one Act (Iplo, n.d.-b). The current Water Act houses the National Delta Programme. This program keeps existing within the Water Act when the Environment and Planning Act (Omgevingswet) is implemented (Iplo, n.d.-d). The purpose of the Environment and Planning Act is that there will be a better overview, easier to understand, room for local customization, and faster decision-making (Iplo, n.d.-e). A focus point of this act is decentralization, which leads to more responsibility at local levels and more autonomy for local authorities (Kennispotaal Klimaatadaptatie, n.d.-e). The National Strategy on Spatial Planning and Environment (NOVI) (Omgevingsvisie) is part of the implementation of the Environment and Planning Act (Omgevingswet). It gives a national perspective on the environment. The Environment and Planning Act is going to be implemented in 2024 and until implementation the NOVI is included in the Environmental Management Act (Wet ruimtelijke ordening) (Ministerie BZK, n.d.). It is worth mentioning that the National Strategy on Spatial Planning and the

Environment is not implemented within this research because the other document describes climate adaptation more extensively.

4.2.2. From National policy to provincial and local government policy levels

The National Delta Programme (NDP) follows a multi-level governance approach involving municipalities, water boards, provinces, and central government. The National Adaptation Strategy (NAS) employs a multi-sector approach. Authorities who operate on a lower governmental level such as municipalities, regions, and provinces set up their climate adaptation strategy and environmental strategy and take the NAS, NDP as a guideline or inspiration as well as other instruments. Some municipalities that are close to each other and have the same concerns formulate their climate adaptation strategy together within their DPRA working region (Climate-ADAPT, 2023). There are five different DPRA working regions within the Rijnmond-Drechtsteden region. In A working region, different governmental actors collaborate with each other (Kennisportaal Klimaatadaptatie, n.d.-b). The Rijnmond-Drechtsteden region, within the NDP framework, has its adaptation strategy known as the preference strategy Rijnmond-Drechtsteden (Programme Team Rijnmond-Drechtsteden, 2020). The relationship between the law and policies at different policy levels is visualized in Figure 5. The Environment and Planning Act (Omgevingswet) is going to be implemented in 2024 but the related policies are already published for all policy levels. Notably, the NOVI and Environmental Strategies are not within the scope of this research, given the comprehensive coverage provided by the NAS, NDP, and adaptation strategies regarding climate adaptation specifics.

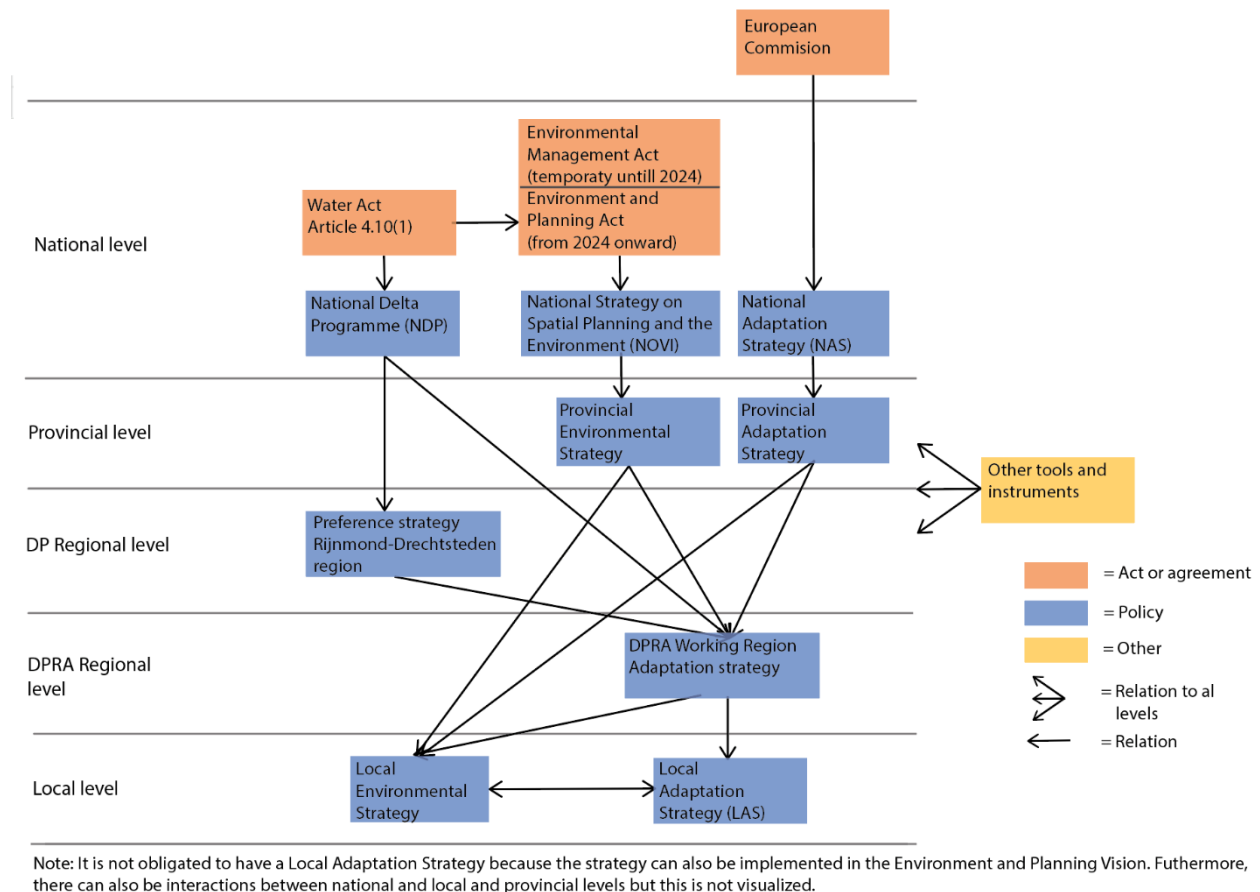


Figure 5 Relation of climate adaptation documents at different levels (Author's own)

4.2.3. Responsibility and tasks public authorities

The different public authorities work together to create climate adaptation policies, but the authorities do have different responsibilities and tasks. The Ministry of Infrastructure and the Environment is responsible for developing national policy. The province is responsible for translating this policy to the circumstances within the province. The local municipalities have a responsibility to develop the local policy on climate adaptation and planning and the implementation of this policy. Regional water authorities are responsible for managing the quality and quantity of surface water in the Netherlands and for managing and maintaining flood defenses (Ministry I&W, 2012). The specific authorities that are present in the Rijnmond-Drechtsteden region are the Central government (Ministry I&W and National water authority), the Delta Programme, the Province of South Holland, Five Regional water authorities which are Regional Water Authority Rijnland, Regional Water Authority Delfland, Regional Water Authority Schieland and Krimpenerwaard, Regional Water Authority Rivierenland, and Regional Water Authorities Hollandse Delta, and three drinking water companies which are Dunea, Oasen, and Evides, and the different local municipalities located within the Rijnmond-Drechtsteden region (Ons Water, 2022). Table 7 outlines the responsibilities before the implementation of the Environment and Planning Act (Omgevingswet). While Dutch regulations address water-related climate adaptation extensively, there is a notable lack of focus on other climate risks such as heat stress and indirect effects in the Netherlands. Additionally, there is limited attention to monitoring and evaluation of climate adaptation in the Netherlands (Hart et al., 2023).

Table 7 Responsibility and tasks related to spatial adaptation in the Netherlands (Author's own)

Authority	Responsibility and/or tasks	Source
Ministry I&W	Developing policy for the national context	(Ministry I&W, 2012)
	Evaluating policy and facilitating other authorities	(Interviewee implementation programme NAS, 2023)
Delta programme	Implementation and further elaboration of the Delta Decisions and preferred strategies	(Ministry I&W., 2023)
	Informing the Delta Commissioner about progress	(Ministry I&W., 2023)
	Submitting recommendations about the annual proposal for the Delta Programme	(Ministry I&W., 2023)
National water authority	Management and maintenance of primary flood defenses	(Ministry of General Affairs, 2019)
	Developing national water policy and national measures	(Ministry of General Affairs, 2019)
Province	Translating the guidelines of the national policy into the regional context	(Ministry I&W, 2012)
	Provincial zoning guidelines	(Ministry I&W, 2012)
	Responsible for environmental permits	(Ministry I&W, 2012)
	Facilitating other authorities for heat stress and collaboration	(Interviewee from South Holland, 2023)
Regional water authority	Management and maintenance of water quantity and quality for rivers in the country	(Ministry I&W, 2012)
	Management and maintenance of secondary flood defenses	(Ministry of General Affairs, 2019)
	Facilitating other authorities with water stress tests	(Interviewee from RD, 2023)
Municipality	Develop local policy for planning and the environment	(Ministry I&W, 2012)

Preparing and implementing environmental regulations and measures	(Ministry I&W, 2012)
Drainage of rainwater	(Ministry I&W, 2012)
Groundwater in urban areas	(Ministry of General Affairs, 2019)

In 2018 the Administrative Agreement on Climate Adaptation was signed by the national government, provinces, regional water authorities, and municipalities. From 2021, the national government has set aside 300 million euros for climate adaptation and out of this amount, 200 million was for incentive scheme that other lower authorities could use for adaptation efforts. Local and regional authorities also made 300 million available themselves for adaptation efforts. There are also other subsidy schemes for local and regional authorities (Kennisportaal Klimaatadaptatie, n.d.-f; Ministerie I&W, 2023-d).

4.3. Information analyzed strategies

There were eleven governmental documents analyzed in this research. Background information about these documents is described in this paragraph. Figure 6 shows the experiences in climate adaptation for de different government levels and shows when the reviewed documents were published.

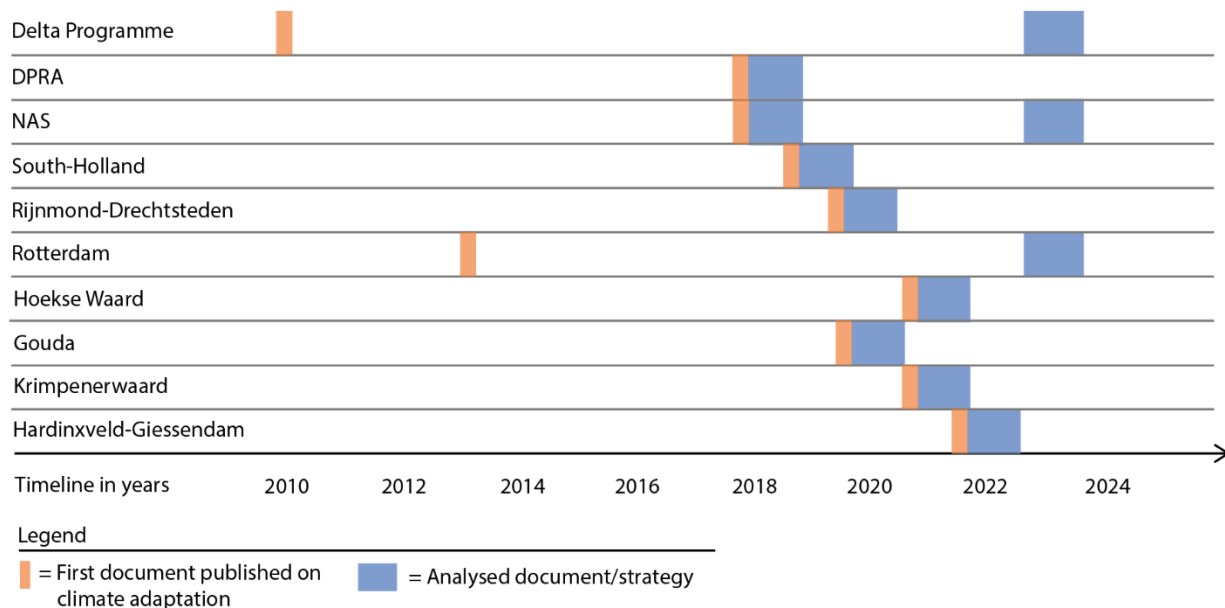


Figure 6 Timetable spatial adaptation documents (Author's own)

National: National adaptation strategy

The last National Adaptation Strategy (NAS) was published in 2016 and has 44 pages. As described in the chapter 'Background' this strategy was published because the European Commission decided that each country in the EU should publish a National Adaptation Strategy before 2017 and that it needs to be renewed every 10 years. The NAS is a strategy that focuses on multiple sectors such as water, agriculture, nature, culture, housing, etc. The subjects described in DPRA are described to a lesser extent in this document (Ministry I&W, 2016).

National: Implementation programme NAS

An implementation program of the NAS was published in 2023 and has 112 pages, made after an evaluation of the NAS 2016. In this program, different priorities and subjects are described that need to be implemented in a renewed strategy that is going to be published in 2026. The AJI is used to see how just the coming strategy would be if the actions and subjects described in the implementation program are implemented. The implementation program describes that the topics formulation of concrete adaptation goals, accessibility, and applicability of knowledge, increased focus on climate justice, standardization of climate adaptation in policy and implementation, and exploration of financing options for climate adaptation are a priority in the coming strategy (Ministerie I&W, 2023-c).

National: Delta programme 2018 (DPRA)

The Delta Programme decided in 2018 to make aside from Deltaplan water safety and Deltaplan freshwater availability a separate Deltaplan for spatial adaptation. It is mentioned in the Deltaplan Spatial Adaptation that the goal is to make the Netherlands climate adaptive and water resilient by 2050. A sub-goal was that climate adaptation should be integrated within policy and governmental systems by 2020. The DPRA is part of the Delta Programme of 2018. The DPRA was 31 pages and the DP 2018 147 pages inclusive of the appendix (Delta Commissioner, 2017). However, only the DPRA and general statement such as the introduction and the progress description were analyzed for the AJI.

National: Delta programme 2024

Each year a new A Delta programme is published. Spatial adaptation is one of the three topics described in this program. The Delta Commissioner leads the programme, and it is made with different governmental organizations and other organizations. Because of the scope, only the topic of climate adaptation and other related topics from the Delta Programme are analyzed (Delta Commissioner, 2023). The DP was published in 2023 and has a total of 120 pages and the chapter spatial adaptation has 4 pages. However, only spatial adaptation and other general chapters such are the introduction, developments, development, and delta funding were analyzed.

Provincial: Province South Holland

The Province of South Holland is the province in the Rijnmond-Drechtsteden region. It has approximately a population of 3,8 million and a surface area of around 2.700 km² (CBS, 2023). The strategy was published in 2019 and has 56 pages including an appendix. The adaptation strategy of South Holland is based on the principles of the DPRA. The strategy is focused on weather extremes and soil subsidence. The province closely works together with the working regions to implement tools and knowledge. The strategy consists of six different themes which are future housing, robust infrastructure, a green living environment, water with value, an adaptive economy, and resilience (Provincie Zuid-Holland, 2018).

Region DP: Rijnmond-Drechtsteden region

The Rijnmond-Drechtsteden region is a region in the Delta Programme. There are three different regions in the Delta Programme chosen and each of these regions has a special focus. The strategy was published 2020 and has 61 pages including an appendix. There are three aspects within the Delta programme which are water safety, spatial adaptation, and fresh water. The preference strategy for the Rijnmond-Drechtsteden region focuses on water safety but also incorporates spatial adaptation and freshwater availability briefly (Programme Team Rijnmond-Drechtsteden, 2020). The spatial adaptation chapter was three pages but other general chapter such as tasks, tasks Rijnmond-Drechtsteden, justification, and implementation programme were analyzed.

Working region DPRA: Rotterdam

Rotterdam is the second biggest city in the Netherlands, and it has approximately a population of 664.000 and a surface area of 218 km² (CBS, 2023). Rotterdam is also a working region. The most current climate adaptation strategy of Rotterdam is Rotterdams Weerwoord. This strategy was published in 2023 and consists of 254 pages inclusive of the appendix. The municipality, two regional water authorities, a drinking water company, and four housing corporations collaborated to make it. The DPRA principles are the basis of the strategy. Additionally, it includes a concrete description of how to implement concrete climate adaptation actions (Gemeente Rotterdam, 2023).

Working region DPRA: Hoekse Waard

Hoekse Waard is a municipality and a working region. It has approximately a population of 89.000 and a surface area of approximately 324 km² (CBS, 2023). Hoekse Waard has since 2019 been a fusion municipality which means that several municipalities have joined together and are now one municipality. The document development involved different public and private partners. The document was published in 2021 and consists of 36 pages including the appendix. The document has four pillars which are new housing climate adaptive, existing building area climate adaptive, rural area climate adaptive, and essential infrastructure climate adaptive. The strategy refers to the goal of the DPRA, which is to be climate adaptive in 2050 (Gemeente Hoekse Waard, 2021).

Municipality: Gouda

Gouda is a medium-sized municipality in the Netherlands, with 75.000 inhabitants and a surface area of approximately 18 km² (CBS, 2023). The strategy refers to the goal of the DPRA to be climate-robust in 2050. The climate adaptation strategy consists of 16 pages, and it was published in 2020. The document follows the themes of water safety, water nuisance, drought, and heat. The document refers to the DPRA, and the RAS (regional adaptation strategy). It is noteworthy to mention that the implementation program and the appendix are missing (Gemeente Gouda, 2020). But when things were mentioned about what was written in the implementation programme it was included in the score.

Municipality: Krimpenerwaard

Krimpenerwaard is a fusion municipality and is considered a medium-sized municipality. The total population of Krimpenerwaard is around 58.000 and the surface area is around 161 km² (CBS, 2023). The local climate adaptation strategy was published in 2021 and it has 46 pages including the appendix. They reference the DPRA. There were four scenarios made and the municipal executives were able to choose their preferred strategy, which was scenario 2 – working on it together. The focus of this strategy is facilitating and stimulating private property owners (Gemeente Krimpenerwaard, 2021). It is noteworthy to mention that the implementation programme was generally described.

Municipality: Hardinxveld-Giessendam

Hardinxveld-Giessendam is a relatively small municipality with 19.000 inhabitants and a surface area of approximately 19 km² (CBS, 2023). The municipality refers to the DPRA and their RAS which is the strategy from their working region. The climate adaptation strategy consists of 25 pages, and it was published in 2022. It is noteworthy to mention that the appendix and the implementation programme is described in a general matter. The focus of this document is on water, temperature, soil, and nature (Gemeente Hardinxveld-Giessendam, 2022).

5. Adaptation Justice Index applied to climate adaptation strategies

To answer the first sub-question ‘*To what extent are justice forms integrated into the adoption strategies at different policy levels in the Rijnmond-Drechtsteden region?*’ A document analysis was conducted with the help of the Adaptation Justice Index. This index divides four forms of justice which are recognitional justice, distributive justice, procedural justice, and restorative justice. The extent of integration can also be measured when implementing this index because the indicators of the forms of justice are coupled to scales and values. It needs to be mentioned that is a qualitative method because the indicators of the different forms of justice are ascribed to the different scales and values. Appendix III has a table with the individual scores of the different indicators that I have ascribed. The strategies are divided between the following government levels; national, provincial, regional, regional/municipal, and municipal. In this chapter, the result of each analyzed document is described. The chapter is finished with a concluding paragraph with the main findings.

