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# Regional Governance in Upscaling Drought Management Innovations: A Multi-Level Perspective

**Master's Thesis for the Spatial Planning Programme  
Cities, Water and Climate Change.**

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**KEYWORDS:** UPSCALING INNOVATIONS, DROUGHT  
MANAGEMENT, TRANSITION MANAGEMENT,  
MULTI-LEVEL PERSPECTIVE

**28636 WORDS**



# Colophon

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This document is a master's thesis for the completion of the Master Spatial Planning at Radboud University, Nijmegen, The Netherlands.

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# Preface

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Dear reader,

As an inhabitant of the researched area and a 'Brabander' at heart, the topic sits close to me. Drought is very much visible where I live and the governance of problems like this is something that interests me very much. This is why the choice for this subject was clear to me quite quickly.

I also felt that with the challenges that lay ahead of us in this field and the intrinsic interface that the issue has with my bachelor's degree, this master's degree and my current and future work, it would be instrumental for me to work on for my thesis. I feel it has really given me a solid foundation on the fields of transition, upscaling innovations and drought issues on the sandy soils.

In combination with my work, courses and personal life, this master's thesis process spans two years. Keeping the appropriate amount of focus and energy for it has therefore been a challenge, but I have learned a lot along the way. I would however, not recommend doing it as I did.

The master's thesis before you is meant as an addition to the field of upscaling innovations, combining theories that seemed to not have been combined before on a subject that is relatively little studied. I think it would therefore be interesting to researchers working in the fields of innovation or Dutch drought issues. On the other hand, I also hope that civil servants from provinces and water boards take their lessons from this research. They are the ones who are practically working with the issues and they are the ones who actually have to solve it.

At last, I would like to take a few words to express my gratitude to the following people:

- The interviewees who contributed, for sharing their knowledge and experiences.
- My supervisor, for the meetings, feedback and for bearing with me for almost two years.
- All people who have proof-read my thesis, for their feedback and their findings.
- My colleagues and employer, for their patience and flexibility in my work schedule.
- My family, friends and girlfriend for the continuous support and advice.

May this thesis hand you new insights. May it activate you to go out and work on drought issues. May it play its part in making this world a better place, if even just a tiny bit better.

*Edward van Erp, Sint-Michielsgestel*

*10-09-2023*

# Summary

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The current ways of managing water are not sustainable anymore for the Dutch sandy soils, the succession of dry summers has shown this. These areas need to adapt to the new meteorological conditions and one way through which this can be done is by implementing drought management innovations. This thesis investigated how the regime of Dutch regional drought governance, namely the provinces and water boards, supports or obstructs the upscaling of these innovations. Water Board De Dommel and the Province of Noord-Brabant were taken as a case-study for the regime. A theoretical framework was set up that combined the Multi-Level Perspective and Transition Management. These theories were used to research what the regime is like (through the analysis the regime dimensions) and the actions it takes (through the analysis of steering & accelerating mechanisms) respectively, in relation to upscaling innovations.

To determine what the influence of the regime actors is on the upscaling process, two methods were used: content analysis and semi-structured interviews. The first method involved analysis of both policy and research documents to characterise the regime and identify its actions towards upscaling drought management innovations. For the interviews three groups were made: Governance, Consultants and Users. People were invited to contribute to the research and were grouped and interviewed according to their occupation. The data, in the form of documents and transcripts, was analysed using Atlas.ti. Through this, all the dimensions and mechanisms were described.

The results lead to the conclusion that the regime supports upscaling by consisting of two progressive organisations with shared visions. They can fill each other's knowledge gaps through sharing and cooperating and support innovations with financial means, research and manpower. There are however, more obstructing than supporting factors unfortunately. The regional governments are risk-averse and technically oriented. Current policies and regulations limit their ability to act freely, but their own lack of providing perspective and insufficient support from the national government are also obstructing upscaling. Moreover, pilots are not being conducted optimally with regards to upscaling and the holistic and strategic thinking to successfully upscale an innovation is still missing.

Recommendations were made, based on the findings. Reflecting on the research, we underscore the usefulness of using two methods and the added value of conducting this research with different theories. What remains unclear however, is the holistic process of upscaling an innovation: the technical details are more than sufficiently known, but the economic, social and organisational aspects will have to be incorporated into the process for it to really become smooth and successful.

**KEYWORDS:** UPSCALING INNOVATIONS, DROUGHT MANAGEMENT, TRANSITION MANAGEMENT, MULTI-LEVEL PERSPECTIVE

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# 1. Introduction

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## 1.1 Research Problem and Research Interest

This research centres on drought management issues concerning the higher-lying areas in the Netherlands, which tend to have a soil that consists of (mostly) sand and therefore is commonly referred to as sandy soils (or in Dutch: Hoge Zandgronden). This soil type is mostly found in the provinces of Utrecht, Noord-Brabant, Limburg, Gelderland, Overijssel and Drenthe. Water quantity issues were prevalent in 2018, 2019 and 2020, plus that of 2022. It damaged farmers' yields, nature conservation areas and endangered the drinking water supply (Deltaprogramma Hoge Zandgronden, 2020). Even though the 'drying out' of the soil has been an ongoing issue for decades in the field of nature conservation, these three years of drought seem to have worked as a shock event to get policymakers and water managers to realise that the classic Dutch idea of 'keeping dry feet' is not a climate resilient mentality. Especially not for the Dutch sandy soils.

The aforementioned summers were a succession of droughts: dry springs and summers combined with high temperatures left the groundwater levels dwindling in many places in The Netherlands. These events could be seen as a twist of fate, where many conditions for drought were combined by simple chance. However, this phenomenon is indicative of a trend, as the average precipitation deficit for April and May has grown by 50% over the last half a century (KNMI, 2020). The amount of rain has been approximately the same value, but the evaporation has increased. This increase is caused not just through higher temperatures, but also because globally skies are becoming cleaner. This leads to more solar radiation passing through the atmosphere, making it more intense (Diaz et al., 2003).

The precipitation deficit differs throughout the country, with coastal areas suffering less from the increased evaporation and solar radiation than inland areas do. Adding to this difference is the manner in which water finds its way to these areas, the coast and the areas next to the great rivers and lakes are supplied by these bodies of water. Inland areas and especially the higher lying sandy soils are supplied almost solely through rainwater, making them very vulnerable to drought events (Deltaprogramma Hoge Zandgronden, 2020; Werkgroep Zoetwatervoorziening Oost-Nederland, 2020).

Therefore, these areas have to adapt to these drought events; by developing resilience through physical measures, water management policies and growing awareness. The KLIMAP-project (Climate Adaptation in Practice) was set up to design climate development pathways (Denton et al., 2014) to adapt to the effects of climate change in the higher sandy soils of The Netherlands. A wide range of parties contribute to the project, from water boards and provinces to companies and research institutes. Stemming from the Lumbricus project (KLIMAP, 2021), which accumulated knowledge on climate resilience in soil and water systems.

KLIMAP sets out to experiment in actual practical settings (living labs and trials) and to investigate how to upscale the findings from these living labs. These findings should culminate into a process description of how the methods from the development paths should be implemented, advice on which instruments and tools are most fit to be applied in the situation and finally a 'menu' in which the effects and feasibility of different types of measures are visualised in a clear way (KLIMAP, 2021).

## 1.2 Research Gaps and Research Questions

This research aims to cover three research gaps, which have been identified in both scientific literature on the subject as well as in practice. The first gap concerns the *theories* that have been used in prior and current research on upscaling drought management innovations. There is a variety of theories that can be applied to upscaling (see the introductory statement of section 2). This thesis will use Transition Management (TM) in addition to the framework of the Multi-Level Perspective (MLP) to answer the research questions. Combining these two theories can form a full and bigger picture which, through the MLP, can be used to fill the theoretical gap that exists in the literature on this topic. Additionally, by adopting the MLP this thesis aims to investigate the roles played by the different levels in the framework. We will focus in particular on the regional governance, which corresponds to the 'regime' in the MLP, to better understand how regional government organisations may hamper or foster the process of upscaling drought management innovations.

The second gap concerns the focus on the *regional governance* for drought management and its role in the successful upscaling of drought management innovations. Upscaling research tends to be focussed on societal and market actors, mostly on a smaller or more local ('niche') level. This research however, will investigate the role played by the organisations in the regional level of government in Dutch drought management, namely water boards and the provinces. The region of Noord-Brabant was chosen because it mostly consists of sandy soils and suffers under the effects of drought. This region is governed by the Province of Noord-Brabant, and a group of four water boards. To keep the expanse of this research manageable, one water board was chosen to investigate specifically: Water Board De Dommel. These two organisations correspond with the 'regime' level in the Multi-Level Perspective, which will be dissected into the separate dimensions that constitute them, as well as their actions regarding the upscaling process to help answer the research question.

This leads us to the third and final gap, concerning the way in which *upscaling* of innovations can be pursued. The theories and level that have not yet been researched will add to the knowledge on upscaling drought management innovations and make this process more successful.

The three research gaps above will be covered with a focus on the regional governance of sustainability transitions. The research centres on the manners in which the Province of Noord-Brabant and Water Board De Dommel support or obstruct the successful upscaling of these innovations. To investigate this, the following main research question has been formulated:

***In what ways does Noord-Brabant's governance support and obstruct the successful upscaling of drought management innovations for sandy soils?***

To answer this question, the following sub-questions are posed:

1. *What are the dimensions that form the regime of Noord-Brabant's governance of drought management?*

According to the Multi-Level Perspective, a regime consists of a set of dimensions (Geels, 2002; Lawhon & Murphy, 2012; Smith et al., 2005) that interact, lock in and consolidate to form a 'dynamically stable' structure (Geels, 2002). To discern how this regime works and how it relates to the other levels, these dimensions require investigation and specification.

2. *Which steering and acceleration mechanisms are used by the regime?*

The literature on Transition Management will be used to analyse these mechanisms and gain insights into the ways in which their use influences the upscaling process. To see how the regime influences the upscaling process, the application of these mechanisms by the regime will be investigated.

## 1.3 Scientific and Societal Relevance of the Proposed Research

This thesis aims to cover the three research gaps that were specified in the previous paragraph about theory, level and upscaling. These gaps constitute the scientific relevance in paragraph 1.3.1, the relevance of this research to society as a whole will be elaborated upon in paragraph 1.3.2.