5.1. Integration of the four forms of justice

Looking at the results of the scores I have described all the different strategies as visualized in Figure 7. The average score for all the climate justice forms is low with the most integrated form of justice being procedural justice with an average of (76%). Distributational justice scores the second highest at (39%) and recognitional justice scores the second lowest at (19%). There is a large difference between the score of procedural justice and the other scores, with restorative justice (5%) as the least integrated.

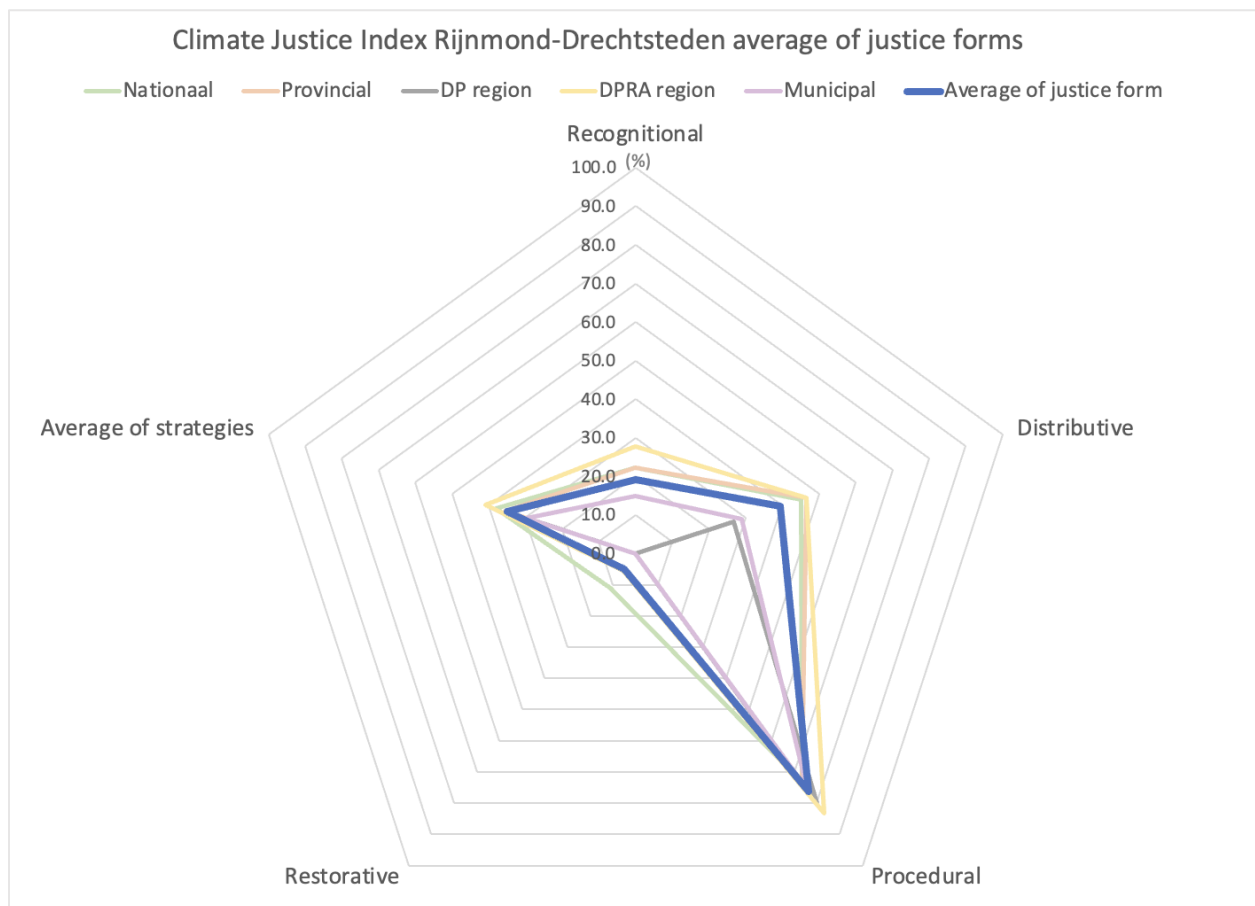


Figure 7 Average climate justice scores ascribed by the researcher for various governmental for climate adaptation strategies in Rijnmond-Drechtsteden region (Author's own)

The overall patterns of the integration climate justice forms are the same with some exceptions. The score of between the different levels do differ. The score I ascribed for procedural justice for the different government levels are close to each other. This is not the case for the other three climate justice forms. For restorative justice, where the score I ascribed for national government levels, and the DPRA regions is relatively higher than for the other government levels. The overall score for recognitional justice is higher at the DPRA region government level. National policies overall score the highest whereas municipalities and the DP region had a relatively lower score for all the forms of justice.

5.2. Scores of the strategies

Figure 8 shows that there can be large differences within the same government level, hence the importance of describing the scores of all the different strategies. The strategies are separated into the following three sub-section: relatively low score (lower than 30%), relatively average score (between 30 and 40%), and relatively high score (higher than 40%). Detailed scores of all the analyzed strategies are described in Appendix IV.

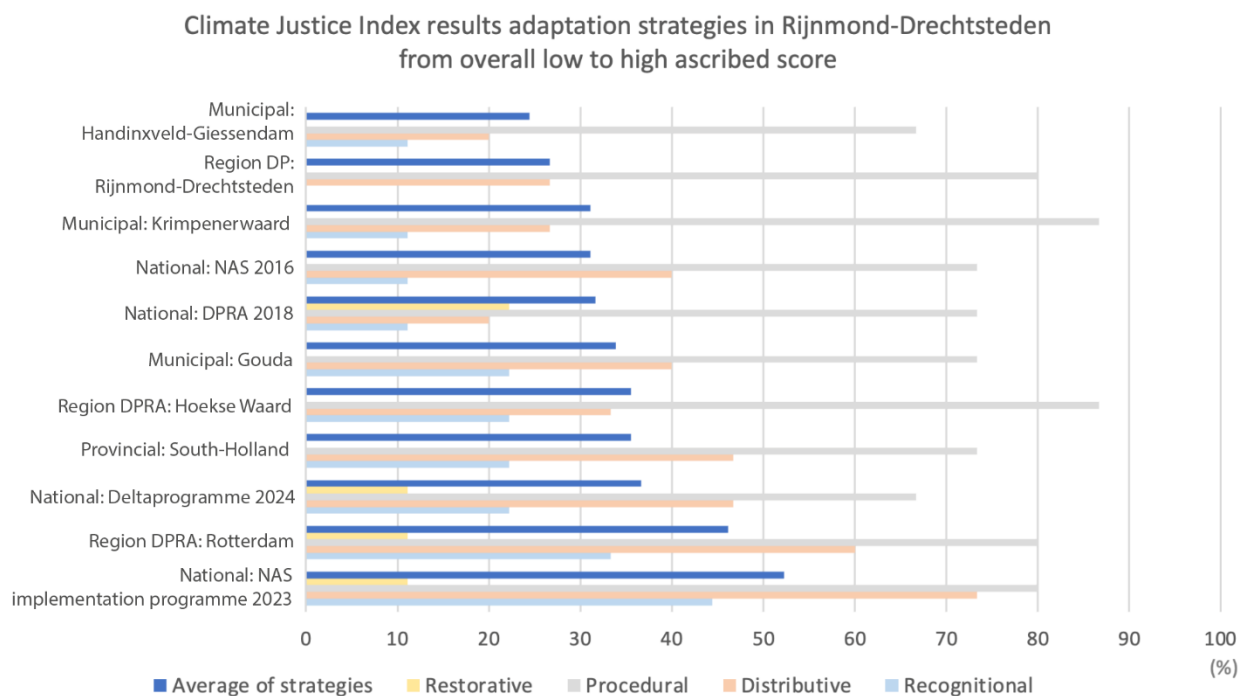


Figure 8 Results Adaptation Justice Index Rijnmond-Drechtsteden region (Author's own)

5.2.1. Documents that scored relatively low

Two documents were the scores that I ascribed were lower than 30 out of 100. The document that I ascribed the score to and scored the lowest is Hardinxveld-Giessendam, which scored an average of 24 out of 100 for Hardinxveld-Giessendam and 29 out of 100 for Rijnmond-Drechtsteden.

Municipal: Hardinxveld-Giessendam

I ascribed the climate justice score for the climate adaptation strategy of Hardinxveld-Giessendam using the AJI, and the overall score was 24%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 1/9 (11%) Different stakeholders, such as housing corporations, GGD, nature, and environment associations, farmers, advocacy groups, etc., identified the

needs through a risk dialogue. When these people are involved, they also mention what they find important and therefore the needs are identified, but this is not explicitly mentioned. It was also mentioned that vulnerable people need to be considered for heat stress. What has contributed negatively to the ascribed score is that within the strategy, adaptation is described as a technical fix and something that needs to be done because otherwise it will cost money and the livability will decrease. Regarding distributive justice, the score I ascribed was 3/15 (20%) because there has been a risk assessment. Furthermore, there was not as identification of vulnerable groups, only for vulnerable places for climate change risks. There was not a process that assessed the distribution of the benefits from adaptation. Aside from this, the distribution of the costs was mentioned in a general way. The score I ascribed to procedural justice was 10/15 (67%) due to participation in the development of the climate adaptation strategy including participation from citizens, but it was not mentioned if this was open or closed participation. Participation in the development of the strategy took place on multiple occasions during the development of the strategy. Within the strategy, the different responsibilities for some of the adaptation measures were mentioned. The implementation program, which is not included in the strategy, may describe the responsibility in more detail in this program. A separate participation plan is going to be developed but, in this strategy, it is not mentioned that there will be stakeholder participation collaboratively and continuously. Lastly, updating is mentioned but the evaluation of the strategy is not described. Regarding restorative justice, the score I ascribed was 0/9 (0%) for not describing anything to the compensation for the impact of climate change, unequal distribution of adaptation measures, and maladaptation are mentioned in the climate adaptation strategy.

Region DP: Rijnmond-Drechtsteden

I ascribed the climate justice score for the preference strategy Rijnmond-Drechtsteden using the AJI, and the overall score was 27%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 0/9 (0%) because nothing is mentioned about vulnerable populations and different needs. They do describe that there are different types of groups and stakeholders who use water in different ways. Regarding distributive justice, the score I ascribed was 4/15 (27%) because there is a risk assessment used in the water safety part for the risk of flooding and the dikes, and in the part of the spatial adaptation, it is stated that different climate change-related risks require a risk assessment, but one has not been conducted yet. Only places that have a high risk are identified but there is not a process for identifying vulnerable groups. The strategy implicitly mentioned maladaptation because they describe that the decisions around choosing adaptation measures need to be done integrally, otherwise, measures can have negative effects on other spatial implementations and transitions. The score I ascribed to procedural justice was 12/15 (80%) due to the mention of including public, private actors, and citizens in the Deltaprogramme, which this strategy is part of. However, there were no measures mentioned that enabled vulnerable populations to engage in participation. Within the texts, they describe clearly who is responsible for adaptation measures. Many of the measures are about conducting research and the results of those research are going to be used in the next preference strategy which is going to be published in 2024 or 2025. It is clearly described who is going to do this research and the other measures. There are also law-related evaluations as described but this is related to water safety. Regarding restorative justice, the score I ascribed was 0/9 (0%) for not describing anything to the compensation for the impact of climate change, unequal distribution of adaptation measures, and maladaptation are mentioned in the climate adaptation strategy.

5.2.2. Document that scored relatively average

Seven documents were the scores that I ascribed where between 30 and 40 out of 100, with the lowest score being 31% of Krimpenerwaard and NAS 2016 and the highest score being National Deltaprogramme 2024 with 37%.

Municipal: Krimpenerwaard

I ascribed the climate justice score for the climate adaptation strategy of Krimpenerwaard using the AJI, and the overall score was 31%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 1/9 (11%) because they included a risk dialogue with different groups, and therefore the needs of these different groups are included. Regarding distributive justice, the score I ascribed was 4/15 (27%) because there was a risk assessment, and this is an instrument described in the DPRA. There are measures coupled to the results of the risk assessment. Furthermore, there was an acknowledgment of vulnerable populations about the climate risks of heat stress, but no specific vulnerable group was mentioned. Additionally, there is a distribution of costs, but it is not focused on the distribution between different groups of people but on different governmental authorities. Some benefits of adaptation were mentioned in a general matter. The score I ascribed to procedural justice was 13/15 (87%) due to participation in different phases of the development of the strategy with the public sector, private sector, experts, and through the citizen panel. A table in the strategy describes the measures and allocates the initiator and mentions the involved stakeholders. Throughout the texts, the responsibility for different measures is described. Aside from this, the strategy dedicates a paragraph to monitoring and evaluation. Every 5 years, they are going to evaluate and update the strategy, and this will take place in the form of stress tasks, that is advised for each municipality in the Netherlands. With an actualized stress task, the difference in the climate impact over the years can be compared, and this way the progress will be visual. Regarding restorative justice, the score I ascribed was 0/9 (0%) for not describing anything related to the indicators of restorative justice.

National: National Adaptation Strategy 2016 (NAS)

I ascribed the climate justice score for the NAS 2016 using the AJI, and the overall score was 31%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 1/9 (11%). There was a risk dialogue, and therefore different sectors were able to say what was important to keep in mind when it comes to climate adaptation. The focus was not specifically on vulnerable populations and their needs, but some needs of farmers were identified. The strategy describes adaptation as a societal and economic issue but not mentioned that adaptation is a basic human right. Regarding distributive justice, the score I ascribed was 6/15 (40%) because a risk assessment was conducted including different sectors and organizations that could mention their knowledge about water safety, water nuisance, drought, and heat stress risks. The strategy does recognize that heat stress can lead to sickness and even death, especially for the elderly. The distribution of the costs is described in a general matter for the different sectors and are related to the responsibility of the different governmental actors for public property. Maladaptation is not addressed. However, side-effects and cascade effects from one sector to another are mentioned. The score I ascribed to procedural justice was 11/15 (73%) due to the consultation of public sector, private sector, and experts in different phases of the strategy. Furthermore, all the actions and responsibilities described in the strategy were allocated. There is not an implementation yet. The strategy includes collaborative and continuous stakeholder participation in the implementation program as described in the following citation;

“The new cabinet will present the Climate Adaptation Implementation Programme in the second half of 2017, coordinated with departments, Delta Programme, decentralised authorities, businesses, knowledge

institutions, and civil society organizations. Its preparation is already in full swing. Everyone in the Netherlands is called upon to think along and, above all, to actively participate.” (Ministry I&W, 2016)

Another aspect that influences the assigned score positively is that every ten years, the strategy will be updated, and the NAS 2016 will be used as a zero measurement for the evaluation. For the evaluation different indicators are going to be developed and the different climate risks are related to these indicators. Regarding restorative justice, the score I ascribed was 0/9 (0%) because nothing was mentioned concerning past harms and the need to compensate these.

National: Deltaplan Spatial Adaptation 2018 (DPRA)

I ascribed the climate justice score for the Delta Programme 2018 which also integrated the DPRA using the AJI, and the overall score was 32%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 1/9 (11%). The strategy considers different needs such as that elderly and younger people are vulnerable to heat stress and that needs to be considered. The strategy also described that there is a risk because elderly people live longer in their homes. It was mentioned that some people are not aware of the risks of climate change, therefore they do not take enough action to reduce climate risks and they often do not take insurance. Regarding distributive justice, the score I ascribed was 3/15 (20%) because there is no risk mapping. However, it is mentioned because they describe the stress tasks and risks dialogue that can be used at lower government levels. The strategy focuses on vulnerable functions such as hospitals and sometimes nursing homes. However, they do not focus on the vulnerable populations. There is not a cost/benefit assessment for the adaptation measures, but the development of an assessment is mentioned as an action point. The costs of the different types of actions have been described in the strategy and a whole chapter is devoted to the Deltafonds which is a national fund for climate adaptation in the Netherlands. The score I ascribed to procedural justice was 11/15 (73%) due to participation from different public authorities, societal organizations, knowledge institutions, and other organizations that have contributed to the development of the plan. Participation in the development and implementation of the plan is collaborative and continuous. There is not a structured overview of the different responsibilities of different measures but some of the responsibilities are mentioned in the plan. The plan will be evaluated by doing a zero measurement and will have an interim evaluation. The results may cause adjustments to the plan. Regarding restorative justice, the score I ascribed was 2/9 (22%) for having a disaster fund and describing that there needs to be action taken to make sure that everyone knows the climate risks and measures they can apply to reduce those risks.

Municipal: Gouda

I ascribed the climate justice score for the climate adaptation strategy of Gouda using the AJI, and the overall score was 34%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 2/9 (22%) because considering different adaptation needs such as that of vulnerable populations like the elderly and children have a higher risk when it comes to heat stress issues. They also describe that they want to consider residents who have insufficient command of the Dutch language. Regarding distributive justice, the score I ascribed was 6/15 (40%) because there are stress maps and a risk dialogue for the four different climate risks. In the climate strategy, there is not an assessment of vulnerable populations, the benefits of the adaptation measures, and the costs. However, a separate implementation program is described in the strategy which is based on priority. It also describes that knowledge about the vulnerability of houses, routes, functions, groups, and neighborhoods should be up to date. The strategy does identify the distribution of costs of adaptation measures in general. Lastly, the strategy states that the adaptation measures should not have a negative effect on climate change and the living environment. The score I ascribed to procedural justice was 11/15 (73%) due to continuous and collaborative participation in the development and implementation of the strategy. For the

implementation, the strategy clearly states that climate adaptation is something that needs to be done together and that collaboration is important. For the development of the strategy there were working groups and risk dialogues within the municipality. It is also described that in the implementation program, the different adaptation measures are described, and the measures are attributed to the responsible actors. Lastly, the stress tasks will be used as an instrument to monitor the progress of climate adaptation. Regarding restorative justice, the score I ascribed was 0/9 (0%) for not describing anything to the compensation for the impact of climate change, unequal distribution of adaptation measures, and maladaptation are mentioned in the climate adaptation strategy.

Regional DPRA: Hoekse Waard

I ascribed the climate justice score for the climate adaptation strategy of Hoekse Waard using the AJI, and the overall score was 36%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 2/9 (22%). The strategy implements different needs based on expert review and on and from responses to a questionnaire sent to citizens. Regarding distributive justice, the score I ascribed was 5/15 (33%) because stress tasks and risk assessment are for the four climate-related risks. Furthermore, the strategy identifies the adaptation costs and benefits in a general way. Research about the possibility of implementing a district-oriented approach and making use of monitoring with different indicators is mentioned. The score I ascribed to procedural justice was 13/15 (87%) due to participation with different area partners such as governmental organizations, private organizations, housing corporations, schools, etc. The participation took place collaboratively and continuously in the development of the strategy and the implementation of the strategy. Some of the responsibilities were mentioned in the strategy. Lastly, the strategy involves an update and evaluation plan that includes stakeholder participation as described in the citation;

"We measure randomly and in collaboration with our area partners whether our vision, strategy, and agenda are having the desired effect. Do the requirements we set to meet? Does theory match practice? With aerial photo analyses, smart sensors, and model calculations, we check whether the requirements set are having the desired effect on drought, heat, and flooding and make adjustments where necessary."
(Gemeente Hoekse Waard, 2021)

From 2022 onwards, there will be several assessments done yearly. Regarding restorative justice, the score I ascribed was 0/9 (0%) for not describing anything to the compensation for the impact of climate change, unequal distribution of adaptation measures, and maladaptation are mentioned in the adaptation strategy.

Provincial: South-Holland

I ascribed the climate justice score for the climate adaptation strategy of South Holland using the AJI, and the overall score was 36%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 2/9 (22%). It took different adaptation needs into account based on expert reviews. It is mentioned that heat stress should be reduced and there needs to be a focus on elderly and children for these risks. Additionally, making houses from housing corporations more climate-adaptive because vulnerable populations often live in these houses is mentioned. The strategy also considers that vulnerable populations may not have the financial means to implement climate adaptation measures and describes measures to decrease these such as subsidies for schools and nursing homes. However, this measure will only be implemented if they have an extra budget available. Regarding distributive justice, the score I ascribed was 7/15 (47%) because there are risk maps for weather extremes and soil subsidence. Some vulnerable groups are identified and financial help for the implementation of climate adaptive measures such as green roofs for these groups is mentioned. Furthermore, it is

mentioned that the decision scenarios and the financial consequences will be part of the yearly implementation program, which can be adjusted to different needs. Mostly governmental actors and house owners are mentioned in relation to the costs. What also contributed to the score I ascribed is that cascade effects and adaptation pathways are mentioned. Taking preventative measures, you can minimize or avoid possible side effects. The score I ascribed to procedural justice was 11/15 (73%) due to the participation of public, and private actors, and experts in the development of the climate adaptation strategy and the implementation. The participation in the strategy process has been collaborative and continuous. There is not a clear overview of the different responsibilities but some of the responsibilities are mentioned. Aside from this, the strategy is going to be monitored and evaluated with the help of the 'leefomgevingstoets'. Regarding restorative justice, the score I ascribed was 0/9 (0%) for not describing anything related to compensation and/or redistribution.

National: Delta programme 2024

I ascribed the climate justice score for the Delta Programme 2024 which also integrated the DPRA using the AJI, and the overall score was 37%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 2/9 (22%). Different adaptation needs are considered based on experts and social organizations. The signal group Delta Programme has mentioned that there needs to be action and research in communication methods to research a wider group of citizens for climate adaptation and to keep socially vulnerable people and people with low socioeconomic backgrounds in mind. The group that has special attention in this program is the younger generation. The younger generation also described that they find it important to keep vulnerable populations in mind in the programme. The letter of the younger generation also had the following sentence;

“Certain groups, such as highly educated people, are overrepresented in the delta community and the water sector. This means that developed ideas may come from a one-sided perspective and communication may not adequately reflect the diversity in the community.” (Delta Commissioner, 2023)

Regarding distributive justice, the score I ascribed was 7/15 (47%) because there was a national risk assessment for some risks. These are mostly focused on national water structures. As mentioned in the DPRA 2018, most stress tasks and risk dialogues are on lower government levels. The programme describes that when implementing or formulating measures passing on to other generations, areas or from private to public should be kept in mind. Additionally, it is stated that the different instruments developed, such as 'Landelijke Maatlat' and the 'ruimtelijk afwegingskader' should be used by decentralized governments. The distribution of Deltafonds costs is assessed as part of the strategy process. The distribution of some negative impacts is identified such as increasing mosquitoes due to water storage. The score I ascribed to procedural justice was 10/15 (67%) due to the participation of the public sector, private sector, and experts in different phases of the development of the strategy process and the implementation process collaboratively and continuously. There is not a clear overview of the responsibilities but the responsibilities for some adaptation measures are allocated. The program has a yearly update and new insights from diverse reports are used. Regarding restorative justice, the score I ascribed was 1/9 (11%) for the acknowledgment of compensation for climate damage with the damage fund. Furthermore, they describe that they are doing exploratory research on the insurability of climate damage and possible solutions.

5.2.3. Documents that scored relatively high

Two documents were the scores that I ascribed were higher than 40 out of 100. The document that I ascribed the score to and scored second highest is Rotterdam, which scored an average of 46 out of 100

and the highest score I ascribed was for Implementation programme NAS 2023, which has an average score of 52.

Regional DPRA: Rotterdam

I ascribed the climate justice score for the climate adaptation strategy of Rotterdam using the AJI, and the overall score was 46%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 3/9 (33%). There is a clear mention of adaptation as a way to secure basic human rights. The quotation from Rotterdams Weerwoord is as follows;

"Climate adaptation is not an optional luxury, but a basic requirement to keep Rotterdam livable and safe despite climate change." (Gemeente Rotterdam, 2023)

This makes clear what the perspective is of climate change adaptation. Unlike the other adaptation strategies, the focus here is on human rights and not societal and economic issues which can also be implicitly related to rights. Aside from this, one of the sections is called climate injustice and vulnerable populations and, in this section, different measures are described to decrease the impact of societal structures on vulnerable populations. For example, implement measurements to enable socially vulnerable populations to get more knowledge about insurance for extreme weather. Lastly, the strategy is built on different groups such as lonely elderly, young children, and people with a low income identifying their adaptation needs. Regarding distributive justice, the score I ascribed was 9/15 (60%) because there are risk maps for all different climate risks, vulnerable groups are identified, and the distribution of the costs and benefits are generally described. But it is mentioned that there will be a separate implementation programme where the costs are in more detail described and assessed. It was also mentioned that there are extra public space measures needed in areas with large climate risks and where many vulnerable populations live. Aside from this, it was mentioned that the increased water demand because of increased greenery could have a negative effect on water shortages during drought periods. The score I ascribed to procedural justice was 12/15 (80%) due to the collaborative and continuous participation of different governmental organizations, housing corporations, water companies, private organizations, and societal organizations in the development of the strategy and implementation of the strategy. Furthermore, all the different responsibilities are described. The strategy, especially the maps will be updated every year. The evaluation will take place every 4 years with the new municipal executives. Regarding restorative justice, the score I ascribed was 1/9 (11%) for mentioning that people should be compensated for extreme weather issues and even an action to lobby with the national government for this issue as cited;

"Lobby the state for a low-threshold calamity fund in case of heavy precipitation or flooding to support people afterward where insurance does not cover the damage." (Gemeente Rotterdam, 2023)

National: Implementation Programme 2023

I ascribed the climate justice score for the Implementation programme 2023 using the AJI, and the overall score was 52%. If we look into the four different elements of climate justice, we see that the score I ascribed to recognitional justice was 4/9 (44%). The different needs are identified such as that heat stress is a critical issue for elderly people and that it can affect their self-reliance. Its climate adaptation strategy is also going to include a broad group to get more insight into the perspectives and needs of vulnerable people. The results of the WRR report are kept in mind and one of the results of this report is that people find it more important to be included in the process instead of a fair distribution. The strategy does not describe adaptation as a way to secure basic human rights, but it does describe adaptation as a societal issue. Regarding distributive justice, the score I ascribed was 11/15 (73%) because there is a risk

assessment conducted for some of the climate risks such as water safety. Different instruments for lower government levels there are tools described to use for risk mapping. There will also be a risk assessment for the effect of climate risks on cultural heritage. Some specific vulnerable groups are identified such as elderly people and people with hay fever. It is advised to link social factors to climate-related risks in order to assess vulnerability. The implementation program described that every ministry should make an overview of the costs and benefits of adaptation measures. This should be included in the next national climate adaptation strategy. The adaptation monitor will be updated. However, it is not described in detail how the ministries can make an overview of their costs and benefits and in what way the adaptation monitor will be updated. Furthermore, some side effects of adaptation measures are kept in mind such as, increased risks in wildfires in urban areas, increased vermin, and health complaints due to allergies when implementing greenery. The score I ascribed to procedural justice was 12/15 (80%) due to the description that the coming strategy should be open to include the whole society and vulnerable people are considered. There will be different working groups and collaborative and continuous participation in order to get bigger societal support which helps with the distribution of costs and benefits as described in the following citation;

"A more inclusive process for arriving at climate policies ensures greater public support and more attention to climate vulnerability, which is important for the distribution of costs and benefits of measures across society. This is crucial for the transition to succeed." (Ministerie I&W, 2023-c)

Another aspect that had a positive effect on the assigned score is that it set a goal for arrangements to clarify the different responsibilities within the state and levels of government. They describe other actions as participation plans for implementing the strategy. However, it is not described that the coming strategy will involve stakeholder participation in the implementation of the strategy. Bear in mind that this document serves as the implementation program for developing the upcoming national climate adaptation strategy, rather than being the strategy itself. Once every two years, they will update and describe the progress evaluation plan in our strategy. Regarding restorative justice, the score I ascribed was 1/9 (11%) for mentioning climate robustness concerning damage repair for extreme weather circumstances. Special attention is given to the repair of damage to houses (including foundations) and insurance for farmers.

5.3. Outcome specific indicators

The scores I assigned to the different indicators vary, as shown in Figure 9. It is not surprising that restorative justice indicators have the lowest ascribed scores because it was also the climate justice form that had the lowest score. The first indicator of restorative justice is the only score that is above zero. This is because there was an acknowledgment in some strategies about the need to compensate for the diverging impacts of climate change for water-related issues and calamities. Sometimes vulnerable people, which is part of distributive justice indicator 2, were recognized for water-related disasters, and the focus for that was on elderly and hospitalized people. However, in most documents, the only vulnerable populations recognized were the elderly about the climate risks of heat stress. It is also not surprising that procedural indicators had the highest score because it is the climate justice form that scored the highest. The lowest score for procedural justice is indicator 1 which is diversity in the participation process. Mostly governmental authorities and experts were involved in the development of the strategy. For recognitional justice, two indicators scored relatively low: acknowledgment of adaptation as a basic human right and acknowledgment of the societal background of vulnerable populations. Identification of the needs scored the highest and this was mostly done by having the risks dialogue. Regarding distributional justice, indicator one, implementation of risk assessment, scored relatively high compared to the other indicators.

All the different strategies on the municipal level refer to the DPRA which advised to make stress tasks for the four climate change risks and afterward have a risk dialogue with stakeholders. There is limited implementation of the monitoring of costs and benefits of climate adaptation, as can be seen for the score of indicators 3 and 4. Additionally, maladaptation is often not mentioned and there are not compensation measures for maladaptation.

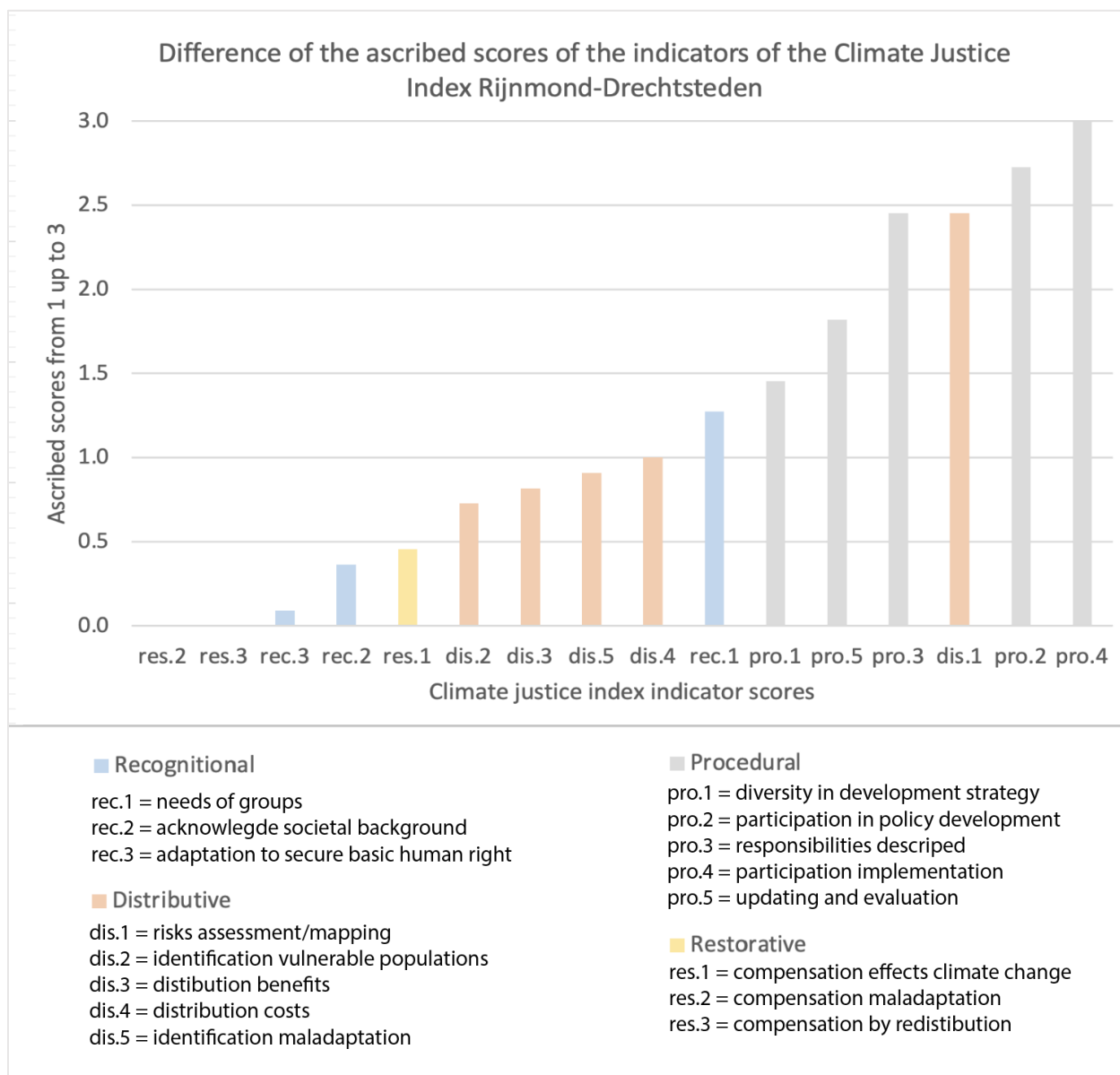


Figure 9 Scores Indicators Climate Justice Index for Rijnmond-Drechtsteden (Author's own)

5.4. Concluding paragraph of results Adaptation Justice Index

First, in terms of different justice types, we see that procedural justice, especially the participation indicators, is way more reflected and restorative justice the least reflected. The overall score for all the different climate justice types is 35%. Secondly, if you look at the different levels of government, we see that restorative justice is almost only present in national strategies which exception of DPRA working region Rotterdam. It is also noticeable that recognitional justice is not most present at municipal levels despite that they are closer to the local context. Thirdly, there are large differences within different

government levels and the two documents that score the highest have climate justice described in their strategy and are also more recently published. The two documents that scored the highest were the implementation programme NAS 2023, which is a national document, and Rotterdam which is a DPRA region. Rotterdam stood out for the recognitional justice score because it linked climate justice to basic human rights and acknowledged the societal background of vulnerable populations. Fourthly, when we look into the scores of the different indicators' large differences in the scores within the same climate justice forms. For procedural justice, it was noticeable that the diversity of the participation did not score high. The first indicator for restorative justice which refers to the acknowledgment of compensation for the diverging impacts of climate change, was the only indicator of restorative justice that scores above zero. The documents that described this focused on water-related risks and disasters. Zero scores were ascribed to acknowledgment of compensation for maladaptation or redistribution. Regarding distributional justice, the distribution of costs and benefits were mentioned in a general way or even not at all. Furthermore, there was mostly recognition of the elderly or young children as a vulnerable population group for heat stress. Not often were things mentioned concerning people with fewer resources and capabilities. Acknowledgment of the societal background was also missing in most of the strategies.

6. Perspectives and considerations

To answer the second sub-question ‘How do policy actors consider and perceive climate justice forms in climate adaptation strategies in the Rijnmond-Drechtsteden region?’ interviews with policy actors were held and were analyzed with the help of inductive coding. When analyzing things there were three possible ways of explaining the considerations and perspectives that emerge, and therefore I made three different categories. The categories are (7.1 & 7.2.) drive, (7.3.) capacities & institutional factors, and (7.4.) complexity of climate adaptation and climate justice. Drive is about how people understand things and the psychological factors influencing them. The second category, capacities & institutional factors is about the external aspects surrounding people, limiting or enhancing the ability to integrate climate justice forms. This category mainly addresses practical aspects. The last category is the complexity of climate adaptation and climate justice. Noticeably, the three subjects are interrelated as visualized in Figure 10. For each category, there are sub-themes that fit within their category, and these are described in this chapter.

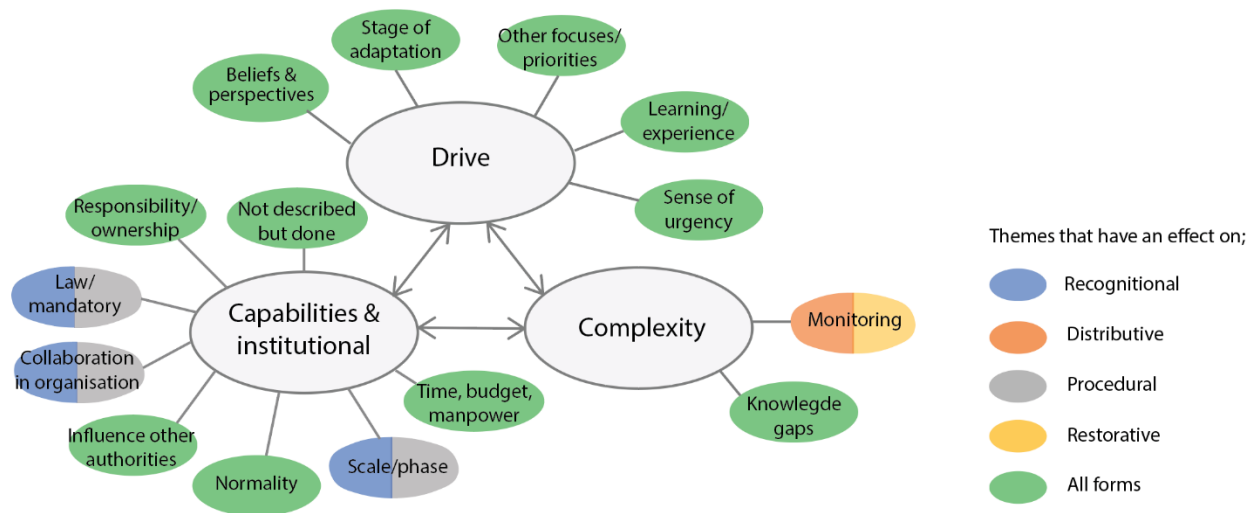


Figure 10 Categories considerations climate justice policy actors (Author's own)

6.1. Definition of climate justice by interviewees

The first question in the interview that was about climate justice and therefore there was no influence of other questions. The definition of climate justice by the interviewees is part of the first category drive because it is about how different interviewees described how they define climate justice and make sense of the topic climate justice. I applied these codes for the different climate justice forms, without interviewees explicitly mentioning these forms describing them. It should be mentioned that their definitions of climate justice are from the current understanding of climate justice and not when they developed the climate adaptation strategy. Interviewees often note that during the strategy's development, climate justice was not a topic of discussion or had never heard of climate justice at that point in time.