### 1.3.1 Scientific Relevance

#### *Theory*

For the specific case of Dutch drought management, research on upscaling in drought management is currently being employed from the perspective of applied practises theory in the context of KLIMAP. Other programmes such as Zoetwatervoorziening Oost-Nederland (drinking water supply East-Netherlands), the Deltaprogramma Hoge Zandgronden and the aforementioned Lumbricus programme have also investigated this issue. Upscaling drought management innovations has been researched using various perspectives, mostly concerning agriculture. They include theories such as the Internet of Things (Oke Saheed et al., 2019), Applied Practices Theory (KLIMAP, 2021) and mathematical modelling (Ranjan, 2014).

One theory that seems not to have been applied to upscaling drought management innovations however, is Transition Management. Transition Management is a theory that can be seen as a governance approach (Loorbach & van Raak, 2006) that considers society a patchwork of complex adaptive systems, aiming to find out how transitions between the levels of the Multi-Level Perspective (Geels, 2002) happen and how they can be managed.

#### *Regional Governance*

Inspecting the current body of literature on Dutch regional drought management reveals another gap: participation has been studied, but governance has received significantly less attention. Regional governance has of course been studied extensively for topics like: policy experiments (den Uyl & Munaretto, 2020), adaptive capacity of institutions (Gupta et al., 2016), adaptive governance (van Buuren et al., 2015) and public trust in watermanagers (Voogd, et al., 2021), to name a few. The subject of upscaling drought management innovations and the context of the Dutch sandy soils, however, has not had much attention from a governance perspective. Current research seems to keep very much to either the level of local and separate innovations or to the national level (Fuenfschilling & Binz, 2018; Raven et al., 2012), this despite the fact that the regional governments (water boards and provinces) are the ones responsible for the creation, implementation and enforcement of policies in the fields of water and drought management. Water boards and provinces have a central role in the upscaling of drought management innovations.

## *Upscaling*

The Dutch sandy soils have to be made more resilient to the effects of climate change, specifically to drought. The KLIMAP-project is testing innovations in physical trials for this specific purpose. If these measures prove to be functional and feasible, the next step follows: upscaling. Testing innovations is one thing, but to actually implement them on a bigger scale is a completely different challenge. This has to do with the so-called 'pilot paradox' (Breman et al., 2017): if an experiment is successful, it does not necessarily mean that it can be used on a bigger scale with the same positive results.

Upscaling innovations has been researched for many different subjects such as public spaces, agriculture, electric vehicles, sustainable energy and negative emissions (Druijff & Kaika, 2021; Hermans et al., 2013; Meelen et al., 2019; Naber et al., 2017; Nemet et al., 2018). For drought this type of research seems to be lacking, no papers combining the upscaling of innovations with drought were found; noting that this is not the case for agriculture-related climate and drought innovation upscaling (Baas et al., 2014; Hermans et al., 2013; Musafiri et al., 2022; Smith et al., 2021; Wigboldus et al., 2016). The KLIMAP-project is to fill in this knowledge gap, however these results are not yet available as the project is slated to run for another 4 years. It is therefore useful to proactively provide research that focuses on the upscaling part of the project.

### 1.3.2 Societal Relevance

Many ecosystems in the Netherlands are directly and highly dependent on rain and groundwater for their survival. Fens, high-lying heath and the valleys around rain-fed streams will for instance dry out, mauling biodiversity in plants as well as animals: the first year of drought already made species die out in Noord-Brabant (Schapendonk, 2018) and some creeks only had 10% of the normal amount of water in them (Provincie Noord-Brabant, 2019) It also leads to a host other problems including, but not limited to: diseases, diminishing water quality, wildfires and easier spreading for invasive species (Stichting Natuurmonumenten, 2021).

All these risks present a physical or health hazard to the people who are subjected to it. Whereas on the other hand, healthy ecosystems lead to a healthier society (Depledge & Galloway, 2005). In many instances in 2018 ponds, fens and swimming locations were closed because the bad water quality led to botulism or the occurrence of blue-green algae (Alleman, 2018; van de Wolffelaar, 2018). The number of natural fires doubled compared to 2017 (CBS, 2019), causing fires in many places throughout the province (van Egmond, 2018). The effects of drought are not limited to nature and surface water however, houses were also damaged by the 2018 drought (Heesakkers, 2018)

Agriculture suffers from droughts through decreased yields, yet it also contribute to droughts (Groenewoud & van Atteveld, 2022). This happens through the irrigation of crops and their desire to be able to use heavy machines on wet soils without damaging their fields too much. This lowered groundwater level makes for a less drought-resilient system as there is less water in that system to act as a buffer, thus contributing to drought issues (CBS et al., 2003; Witte et al., 2019). For farmers and other professions directly related to agriculture, serious drought directly impacts their livelihood (Polman, Peerlings, & Vat, 2019). Because it is usually centred around certain soil types catering for certain functions, entire communities can fall victim to the problems that a drought causes. In Brabant, the gross income per farmer in 2018 was 30.000 euros lower than it was in 2017 and in the case of one insurer, 75% of its clients reported damages (Provincie Noord-Brabant, 2019). Moreover, an irrigation ban was put in place by the water boards that lasted until very late in the year (Peeters, 2018), further damaging farmer's yields and livelihoods.

During droughts and the concurrent heat, drinking water usage can skyrocket. This increased demand leads to drinking water companies lowering their pressures to save water and try to keep their reserves intact (Drinkwaterplatform, 2022). If these situations persist for too long and the reserves run out, drinking water might not be replenishable at a sufficient rate, leading to shortages in what is one of the most basic human necessities (van der Aa & van Soest, 2020). This scenario, though perhaps distant, would impact all of society, not just nature or farming communities. A shortage or absence of this basic life necessity should be avoided at all costs.

The examples of the effects of drought in the Province of Noord-Brabant listed above are by all means not self-contained incidents, nor did they only occur in 2018, as the majority of the sources' dates would suggest. 2018, 2019, 2020 and 2022 were all dry years, in which similar drought-related phenomena kept taking place. Moreover, they are projected to keep happening, which is why we need to learn how to adapt our way of water management in a sustainable way. The transition to a more climate-resilient water system will benefit all of society and this research will play its part in that process.

## 2. Literature Review and Theoretical Framework.

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Before the theory was actually decided upon, three other theories were also considered based on the literature that was found during the initial exploratory phase of this master's thesis' topic. The first one is Practice Theory, an approach that constitutes the analysis of the separate element of an action or practice such as sayings and doings, practical concerns, conditions of legitimacy etc. and then seeing the connections and associations between practises and identifying their effects (Nicolini, 2009). Next, there is the Theory of Change: a planning process mapping the relationship between a long-term goal and the intermediate and early changes that are required to meet this goal, emphasising the theory and assumptions that underlay the pathway of change from intervention to outcome (Pringle & Thomas, 2019). Lastly, Actor Network Theory: a theory that supposes that everything exists in constantly changing and shifting networks of relationships, trying to understand the relations and elements that form a process (van der Waal et al., 2018).

There is still a broad range of other general, technological and 'green' approaches and theories (Markard et al., 2012) that have not been considered and elaborated on. However, as will be explained later in this section, Transition Management can form a fuller and bigger picture when used together with the Multi-Level Perspective, which is why they are the theories of choice.

This thesis builds on three main theoretical concepts:

- The field of **Sustainability Transitions** (ST)
- The framework of the **Multi-Level Perspective** (MLP)
- The theory of **Transition Management** (TM)

### 2.1 Sustainability Transitions

The field of ST may be a relatively new one, but a wide variety of subjects and concepts can be found when searching for literature within the field. ST lies at the intersection between science and policy, merging innovations research and sustainability research (Loorbach, Frantzeskaki, & Avelino, 2017). It encompasses transitions in socio-technical systems such as energy, water supply and transport that aim to make a socio-technical system (more) sustainable. They differ from purely technical transitions in the sense that they include not just technological changes, but also changes in institutional structures and user practises (Markard et al., 2012).

A transition can be defined as: *"a gradual, continuous process of change where the structural character of a society (or a complex sub-system of society) transforms"* (Rotmans et al., 2001, p.16). Or as Markard et al. (2012, p. 956) put it: *"A socio-technical transition is a set of processes that lead to a fundamental shift in socio-technical systems."* Sustainability transitions are then defined by Loorbach et al. (2017, p. 600) as: *"large-scale societal changes, deemed necessary to solve grand societal challenges."* Authors within the field agree on the idea that sustainability transitions always incorporate some kind of shift or innovation which encompasses many different discourses and sectors and also leads to institutional change (van der Brugge & Rotmans, 2006; Coenen et al., 2012; Fagerberg, 2018; van Oers et al., 2021).

There are five different phases that can be distinguished in a transition (van der Brugge & Rotmans, 2006; Rotmans et al., 2001). The process starts with the *predevelopment*, in which there is a status quo that does not change visibly while the transition is slowly developing. The point at which the process of change starts is the *take-off* phase, the state of the system begins to shift. At a certain point, *breakthrough* occurs: visible structural changes take place through an accumulation of changes reacting to each other. Next, the transition *accelerates* and collective learning processes, diffusion and embedding processes take place, giving momentum to the transition. Finally, the speed of the social change decreases and a new dynamic equilibrium is reached, the transition *stabilises*. Apart from being multi-phase, like described above, transitions also have a strong multi-level aspect which will be handled in paragraph 2.2. Putting the transition process (figure 1) into the context of this thesis, the research will be concerned with the conditions that influence the trajectory of the line or rather, the transition progress.

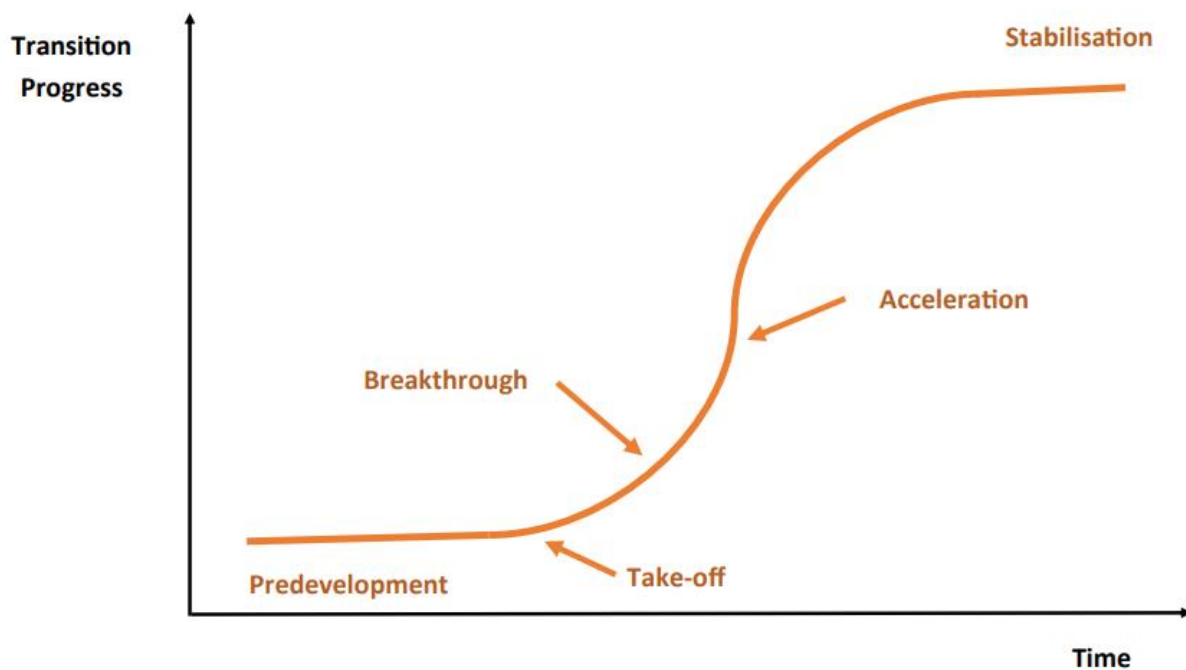


Figure 1: The phases in a transition, adapted from Rotmans, Kemp, and Asselt (2001)

A founding idea within the field is that the grand societal challenges that ST is trying to tackle, such as the energy transition, climate change and the biodiversity crisis, should be understood as systemic. They originate from and are amplified by strong path-dependencies and various types of lock-ins (Markard et al., 2012). The idea then is that these challenges can only be overcome through fundamental and structural changes in regimes (Loorbach et al., 2017), as the regime is the level that houses the rules, institutions and the power distribution (Raven et al., 2010). These regimes are not simply changed, because of their relatively static nature (Geels, 2002), the aforementioned lock-ins and the slow pace that can be prevalent in institutional change (Roland, 2004). ST strives to better understand these regime changes: to anticipate transitions, prevent and adapt to undesirable transitions, and to advance, multiply and accelerate desired transitions.

## 2.2 Multi-Level Perspective on Socio-technical Transitions

The Multi-Level Perspective (MLP) originates in Nelson and Winter's (1982) concept of the technological regime, "which defines boundaries for technological progress and indicates directions in which progress is possible and worth doing" (Kemp, 1994, p.1025). The idea of technological regimes was then broadened by adding a sociological element (Rip & Kemp, 1998), transforming it from an exclusively technological discourse to an all-encompassing one that can be applied to all sectors. This spawned the term "sociotechnical regimes" (Geels, 2002, p.60), which will be elaborated on in paragraph 2.2.2. Geels (2002) follows up the sociotechnical regime with the actual specification of the Multi-Level Perspective. In this framework, Geels worked out the three levels and their relations to each other. However, they have been criticised and elaborated upon by many others, who we will encounter in the paragraphs to follow.

To better understand and visualise sustainability transitions and how they work, the MLP is imperative. As mentioned before, transitions have a strong multi-level aspect: a niche-level innovation has to go through an elaborate process to be able to change the regime level and in turn the landscape level. This thesis will be concerned with the regime level, since it corresponds with the focus of this work on Noord-Brabant's governance of drought management innovations. The MLP will be used to investigate and specify the dimensions that make up this regime, to find out how it works and how it relates to the other levels in this context. The three levels of the MLP are elaborated on as follows.

### 2.2.1 Landscape Level

The landscape level is the wider background providing the highly structured context to which the other levels are set (Smith et al., 2010). It forms the exogenous environment, pertaining to macro-economics, deep cultural trends, macro-politics, demographic change and other globally impactful developments (Geels & Schot, 2007; Smith et al., 2010). The landscape level cannot be easily changed by either the niche or the regime (Geels, 2011); on the other hand, the landscape does influence these two levels through landscape pressure (Raven et al., 2010; Rip & Kemp, 1998). This pressure stresses the regime, which can then be more susceptible to niches or be generally more inclined to change (Smith et al., 2010). The landscape level itself does change, yet very slowly and is likely to take decades (Geels, 2002).

Three types of landscape change exist: the first is slow change (climate for instance), followed by long-term change (constituting developments like industrialisation) and lastly there are rapid external shocks such as droughts. Landscapes can reinforce regimes, but also undermine them (Smith et al., 2010). Satisfaction with a functioning status quo will leave little room for niche innovations to take hold, but if a regime cannot handle a situation, people will look for alternatives.

### 2.2.2 Regime Level

The (socio-technical) regime level is used in various contexts and the term 'regime' can have differing definitions in the literature on transitions (Raven et al., 2010). They are listed below:

- The rules and institutions that constrain regime actors' behaviour. These provide coordination and orientation to actors (Geels, 2002) and of course also limit and nudge their choices (Geels & Schot, 2007).
- The 'establishment' representing power, its history and resistance to fundamental change. The current way in which things are done, who is in charge, the path-dependencies and lock-ins that ensue (Geels, 2011).
- The structures, cultures and practises that dominate the way in which social needs are fulfilled. Institutional and material (inter)dependencies in knowledge, financial means, physical structures, laws, values and resources lead to the establishment of a regime (Smith et al., 2010).

- The selection environment for innovations, in which internal and external selection pressures lead to niches influencing eventual regime change (Smith et al., 2005).

For this thesis, the term 'regime' pertains to the second definition, by Geels (2011). The 'establishment' in this will be Dutch regional drought management, represented by the Province and the Waterboard. The various definitions have their origins in the multiple dimensions that a regime consists of. The 'original' seven of these were defined by Geels (2002) and adapted by Smith (2007) as a heuristic, leaving us to give them meaning ourselves:

1. **Guiding principles:** these pertain to the interests, behaviour and convictions that form the basis to a regime's principles and guide it.
2. **Technologies and infrastructures:** these are the hard technological and infrastructural parts of a regime. These tend to be big, locked-in investments of a static nature and are therefore hard to change.
3. **Industrial structure:** this dimension relates to the economic aspect of the society or structure that formed the regime.
4. **User relations and markets:** the markets and their corresponding consumers and/or users that have to do with the regime.
5. **Policy and regulations:** the legal underpinnings of the regime can provide it with a lot of stability, as does the policy that applies to it. The regime itself however, can also provide policies and regulations which can influence all three levels of the MLP, including its own.
6. **The knowledge base for the regime:** the body of knowledge within the regime and also its expertise, are linked to all other dimensions and can therefore have great influence on the regime overall.
7. **Cultural and symbolic meanings** underpinning practises: this dimension is close to the guiding principles but is grounded deeper. It stems from history, cultural beliefs and experience.

Following criticisms on the MLP, Smith et al. (2005) and Lawhon & Murphy (2012) added an additional four:

8. **Agency and power relations:** agency constitutes the action-taking and decision-making ability of regime actors and power relations refer to the discrepancies in power between the regime's actors and between other actors outside of the regime.
9. **Regime membership:** this dimension is concerned with the question of which actors are part of the regime and which are not.
10. **Resources and distribution:** The (different types of) resources that a regime can access and how these are distributed among the regime actors.
11. **Visions and expectations:** these will form the basis for a regime's future actions and therefore play a vital role in regime change.

Both the stability and the dynamics of a regime stem from the dimensions above. Regimes change, innovation occurs, but it does so incrementally. Therefore, it is referred to as dynamic stability (Geels, 2002): changes happen but they are never sudden or instant, even when influenced by a shock event. Niches need to overcome the regime's stability to influence it, but on the other hand, regime change can also be caused by or influenced through landscape pressure or through interaction with other regimes (Smith et al., 2010). The opportunities for niches lie in these sources of change and the tensions they cause.

The eleven dimensions will be used to decompose and analyse the regime of Noord-Brabant's governance of drought management, in turn answering sub-question 1. All these dimensions are linked and co-evolve, but they also have internal dynamics which may result in tensions within the regime (Geels, 2002). These indicate uncertainty and differences in opinion and if these links weaken, the regime may become less stable and more susceptible to change.

### 2.2.3 Niche Level

The niche level is considered the locus of radical innovations (Geels, 2011). It forms the smallest level, where novelties are born (Raven et al., 2010). Initially, niches are very unstable and might not perform well, because they are new, unknown and lack support. However, protected from mainstream market selection (Schot, 1998) and carried and developed by so-called niche-actors (Geels & Schot, 2007), they stand a chance to actually influence and make it into the regime.

Niches might form in laboratories, research & development trajectories, pilot programmes, living labs or through a very specific market issue, the niche actors are the entrepreneurs, researchers, start-ups and designers that conceive and carry these niches until they are stable enough to exist on their own (Geels, 2011), all this time, the actors hope that their niche will one day be able to change or replace the current regime. However, the current regime is stabilised by lock-ins and path dependencies, making it hard for a niche to be adopted (Geels, 2011). It relies on gaining more momentum and becoming more stable by overcoming regime constraints, branching out its network and linking up with other change processes (Smith et al., 2010). Niches represent progress, improvement and “the new things to the world” (Raven et al., 2010, p.62).

Three main phases can be distinguished in the development of niches (Geels, 2011; Kemp et al., 1998; Schot & Geels, 2008), namely (1) the *articulation and adjustment of expectations*, which provides guidance to the innovation process and aims to attract attention and funding from external actors; (2) the *building of social networks* and the enrolment of more actors, expanding the resources available for niche-innovations; and (3) *learning and articulation processes* in various dimensions, such as technical design, market demand and user preferences, infrastructure requirements, organisational issues and business models, policy instruments, symbolic meanings.

Note that these three levels also differ in their ‘malleability’, the ease with which they can be changed. Niches are the birthplace of innovation, the regime's rules are more inflexible and the ‘hardness’ of the landscape prevents that from changing if only very slowly (Geels, 2002). A transition will finally occur when the sociotechnical regime shifts to another regime, something which is not easily achieved.