Distributive and recognitional aspects have been mentioned the most. Often mentioning fair distribution of burdens and benefits for vulnerable people and those with many capacities. In some interviews, the societal background of vulnerable populations is described but for most interviewees, the vulnerable populations defined as less wealthy people. Self-resilience was also mentioned as a part of climate justice as described in the following quote;

'You also have to think about whether people can be self-sufficient. In a posh neighborhood, it's best to ask people to plant a tree and in the poor neighborhood, people don't have the money to plant a tree because they prefer to spend the money on food' (Interviewee from DP & DPRA, 2024)

What was noticeable is that some interviewees spoke of justice along different spatial and temporal axes. Some interviewees mentioned that there is an intergenerational aspect when it comes to climate justice and explained that we have to implement climate adaptation measures now because otherwise, further generations will suffer the consequences. The interviewees that are involved in the Delta Programme, the DPRA as well and the preference strategy Rijnmond-Drechtsteden, have all mentioned this time-related aspect for distributive justice. Some interviewees also mentioned the international scale aside from their policy scale. The differences between the emissions and the consequences of the emissions which then often have more severe consequences for those who have emitted less and also have less scope for action are often mentioned here. Aspects related to procedural justice only come up one time for the definition of climate justice. However, it was not about the inclusion of actors and collaboration in the process and the implementation. It was more focused on creating transparency and knowledge sharing with different stakeholders about experiences. Nothing was mentioned concerning compensation and/or redistribution for climate adaptation measures which means that no restorative justice aspects were mentioned by the interviewees.

Two interviewees have never heard of climate justice and one interviewee defined climate justice as implementing the most efficient measures. One of the interviewees who has never heard of climate justice mentioned that they are involved in different spatial adaptation working groups that involve policy actors from different public organizations and that this topic never has come up.

When asked about the importance of the different climate justice forms recognition justice was often mentioned as the basis by the interviewees. It is notable, however, that recognitional justice does not score high in the results of the AJI. Possible explanations are described in the following paragraphs. This explanation quotes why recognitional justice is seen as a basis by interviewee from Rotterdam-b;

'I think the recognition is always the basis here, because, without recognition of a problem or a structure, you can never actually start doing things. If people don't see it, it's not there. So, I think that might be the basis of everything.' (Interviewee from Rotterdam-b, 2024)

There were also different tradeoffs mentioned by the interviewees. These tradeoffs were dependent on different perspectives. Interviewee from Implementation program NAS mentioned that procedural justice is most important if people are content with the process (procedural justice) and the effects of the implementation matter less (distributive justice). Interviewee from DP & DPRA mentioned that the significance of the implementation of climate justice forms depends on the extent of damage incurred when no climate justice forms are integrated within climate adaptation policies. Interviewee from NAS mentioned that because there is a focus on prevention, restorative justice could be considered less but they also mentioned that restorative justice can be seen as important because there is not much focus on it yet.

6.2. Drive

The first category drive which is about how people understand things and the psychological factors influencing them. This paragraph consists of various subtopics falling under this category such as; stage of adaptation, other focuses and priorities, learning through experience, sense of urgency, and beliefs & perspectives.

Some interviewees mentioned that at the time of the development of the adaptation strategy, the topic of climate adaptation was relatively new, and the urgency of climate adaptation is still missing. This was the reason why the focus of this strategy was based on creating awareness for different sectors and domains and a widely supported document to increase the urgency of climate adaptation. Interviewee from Krimpenerwaard-a mentioned that the focus of the strategy was more on the broad issue of climate adaptation and its risks within the city. The stage of spatial climate adaptation can also explain why the score of restorative justice of the AJI are relatively low in the Rijnmond-Drechtsteden region. Interviewee from Rijnmond-Drechtsteden described this as follows;

'I think we are still at the stage of understanding what is coming at us and thinking how to cope and measures are being taken here and there on a small scale, but I think the real blow is yet to come both in the effects and the approach and that I why I think restorative has a low score.' (Interviewee from Rijnmond-Drechtsteden-a, 2023)

Different interviewees mention that the focus is on prevention in the Netherlands and that this plays a part in the low score for restorative justice in the Rijnmond-Drechtsteden region. Interviewee from South-Holland mentioned that the citizens expect this too because we recently surveyed the role of the province among citizens and one of the main points of this was the role that the province ensures that we keep dry feet. He also mentioned the following;

'Restorative justice doesn't seem to be in play yet because we have set up our country so that we are not at risk or don't think we are at risk' (Interviewee from South-Holland, 2024)

However, different interviewees from different government levels have mentioned that because of heavy rainfall Limburg in 2021, where there was damage, the urgency for compensation, which is part of restoration grew, and interviewee from South-Holland mentioned that there is no research done on the consequences, and damage of a similar situation in the context of South Holland. Depending on the publishing of the document this could have influenced the score of restorative justice from the AJI. Interviewee from Rijnmond-Drechtsteden-a mentioned that the disaster in Limburg influenced the new insight on restorative aspects which are going to be implemented in their next preference strategy.

Different interviewees explain that they have learned through experience. Interviewees mention that there is a difference in experience with climate adaptation within different governmental organizations. For example, the municipality of Gouda mentioned that they have more experience with climate adaptation in their working region and that within this region topics have been addressed that they did years ago. Interviewees have mentioned that the urgency grew as the negative effects became more widely known.

Interviewees from Rotterdam-a and Rotterdam-b mentioned that they have had four different climate adaptation strategies and each time different subjects came forward that needed more attention. In the first strategy, the focus was on the water, in the second strategy climate change integrated, in the third

resilience was the focus, and in the last one collaboration with the city of Rotterdam was seen as important. The explanation of why it is considered important is described as;

'This is important because climate adaptation is not just about the technical measures. It is about adapting the city so that it enhances livability, and it is both about livability in the sense of hot and wet conditions but also the sense of social. That it is a nice place to be. You cannot then do this in isolation from Rotterdammers, because every neighborhood has different needs. Because of this, it is essential to involve people.' (Interviewee from Rotterdam-a, 2024)

Interviewee from Rotterdam-a mentioned that now they saw that there was climate injustice in Rotterdam and that adaptation measures sometimes increase the injustice. This is the reason that Rotterdam now has a program ICAR which advises in relation to climate justice in policy and projects. Interviewee from Rotterdam-b mentioned that a transition can be seen from more technical to also incorporation of social aspects in climate adaptation. They mention that they now also do the risks assessment differently and also look at the impact on different populations. When there is a higher impact on the citizen, possibly due to less capacities, they consider it a higher risk. However, they also mentioned that the urgency needs to be felt to implement this and this is also why they currently focus on creating awareness for vulnerable populations within the different domains in the municipality of Rotterdam, especially in the technical domain. They make use of the Wheel of power and perspective to accomplish this. Aside from the experience, the interviewee from Krimpenerwaard-b mentioned that a possible reason the urgency of climate justice is not felt is that in the city of Rotterdam, there are relatively fewer vulnerable people in than Krimpenerwaard. This means that experience and a sense of urgency influence can influence the implementation of climate justice within climate adaptation policies.

There are different beliefs and perspectives when it comes to climate adaptation. Different interviewees from municipality levels describe that in the technical domain, they have difficulty with the recognition of vulnerable populations. The policy actors of Krimpenerwaard-a mentions that they normally look more from a technical perspective at climate adaptation;

'I'm working from public space daily. That's also where the focus is for me, so to speak. Climate justice incorporation is a completely different approach. As a result, there are probably still steps to be made towards the social domain.' (Interviewee from Krimpenerwaard-a, 2023)

Interviewee from Hardinxveld-Giessendam-a mentioned that the social domain does not see the urgency of being integrated into the adaptation strategy, but that these domains do have insight into vulnerable population and communication tools. Aside from this, more political beliefs play a role in the implementation of climate justice. It is mentioned by different interviewees that climate justice can sound politically left and therefore can create resistance for right parties. Climate adaptation itself is also an issue within municipalities because they have the right municipal executive such as in Hardinxveld-Giessendam mentioned interviewee from Hardinxveld-Giessendam-b. What is noticeable is that interviewees from Rotterdam-a and Rotterdam-b mention that climate adaptation has become a less political topic and is now seen as something that needs to happen. Interviewee from Rotterdam-b also mentioned that climate justice does not have to be a political issue because it is about basic human rights and can be related to national laws. Interviewee from Implementation programme NAS mentioned the topic because climate justice also plays a part in livelihood security (bestaanszekerheid) which is currently a topic that is often mentioned in the House of Representatives in the Netherlands. It was mentioned by different interviewees that they believe that collaboration is needed for success and to create a widely supported climate adaptation strategy, this might positively affect procedural justice.

6.3. Capacities & institutional factors

The second category is capacities and institutional factors which is about the external aspects surrounding people, limiting or enhancing the ability of integrating climate justice forms. This category mainly addresses practical aspects. This paragraph consists of various subtopics falling under this category such as; time, budget, manpower, responsibility/ownership, law/mandatory, scale/phase, collaboration in organization, facilitation authorities, and normality. Some interviewees mentioned that climate justice aspects were done but were not incorporated within the strategy. Reasons for this that were mentioned were that it was already described in another governmental document or other already existing instruments.

Interviewee from South-Holland mentioned that capacity and resources are related to the urgency. Different subjects were mentioned are subcategorized under capacities. Firstly, different interviewees mentioned that there was time pressure. Interviewee from NAP mentioned that time pressure has influenced the choices of participation gatherings during the development of the climate adaptation strategy. Different governmental actors mention that because of the impulse subsidy of the National government, there was more capacity for the process and the measures. Aside from this budget, different interviewees mentioned that there is a lack of budget for climate adaptation. Interviewee from Gouda mentioned that smaller municipalities have fewer and sometimes even no employees available for the topic of climate adaptation and that this can also be viewed as distributive injustice because they have a lack of capabilities. Interviewees from Hardinxveld-Giessendam-a and Krimpenerwaard-a mention that because of a lack of employees, it is difficult to implement climate adaptation and spend time on this topic. They mention that this is also the reason their strategies are shorter. This may explain why there is less incorporation of climate justice forms within their strategies. Furthermore, because of the lack of budget different interviewees mention that often only generic measures are implemented, especially in smaller municipalities, and that this makes the topic of distributive justice less relevant for their policies. This is also mentioned by interviewee from South-Holland;

'We are not there yet. Because there's not that much money and there's also very generic measures being taken there that equity, so vulnerable people, that it doesn't play that much yet in the monies we have to spend.' (Interviewee from South-Holland, 2024)

Interviewees from Rotterdam-a and Rotterdam-b as well as interviewee from Gouda mention that they do have more manpower and budget for (innovative) climate adaptation efforts compared to other smaller municipalities. Interviewee from Rotterdam-b mentioned that they also have influence on the national scale, and they mentioned that they have good connections with actors who work at national governmental authorities.

At higher scale levels some interviewees mention that recognitional justice is more for lower scales because lower scales governments have a better insight into vulnerable populations. Interviewees from lower scale levels often mentioned that they did though of recognitional justice but that this was not mentioned in the text because it is more relevant in the implementation phase with projects. And in projects, you can better consider the context. It was mentioned by different interviewees that procedural justice is a focus for developing the strategy and that distributive justice takes more part in the implementation phase. Interviewees also mention that recognitional justice aspects and procedural aspects are implemented at the project level but that it is not described in the strategy because this is difficult. After all, the context of each measure and area is different.

Different interviewees mention that the relatively high score of procedural justice can partly be explained by that various parties in the Netherlands share responsibilities for climate adaptation and that the water system is interrelated. This ensures that these different actors cooperate to draft strategy. This way of working together is also encouraged through the Delta Programme. Interviewee DPRA, mentioned that working regions have been drawn up and that the evaluation of the strategy is based on the cycles of the stress tests. Interviewee from DP & DPRA mentioned that the described things are advisory and not mandatory. Additionally, they mentioned that this can cause discussion for the municipal executives because there are no embedded rules. The working regions work together when it comes to climate adaptation. Because of this cooperation, procedural justice scores relatively high in the AJI. However, in some municipalities, it is mentioned that they only have continuous participation with the actors who have responsibilities within the water system. As stated by the interviewee from Gouda;

'You also always end up with the water boards because they also have certain responsibilities in Gouda, so you are just all a partner in the water chain, and we just work with the water partners.' (Interviewee from Gouda, 2024)

It should be mentioned that interviewee from Gouda mentioned this in relation to whom they now work with in the water programme, which is a newer programme that is not public yet. The interviewee from the implementation programme NAS as well as the interviewee from Rotterdam-b mention that often the collaboration is more with the usual suspects such as regional water authorities, municipalities, etc. Interviewee from implementation programme NAS mentioned that she would also want to incorporate the unusual suspects to get a better understanding of the different perspectives and needs of these actors. Interviewee from Rotterdam-a and interviewee from Gouda both mentioned that they collaborated within the organization from the beginning of the development of the strategy with the purpose to create a broadly supported document. It was mentioned by the interviewees from Hardinxveld-Giessendam-a and Krimpenerwaard that there is currently a lack of collaboration between the technical and social domains and that this plays a role in the integration of vulnerable populations within their strategy. This is also related to the current number of employees available because it also takes manpower to explain the importance and get a connection to the social domain when it comes to climate adaptation. Interviewee from Krimpenerwaard-a added that there currently the climate adaptation strategy was not part of a separate program within the municipality and that this makes it more difficult to get in contact with other domains, as described in the quote;

'If you have a programme within the organization, several domains are involved, which makes the lines of communication easier. Now you have to draw up a structure yourself, which we have already done with the working group. But that is quite difficult, because climate adaptation is not just a matter for the public space team. It transcends team boundaries, which means you have to have coffee with everyone. So that is also a stumbling block.' (Interviewee from Krimpenerwaard-a, 2023)

Topics such as making the strategy available for inspection (ter inzage leggen), seeking the council for approval, and B1 level for letters are all things that are mandatory within the Netherlands mentioned by different interviewees. These topics relate to procedural justice as well as recognitional justice and therefore can influence these climate justice forms. Noticeably, interviewee from Rijnmond-Drechteden-b mentioned that they did not make the strategy available for inspection because it was a new collaboration, but they say that later on in the implementation of this strategy they experienced difficulties because there was no inspection. When asked about why certain climate justice aspects were integrated into the strategy it was mentioned by different interviewees that it was 'normal' to do it this way and that

earlier ways of doing it are the basis for the process. An example is interviewee from Rijnmond-Drechtsteden-a;

'I did not recognize a conscious choice moment in that. We're kind of building on, the way we did in 2014' (Rijnmond-Drechtsteden-a, 2024)

Often the topic of responsibility and ownership was mentioned in the interviews. Interviewee from Hardinxveld-Giessendam mentioned that there is a need to create responsibilities at the national level when it comes to spatial climate adaptation. In addition, interviewee from NAS mentioned that decentralization of responsibility could have led to underdeveloped monitoring;

'The monitoring at the level of who is doing what measure and is that sufficient is in my view underdeveloped in the Netherlands. And that has a lot to do with the fact that we place the implementation of climate adaptation measures at a low level in the administrative culture (Huis van Thorbecke) and that municipalities are mainly responsible.' (Interviewee from NAS, 2024)

Monitoring is part of distributive justice, and this is a possible explanation of the results of distributive justice of the result of the AJI. Aside from distributive justice, responsibility, and ownership can also be related to restorative justice. Compensation is often not seen as their responsibility by different interviewees because often measures are taken on public property which has the property of the government. On private property, the responsibility lies with the house owners. Different interviewees at lower government levels mention that they now mostly focus on providing information and facilitating when it comes to private property. Interviewees from higher government levels also mention that they facilitate, but they facilitate more at lower government levels. It was mentioned in different interviews that when it came to heat stress the province of South Holland held a webinar, and this made an interviewee from Krimpenerwaard-a mentioned that this helped them with collaboration with the social domain when for heat stress and implementing vulnerable populations within the heat stress plan. When it comes to procedural justice, responsibility also plays a part. Different interviewees mention that they collaborate with actors who have responsibilities within the water system. Interviewee from Rijnmond-Drechtsteden mentioned that the responsibilities within the water system of different actors are known and this is the reason why this is sometimes not explicitly mentioned in the strategy.

6.4. The complexity of climate adaptation and climate justice

The complexity climate adaptation and climate justice were seen as an issue and therefore complexity is considered as a category. Other categories are also related to complexity. Different interviewees also mention complexity as a topic for their considerations and perspectives. It was mentioned by interviewees from Hardinxveld-Giessendam-a that climate change is difficult to predict that it is often not yet graspable either and that this makes it difficult to create a sense of urgency for society. Many things are related to experience, as mentioned by different interviewees in earlier paragraphs that climate adaptation is a relatively new topic, and climate justice is even a newer topic. Interviewees explain that there are currently different knowledge gaps when it comes to climate justice. Knowledge gaps that were mentioned by different interviewees are mentioned in Table 8.

Table 8 Mentioned knowledge gaps climate justice (Author's own)

Knowledge gaps	Interviewee who mentioned it
----------------	------------------------------

The damage when climate justice aspects are not implemented	DP & DPRA
What ways to involve vulnerable people in the policy process	NAS and Rotterdam-b
What are the vulnerable populations in their scope	Hardinxveld-Giessendam-a
What to use as zero-measurement when it comes to restorative justice and distributive justice	NAS, Rotterdam-b, and RD-b
How do deal with homeowners and private property for climate adaptation	Gouda
What are the exact responsibilities in case of calamities	South Holland
How to monitor climate adaptation measures and their costs and benefits	DP & DPRA, and NAS
How are you going to respond to certain perspectives and how can you gather these perspectives	Rotterdam-b
What can you do differently for vulnerable people in the public space and how can you support them then	Rotterdam-b

Several studies are currently in place to answer these questions, but it was mentioned by interviewees that some of these topics are complex. For example, it was mentioned by interviewees from Rotterdam and DP & Rijnmond-Drechtsteden-b that it is not possible to involve everyone in the development and implementation of the strategy and that choices have to be made. People may not know when it is done sufficiently because some individuals will always be excluded. Additionally, sometimes it is better to involve an overarching organization. This is also the case for the broader topic of climate justice as a whole. Interviewee from NAS implementation programme mentioned that they do not know what the best way is to include climate justice-related topics within strategies.