## 2.2.4 Critiques on the Multi-Level Perspective

The MLP has been critiqued extensively for different reasons: Undervaluing agency and focussing too much on the niche level and bottom-up change (Berkhout et al., 2004; Genus & Coles, 2008; Smith et al., 2005) while at the same time using the landscape level as a residual category or 'garbage can' (Geels, 2011), being ambivalent and overly simplistic in its levels (Berkhout et al., 2004; Jørgensen, 2012; Markard & Truffer, 2008), disregarding social and political relations (Genus & Coles, 2008; Lawhon & Murphy, 2012; Meadowcroft, 2009) and failing to actually explain the dynamics, patterns and outcomes of transitions (Svensson & Nikoleris, 2018).

These criticisms have spawned a set of 'Transition Pathways' that give the MLP less of a bottom-up movement (Geels & Schot, 2007) and a revised visualisation of the MLP as seen below (Geels, 2011). In their responses on these criticisms, Geels and Schot have nuanced and elaborated on the MLP to make for a framework that does indeed have more focus on agencies, spreads its focus to all the levels and relations and it has become less simplistic, albeit with the additions from other researchers (Fuenfschilling & Truffer, 2014; Genus & Coles, 2008; Jørgensen, 2012; Markard & Truffer, 2008; Smith et al., 2005).

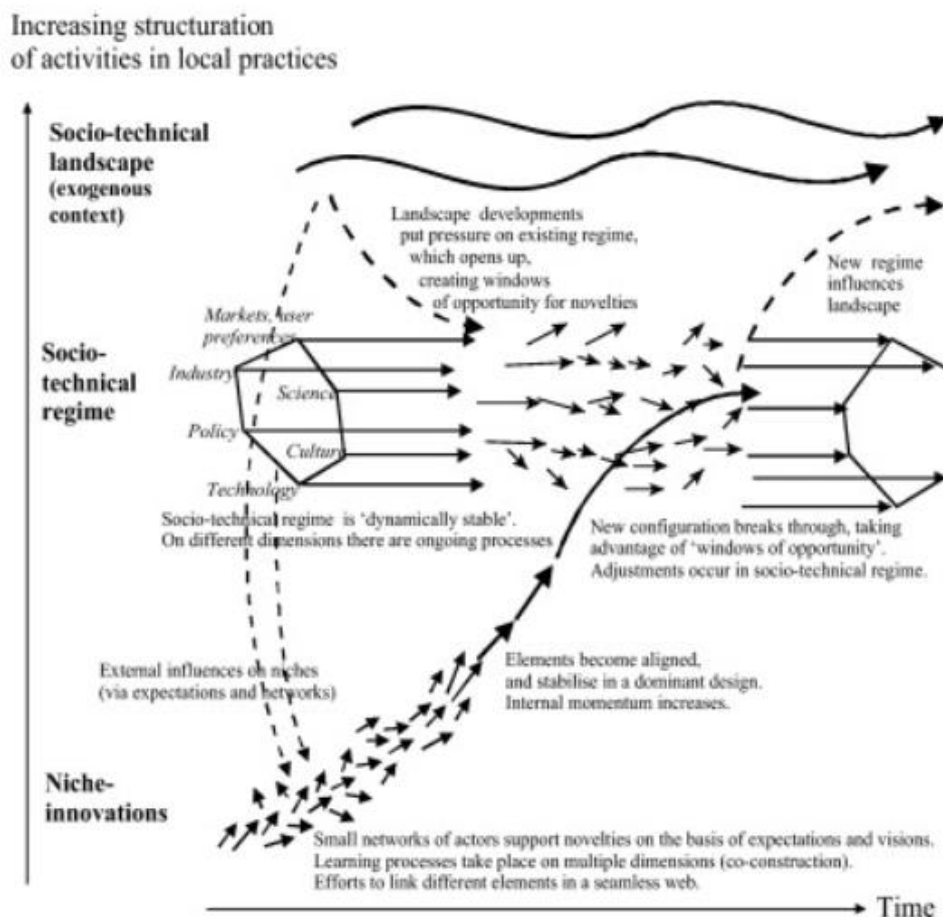


Figure 2: Ideal representation of the MLP, taken from Geels (2011)

## 2.3 Transition Management

To fully understand how Noord-Brabant's governance supports or obstructs the upscaling process, the MLP is not enough. Apart from the analytical shortcomings and excessive focus on the niche-level and bottom-up change that were criticised a paragraph earlier, it also does not provide any perspective for the influence that the regime has on the upscaling process, only for its constitution. For the purpose of researching this, the theory of Transition Management (TM) is introduced, noting that this type of 'theoretical enrichment' was also recommended by Geels (2011) in response to the aforementioned criticisms. Specifically, this part of the research will be focussing on what Brockhoff, Biesbroek, and van der Bolt (2022) called 'Steering and Acceleration Mechanisms', from the perspective of the regime of Noord-Brabant's governance. This means that this thesis will focus on the consequences of the regime's current constitution and analyse how these events, documents and procedures (to name a few options) influence the upscaling process through use of the aforementioned Steering and Acceleration Mechanisms that are provided by the literature on TM. These mechanisms will be discussed in paragraph 2.3.2, but first, the theory of Transition Management will be elaborated upon.

### 2.3.1 Framework of Transition Management

As was stated in chapter 1, TM can be seen as a governance approach that is based on the analytical perspective of society being a patchwork of complex adaptive systems which evolve, change and adapt. Society can therefore sometimes undergo structural changes which are referred to as transitions (Loorbach & van Raak, 2006). In the literature, TM is presented as regime transformation, guided principally by negotiation between external social actors and stakeholders (Meadowcroft, 2009). They exert pressure for change and temporarily 'protect' niches whilst providing them with resources, capabilities and networks (Smith et al., 2005). This 'safe space' for niches is referred to as the transition arena.

Combining insights on transitions leads to a management strategy for public and private actors: a more process-oriented philosophy balancing coherence with complexity and uncertainty. It concentrates on influencing persistent societal problems and is not exclusively focussed on a solution, but it is also explorative and design-oriented in the sense that it organises a joint searching and learning process (Rotmans & Loorbach, 2008). TM tries to use innovations more strategically through multi-level coordination and fostering self-organisation, using new types of interactions and cycles of learning and action, viewing social change as the result of interactions between all actors on different (societal) levels within the landscape (Loorbach & van Raak, 2006).

The aforementioned persistence and complexity of the problems that TM was devised to help to solve, leads to the need for a form of multi-level governance with interaction between three levels: the **Strategic** level which includes processes such as vision development, strategic discussions and long-term goal formulation, the **Tactical** level which includes agenda building, negotiating, networking and coalition building and lastly, the **Operational** level which comprises experimenting, project building and implementation (Loorbach, 2004). Process-wise, TM consists of four coherent activity clusters that run in a cyclical and iterative way (see figure 3 below). Transitions cannot be steered in terms of command and control, as they are too complex and come with many uncertainties and surprises. However, transitions can be influenced and guided by influencing the speed and direction of these processes (Rotmans & Loorbach, 2008).

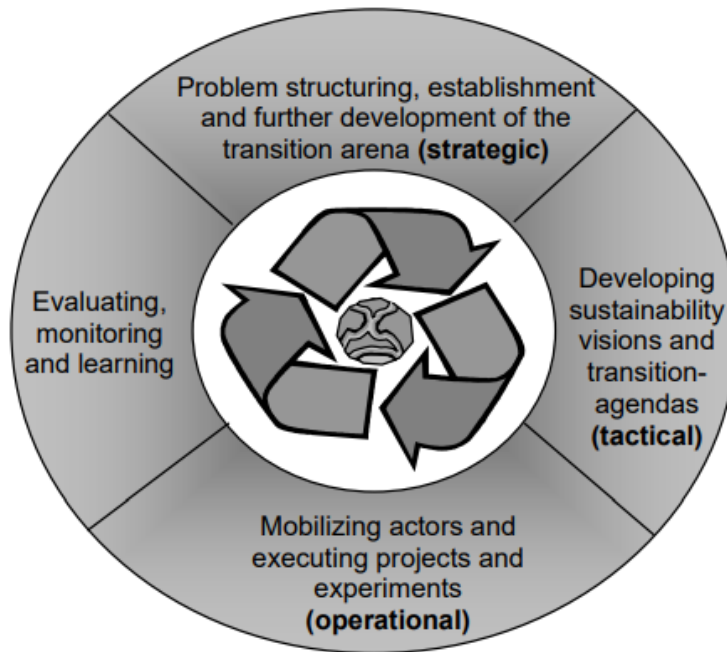


Figure 3: The four activity clusters of Transition Management, taken from Loorbach (2004)

### 2.3.2 Steering and Acceleration Mechanisms

Actors practising TM can use many mechanisms to steer and accelerate a transition. They can also be placed under one or more of the clusters shown above, depending on the level at which they are applied. The literature on TM has since provided a more detailed body of mechanisms:

1. **Long-term thinking, agenda building** and **visions** as a base for devising short-term policy. Longer time frames of at the very least 10 years should be adopted and alternative trajectories should be explored, inspiring visions and goals can have an important mobilising function in maintaining focus and energy (Loorbach, 2004; Loorbach & van Raak, 2006; Meadowcroft, 2009; Rotmans et al., 2001; Rotmans & Loorbach, 2008; Smith et al., 2005).
2. The aforementioned visions should be the starting points for the process to achieve their goals, through this **backcasting** transition pathways can be generated that link the future goals to actions in the present (Voss, Smith, & Grin, 2009).
3. **Collective problem structuring** among the actors leads to an understanding of the problem at hand that is shared between stakeholders and creates a stronger sense of urgency (Jhagroe & Loorbach, 2015).
4. **Multi-domain** and **multi-actor** thinking on **multiple levels**. Transitions operate in multiple domains with many different stakeholders across all the levels. Differences in dynamics, power distributions, policy instruments and competencies mean that these all have to be considered (Loorbach, 2004; Loorbach & van Raak, 2006; Rotmans et al., 2001; Rotmans & Loorbach, 2008).
5. **Learning by doing, doing by learning** and **social learning**, because only through initiating change can we learn the potential and limits of different approaches and reframe all the actors' perspectives to align (Loorbach & van Raak, 2006; Meadowcroft, 2009; Rotmans et al., 2001; Rotmans & Loorbach, 2008).
6. Trying to bring about **system innovation** alongside **system improvement**, to both improve the current system as well as innovate in ways that are completely new to the system (Rotmans et al., 2001).