Different interviewees mention that there is currently a lack of sufficient monitoring. Interviewee from NAS mentioned that this is because monitoring is complex. Interviewee from Rotterdam-b adds that a lack of monitoring can cause a lack of implementation integration of distributive justice as well as restorative justice because when you do not know what goes wrong you are not able to restore it properly. The interviewee from DPRA mentioned that they are currently developing a monitoring system and goals for climate adaptation. There are monitoring systems in place but the interviewee from implementation programme NAS mentioned that these tools do not explicitly take climate justice into account, but it is implicitly integrated.

6.5. Concluding paragraph of results interviews

From all climate justice considerations that were induced from the interviews, three categories emerged which are drive, capabilities & institutional, and complexity. The categories are interrelated. There are sub-codes, which are the considerations of the interviewees for the integration of climate justice forms, linked to the categories. This paragraph describes the seven main findings.

Firstly, the understanding of the concept of climate justice is limited, and different amount interviewees. Some interviewees are even unfamiliar with the concept of climate justice. Distributive and recognition justice aspects were mentioned most frequently by interviewees when asked if they could describe their definition of climate justice. They often related elderly and low income to vulnerable populations. There were also mentions of intergenerational justice and international climate justice by interviewees. Secondly, some interviewees mentioned that there was no sense of urgency for climate justice at the time and that the focus was more on creating urgency for climate adaptation and implementing and looking at

possible measures for climate adaptation. This can potentially influence all climate justice forms. It was noticeable that the interviewees with more experience such as NAS and the municipality of Rotterdam did mention that climate justice is one of the priorities in their adaptation strategies. It was also mentioned by the interviewee from the implementation programme NAS that new insights also created a sense of urgency. It was also mentioned by interviewees that restoration justice is not a priority now and some interviewees mentioned that there is already a slight change happening currently because, after the disaster in Limburg, different interviewees mention that they now also look at what can happen and what to do after a disaster. This can influence the integration of restorative justice. Thirdly, beliefs can influence the integration of climate justice forms. It is mentioned by different interviewees that climate justice can sound politically left and therefore can create resistance for right parties. This is not the case for every governmental organization because interviewee from Rotterdam-b mentioned that climate adaptation is not seen as a political topic anymore but as a task and that they have a right wing, but they do find collaboration important. Fourthly, responsibility was often mentioned by interviewees. Decentralization was noted by interviewees to have an impact on the distribution of responsibilities. What was also noticeable was that the interviewees emphasized that the responsibility for private property lies with the residents, highlighting the focus on information provision and facilitation of governmental organizations. Aside from this, actors who have a responsibility and tasks for the water system often collaborate for the development and implementation of the climate adaptation strategy. Fifthly, no integration different domains and separate documents. The lack collaboration different domains in small municipalities. Interviewees from Krimpenerwaard and Hardinxveld-Giessendam also pointed out that there is currently limited collaboration with the social domain, potentially influencing the aspect of recognitional justice. It is also mentioned by multiple interviewees that they currently have separate document for example for participation and that it is not incorporated into the strategy because of that. Sixthly, consideration at different phases of the policy process. At lower government levels it was mentioned that recognitional justice aspects and participation often take place at the implementation level because it is context-specific and because of that it is not integrated into the strategy. Furthermore, climate justice aspects are not explicitly mentioned within monitoring says interviewees from NAS and Implementation programme NAS. This can influence distributive justice and restorative justice because if you do not know if things have negative effects restoration is less likely to happen mentioned interviewee from Rotterdam-b. Lastly, time, budget, and manpower play a role in the integration of climate adaptation and therefore also influence climate justice integration. It is mentioned by interviewees that there is an overall lack of budget for climate adaptation especially in municipalities with a small scale.

7. Discussion

The Adaptation Justice Index (AJI) results of the various strategies had the same patterns, with procedural justice scoring highest, followed by distributive justice, recognitional justice, and restorative justice with the lowest score. Other research on Western countries found similar patterns (Anežka, 2023; Juhola et al., 2022). Within the research of Juhola et al. (2022), there were similar patterns between different levels of government found. Collaboration in water-related sectors, which is part of procedural justice received high scores in this research. Looking at the considerations of the policy actors interviewed, this can be attributed to the responsibilities within the water system and recommendations from the Delta programme to engage in risk dialogues and establish working relationships. However, the collaboration was often with the actors who have certain responsibilities in the water sector, indicating a lack of diversity in participation. Diversity in adaptation planning is considered an important aspect for just climate adaptation (Shi et al., 2016). Surprisingly, recognitional justice for municipal levels did not score high on the AJI, despite the crucial role they play for interaction with citizens within their local context (IPCC, 2014).

Overall, climate justice forms were not much present in the analyzed climate adaptation strategies because the overall score of the Adaptation Justice Index is 32%. This is partly explained by the considerations that were extracted from interviewees with policy actors which I categorized in the three groups: *drive*, *institutional factors & capacity*, and *complexity*. These three categories are interrelated. While previous research by Chahboun (2017) outlined three categories, ability, motivational, and institutional, as feasibility constraints for justice, it is essential to note this relates to justice, not specifically climate justice within climate adaptation strategies. Motivation corresponds to the drive category in this research, while ability aligns with capacity. The categories institutional factors, which is also identified as a barrier for climate adaptation (Inderberg & Eikeland, 2009), is more focused on the external nature. Additionally, complexity was addressed separately in this study due to its frequent mention by interviewees and its dual relevance to both categories.

The knowledge and the sense of urgency for climate justice are aspects related to the categories of complexity, and drive, and are indirectly linked to capacity within this research. Climate justice focusing on urban context is a scientific topic that has increased exponentially over the last years (Mohtat & Khirfan, 2021); therefore, it is not surprising that the most recent documents that explicitly mention climate justice in the strategy have the highest average scores of climate justice. Restorative justice the newest discussion within climate justice in adaptation planning (Robinson & Carlson, 2021) and also has the lowest score. There is ambiguity concerning the concept of climate justice within the scientific field as well as the interviewed policy actors (Newell et al., 2021). When asking the definition of climate justice interviewees often mentioned things related to distributive justice and recognitional justice, with different considerations spanning different scales and temporal dimensions. These dimensions are also mentioned often within the scientific field (Parsons, 2024). Procedural aspects and restorative aspects were rarely mentioned. The lack of procedural justice mentioned within the definition of climate justice is noticeable because there are, compared to the other forms of justice, relatively many articles published about procedural justice and scored high on the AJI (Mohtat, & Khirfan, 2021). Furthermore, two interviewees do not know climate justice, which can be attributed to the recent prominence of climate justice literature (Parsons, 2024). Recognitional justice was often described by interviewees as foundational for just climate adaptation by some interviewees, mirroring statements made by Fraser, 2000 and Bulkerey et al., 2014. Noticeably, interviewees often only mentioned the socioeconomic status of low-income households or age when they described vulnerable populations, neglecting factors mentioned by Tagtachian & Balk (2023) such as; racial and ethnic minorities, low-income residents, renters, older residents, and non-native English speakers (Allen et al., 2021; Bjarnadottir et al., 2011; Chakraborty et al., 2019; Cutter et al., 2012;

National Academies of Sciences, Engineering, and Medicine, 2019), that are more explored in the US. This empathizes the need for a deeper understanding and discourse of vulnerable populations and their societal background to effectively integrate recognition into adaptation strategies.

Different interviewees also mentioned the existence of knowledge gaps related to climate justice and its implementation. For example, difficulties in knowing when the diversity in actors is sufficient considering the complexity of including all population groups. Interviewees express a prevalent focus on understanding climate risks and fostering urgency for adaptation, potentially overshadowing the focus on climate justice aspects within climate adaptation strategies except for Rotterdam and Implementation programme NAS, where adaptation experiences and new insights boosted awareness and created a sense of urgency for climate justice. Society's overall lack of awareness and urgency for climate adaptation (Lenzholzer et al., 2020), especially in smaller municipalities, also due to budget and capacity constraints (Biesbroek et al., 2011). This underscores the need for education and communication to increase awareness for climate adaptation (Lenzholzer et al., 2020), but also for the topic of climate justice. We need more education about the concept of climate justice, how to implement it, and what the negative effects are of climate injustice so the sense of urgency for this topic can grow.

Three important aspects emerge within this research that can help with a better understanding and integration of climate justice in adaptation strategies in the Rijnmond-Drechtsteden region. My results point to three lessons, and these can be understood as the *Who*, *What*, and *When*. *Who* is about the actors that should take responsibility, *what* is about what is needed to create better insight into climate justice as a social concept, and *when* is about the implementation of climate justice within the policy cycle.

7.1. Aspects concerning the integration of climate justice in climate adaptation

7.1.1. Who –Actors and responsibilities

It is important to understand the effect of responsibility for the integration of climate justice in climate adaptation strategies. Responsibility is often mentioned by interviewees and therefore may influence the integration of climate justice aspects. Interviewees mentioned that they often collaborate with other actors who have responsibilities within the water system, which can be related to the dominance of water focus in climate adaptation in the Netherlands (Hart et al., 2023). The underlying reason for this could be the interrelatedness of tasks and responsibilities.

Interviewee from NAS mentioned that responsibilities are decentral addressed in the Netherlands. It was mentioned by an interviewee from DP & DPRA that often certain aspects of climate adaptation from the Delta Programme are advisory and not compulsory, which means that authorities cannot be held accountable when the advice is not implemented. They also add that this can also create a discussion for the municipal executives because there is more freedom in decision-making, which may hinder climate adaptation and climate justice integration. A positive effect of decentralization of adaptation for climate justice is it may enhance local participation, which creates room for them to mention their needs (Kirkby et al., 2018), but marginalized groups with less social power often face disadvantages (Few et al., 2007; Nagoda & Nightingale, 2017). Furthermore, there is less focus on non-water-related tasks such as heat stress, indirect consequences, and monitoring in the Netherlands (Hart et al., 2023). An important building block for monitoring is the identification of the organizations that are responsible for monitoring (Klostermann et al., 2018). Unclear responsibility and tasks are seen as a barrier to climate adaptation (Biesbroek et al., 2011), which can be caused by the institutional void because of the decentralization of climate adaptation in the Netherlands (Hart et al., 2023; Lee et al., 2022), which could indirectly affect climate justice.

Interviewees mention that they are responsible for public space and that residents are responsible for climate adaptation on their property. However, adaptation implementations on public property can also affect citizens. Aside from this, Doorn et al. (2021) mentioned that when transferring responsibilities to citizens, governments should ensure citizens' capability to assume these duties. Additionally, governments have a responsibility to prevent the exacerbation of inequalities resulting from citizen involvement in these responsibilities for it to succeed. Interviewees do mention that they focus on facilitation and providing information for private property. However, specific measures to address vulnerable populations are mentioned to a lesser extent which can lead to inequalities and insufficient capability to responsibility duties. Additionally, citizens are often not aware about their responsibility concerning climate adaptation (Trell & Geet, 2019).

The Delta Programme is based on collaboration, and they advised making working regions with different governmental actors who operate at different scales for climate adaptation (Ministerie I&W, 2023-c). The interviewee from the Implementation Programme NAS mentioned that collaboration is often done with the usual suspects, which are the actors involved in the water domain, however, they also mention that they want to look collaborate with the unusual suspects and make the actors more diverse. This will positively affect procedural justice. Climate justice is also a focus topic in the implementation programme NAS (Ministerie I&W, 2023-c). However, the DP is more often mentioned in the strategies and by the interviewees than the NAS and therefore there is a change that can be overlooked by other governmental levels. The Delta Commissioner who is responsible for the Delta Programme has an important role in policy networks because they have a brokering role (Wamsler, 2020). They prove to help with the integration of different levels and actors for climate justice adaptation (Biesbroek & Candel, 2020), however, the actors can still be more diverse and climate justice is not mentioned explicitly within the Delta programme.

Responsibility is a crucial aspect concerning climate justice integration, as seen in collaboration among actors and the distribution of tasks within the water system. To answer the question of who should be responsible and what needs to be done to accomplish, clarity in governmental responsibilities and ensuring citizen's capability to execute their duties is crucial when it comes to preventing inequalities for climate adaptation is needed. Aside from this, the Delta Programme is important for policies in the Netherlands but does not explicitly mention climate justice and there is still improvement for diversity of actor.

7.1.2. What – Bridging domains and perspectives

Climate justice is a partly social issue and therefore connected to the social domain. To accomplish climate justice there is a need to involve the social domain within climate adaptation strategies. Interviewees of smaller municipalities such as Hardinxveld-Giessendam-a mentioned that the social domain does have the resources and information over vulnerable populations, but they currently do not often collaborate with the social domain due to the lack of manpower in the social domain. A lack of capacity is seen as a barrier to climate adaptation integration (Runhaar et al., 2018).

Another barrier that was mentioned by interviewee from Hardinxveld-Giessendam-a is that the social domain did not see the urgency to be involved in climate adaptation and the technical domain did not consider it necessary to include vulnerable populations. Issue framing can help integration (Biesbroek, 2021). Eriksen et al., 2015 mentioned that adaptation should be seen as part of the dynamics of societies instead of framing it as a technical fix to deal with climate change. By reframing adaptation this way aspects of climate justice such as recognizing different population groups and their societal background may be easier to recognize and be incorporated in strategies. However, this is often not implemented in climate

adaptation strategies in the Rijnmond-Drechtsteden region. To create broader political support for climate justice, it can be reframed and integrate popular topics that are addressed within climate justice such as livelihood security (bestaanszekerheid), which was mentioned by interviewee from implementation programme NAS.

Interviewee Rotterdam-b as well as interviewee Gouda mentioned that they had early involvement and collaboration from the beginning of the policy development to create a broadly supported document. Biesbroek (2021) mentions that enablers for designing an integrated policy are, adaptive arrangements and involvement when designing and implementing integrated policies (Molenveld et al., 2020), as well as informal relationships which are focused on trust (Metz et al., 2020). Other enablers for policy integration are creating high issue attention and not harming core policy believes of different domains (Biesbroek & Candel, 2020; May et al., 2009). The Delta commissioner can also be seen as an enabler because it has a leadership role in ensuring the integration of climate adaptation (Biesbroek & Candel, 2020). It is important to mention integration attempts should be aligned with institutional systems, logics, and capacity to have a higher chance of success. It is noteworthy to mention that through learning and reflection, adjustments are made to the policy integration process (Biesbroek, 2021). This is also aligning with interviewees who mentioned that they learned through new insights, evaluations, and experiences.

To achieve climate justice in climate adaptation strategies, the involvement of the social domain is crucial due to its knowledge of vulnerable populations and communication tools. The results of this research indicate that smaller municipalities often lack insight into vulnerable populations during policy-making due to limited collaboration with the social domain. To answer what needs to happen, overcoming barriers such as capacity constraints and differing perceptions, enablers such as issue framing, and creating issue attention can help integration of climate adaptation, including climate justice. However, these things can be best incorporated when it is aligned with institutional systems, logics, and capacity. Furthermore, integration of policy domains can be influenced by learning and reflecting.

7.1.3. When – Integration in policy process

The policy cycle, consisting of agenda-setting, policy formulation, policy adaptation, policy implementation, and evaluation, describes the process of policy making (Lasswell, 1956). The risk assessment, which is part of the agenda setting, is often based on climate risks in the Rijnmond-Drechtsteden region. An interviewee from Rotterdam-b mentioned that they have recently changed the way they look at risks and incorporate social aspects to look at them from the perspectives of impact. Depending on the population group the impact can differ because vulnerable populations often have fewer resources to overcome impacts (Benevolenza & DeRigne, 2019). However, of all the governmental organizations within this research, only Rotterdam uses this method.

Monitoring and evaluation are integral components of assessing the effectiveness, learning from climate adaptation efforts, and ensuring accountability for adaptation (Adaptation Committee, 2023). It was mentioned by NAS that monitoring is currently underdeveloped in the Netherlands. Other interviewees mentioned that monitoring is complex. Aside from the complexity of monitoring itself, there is a lack of explicit inclusion of climate justice aspects in monitoring descriptions within the climate adaptation strategies as mentioned by interviewee from implementation programme NAS. A building block for monitoring is the definition of the system of interest (Klostermann et al., 2018). Climate justice including the distribution between different vulnerable populations and their capacity is not considered part of the system of interest according to the AJI results. When this is not incorporated into the monitoring systems it is also more difficult to see the effects of climate adaptation on vulnerable populations. From a long-term perspective, not incorporating social aspects within the different phases of the policy process, such

as monitoring and evaluation, can lead to overlooking important aspects (Adger et al., 2018). Therefore, enhancing climate justice within different phases of the policy process is essential for a comprehensive implementation of climate justice. Monitoring and evaluation are also important in considering maladaptation, which has an overall low score in the AJI, because this means that climate adaptation does not always get the intended and expected outcomes even when there is a focus on participation with vulnerable populations in the adaptation effort (Eriksen et al., 2021). Additionally, from the results of the AJI it can be seen that citizens are often not part of monitoring and evaluation even though it can produce relevant insights and lessons (Adaptation Committee, 2023).

Some interviewees mentioned that recognition justice and procedural justice are more relevant in the implementation phase because it is context-dependent. This was the reason why they did not implement these aspects in the strategy. However, Chu & Cannon, 2021 describe that decisions in the policy process should include different voices and viewpoints. Interesting research would be to look into detail which forms of justice are more relevant for different phases in policy development. This can also include aspects that include meaningful participation, which is part of procedural justice (Centre for Policy Research, 2019; Newell et al., 2021). This research can be done through literature research combined with interviews with experts and professionals within climate justice and adaptation. Another interesting research would be to do an empirical case study about climate justice within the climate adaptation policy cycle.

To conclude the *When* question, climate justice needs to be integrated into every step of the policy cycle. Therefore, climate justice needs to be integrated explicitly, especially in the monitoring and evaluation phase, to create a learning process about the effects of the policy on climate justice and reduce the chance of overlooking climate justice. However, it is still difficult to answer specifically how this can be done for each government level and when which aspects of the justice forms are more important. Researchers need to conduct more studies on what climate justice forms are most relevant in which phase of the policy cycle and how to integrate this into practice.

7.2. Limitations and further research

Personal bias may have influenced this research due to my technical background which makes me more inclined to structured approaches such as the AJI index. Furthermore, because I live in Rijnmond-Drechtsteden, I may have biases towards cities I have had experiences in such as Gouda and Rotterdam. Efforts to remain objective were looking critically at the scores I have ascribed and comparing them to each other. However, there is a risk of overlooking certain aspects due to inherent human limitations.