7. **System's thinking** and **integral policy**. Because of the complexity of transitions, different perspectives need to be integrated and made specific. A holistic approach is necessary (Loorbach, 2004).
8. **Keeping options open**, encouraging a wide **diversity of innovations**. With innovations one needs to keep an open mind and not discard an idea when it does not work immediately. When choosing innovations, enough has to be known to make an educated choice even with the high uncertainty that comes with them (Loorbach, 2004; Loorbach & van Raak, 2006; Meadowcroft, 2009; Rotmans et al., 2001; Rotmans & Loorbach, 2008).
9. **Linking content** and **process**. Both technological (content) and social (process) innovation are needed for transitions (Loorbach & van Raak, 2006; Meadowcroft, 2009; Rotmans & Loorbach, 2008).
10. **Aiming for results** by targeting critical (societal) sub-systems that have deeply embedded unsustainable practises (Meadowcroft, 2009).
11. **Courage, leadership and persistence** to break through the prevailing structures, introducing different approaches that help speed up the transition (Brockhoff et al., 2022).
12. **Deepening, broadening** and **scaling up**, this mechanism refers to the experimentation process, innovations need to mature before they can be rolled out on a greater scale. They need to be learned from and thoroughly investigated (deepening), repeated in different contexts (broadening) and then applied to the next scale level (scaling up) (Loorbach, 2004; Loorbach & van Raak, 2006; Raven et al., 2010; Rotmans & Loorbach, 2008).

The mechanisms above will serve to analyse the actions of the regime of Noord-Brabant's governance on the part of upscaling drought management innovations, the ones that they apply are equally as important as the ones they do not. Only checking whether or not a mechanism is employed does not show the full picture however, it is also necessary to evaluate if a mechanism has been employed successfully.

### 2.3.3 Critiques on Transition Management

Like the MLP, TM has also been criticised, Berkhout et al. (2004) argued that guiding visions are contested and that building consensus on these is problematic. The rather small empirical basis of the theory has been criticised as well (Rotmans & Loorbach, 2008). Additionally, the collection of rules that it uses for managing these complex social systems has been deemed rather deterministic (Hajer, 2005). Comments have also been made on it being a very typical expression of the Dutch consensus culture and might therefore not be very applicable in other cultures (Rotmans & Loorbach, 2008), which links with Meadowcroft's (2005) questions on the open and cross-boundary nature of transitions that might span multiple countries or regions. Lastly, the conceptualisation of 'power' within TM was unclear and needs to be theoretically and empirically grounded (Rotmans & Loorbach, 2008).

## 2.4 Conceptual Framework

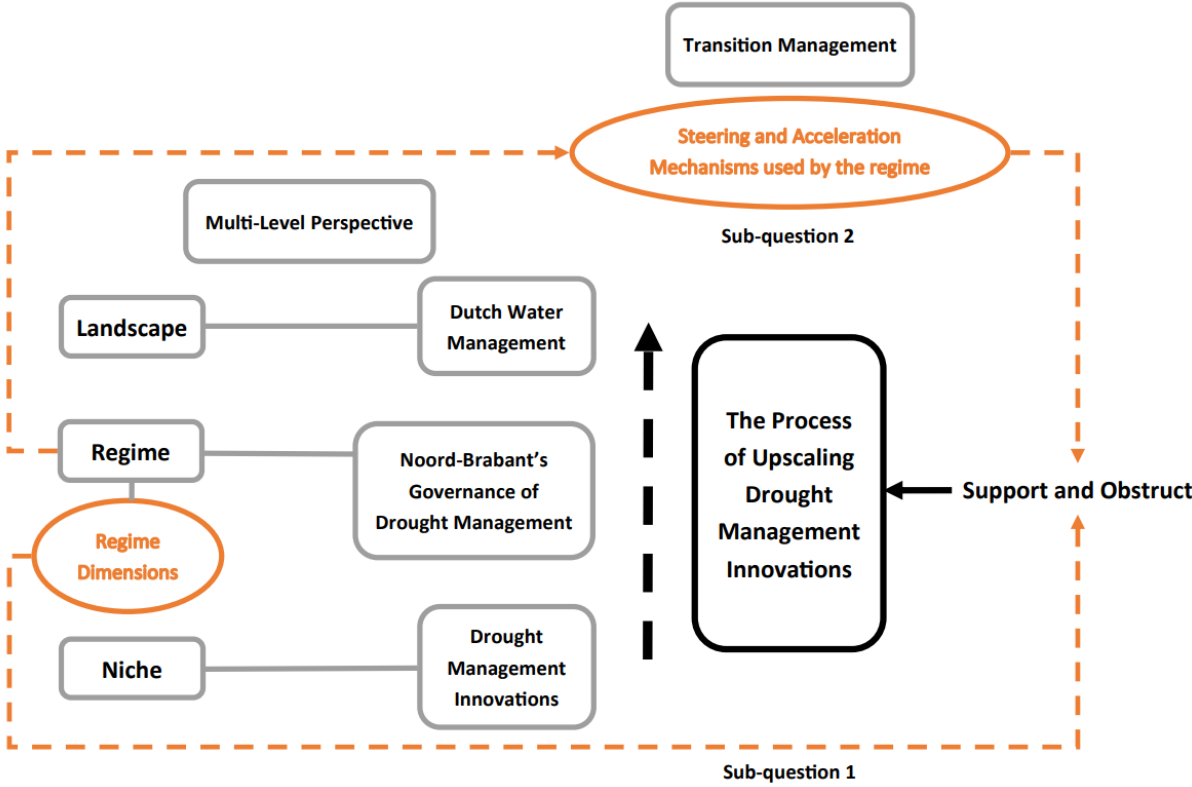


Figure 4: Conceptual Framework

The image above shows the conceptual framework for this thesis. In black is the main research focus, the manners in which the regime of Noord-Brabant's governance supports and obstructs the process of upscaling drought management innovations. Grey represents the two theories that are used for this research and in orange we find the components of those theories that are used and investigated to answer the research questions.

The black dashed arrow shows how a niche in the form of a drought management innovation can be upscaled through the regime of Noord-Brabant's governance into the landscape level of Dutch water management. The supporting and obstructing influences on this process, which is the main interest of this research, are linked to the regime via two ways. These are the two sub-questions that need to be answered first. The first sub-question uses the regime dimensions from the MLP to find out how the regime's constitution influences the upscaling process. The second sub-question investigates which steering and acceleration mechanisms from TM the regime uses both wittingly and unwittingly, to find out how its actions influence the upscaling process.

## 3. Methodology

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This section will elaborate on the strategy and the methods that were used to collect and analyse the data. Following this, it gives an overview of how the data collection and analysis phases were completed. It ends with an elaboration on the research validity and reliability.

### 3.1 Research Strategy

To acquire the specific data needed to answer the research question, a case study was executed. It focused on two specific regime actors: The 'Provincie Noord-Brabant' (Province) and 'Waterschap De Dommel' (Water Board). It was aimed at gathering data on how the regional governments are involved in the process of upscaling innovations in drought management. The case study as a concept has been defined in multiple ways, but there is always a bounded system or case that is analysed, described in detail and researched empirically (Harrison et al., 2017); which is in this case the regime. Confusion can arise as to whether a case study is a method or a methodology or both, in this research however, it is a methodology, the actual methods to be applied will be elaborated upon later in this section.

This thesis examines this specific regime's dimensions, as well as its actions with regards to the upscaling process. It does so by employing both content analysis as well as interviews. Use of these two methods ensures a bigger and more complete body of data and additionally helps to ensure the validity and reliability of the research by enabling triangulation (van Thiel, 2014).

#### 3.1.1 Desk Research

The first step of the empirical research was desk research, which was done using content analysis. This is a systematic procedure for reviewing or evaluating the content of these documents (Bowen, 2009) and first appeared in the 1940's in quantitative research, but has since also been applied for qualitative work (Gaur & Kumar, 2018; Graneheim, Lindgren, & Lundman, 2017). The documents that can be analysed using content analysis can take almost any form, from diaries to newspapers and from movie scripts to books (Bowen, 2009). For this thesis' context however, the documents were all connected to regional governance in drought management.

The body of data consisted mostly of policy documents, regulations from the EU and national level and research documents concerned with drought issues. However, news articles or publications from nature preservation or agricultural organisations could also hold valuable information and have therefore been looked into as well. The desk research would form the basis for the interviews in the sense that it showed what dimensions and mechanisms needed more looking into. The interview guides were based on this information, focussing on what still needed more data after the documents had been analysed.

#### 3.1.2 Interviews

The second step was interviewing. The interviews were conducted in a semi-structured way, leaves the necessary amount of freedom to react and ask deeper questions. This leads to better, clearer and more complete insights, thus providing more valuable data. The interview guides were set up to provide data following the content analysis. This means that they contained questions pertaining to the regime dimensions and steering and acceleration mechanisms that were left with little or no data. How this worked out can be found under paragraph 3.2.2 and the interview guides themselves, included under appendix 2, 3 and 4.

People working on or within Dutch drought and water management were approached for interviews, they have knowledge, experience and visions and expectations on the upscaling process. They were not only the civil servants that work for the regional governments, but also the people that have a more external perspective on regional governance as well as the users of the water system, which are dependent on it to fulfil their tasks. Concerning the number of interviews that needed to be conducted: one can assume that all the data from interviews has been collected when we get the sense that there is no new information being found: ‘saturation’ has been reached (Seidman, 2006). The most straightforward way to achieve this was to keep doing interviews until we thought this point was reached and possibly do one or two extra ones to verify this.

However, since we could not be sure how much data really was available to be obtained, a logistically more feasible way was to base the number of interviews on judgement (Cobern & Adams, 2020). This judgement was based on the number of different perspectives that might exist on the issue of upscaling drought management innovations. Since the plan was to interview (1) civil servants, (2) external people (mostly consultants of sorts) and (3) the water system’s users, we had three perspectives that we named respectively: *Governance*, *Consultants* and *Users*. Within these perspectives, a range of 2 to 5 different opinions between the interviewees seemed reasonable, taking into account that the contributors might not all have been on the same line but are also not likely to have had a major difference in opinions. In addition, the ‘Governance’ group consisted of people from the province as well as people from the water board, making it double the size effectively. Multiplying the number of perspectives with the estimated number of different opinions (which we will assume here to be 3 on average per perspective) shows that to get a reliable dataset to analyse, at least 12 interviews would need to be conducted. If by the time these interviews were conducted it showed that saturation had not been achieved, more could still be added of course. The interviews were transcribed as soon as possible after they had been conducted, to ensure that the researcher’s memory was still fresh.

### 3.1.3 Operationalisation of the Dimensions and Mechanisms

Before the data collection could start, it needed to be known what we were actually looking for. To be able to recognise the dimensions and mechanisms, they needed to be operationalised for this research. Paragraphs 2.2.2 and 2.3.2 have already given the broad and theoretical definitions, but this paragraph will elaborate on what actually was investigated in the following phases of the thesis research.

#### *Regime Dimensions*

The regime dimensions serve to identify the characteristics of the current regime. They show what the regime is like now, how it acts and why it acts that way. Below are the operationalised dimensions:

Table 1: Operationalisation of the Regime Dimensions

REGIME DIMENSIONS	OPERATIONALISATION
<b>Guiding Principles</b>	To find out what the guiding principles of the regional governments are, the current concepts and philosophies that guide the Province and the Water Board were discerned. This shed light on the way in which these parties conduct their drought governance and why they function in the manner that they do.
<b>Technologies and Infrastructures</b>	This dimension consists of the digital and physical infrastructure that the regime uses and has invested in. It was necessary to find out what technologies and infrastructures are used and see what these meant for the upscaling process.

<b>Industrial Structure</b>	This dimension is very broad and abstract. Moreover, it did not have enough to do with the upscaling process, certainly in relation to the other dimensions. It was therefore discarded from this research.
<b>User Relations and Markets</b>	This dimension pertains to the relation that the regime has with the markets and the users of the water system and was analysed from the perspective of drought management innovations.
<b>Policy and Regulations</b>	This dimension would consist of two types of policies and regulations: those that form the regime actors and those that have been made by those regime actors. Together they form the legislative base for the regime. Both types were researched and constituted an important part of the analysis.
<b>Knowledge Base</b>	The knowledge base refers to all the data, knowledge and expertise that exists within the regime. It consisted of knowledge that had been around for decades, but also of new insights and research that shed light on current issues. All instances of this knowledge base were of interest and were analysed.
<b>Cultural and Symbolical Meanings</b>	This dimension was closely linked to the guiding principles in the sense that many of those principles flow from the cultural and symbolic meanings. These meanings however, are grounded much deeper in culture and history. For this research this meant that this dimension would be formed mostly by the Dutch administrative culture as well as events from the past.
<b>Agency and Power Relations</b>	To identify this dimension we looked at the power relations within the regime, as well as how its power relates to actors outside of it. Agency was identified by the regime actor's ability to make decisions and take action.
<b>Regime Membership</b>	This dimension was also relatively straightforward and was concerned with which actors are part of the regime. There are different divisions within the Province and Water Board and there could also have been other parties that significantly influence Noord-Brabant's drought governance in such a way that they should be considered when researching the regime.
<b>Resources and Distribution</b>	To identify this dimension we investigated what the regime's resources are and how they are distributed between the regime actors.
<b>Visions and Expectations</b>	For this last dimension we identified the visions and expectations that the regime had for the future. What their role would be, what challenges they faced, what changes they wanted to make and what changes they did not want to make.

### *Steering & Acceleration Mechanisms*

We sought to find out what steering & acceleration mechanisms the regime currently uses, both wittingly as well as unwittingly. Essentially, we investigated what the regime does and compared that to the mechanisms, as given by the TM-literature (paragraph 2.3.2.). We looked for indications that show that a certain mechanism was being used, as well as indications that it is not being used properly. Absence of indications towards a mechanism points to the mechanism not being used at all.

The mechanisms have already been collected and elaborated upon, but these are the general mechanisms that can be applied within the context of a full socio-technical transition. Since this thesis is concerned with only the upscaling of innovations within a specific field, most of the mechanisms are too big and broad to be applicable. It is for this reason that the five mechanisms in the table below have been selected to be included in the research.

Table 2: Operationalisation of the Steering & Acceleration Mechanisms

STEERING & ACCELERATION MECHANISMS	OPERATIONALISATION
<b>Collective Problem Structuring</b>	it is impossible for only one actor to upscale innovations all by themselves. For instance, one farmer can only go so far as to use an innovation on all of his own plots and a water board cannot simply implement drought management measures on plots they do not own. All involved parties need to have a shared understanding of the problem and they have to work together for it to be solved effectively.
<b>Learning by Doing, Doing by Learning and Social Learning</b>	Everybody involved in the upscaling process needs to learn to be able to scale up. Different actors might learn in different ways, leading to multiple angles of knowledge on upscaling. To learn about innovations in drought management and upscale them, actors will have to ‘just do it’. Change has to be initiated to really learn what the potential and limits of different approaches are (Loorbach & van Raak, 2006).
<b>Keeping Options Open, Encouraging a Wide Diversity of Innovations</b>	With the drought-related challenges of the future in mind, combined with the rigidity of the regime, a broad palette of innovations needs to be considered. Dutch water managers can no longer rely on technical measures alone and will have to broaden their pool of options when it comes to managing drought, even if this does mean they have to engage with novelties and uncertainties.
<b>Courage, Leadership and Persistence</b>	These qualities essential for change. Within the relatively inert structure of the regime, one or more driving forces have to push innovations through to upscale them. This comes with risk, but the risks involved with not acting are much greater. Government actors are notoriously risk-avoiding, which makes this mechanism even more influential.
<b>Deepening, Broadening and Scaling Up</b>	Experimenting with innovations, testing them and maturing them before rolling them out on a greater scale is essential for an effective upscaling process. We know that many actors within drought management, from within the regime as well as from outside, have been occupied with this. We will investigate how this influences the upscaling process.

### 3.1.4 Ethical Considerations

The subject of ethics is in this thesis represented mainly in the interviews and the way in which their data was handled, considering confidentiality and interviewee anonymity if requested. It was imperative that all interviewees were participating voluntarily and that this was verifiable, for this research the interviews were recorded audio-visually to be transcribed. The interviewees were asked if they were okay with this. If not, the interview would not be recorded. In case of a physical interview, the interviewee would be able to check this themselves with the interviewer. In case of a digital interview, the medium would tell all participants if the meeting was being recorded, which also allowed the interviewee to check if their wishes were being respected.

This links directly to another ethics consideration: privacy. The identities of the interviewees should not be directly traceable and care was taken that their personal data is handled thoughtfully. It was important for the research however, that it was known who gave which answers in the sense that we needed to know what function they were fulfilling for whom. The point of view on a subject can be very different between a farmer, a researcher and a policy maker for instance. For this reason, the interview data could not be handled with full anonymity. Still, it was made sure that personal information was not traceable from this master's thesis, so that interviewees could speak freely. So, for this reason, the interviewees will be referred to by group and number. To illustrate this: 'Governance 1' for instance was the first interviewee in the Governance group.

Looking at the subject of this thesis, any forms of psychological, social or physical harm as a direct result of the interviews can be ruled out. A case of legal harm could only occur if the interviewees willingly shared information that they should not, for which the anonymisation of the research data should provide protection. Interviewees were informed about the results and were asked if they wanted to see them. Through this step, research transparency towards those who contributed was ensured. Moreover, the researcher should not have any conflicts of interest which may implicate certain findings. The researcher did not stand to gain anything from this research apart from a master's degree and therefore states that there are no such conflicts.

## 3.2 Data Collection

Having provided the research strategy and the ethical considerations involved, we can now elaborate on the data collection phase; doing so per step.

### 3.2.1 Desk Research

Desk research was the first step of the data collection phase. Documents forming the foundations for policies, legislation and relationships between actors were accumulated, as well as all others that could shed light on the dimensions of the regime and the mechanisms it uses. Adding to this, earlier research on governance of drought issues from the regional level was also gathered to see what other researchers have found before, to add to the strength of the data. Eventually, for the purpose of creating a logical overview, two groups were created: *Policy documents*, which pertained to laws, policies and plans on the different levels of government and *Research documents*, papers that scholars had written on the subject. The first group contained legislative as well as policy documents on drought management, stemming from the international (EU), national, provincial and water board levels. The second group contained a variety of papers and reports shedding light on this thesis' specific issues from a non-governmental perspective. A detailed elaboration on the documents that were analysed for this research is available and included in appendix 1.

### 3.2.2 Interviews

Following the desk research, the interviews were initiated. The interview guides were set up and potential interviewees were approached. The content analysis provided a lot of data, but it seemed that the interviews could shed extra light on most dimensions and mechanisms and provide them with richer data. Paragraph 3.1.1 mentioned that the desk research would form the basis for the interview and it became clear that the documents had provided enough data for the following three dimensions:

1. *Technologies and Infrastructures*
2. *Policy and Regulations*
3. *Regime Membership*

These three dimensions were already saturated with data at this point and for all of them the data was also of sufficient depth. All other dimensions and mechanisms were more complex and needed both content analysis as well as interview data. Therefore, the dimensions above were not included in the interview guides, whereas the other 7 dimensions and 5 mechanisms did receive attention during the interviews. This is not to say that no data on these three dimensions was found of course, this was still analysed if it was encountered in the interview transcripts.

Three different interview guides were made for the three different types of interviewees, each was slightly different from the other on the detail level. For instance, questions about the dimension of User Relations and Markets, should have a different focus when asked to an actual user as compared to a consultant. The three different interview guides can be found in the appendices. They were written in English, but the interviews themselves were conducted in Dutch. This was to ensure that the data would be as rich as possible, considering that all interviewees were Dutch and the level of English might not be consistent.

The pool of interviewees was divided into three groups in paragraph 3.1.2, the selection of the interviewees also followed from the distinction between these groups. Interviewees were sourced from the combination of the KLIMAP-network and my personal network. In addition, both these groups referred to potential interviewees in their own network as well, creating an even wider band of interviewees. All interviewees were approached via an email in which the thesis was shortly introduced and it was stated how their contact details were acquired. People were very eager to help, once they had made time in their busy schedules.

Eventually, 13 interviews were conducted, which is in line with the at least 12 mentioned in paragraph 3.1.2. The 'Governance' group included both water board and province interviewees. Moreover, the 'Consultants' group included consultants, researchers and a project manager from a climate adaptation innovation facility. The 'User' group represented the users of the water system, including the drinking water company and a nature organisation. All interviews were eventually conducted via Microsoft Teams, because of scheduling restrictions on the ends of both parties.