The strengths of this research are within the multiple types of analyses. The document analyses created a better insight into the described integration of climate justice forms, while semi-structured interviews give an insight into the thought process and the perspectives of the policymakers who have developed the strategy. The AJI facilitates the comparison of different forms of justice and different policies, which creates a better understanding of integration of climate justice forms. There were thirteen interviews held, with follow-up interviews to address information gaps. By starting the interviews with the question if they had heard of climate justice and if they could give their definition, minimized possible knowledge they could have gathered during the interview. Through inductive coding, themes emerged that were comparable to other adaptation and climate justice studies.

There are no clear boundaries to when scores can be given in the AJI. This could affect the validity, however by adding how I used the AJI this is prevented. Document analyses and AJI lack the background knowledge about why the climate justice forms were integrated. Therefore, semi-structured interviews

were conducted to provide a deeper understanding of the integration of climate justice forms. More interviews were conducted at lower government levels, which means that there is possibly more information extracted compared to other government levels. Additionally, the DPRA region Hoekse Waard was not included due to availability constraints. The Rijnmond-Drechtsteden region was the scope of this study, however, not all strategies were included in this research, which means that this research gives insight into the integration and considerations of climate justice forms in adaptation strategies but cannot be generalized for the whole region, or other areas. Subjectivity was inevitable due to coding by the author alone, but this was necessary given the study's time constraints. Despite these limitations, the study identified themes and differences across government scales. Furthermore, this study only focuses on the strategy and not the implementation of the strategies and therefore the actual implemented justice is not considered. However, strategies serve as a foundation for guiding and influencing the implementation of climate adaptation efforts (Juhola et al. 2022), and therefore say something about the intent of climate justice integration.

The AJI method for assessing climate justice within policies has room for improvement. Firstly, there is a need to address different risks separately, as observed in this analysis, particularly concerning the indicator recognition of vulnerable populations. Secondly, increasing the scales and values could clarify policy differences in more detail. This was missing while doing the analyses. Thirdly, intergenerational justice aspects were mentioned a few times in the interviews. Therefore, intergenerational justice can be incorporated into the AJI, possibly as a separate topic or integrated within distributive justice because intergenerational justice is based on distributional ethics (Klinksky & Dowlatabadi, 2009). Fourthly, retributive justice, focusing on actors' responsibilities (Cañizares, 2023; Okereke, 2010), can be implemented within a separate topic or in procedural justice more extensively because responsibility was also mentioned often by interviewees. Fifthly, procedural justice results may be misleading when different actor types participate but are involved in only a small part of the strategy. Continuous collaboration among a few actors within a group can inflate scores, as observed in this research. To address this, differentiation within the AJI is recommended. Other aspects that can be assessed for procedural justice are unusual suspects and transparency (Chu and Cannon, 2021; Wenta et al., 2018). Sixthly, reconciliation between offender and victim is normally seen as an important part of restorative justice within the criminal field because this allows the victims to confront their offenders which helps the victim to move forward and can be seen as a method of rehabilitating the offenders (McAlinden, 2011; Welton et al., 2015). Within this research the focus was on compensation however, adding reconciliation would make fit better within the original meaning of the justice form. Seventhly, the indicator 'impact of climate risks on different population groups' can be added because it gives insight into whether the distribution of their measures takes the impact on vulnerable people in mind. Lastly, indicators for the involvement of stakeholders in monitoring climate adaptation should be added to distributive justice assessments.

Interviewees have mentioned that there are knowledge gaps for climate justice which makes it difficult to implement climate justice aspects. Aside from these knowledge gaps that are mentioned by these interviewees, other studies are recommended. Such as updating the AJI by using the recommendations that were mentioned in the last paragraph, literature studies, and interviews with experts and policy actors. Testing different AJI versions in various countries and cities is suggested. While this study was on spatial climate adaptation, other topics can also be explored such as water safety, and freshwater availability or integrated strategies, especially in light of the Environment and Planning Act which was implemented in 2024 in the Netherlands, which integrates policies (Ministerie BZK, n.d.). A focus of this Act is on the integration of policies and transitions. It is also suggested to conduct this research in a different context, such as another country or region. This would be intriguing to explore potential differences or patterns.

7.3. Recommendations

From the results and discussion, five recommendations have been drawn up that can ensure that the various forms of climate justice receive more attention within climate adaptation strategies. These recommendations relate to learning and education about climate justice, which is currently limited within the Rijnmond-Drechtsteden region and the (*Who*) actors and responsibilities, (*What*) integration of social and technical domain, and (*When*) implementation in the policy cycle. Table 9 p.46 describes the recommendations, including the purpose and the initiator. Implementing this advice also takes time and manpower, which is currently also seen as a barrier to implementing climate adaptation. As a result, choices might have to be made about which things have the highest priority. Special attention is needed for smaller municipalities with less capabilities.

Table 9 Recommendations integration climate justice for analyzed climate adaptation strategies (Author's own)

Recommendation	Purpose	Initiator and involved organizations
<p>Learn from each other. Create a platform and events for adaptation climate justice where things can be shared about climate justice such as practical tips, experiences, studies, perspectives, and current knowledge gaps. Special attention is needed for recognitional justice, especially for vulnerable populations and societal background.</p> <p><u>Tips and examples:</u> 1) create visualizations and texts that are easy to understand and implement, 2) look into good practices of other countries such as the US, 3) use wheel of power and perspectives that DPRA region Rotterdam is using for awareness about different populations.</p>	<p>This can help with the understanding of climate justice, the consequences of climate justice. Eventually it can also lead to a sense of urgency for climate justice within climate adaptation. More knowledge about the current climate injustices can also create issue attention.</p>	<p>Ministry I&W, province and/or region, other governmental authorities</p>
<p>Clear and fair responsibilities. Create an overview of the current and missing responsibilities and tasks for spatial adaptation and if the responsible actor is able to fulfill these responsibilities. After this, research is needed on how these gaps can be addressed.</p> <p><u>Tip:</u> 1) Vulnerable population groups and smaller municipalities should be included 2) can be combined with monitoring costs and benefits for climate adaptation.</p>	<p>The clarity in governmental responsibilities and ensuring citizens' capability to assume duties are vital to prevent inequalities in climate adaptation is needed. This can also give insight in if smaller municipalities are able to fulfill responsibilities.</p>	<p>Ministry I&W and other governmental authorities</p>
<p>Framing matters. Reframe climate adaptation so that climate justice aspects are more incorporated. Adaptation should be seen as part of dynamics of societies with different</p>	<p>This way of looking at adaptation also should recognize the importance of understanding possible inequalities for adaptation</p>	<p>Delta Programme</p>

populations groups with different backgrounds.	measures. It can also help with integration of social domain.	
<p>Climate justice in whole policy cycle. Climate justice forms should be explicitly incorporated in the whole policy cycle.</p> <p><u>Examples:</u> 1) use social factors, and distributional aspects in the risk assessment, monitoring, and evaluation of adaptation measures, 2) identify needs and opinions of vulnerable populations by collaborating with community centers and spoke persons of neighborhoods. 3) integrate costs and benefits of climate adaptation in monitoring system in and between governmental authorities.</p>	It reduces overlooking climate injustices. Additionally, it can create a better understanding of the impact of climate risks, can identify if the policy is successful for different population groups, and can create a better insight into the distribution of climate adaptation. Furthermore, efficient monitoring and evaluation can also identify maladaptation.	All governmental authorities

8. Conclusion

Climate justice has gained increased attention in the last two decades for its relevance and studies revealed that unequal distribution and integration of actors worsen the impact of climate change on vulnerable populations. The complex concept of climate justice includes recognitional justice, distributive justice, procedural justice, and restorative justice. Currently, there is a notable lack of climate justice studies that focus on the four climate justice forms, particularly in the context of different spatial strategies at various government levels within a single region. There is also a lack of knowledge about the considerations of policy actors regarding the integration of climate justice within adaptation strategies in Rijnmond-Drechtsteden. The study seeks to contribute to the scientific body by connecting spatial adaptation strategies at different policy levels and supporting policy actors and researchers in identifying considerations within the context of the four forms of climate justice. Eleven spatial adaptation strategies were analyzed using the Adaptation Justice Index (AJI) and considerations were gathered by conducting semi-structured interviews with thirteen policy actors involved in the development of the strategy.

Regarding the first sub question, *"To what extent are justice forms integrated into the spatial adoption strategies at different policy levels in the Rijnmond-Drechtsteden region?"* The analysis revealed that procedural justice, distributive justice, recognitional justice, and restorative justice were scored from highest to lowest frequency in the AJI. Differences between documents were that recent strategies with explicit references to climate justice scored higher overall. The only government levels that included aspects of restorative justice were National levels and the DPRA region Rotterdam. There were relatively large differences within the same government levels. Concerning the different indicators of procedural justice, the indicator diversity of actors scored low. Concerning recognitional justice, the vulnerable population that was mostly mentioned were elderly, concerning the climate risks heat stress. There is an overall lack of acknowledging the societal background of vulnerable populations. Regarding distributive, which includes mentioning maladaptation and distribution of costs, benefits and population groups were often mentioned in a general way or not mentioned at all.

Regarding the second sub question, *"How do policy actors consider and perceive climate justice forms in spatial adaptation strategies in the Rijnmond-Drechtsteden region?"* Policy actors often mention distributive and recognitional aspects when defining climate justice. Recognitional justice is often viewed as a foundational element by policy actors. They often associated vulnerable individuals with the elderly or those less wealthy. From all the climate justice considerations that were induced from the interviews, three categories emerged which are drive, capacities & institutional factors, and complexity. The main findings are as follows. Most interviewees focused on creating urgency in climate adaptation, especially in smaller municipalities. This can overshadow climate justice concerns. A lack of capacity was mentioned and can lead to general measures and less emphasis on climate justice. The interviewees who do mention that there is a sense of urgency say that it is caused by experiences in climate adaptation and new insights into climate justice. It was mentioned by policy actors of smaller municipalities that there are integration challenges between social and technical domain which made integration of climate justice aspects more difficult. It was mentioned that collaboration opportunities emerged through the Deltaprogramme and responsibilities in the water domain, possibly influencing procedural justice. Responsibility, ownership of citizens, and a focus on prevention created a barrier to restorative justice incorporation. The complexity and knowledge gaps of climate adaptation and climate justice, especially for monitoring, was mentioned as a barrier for climate justice integration.

Interviewees acknowledge that recognitional justice is the basis, but the score on the AJI is low. Vulnerable groups were mostly defined by socioeconomic status and age. However, other vulnerable population and

their societal background are often overlooked in analyzed adaptation strategies in Rijnmond-Drechtsteden region. Aside from this, high scores in procedural justice do not necessarily ensure sufficient integration and collaboration with diverse groups. For most of the strategies, there is a lack of urgency and knowledge about climate justice. More education and integration of climate justice is needed. This can be accomplished by looking at (*who*) actors and responsibilities, (*what*) integration of social and technical domain, and (*when*) integration of climate justice in all steps of the policy cycle. While house owners are responsible for their own property, governments have a responsibility to prevent the exacerbation of inequalities resulting from the distribution of the responsibility. Furthermore, measures on public property can also affect citizens. Integration of the social and technical domain are needed for climate justice for because climate justice is based on social concepts. Often it was mentioned that climate justice where difficult to implement into the policy process or that it was not the stage to implement is, but this can lead to overlooking climate justice forms. Integration is a continuous process with those forms throughout learning and reflexivity. Multiple recommendations are given in the discussion such as learning from each other by creating a platform, using tools to create a better understanding of different vulnerable populations, and using climate justice forms within different phases of the policy process. Implementing this advice also takes time and manpower but the capacity can grow when there is a sense of urgency for climate justice.

To answer the research question, considerations that take place for the actors within the Rijnmond-Drechtsteden region that effect the integration of climate justice forms are a lack of capacity possibly leading to general measures and less emphasis on climate justice. Furthermore, for most of the interviewees, there was not a focus on climate justice within adaptation but on creating awareness for climate adaptation. However, the interviewees that mention who mention climate justice as an urgent issue say this was created through adaptation experiences and new insight into climate justice. Responsibility of property owners and focus on prevention can, potentially explain the lower score for restorative justice. Lower municipal levels struggle with social domain integration which can lead to a lower climate justice integration. Interviewees also mentioned that there are still different knowledge gaps that influence the implementation of climate justice and the definitions of climate justice also vary among the interviewees. Despite challenges, procedural justice scores high in every strategy, possibly due to interrelated tasks and collaboration facilitated by the Delta Programme.

To conclude, climate justice is complex and evolving. While adaptation strategies often include procedural and distributive justice, recognitional justice and restorative justice remain less integrated. The urgency for climate justice is heightened experiences and new insights into climate adaptation. Despite the low integration of climate justice in most of the analyzed adaptation strategies in Rijnmond-Drechtsteden, the government's commitment to protecting citizens and creating a livable environment implies that climate adaptation strategies should eventually integrate climate justice aspects within their adaptation strategy. Otherwise, the vulnerable population may be unproportionally affected. To address climate justice effectively, increased education on the concept of climate justice and its implementation, together with the integration of the social and technical domains within the different phases of the policy process is needed.

References

- Adaptation Committee. (2023). *Monitoring and Evaluation of adaptation at the national and subnational levels*: Technical paper by the Adaptation Committee [Technical paper]. UNFCCC. https://unfccc.int/sites/default/files/resource/AC_TechnicalPaper_AdaptationMandE_2023.pdf
- Adger, W. N., Brown, I., & Surminski, S. (2018). Advances in risk assessment for climate change adaptation policy. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2121), 20180106. <https://doi.org/10.1098/rsta.2018.0106>
- Allen, T., Behr, J., Bukvic, A., Calder, R. S., Caruson, K., Connor, C., ... & Zinnert, J. C. (2021). Anticipating and adapting to the future impacts of climate change on the health, security and welfare of low elevation coastal zone (LE CZ) communities in southeastern USA. *Journal of Marine Science and Engineering*, 9(11), 1196. <https://doi.org/10.3390/jmse9111196>
- Anežka, J. (2023). *A Decent environment for all: Climate Justice Assessment of European Regional adaptation Plans* [MA thesis, Utrecht University]. <https://studenttheses.uu.nl/handle/20.500.12932/44467>
- Benevolenza, M. A., & DeRigne, L. (2019). The impact of climate change and natural disasters on vulnerable populations: A systematic review of literature. *Journal of Human Behavior in the Social Environment*, 29(2), 266-281. <https://doi.org/10.1080/10911359.2018.1527739>
- Biesbroek, R., Klostermann, J., Termeer, C., & Kabat, P. (2011). Barriers to climate change adaptation in the Netherlands. *Climate law*, 2(2), 181-199. <https://doi.org/10.1163/CL-2011-033>
- Biesbroek, R., & Candel, J. J. (2020). Mechanisms for policy (dis) integration: Explaining food policy and climate change adaptation policy in the Netherlands. *Policy Sciences*, 53(1), 61-84. <https://doi.org/10.1007/s11077-019-09354-2>
- Biesbroek, R. (2021). Policy integration and climate change adaptation. *Current Opinion in Environmental Sustainability*, 52, 75-81. <https://doi.org/10.1016/j.cosust.2021.07.003>
- Bjarnadottir, S., Li, Y., and Stewart, M. G. (2011). Social vulnerability index for coastal communities at risk to hurricane hazard and a changing climate. *Nat. Hazards* 59 (2), 1055–1075. <https://doi.org/10.1007/s11069-011-9817-5>
- Bowen, G.A. (2009), "Document Analysis as a Qualitative Research Method", *Qualitative Research Journal*, Vol. 9 No. 2, pp. 27-40. <https://doi.org/10.3316/QRJ0902027>
- Boyd, E., James, R. A., Jones, R. G., Young, H. R., & Otto, F. E. (2017). A typology of loss and damage perspectives. *Nature Climate Change*, 7(10), 723-729. <https://doi.org/10.1038/nclimate3389>
- Brus, D. J., Lame, F. P. J., & Nieuwenhuis, R. H. (2009). National baseline survey of soil quality in the Netherlands. *Environmental Pollution*, 157(7), 2043-2052. <https://doi.org/10.1016/j.envpol.2009.02.028>
- Bulkeley, H. (2010). Cities and the governing of climate change. *Annual review of environment and resources*, 35, 229-253. <https://doi.org/10.1146/annurev-environ-072809-101747>
- Bulkeley, H., Edwards, G. A., & Fuller, S. (2014). Contesting climate justice in the city: Examining politics and practice in urban climate change experiments. *Global Environmental Change*, 25, 31-40. <https://doi.org/10.1016/j.gloenvcha.2014.01.009>
- Cañizares, J. C., Copeland, S., & Doorn, N. (2023). Embedding justice considerations in climate resilience. *Ethics, Policy & Environment*, 1–26. <https://doi.org/10.1080/21550085.2023.2197824>
- CBS. (2022, 7 April). *Statusscore per wijk en buurt o.b.v. welvaart, opleidingsniveau en arbeid*. Centraal Bureau voor de Statistiek. <https://www.cbs.nl/nl-nl/achtergrond/2022/14/statusscore-per-wijk-en-buurt-o-b-v-welvaart-opleidingsniveau-en-arbeid>
- CBS. (2023, 29 September). *Regionale kerncijfers Nederlands*. CBS Statline. Retrieved on 20 October 2023, from <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/70072ned/table?dl=3B993>

- Centre for Policy Research. (2019). *Making the Law Count: Environment justice stories on community paralegal work in India* (Version 2). Retrieved from <https://cprindia.org/research/reports/making-law-count-environment-justice-stories-community-paralegal-work-indiaversion>
- Centrum Volksgezondheid, Zorg en Maatschappij. (2023, October 9). *Bevolking Regionaal*. Volksgezondheid En Zorg. Retrieved May 28, 2024, from <https://www.vzinfo.nl/bevolking/regionaal>
- Chahboun, N. (2017). Three feasibility constraints on the concept of justice. *Res Publica*, 23, 431-452. <https://doi.org/10.1007/s11158-016-9336-z>
- Chakraborty, J., Collins, T. W., and Grineski, S. E. (2019). Exploring the environmental justice implications of hurricane Harvey flooding in greater houston, Texas. *Am. J. public health* 109(2), 244–250. <https://doi.org/10.2105/AJPH.2018.304846>
- Chu, E., Anguelovski, I., & Roberts, D. (2017). Climate adaptation as strategic urbanism: assessing opportunities and uncertainties for equity and inclusive development in cities. *Cities*, 60, 378-387. <https://doi.org/10.1016/j.cities.2016.10.016>
- Chu, E. K., & Cannon, C. E. (2021). Equity, inclusion, and justice as criteria for decision-making on climate adaptation in cities. *Current Opinion in Environmental Sustainability*, 51, 85-94. <https://doi.org/10.1016/j.cosust.2021.02.009>
- Clarke, V., & Braun, V. (2013). Successful qualitative research: A practical guide for beginners. *Successful Qualitative Research*, 1–400. ISBN:978-1-84787-581-5.
- Climate-ADAPT. (2023, 11 March). *Information on national adaptation actions reported under the Governance Regulation*. Retrieved on 25 October 2023, from <https://climate-adapt.eea.europa.eu/en/countries-regions/countries/netherlands>
- Cutter, S. L., Boruff, B. J., and Shirley, W. L. (2012). Social vulnerability to environmental hazards. In *Hazards vulnerability and environmental justice*. (pp. 143–160). England, UK: Routledge. ISBN:9781849771542
- Delta Commissioner. (2017). *Deltaprogramme 2018*. Ministry of Infrastructure and Water Management, Ministry of Agriculture Nature and Food Quality, Ministry of the Interior and Kingdom Relations. Den Haag, The Netherlands. <https://www.deltaprogramma.nl/deltaprogramma/documenten/publicaties/2017/09/19/dp2018-nl-printversie>
- Delta Commissioner. (2020). *Deltaprogramme 2020*. Ministry of Infrastructure and Water Management, Ministry of Agriculture Nature and Food Quality, Ministry of the Interior and Kingdom Relations. Den Haag, The Netherlands. <https://www.deltaprogramma.nl/deltaprogramma/documenten/publicaties/2019/09/17/dp2020-nl-printversie>
- Delta Commissioner. (2023). *Deltaprogramme 2024*. Ministry of Infrastructure and Water Management, Ministry of Agriculture Nature and Food Quality, Ministry of the Interior and Kingdom Relations. Den Haag, The Netherlands. <https://www.rijksoverheid.nl/documenten/rapporten/2023/09/19/deltaprogramma-2024>
- Doorn, N., Brackel, L., & Vermeulen, S. (2021). Distributing responsibilities for climate adaptation: Examples from the water domain. *Sustainability*, 13(7), 3676. <https://doi.org/10.3390/su13073676>
- Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. *Global environmental change*, 35, 523-533. <https://doi.org/10.1016/j.gloenvcha.2015.09.014>
- Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., ... & West, J. J.