### 3.3 Data Analysis

The analysis of the collected data, that is the interview transcriptions and collected documents, was carried out with ATLAS.ti. Using the operationalisation from paragraph 3.1.3, all words, sentences and passages that are of interest to the regime dimensions and what influences them were marked with a code that corresponds to the right regime dimension. Through this process it became clear what the regime dimensions are actually like for Noord-Brabant's governance in drought management, answering the first sub-question. For the second sub-question, the application of the steering and acceleration mechanisms from Transition Management needed to be identified from the sources. This was done in the same fashion as that of the regime dimensions, coding any word or word group that corresponded with or hinted at one or more of the mechanisms. However, since application of the mechanisms can be both successful (the application was regarded to be beneficial to the process) as well as unsuccessful (application was not a help or even a hindrance to the process), two separate codes were used for these options for all the mechanisms.

Another important note here is that some of the sources might either not have mentioned any application of mechanisms or they did mention them, but not their outcome. A lack of mention for certain codes is noted during the analysis phase and the findings on this are interpreted using the other codes, quotations and notes as we reach the results section.

The coding structure was very straightforward and changed very little during the analytical process. There were two main groups of codes that were used: Dimensions and Successful Mechanisms. The third group of Unsuccessful Mechanisms was a lot less prevalent in the data, but it certainly was present. The code for 'Tips' was added while analysing the research documents and the interviews, these contain advice for the regime from both the (research) documents as well as the interviews and are therefore incredibly valuable as data towards the influence that the regime has on upscaling.

Table 3: Overview of the codes used.

<b>REGIME DIMENSIONS</b>
<b>R-Agency and Power Relations</b>
<b>R-Cultural and Symbolic Meaning</b>
<b>R-Guiding Principles</b>
<b>R-Knowledge Base</b>
<b>R-Policy and Regulations</b>
<b>R-Regime Membership</b>
<b>R-Resources and Distribution</b>
<b>R-Technologies and Infrastructures</b>
<b>R-User Relation and Markets</b>
<b>R-Visions and Expectations</b>
<b>MECHANISMS SUCCESSFUL</b>
<b>S-Collective Problem Structuring</b>
<b>S-Courage, Leadership and Persistence</b>
<b>S-Deepening, Broadening and Scaling Up</b>
<b>S-Keeping Options Open, encouraging a Wide Diversity of Innovations</b>
<b>S-Learning by Doing, Doing by Learning and Social Learning</b>
<b>MECHANISMS UNSUCCESSFUL</b>
<b>U-Collective Problem Structuring</b>
<b>U-Courage, Leadership and Persistence</b>
<b>U-Deepening, Broadening and Scaling Up</b>
<b>U-Keeping Options Open, encouraging a Wide Diversity of Innovations</b>
<b>U-Learning by Doing, Doing by Learning and Social Learning</b>
<b>TIPS</b>

### 3.4 Validity and Reliability of the Research

Validity and reliability eventually determine the quality of the research. The following distinguishments can be made: internal validity, which relates to the extent to which the presented research proves the conclusions drawn in it; and external validity, which is measured by the degree to which a study's outcome can be generalised. The reliability of a research depends on the accuracy and consistency with which the variables are measured (van Thiel, 2014). For a qualitative research such as this one, these factors can be difficult to ensure since the process of analysis happens mostly inside the mind. The analysis should therefore be well-explained and well-documented to ensure that readers can follow the process comprehensively and that the findings and the process can also be transferred onto other data. This means that interviews are recorded and transcribed, that the choices for documents must be explained and that during the coding phase, the choices made should be registered for later reference as well.

One threat to the reliability of the research is the semi-structured way in which the interviews were conducted. This flexibility could cause differences or discrepancies between the separate interviews' exact questions and the way in which they were conducted. Therefore, care has been taken to ensure that this did not happen (van Thiel, 2014): the interview guide has always been kept to. Additionally, the documents and transcriptions that were coded earlier needed to be revisited occasionally to check if the findings lined up and were still relevant, it was an iterative process to ensure the quality of the analysis remained the same throughout the duration of the research (van Thiel, 2014).

Triangulation was mentioned at the start of this section already, it is a concept that pertains to using different methods (Thiel, 2014), sources or theories to ensure a full 'picture' of the study subject (Farquhar, Michels, & Robson, 2020). It was the primary way of ensuring validity and reliability in this study and was applied by using both interviews as well as content analysis. By corroborating findings across the body of data, the impact of potential biases that can exist in a single study is reduced (Bowen, 2009). Moreover, data from both sources and methods should converge, strengthening its validity (Abdalla et al., 2018).

In addition to this however, Farquhar et al. (2020) defined two other modes of triangulation: complementarity and divergence. Complementarity refers to the data from multiple sources overlapping, but also complementing each other. Divergence of data can lead to new critical insights and provoke a different outcome than might have been expected (Farquhar et al., 2020). Triangulation was mostly utilised in a converging manner, strengthening findings that corresponded with the findings from the other data source. However, complementarity was sought after by using both interviews as well as desk research and through this, diverging data was also found.

## 4. Results

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This section will handle the results of the research. We start with some background information that will help in understanding the results with regards to the regime dimensions and steering & acceleration mechanisms.

### 4.1 Background Information

One occurrence that became clear during the research, was that the droughts from 2018 onwards notably increased the priority of the issue for the regime. Policy documents from before 2018 mention drought rarely, whereas post-2018 documents made a significant shift towards announcing the urgency of the issue. Both regime actors may have been wanting to revise drought management policy since 2018 onwards, but research has already been criticising their policy for decades (Witte et al., 2019). Moreover, both the Province of Noord-Brabant and Water Board De Dommel return on their water management policies of the last century, stating those are no longer sustainable and that a ‘Water Transition’ needs to be put in motion (Waterschap De Dommel, 2021b; Provincie Noord-Brabant, 2021b). This Water Transition became a central theme in the results.

The APA criteria require a certain way of citing interviewees. In the upcoming paragraphs the interviewees are cited repeatedly and because of this multitude of references, the APA criteria become a burden to the readability of this section. Therefore, we have included below a table in which the citation is included, together with an abbreviation with which we refer back to this citation in the text.

Table 4: Interviewee classification

ABBREVIATION	CITATION
Interviewee G1	(Governance 1, personal communication, March 30, 2023)
Interviewee G2	(Governance 2, personal communication, March 31, 2023)
Interviewee G3	(Governance 3, personal communication, April 4, 2023)
Interviewee G4	(Governance 4, personal communication, April 4, 2023)
Interviewee G5	(Governance 5, personal communication, April 13, 2023)
Interviewee G6	(Governance 6, personal communication, April 14, 2023)
Interviewee C1	(Consultant 1, personal communication, March 23, 2023)
Interviewee C2	(Consultant 2, personal communication, March 30, 2023)
Interviewee C3	(Consultant 3, personal communication, April 5, 2023)
Interviewee C4	(Consultant 4, personal communication, April 12, 2023)
Interviewee C5	(Consultant 5, personal communication, May 3, 2023)
Interviewee U1	(User 1, personal communication, April 18, 2023)
Interviewee U2	(User 2, personal communication, April 20, 2023)

## 4.2 Regime Dimensions

Below are the results pertaining to the Regime Dimensions. They have been reordered compared to the first time they were mentioned in section 2. This was done to be able to make a more coherent story of the build-up of the regime, therefore we start with the most fundamental dimensions and work our way down into the dimensions whose contents follow from these.

### *Regime Membership*

We start with the question of which actors are part of the regime and which are not. It was already known that the Province of Noord-Brabant and Water Board De Dommel were the core parties of Noord-Brabant's governance in drought management. Their responsibilities are codified in the Province Law (1992), the Water Board Law (1991), and the Water Law (2009). Since 01-01-2014, nature policy (and therefore a lot of drought policy) is in the provinces' hands (Witte et al., 2019), solidifying the provinces' place in the regime even more. The provinces formulate their policy and ambitions on regional water management, for quality as well as quantity. These are then filled in by the water boards, who also take the actual measures.

There are a few parties who have close ties to the regime or who represent the collective regime actors. They are the following:

- The Interprovincial Consult (IPO in Dutch), who represent the combined provinces.
- The Union of Water Boards, who represent the combined Water Boards.
- The knowledge institutes such as Deltares, TNO or the Louis Bolk institute, who provide the provinces and water boards with knowledge.
- Nature and landscape organisations like Staatsbosbeheer and Stichting Natuurmonumenten, who aim to conserve and develop the landscape and nature.
- Agricultural organisations like the ZLTO who represent the interest of the agricultural sector.
- The drinking water companies who provide the country with clean and enough water, such as Brabant Water.

In addition to the parties above, the national government as well as that of the EU also have a big influence on the regime, mostly through regulations and subsidies. The Deltaplan for the High Sandy soils (Deltaprogramma Hoge Zandgronden, 2020) and the Water Framework Directive (European Parliament, 2000) for instance, have profound consequences for regional policy because this has to follow the higher-level ones. However, even through this higher level trickle-down of policies, the diversity between all the regime actors is still respected (Interprovinciaal Overleg, 2022). Interviewee C2 and interviewee G5 both said that with the letter to parliament titled 'Water en Bodem Sturend' (Water and Soil leading) (Rijksoverheid, 2022a), there will be a change in the roles between Water Board and Province, with the province having to take more initiative in spatial water and soil issues.

### *Cultural and Symbolic Meanings*

The Cultural and Symbolic Meanings that underpin current practises stem in great part from the regime actors' histories. The history of Dutch water management was explicated by multiple research documents in the data set. Summarising from these (Deltares et al., 2021; Kielen, 2009; van der Brugge et al., 2005; Witte et al., 2019), we find that: The Netherlands have a very rich tradition of managing water. Once upon a time we adapted to the possibilities that were given to us by land and water. We built our houses and villages in high places and we would farm the floodplains when they were not flooded by river- or sea water. From 2500 years ago onward we started building structures that allowed us to settle in previously uninhabitable places and in the two and a half millennia that followed we managed to develop infrastructure (see Infrastructure and Technologies) that would allow us to eventually do whatever we

wanted, where we wanted. This safe, habitable and prosperous country became a guide in adapting land and water to human needs and wishes. By now however, areas within the country have sunk and are still sinking multiple metres, river discharges are more capricious than ever and the sea level is rising. The period after World War 2 saw a massive increase in us moulding the water and soil system to our every need. We canalised, diked and drained as much as we could to sustain the growing population. The issues that Dutch water managers are currently facing are partly down to variables we cannot directly control and partly to the history that we are so proud of.