- (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? *World development*, 141, 105383.
<https://doi.org/10.1016/j.worlddev.2020.105383>
- Few, R., Brown, K., & Tompkins, E. L. (2007). Public participation and climate change adaptation: avoiding the illusion of inclusion. *Climate policy*, 7(1), 46-59.
<https://doi.org/10.1080/14693062.2007.9685637>
- Fraser, N. (2008). Social justice in the age of identity politics: Redistribution, recognition, and participation. In *Geographic Thought* (pp. 72-89). Routledge. ISBN:9780203893074
- Gemeente Gouda. (2020). *Klimaatadaptatiestrategie en Uitvoeringsagenda*, Retrieved from <https://api1.ibabs.eu/publicdownload.aspx?site=gouda&id=63668a67-85d9-4988-838f-49108c07f802>
- Gemeente Hardinxveld-Giessendam. (2022). *Lokale klimaatadaptatie strategie 1.0*. Retrieved from <https://raad.hardinxveld-giessendam.nl/Documenten/Lokale-Adaptatie-Strategie.pdf>
- Gemeente Hoekse Waard. (2021). *Uitvoeringsprogramma Klimaatadaptatie Hoekse Waard*. Retrieved from https://issuu.com/gemeentehw/docs/uitvoeringsprogramma_klimaatadaptatie
- Gemeente Krimpenerwaard. (2021). *Klimaatadaptatiestrategie gemeente Krimpenerwaard*. Retrieved from https://cuatro.simcdn.nl/krimpenerwaard/uploads/klimaatadaptatiestrategie_gemeente_krimpenerwaard_0.pdf?cb=-f539cLM
- Gemeente Rotterdam. (2023). *Rotterdams Weerwoord 2030*. Retrieved from https://rotterdamsweerwoord.nl/content/uploads/2023/06/RWW_Programmakader_2030_NL.pdf
- Hart, P. T., Pot, W. D., & Biesbroek, G. R. (2023). Klimaatadaptatie: hoe leggen we onze oogkleppen af? In *Maatschappelijke bestuurskunde: Hoe verbindende bestuurskundigen (kunnen) inspelen op maatschappelijke vraagstukken* (pp. 29-50). Boom. ISBN:9789400112339
- Hooghe, L., & Marks, G. (2001). *Multi-level governance and European integration*. Rowman & Littlefield. ISBN:0742510190
- Hughes, S. (2013). Justice in urban climate change adaptation: criteria and application to Delhi. *Ecology and society*, 18(4). <http://dx.doi.org/10.5751/ES-05929-180448>
- Hughes, S., & Hoffmann, M. (2020). Just urban transitions: Toward a research agenda. *Wiley Interdisciplinary Reviews: Climate Change*, 11(3), e640. <https://doi.org/10.1002/wcc.640>
- Inderberg, T. H., & Eikeland, P. O. (2009). Limits to adaptation: analysing institutional constraints. *Adapting to climate change: Thresholds, values, governance*, 433-447. ISBN:0521764858
- IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. [Core Writing team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf
- IPCC. (2018). Summary for policymakers In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24. <https://doi.org/10.1017/9781009157940.001>
- IPCC. (2022). Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C.

- Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lössche, V. Möller, A. Okem, B. Rama (eds.)). Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–33, <https://doi.org/10.1017/9781009325844.001>.
- IPCC. (2023). Summary for Policymakers. In: *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, <https://doi.org/10.59327/IPCC/AR6-9789291691647.001>
- Iplo. (n.d.-a). *Nationale afspraken en wetgeving klimaatadaptatie*. Informatiepunt Leefomgeving. Retrieved May 25, 2024, from <https://iplo.nl/thema/klimaatverandering/klimaatwetgeving/nationale-afspraken-wetgeving-klimaatadaptatie/>
- Iplo. (n.d.-b). *General information on Environment and Planning Laws*. Informatiepunt Leefomgeving. Retrieved April 9, 2024, from <https://iplo.nl/regelgeving/omgevingswet/english-environment-and-planning-act/general-information-on-environment-and-planning/>
- Iplo. (n.d.-c). *Deltaprogramma*. Informatiepunt Leefomgeving. Retrieved May 25, 2024, from <https://iplo.nl/thema/klimaatverandering/aanpassen-klimaatverandering-klimaatadaptatie/sectoren-klimaatadaptatie/waterbeheer-0/deltaprogramma/>
- Iplo. (n.d.-d). *Intrekken wetten via Invoeringswet Omgevingswet en aanvullingswetten*. Informatiepunt Leefomgeving. Retrieved May 25, 2024, from <https://iplo.nl/regelgeving/omgevingswet/introductie/totstandkoming/intrekken-wetten/>
- Iplo. (n.d.-e). *Uitgangspunten bij het ontwerp van de Omgevingswet*. Informatiepunt Leefomgeving. Retrieved May 25, 2024, from <https://iplo.nl/regelgeving/omgevingswet/introductie/uitgangspunten/>
- Juhola, S., Heikkinen, M., Pietilä, T., Groundstroem, F., & Käyhkö, J. (2022). Connecting climate justice and adaptation planning: An adaptation justice index. *Environmental Science & Policy*, 136, 609–619. <https://doi.org/10.1016/j.envsci.2022.07.024>
- Kennisportaal Klimaatadaptatie. (n.d.-a). *Spatial adaptation*. Retrieved March 18, 2024, from <https://klimaatadaptatienederland.nl/en/information/spatial-adaptation/>
- Kennisportaal Klimaatadaptatie. (n.d.-b). *Werkregio's*. Retrieved March 19, 2024, from <https://klimaatadaptatienederland.nl/beleid/nationale-aanpak/dpra/organisatie/werkregio/>
- Kennisportaal Klimaatadaptatie. (n.d.-c). *Beleid ontwikkelen*. Klimaatadaptatie. Retrieved on 16 October 2023, van <https://klimaatadaptatienederland.nl/aan-de-slag/overheden/beleid-ontwikkelen/>
- Kennisportaal Klimaatadaptatie. (n.d.-d). *Droogte*. Klimaatadaptatie. Retrieved March 19, 2024, from <https://klimaatadaptatienederland.nl/kennisdossiers/droogte/>
- Kennisportaal Klimaatadaptatie. (n.d.-e). *Wat verandert er met de Omgevingswet in het beleid voor klimaatadaptatie?* Klimaatadaptatie. Retrieved on 25 October 2023, from <https://klimaatadaptatienederland.nl/kennisdossiers/omgevingswet/verandert-omgevingswet-beleid-klimaatadaptatie/>
- Kennisportaal Klimaatadaptatie. (n.d.-f). *Bestuursakkoord Klimaatadaptatie getekend*. Klimaatadaptatie. Retrieved May 25, 2024, from <https://klimaatadaptatienederland.nl/actueel/actueel/nieuws/2018/bestuursakkoord/>
- Kirkby, P., Williams, C., & Huq, S. (2017). Community-based adaptation (CBA): adding conceptual clarity to the approach, and establishing its principles and challenges. *Climate and Development*, 10(7), 577–589. <https://doi.org/10.1080/17565529.2017.1372265>
- Klinsky, S., & Dowlatabadi, H. (2009). Conceptualizations of justice in climate policy. *Climate Policy*, 9(1), 88-108. <https://doi.org/10.3763/cpol.2008.0583b>
- Klostermann, J., van de Sandt, K., Harley, M., Hildén, M., Leiter, T., van Minnen, J., ... & van Bree, L.

- (2018). Towards a framework to assess, compare and develop monitoring and evaluation of climate change adaptation in Europe. *Mitigation and adaptation strategies for global change*, 23, 187-209. <https://doi.org/10.1007/s11027-015-9678-4>
- KNMI. (2023). *KNMI'23 klimaatscenario's voor Nederland*. [Core writing team, Bessembinder, J., Bintanja, R., Van Dorland, Homan, C., Overbeek, B., Selten, F., & Siegmund P.] KNMI, De Bilt, KNMI-Publicatie 23-03. https://cdn.knmi.nl/system/data_center_publications/files/000/071/901/original/KNMI23_klimaatscenarios_gebruikersrapport_23-03.pdf
- Kruize, H., Driessen, P. P., Glasbergen, P., & van Egmond, K. (2007). Environmental equity and the role of public policy: experiences in the Rijnmond region. *Environmental management*, 40, 578-595. <https://doi.org/10.1007/s00267-005-0378-9>
- Lasswell, H.D. (1956). *The Decision Process: Seven Categories of Functional Analysis*. College Park, MD: University of Maryland Press. ISBN:0598470921
- Lee, S., Paavola, J., & Dessai, S. (2022). Towards a deeper understanding of barriers to national climate change adaptation policy: A systematic review. *Climate Risk Management*, 35, 100414. <https://doi.org/10.1016/j.crm.2022.100414>
- Lenzholzer, S., Carsjens, G. J., Brown, R. D., Tavares, S., Vanos, J., Kim, Y., & Lee, K. (2020). Urban climate awareness and urgency to adapt: An international overview. *Urban Climate*, 33, 100667. <https://doi.org/10.1016/j.uclim.2020.100667>
- May, P. J., Sapotichne, J., & Workman, S. (2009). Widespread policy disruption: Terrorism, public risks, and homeland security. *Policy Studies Journal*, 37(2), 171-194. <https://doi.org/10.1111/j.1541-0072.2009.00309.x>
- McAlinden, A. M. (2011). 'Transforming justice': challenges for restorative justice in an era of punishment-based corrections. *Contemporary Justice Review*, 14(4), 383-406. <https://doi.org/10.1080/10282580.2011.616369>
- McCauley, D., & Heffron, R. (2018). Just transition: Integrating climate, energy and environmental justice. *Energy policy*, 119, 1-7. <https://doi.org/10.1016/j.enpol.2018.04.014>
- Meerow, S., Pajouhesh, P., & Miller, T. R. (2019). Social equity in urban resilience planning. *Local Environment*, 24(9), 793-808. <https://doi.org/10.1080/13549839.2019.1645103>
- Merriam, S. B. (1988). *Case study research in education: A qualitative approach*. San Francisco: Jossey-Bass. ISBN:1555423590
- Metz, F., Angst, M., & Fischer, M. (2020). Policy integration: Do laws or actors integrate issues relevant to flood risk management in Switzerland?. *Global environmental change*, 61, 101945. <https://doi.org/10.1016/j.gloenvcha.2019.101945>
- Ministerie BZK. (2020, 12 September). *Nationale Omgevingsvisie*. Duurzaam perspectief voor onze leefomgeving. <https://open.overheid.nl/documenten/ronl-59b3033c-0826-4624-ba7f-41aec10b6d7a/pdf>
- Ministerie BZK. (n.d.). *NOVI en de Omgevingswet - De Nationale Omgevingsvisie*. De Nationale Omgevingsvisie. Retrieved May 25, 2024, from <https://denationaleomgevingsvisie.nl/actueel/over+de+novi/novi+en+de+omgevingswet/default.aspx>
- Ministerie I&W. (2023, September 13-a). *Rijnmond-Drechtsteden*. Gebieden Deltaprogramma. <https://www.deltaprogramma.nl/gebieden/rijnmond-drechtsteden>
- Ministerie I&W. (2023, 18 September-b). *Wat is het Nationaal Deltaprogramma?* Deltaprogramma. Retrieved on 25 October 2023, from <https://www.deltaprogramma.nl/deltaprogramma/wat-is-het-deltaprogramma>
- Ministerie I&W. (2023-c). *Nationaal Uitvoeringsprogramma Klimaatadaptatie*. Retrieved March 19, 2024, from <https://open.overheid.nl/documenten/dpc-2f1a2258b86c19919999b03a927ca9e3ba0498af/pdf>

- Ministerie I&W. (2023, September 13-d). *Deltaplan Ruimtelijke adaptatie*. Drie Thema's. Deltaprogramma. Retrieved May 25, 2024, from <https://www.deltaprogramma.nl/themas/ruimtelijke-adaptatie/deltaplan>
- Ministerie I&W. (n.d.). *Waterwet*. Kenniscentrum InfoMil. Retrieved from 25 October 2023, from <https://www.infomil.nl/onderwerpen/lucht-water/handboek-water/wetgeving/waterwet>
- Ministry I&W. (2012, 30 March). *Roles and responsibilities of provincial government, municipal governments and water authorities*. Environment. Government.nl. Retrieved from 25 October 2023, on <https://www.government.nl/topics/environment/roles-and-responsibilities-of-provincial-government-municipal-governments-and-water-authorities>
- Ministry I&W. (2016). *National Climate Adaptation Strategy 2016 (NAS)*. Ministry of Infrastructure and the Environment. [Core Writing Team, Stef Meijs, Ytsen Deelstra, Annemarieke Grinwis, Paul van Hemert, Kim van Nieuwaal, Tis Solleveld van Helden, Hilde Westera, Berend van Zeggeren].
- Ministry I&W. (2023, September 18). *Organisation*. Delta Programme. Retrieved March 19, 2024, from <https://english.deltaprogramma.nl/delta-programme/organisation-of-the-delta-programme>
- Ministry of General Affairs. (2019, 8 October). *Water management in the Netherlands*. Water management. Government.nl. Retrieved on 25 October 2023, from <https://www.government.nl/topics/water-management/water-management-in-the-netherlands>
- Mohtat, N., & Khirfan, L. (2021). The climate justice pillars vis-à-vis urban form adaptation to climate change: A review. *Urban Climate*, 39, 100951. <https://doi.org/10.1016/J.UCLIM.2021.100951>
- Molenveld, A., Verhoest, K., Voets, J., & Steen, T. (2020). Images of coordination: How implementing organizations perceive coordination arrangements. *Public Administration Review*, 80(1), 9-22. <https://doi.org/10.1111/puar.13136>
- National Academies of Sciences, Engineering, and Medicine (2019). *Framing the challenge of urban flooding in the United States*. Washington, D.C., United States: National Academies Press. <https://doi.org/10.17226/25381>
- Nagoda, S., & Nightingale, A. J. (2017). Participation and power in climate change adaptation policies: Vulnerability in food security programs in Nepal. *World Development*, 100, 85-93. <https://doi.org/10.1016/j.worlddev.2017.07.022>
- Navarro-Hernández, M.I., Valdes-Abellan, J., Tomás, R. et al. Analysing the Impact of Land Subsidence on the Flooding Risk: Evaluation Through InSAR and Modelling. *Water Resour Manage* 37, 4363–4383 (2023). <https://doi.org/10.1007/s11269-023-03561-6>
- Newell, P., Srivastava, S., Naess, L. O., Torres Contreras, G. A., & Price, R. (2021). Toward transformative climate justice: An emerging research agenda. *Wiley Interdisciplinary Reviews: Climate Change*, 12(6), e733. <https://doi.org/10.1002/wcc.733>
- Newman, P., Beatley, T., & Boyer, H. (2009). *Resilient cities: Responding to peak oil and climate change*. Washington, DC: Island Press. ISBN:1597268631
- Oke, T. R. (1982). The energetic basis of the urban heat island. *Quarterly journal of the royal meteorological society*, 108(455), 1-24. <https://doi.org/10.1002/qj.49710845502>
- Okereke, C. (2010). Climate justice and the international regime. *Wiley Interdisciplinary Reviews: Climate Change*, 1, 462–474. <https://doi.org/10.1002/wcc.52>
- Ons Water. (2022, 21 June). *Zuid-Holland*. Droogte en wateroverlast. Ons water. Retrieved on 25 October 2023, from <https://www.onswater.nl/droogte-en-wateroverlast/wie-beheert-ons-water-in-de-provincie/zuid-holland>
- Parsons, T., Wu, P. C., Wei, M., & D'Hondt, S. (2023). The weight of New York City: possible contributions to subsidence from anthropogenic sources. *Earth's Future*, 11(5), e2022EF003465. <https://doi.org/10.1029/2022EF003465>
- Parsons, M., Asena, Q., Johnson, D., & Nalau, J. (2024). A bibliometric and topic analysis of

- climate justice: Mapping trends, voices, and the way forward. *Climate Risk Management*, 100593. 5. <https://doi.org/10.1016/j.crm.2024.100593>
- Programme Team Rijnmond-Drechtsteden. (2020). *Voorkeursstrategie Deltaprogramma Rijnmond-Drechtsteden 2020*. <https://www.deltaprogramma.nl/documenten/publicaties/2020/09/15/voorkeursstrategie-deltaprogramma-rijnmond-drechtsteden-2020>
- Provincie Zuid-Holland. (2018). *Weerkrachtig Zuid-Holland*. [Core Writing Team, Luc Absil, Caroline Ammerlaan, Christina Boomsma, Noud Dumoulin, Soerita Guptar, Erik de Haan, Inge Homberg, Werncke Husslage, Miguel de Jonge, Charlotte Kleijn-Goos, Steven Krol, Wouter Smit, Jan Strijker, Rino Vlaardingebroek, Arjan de Wit, Astrid de Wit]. Retrieved from <https://www.zuid-holland.nl/onderwerpen/klimaatadaptatie/documenten-websites/klimaatadaptatiestrategie-weerkrachtig-zuid/>
- Rawls, J. (1971). A theory of justice. Cambridge (Mass.). ISBN:0674000781
- Red&Blue. (n.d.). *Red&Blue – Real estate development & building in low urban environments*. Retrieved April 9, 2024, from <https://redblueclimate.nl/>
- Robinson, S., & Carlson, D. (2021). A just alternative to litigation: applying restorative justice to climate-related loss and damage. *Third World Quarterly*, 42(6), 1384–1395. <https://doi.org/10.1080/01436597.2021.1877128>
- Runhaar, H., Wilk, B., Persson, Å., Uittenbroek, C., & Wamsler, C. (2018). Mainstreaming climate adaptation: taking stock about “what works” from empirical research worldwide. *Regional environmental change*, 18, 1201-1210. <https://doi.org/10.1007/s10113-017-1259-5>
- Schlosberg, D. (2001). Three dimensions of environmental and ecological justice. *European Consortium for Political Research Annual Joint Sessions, Grenoble*, 6(11).
- Schlosberg, D. (2007). *Defining environmental justice: Theories, movements, and nature*. OUP Oxford. ISBN:0199286299
- Schlosberg, D. (2012). Climate justice and capabilities: A framework for adaptation policy. *Ethics & International Affairs*, 26. <https://doi.org/10.1017/S0892679412000615>
- Schlosberg, D., & Collins, L. B. (2014). From environmental to climate justice: climate change and the discourse of environmental justice. *Wiley Interdisciplinary Reviews: Climate Change*, 5(3), 359-374. <https://doi.org/10.1002/wcc.275>
- Shi, L., Chu, E., Anguelovski, I., Aylett, A., Debats, J., Goh, K., ... & VanDeveer, S. D. (2016). Roadmap towards justice in urban climate adaptation research. *Nature Climate Change*, 6(2), 131-137. <https://doi.org/10.1038/nclimate2841>
- Sietsma, A. J., Ford, J. D., Callaghan, M. W., & Minx, J. C. (2021). Progress in climate change adaptation research. *Environmental Research Letters*, 16(5), 054038. DOI:10.1088/1748-9326/abf7f3
- Snazzy Maps. (n.d.). *Snazzy Maps – Free styles for Google Maps*. Retrieved May 31, 2024, from <https://snazzymaps.com/style/93/lost-in-the-desert>
- Tagtachian, D., & Balk, D. (2023). Uneven vulnerability: Characterizing population composition and change in the low elevation coastal zone in the United States with a climate justice lens, 1990–2020. *Frontiers in Environmental Science*. <https://doi.org/10.3389/fenvs.2023.1111856>
- Trell, E.-M., & van Geet, M. T. (2019). The Governance of Local Urban Climate Adaptation: Towards Participation, Collaboration and Shared Responsibilities. *Planning Theory & Practice*, 20(3), 376-394. <https://doi.org/10.1080/14649357.2019.1629573>
- Wamsler, C., Wickenberg, B., Hanson, H., Olsson, J. A., Stålhammar, S., Björn, H., ... & Zelmerlow, F. (2020). Environmental and climate policy integration: Targeted strategies for overcoming barriers to nature-based solutions and climate change adaptation. *Journal of Cleaner Production*, 247, 119154. <https://doi.org/10.1016/j.jclepro.2019.119154>
- Welton, S., Biasutti, M., & Gerrard, M. B. (2015). Legal & scientific integrity in advancing a land degradation neutral world. *Colum. J. Env'tl. L.*, 40, 39. <http://dx.doi.org/10.2139/ssrn.2483232>

Wenta, J., McDonald, J., & McGee, J. S. (2019). Enhancing resilience and justice in climate adaptation laws. *Transnational Environmental Law*, 8(1), 89-118.

<https://doi.org/10.1017/S2047102518000286>

Woroniecki, S., Wamsler, C., & Boyd, E. (2019). The promises and pitfalls of ecosystem-based adaptation to climate change as a vehicle for social empowerment. *Ecology and Society*, 24(2).

<https://doi.org/10.5751/ES-10854-240204>

WRR (2023) *Rechtvaardigheid in klimaatbeleid*. Over de verdeling van klimaatkosten, wrr-Rapport 106, Den Haag: wrr <https://www.wrr.nl/publicaties/rapporten/2023/02/16/rechtvaardigheid-in-klimaatbeleid>

Appendix I - Notes Adaptation Justice Index

Table 10 Climate Adaptation Index with additional notes (Johula et al., 2022; notes added by the Author)

Recognitional justice			
Indicator	Scale	Value	Notes
The strategy acknowledges that adaptation needs are different across groups in society	No acknowledgment	0	
	The strategy states that adaptation needs are different	1	The strategy described that needs are different but does not mention the different needs. This can be mentioned implicitly or indirectly. Example: having a risks dialogue is indirect
	The strategy taken into account different adaptation needs based on expert review	2	Needs are based on experts and or citizens were involved in identifying needs.
	The strategy is built on different groups identifying their adaptation needs	3	Different groups were involved in identifying their needs. Does not have to be vulnerable groups. Risks dialogues with different groups are not part of this because it is about what they think about risks is not considered as their needs.
The strategy acknowledges the impact of existing societal structures on vulnerable groups in adaptation to the impact of climate change	No acknowledgment	0	
	The existence of structures is mentioned in a general manner	1	The background of how societal structures influence the impact of vulnerable populations is mentioned. Can be mentioned implicitly. Or measures to that help with the adaptative capacity are mentioned without mentioning of societal structures.
	There are measures to decrease the impact of structures	2	Measures to increase capacity on vulnerable populations are mentioned and mentioning the societal background of how social structures influence the impact of vulnerable populations
	There is a structured plan to assess the impact of societal structures on vulnerability	3	
	No acknowledgment	0	

The strategy acknowledges adaptation as a way to secure basic human rights	Adaptation as a way to secure basic human rights is mentioned	1	Things related to basic human rights in relation to climate adaptation is mentioned.
	The strategy describes how adaptation can secure basic human rights in general	2	Human rights are mentioned explicitly, and measures are described.
	The strategy has mentioned to secure basic human rights	3	Secure human rights need to be specifically mentioned.
Distributive justice			
Indicator	Scale	Value	Notes
A risk mapping/assessment is conducted	No assessment	0	
	Yes, risk assessment is mentioned but the results are not used	1	
	Yes, risk assessment is conducted, and measures are identified for some risks	2	Measures are mentioned generally and not specifically assigned to different risks
	Risk assessment is conducted, and measures are identified for all risks	3	Measures are specifically mentioned and assigned to different risks
There is a process for identifying vulnerable groups	No process	0	
	Vulnerable groups are identified	1	One of more groups are identified
	There is a vulnerability assessment that will be updated	2	Specific research has been done about what vulnerable populations there are and where they are. (Only elderly in related with heat stress in not sufficient).
	Vulnerability assessment is connected to adaptation planning and monitoring	3	
There is a process that assess the distribution of benefits from adaptation	No process	0	
	The strategy identifies the distribution of benefits of adaptation measures in general	1	Benefits are mentioned and monitoring is mentioned but no social factors are incorporated
	Distribution of benefits is assessed as part of the strategy process	2	Mention differences in benefit distribution among different groups.
	Distribution of benefits is monitored continuously	3	There is a continuous process of monitoring the benefits of climate adaptation for different groups.
	No process	0	

There is a process that assesses how costs of adaptation are divided	The strategy identifies the distribution of costs of adaptation measures in general	1	Costs for population groups for adaptation measures are mentioned generally and/or costs are only mentioned in relation to municipal and other governmental organizations.
	Distribution of costs is assessed as part of the strategy process	2	A research or assessment has been made to identify the distribution of costs among different population groups and/or governmental organizations
	Distribution of costs is monitored continuously	3	There is a continuous process of monitoring the costs of climate adaptation for different population groups and governmental organizations
The strategy identifies the possibility of the distribution of negative impacts, i.e., maladaptation of adaptation measures	No identification	0	
	The strategy identifies (at least implicitly) the distribution of negative impacts of adaptation measures in general	1	
	Distribution of negative impacts of some adaptation measures are identified	2	
	Distribution of negative impacts of all adaptation measures are identified	3	
Procedural justice			
Indicator	Scale	Value	Notes
Adaptation strategy details who participates in the strategy process	No participation outside the public sector	0	
	Participation through invitation for experts, private sector	1	
	Participation of experts and citizen through open invitation	2	Does not have to explicitly be mentioned to be an open invitation.
	Participation and measures to enable participation of vulnerable groups	3	
The adaptation strategy has involved participation during different phases of the process	No participation	0	
	The strategy process has involved information provision about adaptation (at	1	Participation within one governmental organization does not count. Information

	least once during the process before the final output publication)		provision of external stakeholder minimum of one time.
	The strategy process has involved consultation	2	Participation within one governmental organization does not count.
	The participation in the strategy process has been collaborative and continuous	3	Participation within one governmental organization does not count.
The strategy allocates responsibilities related to adaptation	No allocation	0	
	Responsibilities are mentioned	1	Initiator also counts
	Responsibilities for some adaptation measures are allocated	2	Initiator also counts
	Responsibilities for all adaptation measures are allocated	3	Initiator also counts
The strategy has a structured plan for participation in the implementation	No participation in the implementation plan	0	No participation outside the public sector
	The implementation plan involved informing different stakeholders	1	Participation outside the public sector
	The implementation plan involves stakeholder consultation	2	Participation outside the public sector. Tasks are assigned to different stakeholders in the implementation programme.
	The implementation plan involved stakeholder participation in a collaborative and continuous manner	3	Participation outside the public sector. Is described as a collaborative process or programme with different stakeholders, different actors are involved in.
The adaptation strategy has a plan for updating and evaluating the strategy	No plan	0	
	The strategy involved a plan for updating, but evaluation is not described	1	
	The strategy involved a plan for updating and describes how progress will be evaluated	2	
	The strategy involves an update and evaluation plan that included stakeholder participation	3	
Restorative			it needs to be mentioned that a certain impact happened, and they want to restore it. For

<i>Indicator</i>	<i>Scale</i>	<i>Value</i>	<i>Notes</i>
			example: prevention inequality with more adaptation measures in poor neighborhoods does not count, this is considered distributional justice
The strategy acknowledges the need to compensate for the diverging impacts of climate change. Note: the focus is not on compensation though the offender but can also be the government that takes compensation measures in mind	No acknowledgement	0	
	The strategy acknowledges the need to compensate	1	Talking about options of insurance also count because this means they think about consequences after disasters happen.
	The strategy has compensation measures for some impacts of climate change	2	
	The strategy has compensation measures for all relevant impacts of climate change	3	
The strategy has compensation measures to deal with maladaptation. Note: maladaptation can be caused by the people who implement the measures, mostly governmental actors	No acknowledgement	0	
	The strategy acknowledges the need to compensate	1	Talking about options of insurance also count because this means they think about consequences after disasters happen.
	The strategy has compensation measures for some impacts of climate change	2	
	The strategy has compensation measures for all relevant impacts of climate change	3	
The unequal distribution of resources for adaptation is compensated by redistribution	No mention of unequal distribution	0	
	The need for reallocation of resources for adaptation is acknowledges (at least partially)	1	Mention that the effects are disproportionate for different groups and because of these resources must be allocated differently.
	There are measures for reallocation of adaptation recourses	2	
	There are measures for the reallocation of adaptation resources to develop adaptive capacity	3	

Appendix II – Overview interviewees policy actors

Table 11 Overview interviewed policy actors (Author's own)

Government level	Strategy	Function	Working place	Reference in result chapter
National	National Adaptation Strategy 2016 (NAS)	Policy advisor climate adaptation	WING	Interviewee NAS
National	NAS Implementation Programme 2023	Polycymaker climate adaptation	Ministerie I&W	Interviewee NAS implementation programme
National	Deltaplan Spatial Adaptation 2018 (DPRA) & Deltaprogramme 2024	Liaison areas, generic themes and civil society organizations	Delta commissioner's staff	Interviewee DPRA & DP
Provincial	Weather Resilient South-Holland	Polycymaker climate adaptation	Province South-Holland	Interviewee South Holland
Regional	Preference strategy Rijnmond-Drechtsteden region	Polycymaker watersafety	Water Board of Shyland and Krimpenerwaard	Interviewee Rijnmond-Drechtsteden-b
Regional	Preference strategy Rijnmond-Drechtsteden region	Policy and knowlegde	Delta commissioner's staff	Interviewee Rijnmond-Drechtsteden-a
Regional/ Municipal	Rotterdams Weerwoord 2030	Program manager Rotterdams Weerwoord	Municipality Rotterdam	Interviewee Rotterdam-a
Regional/ Municipal	ICAR Rotterdam	Policy Advisor Climate Inclusivity	Municipality Rotterdam	Interviewee Rotterdam-b
Municipal	Climate adaptation strategy municipality Krimpenerwaard	Polycymaker Climate Adaptation	Municipality Krimpenerwaard	Interviewee Krimpenerwaard-a
Municipal	Climate adaptation strategy municipality Krimpenerwaard	Policy assistant Climate Adaptation	Municipality Krimpenerwaard	Interviewee Krimpenerwaard-b
Municipal	Climate adaptation strategy and implementation program	Polycymaker water	Municipality Gouda	Interviewee Gouda
Municipal	Local adaptation strategy 1.0	Program manager Sustainability	Municipality Hardinxveld-Giessendam	Interviewee Hardinxveld-Giessendam-a
Municipal	Local adaptation strategy 1.0	Polycymaker and Advisor Sustainability	Municipality Hardinxveld-Giessendam	Interviewee Hardinxveld-Giessendam-b

Appendix III – Interview guide policy actors

The interview method is semi-structured interviews with policymakers who are involved with the development of the adaptation strategies. This means that the interview guide will not be followed strictly but act as a guide. The questions were modified with the results of sub-question 1. The interviews took around 1 hour. The materials for the interviewer are a laptop for recording and transcribing, a charger, a mobile phone for backup recording, a notebook, and a pen.

Starting / introduction

- What is the most exciting climate adaptation policy/project that you were involved in?

Adaptation strategies

- What was your role in developing the adaptation strategy?
- Can you tell me something about the adaptation strategy?

Climate justice

- Have you heard of climate justice and how would you define it?
- What do you think about climate justice as an issue for adaptation?
- How do you think it is addressed in the adaptation strategy?

Recognitional justice

- To what extent is the needs of different groups and their context considered? Can you explain the process, consideration, and your perspective? Why?
- Why are certain citizens more vulnerable and how is it addressed in the strategy? Why was it done this way?

Procedural justice

- How were (different) groups part of the process of developing the adaptation strategy, and other phases? And what are the responsibilities of the different groups for climate adaptation? And why was it done this way?
- Is there an evaluation and feedback process and how does it work? And why was this chosen?

Distributional justice

- In what way is the distribution of negative and positive impacts of climate adaptation on populations considered in the adaptation strategy? Why were these things considered? Were there any tools used for this and how were they used?
- Do you know what maladaptation? Is it addressed within the strategy? Why is it (not) addressed?

Restorative justice

- How are the negative effects of climate adaptation on different populations considered? Is there compensation? When is there compensation (also looking at maladaptation)? Why were these choices made?

Rounding off

- What factors influence decisions to implement the different forms of justice?
- Do you think that there are any tradeoffs between the different justice forms?
- What factors act as barriers or facilitators in implementing the different climate justice forms?
- What is needed to implement climate justice choices?
- Are there other topics you want to address?

Appendix IV – Result Adaptation Justice Index

Table 12 Overview scores Climate Justice Index from high to low score (Author's own)

Government level	Strategy Indicator	Recognitional				Distributive					Procedural					Restorative				Average overall (%)	Publication Pages			
		1	2	3	Average (%)	1	2	3	4	5	Average (%)	1	2	3	4	5	Average (%)	1	2		3	Average (%)	year	including appendix
Nationaal	NAS implementation programme 2023	3	1	0	44	2	2	3	2	2	73	2	2	3	3	2	80	1	0	0	11	52	2023	112
DPRA region	Rotterdam	1	1	1	33	3	1	2	1	2	60	2	3	3	3	1	80	1	0	0	11	46	2023	256
Nationaal	Deltaprogramme 2024	1	1	0	22	2	1	0	2	2	47	1	3	2	3	1	67	1	0	0	11	37	2023	118
Provincial	South-Holland	2	0	0	22	3	1	1	1	1	47	1	3	2	3	2	73	0	0	0	0	36	2018	59
DPRA region	Hoekse Waard	2	0	0	22	3	0	1	1	0	33	2	3	2	3	3	87	0	0	0	0	36	2020	34
Municipal	Gouda	1	1	0	22	3	1	0	1	1	40	1	2	3	3	2	73	0	0	0	0	34	2020	16
Nationaal	DPRA 2018	1	0	0	11	1	1	0	1	0	20	1	3	2	3	2	73	2	0	0	22	32	2021	46
Nationaal	NAS 2016	1	0	0	11	3	1	1	0	1	40	1	3	2	3	2	73	0	0	0	0	31	2016	43
Municipal	Krimpenerwaard	1	0	0	11	3	0	0	1	0	27	2	3	3	3	2	87	0	0	0	0	31	2017	145
DP region	Rijnmond-Drechtsteden	0	0	0	0	2	0	1	0	1	27	1	3	3	3	2	80	0	0	0	0	27	2020	61
Municipal	Hardinxveld-Giessendam	1	0	0	11	2	0	0	1	0	20	2	2	2	3	1	67	0	0	0	0	24	2022	25
	Average	1.3	0.4	0.1	19.2	2.5	0.7	0.8	1.0	0.9	39.4	1.5	2.7	2.5	3.0	1.8	76.4	0.5	0.0	0.0	5.1	35.0		

Appendix V – Use of AI

I have used AI in this research. I have used ChatGPT to improve the quality of the text, especially for grammar, synonyms, and conciseness. The prompts that I used were ‘How can I make the quality of this text better and improve the conciseness of the text?’ and ‘How can I reduce the word count with [number]%?’. The links to the conversations are;

- <https://chat.openai.com/share/7a7223f1-6f25-4be5-829d-090425bed84b>
- <https://chat.openai.com/share/d5b953df-9cee-434c-989d-6106a61fd8f4>
- <https://chatgpt.com/share/23e0731b-e051-4e6e-b7c9-2d94bbcbb705>

Additionally, I used FeedbackFruits Automated Feedback as a final check for the written text. This tool looks at the active voice, formal writing style, APA style, grammar, punctuation, spelling, vocabulary, In-text citations or references, figures & table captions, and In-text citations of figures & tables.

It should be noted that I did think critically about the feedback and did not copy-paste the content that is generated by AI.