Even though the regional governments have a shared history and the traditional 'old ways' were mentioned by most of the interviewees, there is a shared understanding between them that there are massive differences between the separate water boards and the separate provinces. Compared to their counterparts across the country, Water Board De Dommel and the Province of Noord-Brabant are considered progressive. It must also be said however, that because of soil conditions, drought hits this area of the country possibly the hardest.

Interviewee C2 made some speculations that summarise the difference between the province and the water board in how they act towards innovations. The province has less of a specific water managing history and is therefore less hindered by tradition, this makes them better able to think of and accept impactful innovations. The water board is more traditional because of its history of technical solutions, making it harder for them to accept radical new ideas. However, they are better connected with local stakeholders and small-scale innovations are easier for them because of their more local nature. The water board places itself more in society and is more of a societal stimulator of innovations. In addition to this, water managers are used to lowering water levels, not to making them rise (Interviewee G6).

The common criticism that regional governments are slow to change was supported by interviewees from both the province and the water board. They also stated that the Dutch form of citizen participation, or 'polderen' as this is now around the world, is also a hindrance (Interviewee G3; Interviewee G6). Even though a lot has already changed the last 5 years within the regional governments (Interviewee G4; Interviewee U2), water is still seen as cheap and abundant by society (Interviewee C4); in that respect we are a victim of our own success (Interviewee U2).

### *Guiding Principles*

The regime's guiding principles entail the interests, behaviour and convictions that form its behaviour. The old guiding principles of draining water quickly to make room and good conditions for agriculture were and are not sustainable. This is something that the public has only been hearing for the last few and dry years, but this notion has been around for almost 4 decades already. This trend break in water management is only now starting to happen and both the Province and the Water Board seem to agree on it, looking at the data. In addition, their principles are in line with the broader ones on the national level. However, they are more attuned to their respective regions. The paragraphs below show the specific principles of the Province of Noord-Brabant and Water Board De Dommel.

The Province has quite a few principles, stemming from their vision on climate adaptation (Provincie Noord Brabant, 2021), their structuurvisie (Provincie Noord Brabant, 2014) and the position paper that all provinces together have published (Interprovinciaal Overleg, 2022). It will cooperate intensively with municipalities and water boards while respecting the diversity between these. In addition, the Province will join the knowledge agenda and development (mostly regional) and wishes to make optimal use of EU resources.

The interview data tells us that the Province puts their principles into practice, the organisation wants to be a forerunner and finds it important to join innovations and support them (Interviewee G1). They are also very aware of the drought issues (Interviewee C4; Interviewee G2,), which may help to activate stakeholders in these areas to initiate and accept innovations more than in areas where problems are less prevalent.

Water Board De Dommel's principles are fewer, but are also more specific and practically oriented. They are going towards a future-proof water system in 2050 and will do this using four specific points (Waterschap De Dommel, 2021): 1) they are an activating government, putting the Water Transition on the agenda and putting on clear limits in their policy, 2) they stimulate others to change, by using laws, subsidies, or other types of assistance, 3) They work with an integral, area-oriented approach, together with the Province and 4) they differentiate their approach per area because every area is different, even within the region of a water board. According to the interviewees De Dommel also keeps to their policies, with a 2030 deadline for the first point mentioned above (more on this in Policy and Regulations), Interviewee G4 states that the Water Transition is very prevalent in the organisation.

Both organisations seem to be headed in the right direction, but criticism does exist: strategically the Water Transition is happening, but practice is lagging behind (Interviewee C4). For instance, when thinking about measures, the governments like the ones that allow farming to remain an option in combination with a more drought-robust water system (Interviewee C2). They propose these innovations without stopping to think if there will really be water available in the future to allow agriculture in such an area (Interviewee C4). In addition, Interviewee C3 states that surprisingly little attention goes to drought in projects. Interviewee C1 talked about how the more technical roles within water boards and provinces, like hydrologists, water safety experts and permit providers, tend to keep to traditional knowledge and standards. This hinders innovation and means that opportunities are missed when it comes to drought-adaptation.

### *Policy and Regulations*

Looking into the policies and regulations that formed the regime as well as the ones that they made themselves, it was found that the responsibilities and decision-making power of both the province as well as the water boards are codified in law, as was already mentioned earlier in this section. It is these three laws (Rijksoverheid, 1991, 1992, 2009) that determine which regime actor does what. Again, the Province formulates their policy and ambitions on regional water management, for quality as well as quantity. These are then filled in by the Water Boards, who also take the actual measures. All three of these laws stem from the national level, but a lot of current water management (mostly from the perspective of water quality) comes from the EU-level, via the Water Framework Directive. These regulations flow through the National Water Program (Rijksoverheid, 2021b) into the Regional Water and Soil Programme (Provincie Noord-Brabant, 2021b) of the province, which is then translated by the water board into measures for the specific areas in their Water Management Programme (Waterschap De Dommel, 2021b). In their programme, Noord-Brabant aims to have the soil- and water systems of their region climate-proof by 2050.

The programme of De Dommel then states they want to have achieved a future-proof water system by 2050, already providing concrete numbers to work towards for 2027. The water boards also make laws for their own area (Waterschap De Dommel, 2015, 2021a), these specify what is and what is not allowed within their region. They have specified for themselves the following four pillars in their (ground) water management:

1. Adequate management of the water supply, to prevent exhaustion and compromise of the groundwater supply.
2. Conservation of groundwater quality, aimed at high-grade use.
3. Coherent management of ground- as well as surface water.
4. Combat negative consequences of changes in groundwater levels, ranging from effects on nature to effects on agriculture and buildings.

Analysing the various policy documents and laws do show that the trend break mentioned under 'Guiding Principles' has seemingly made its way into policy, or is at least starting to (Interviewee G2). Climate adaptivity and water robustness are being worked on integrally by a host of parties in the Deltaprogramme and governments have started to spread drought- and climate awareness among citizens (Rijksoverheid, 2021b). What is interesting to see is that Water Board De Dommel, in its mission of being a forerunner and also having some of the biggest drought issues, plans on facilitating the Water Transition until 2030. After this, they will start turning this support and these subsidies into obligations (Interviewee G2; Interviewee C3). The drinking water company Brabant Water and nature preservation organisation Staatsbosbeheer, as water system users, feel that this restriction is a good thing (Interviewee U1; Interviewee U2). From the agricultural perspective however, this is likely to encounter a lot of resistance.

The interviews also yielded more data on Policies and Regulations, or rather the effect that they have on upscaling drought management innovations. Currently policy is still broadly aligned with the 'old ways' of water management, to get water out of the system as quickly as possible (Interviewee C4). In fact, it is legally a lot easier to drain water from an area than to keep it there: digging a waterway or ditch can normally be done without a lot of restrictions or obligations from the water board. However, if one wants to fill a ditch up with soil and close it, the amount of water surface or volume of water retention lost must always be compensated somewhere else (Interviewee G4). At the same time however, the sense of urgency is starting to present itself enough to become part of new policies. This now leads to two-legged policies in which they want to keep more water in the system and return it to a more natural state, whilst also serving the needs of agriculture (Interviewee C2).

In many cases the water level is still set to the (agricultural) needs of the lowest plot of the area, even though water managers agree among each other that function should follow water levels and not the other way round (Interviewee U1). These needs and interests are one of the reasons why policies are hard to change (Interviewee G3; Interviewee G4). In addition, civil servants are having difficulties in fitting innovations into current laws. This makes it harder for them to give out permits (Interviewee C2; Interviewee U2), but also impedes them from taking action themselves. This leaves them calling for deregulation of certain policy fields (Interviewee G3). On the other hand, consultants were stating that both governments are also searching for what new norms and standards should be in relation to water and drought management (Interviewee C3; Interviewee C4). This is a contradiction at first glance, but it does lead to another, central finding: there is a fundamental need for clearer and more generic (national) policy that supports the regional governments' policy, leaving space for a custom approach where needed (Interviewee C4).

Lastly, light was shed on the availability of instruments and tools and how this relates to the perceived urgency of issues. For water safety for instance, instruments exist to push through certain measures that landowners and users might not agree with, such as a dike reinforcement. Similar tools also exist when it comes to preserving nature falling under the EU-legislation (Interviewee G6). For drought management measures (and therefore innovations) however, this is not the case. Policy and Regulations allow less legislative force in this field to take action and take action swiftly.

## *Knowledge Base*

For this dimension, the body of knowledge within the regime and its expertise were investigated. The knowledge base of the regime consists of decades of experience and research. Technical know-how has been built up over centuries even, since the establishment of the first water board almost 800 years ago. This building of knowledge has been continuing through the 20<sup>th</sup> and 21<sup>st</sup> century, but we have seen a shift over the last 40 years from a technocratic to a much more integral and participatory approach (van der Brugge et al., 2005). This shift followed the 1976 drought, after which research was being commissioned and published on the relation of drought and nature to water management. In addition, the damage that Dutch agriculture had done to nature started becoming clear from 1980 onward (Witte et al., 2019), as well as the real extent of the drying-out of the Dutch soil. The near floods of '93 and '95 as well as the drought of 2003 again showed that the Dutch water system was not ready for the 21<sup>st</sup> century (Ministerie van Verkeer en Waterstaat, 2000). These events sparked another wave of research, as have the last dry years since 2018. It seems however, that only now the regional water managers are starting to feel the urgency of the problem.

Both regime actors feel that the knowledge on dealing with an abundance of water is on a more than decent level and research confirms this (Beleidstafel Droogte, 2019; Kielen, 2009; van der Brugge et al., 2005) and the interviewees also agree with each other that technological knowledge is very strong in this field. The expertise lies mostly with the water board of course, since they are directly responsible for the water system: they know it, the local stakeholders and the measures that can currently be taken. On the other hand, both organisations also acknowledge that for the trend break to happen effectively, more knowledge is needed.

Both parties stress the importance of digitisation and knowledge sharing (Waterschap De Dommel, 2021b; Provincie Noord-Brabant, 2021b), but only De Dommel specifically voices an interest in innovation and experimenting. The interviewees did agree that what needs to be done is already known, the data is there and so is the expertise. They know they need to find out how to do it. The consultant group of interviewees shared that the regional governments do not necessarily see what the needs and wants of the user are when it comes to innovations, the integration with them is sometimes missing (Interviewee C2).

## *Technologies and Infrastructures*

Very much like the knowledge base, the infrastructure and technologies used by Dutch water managers have been developed and built up for over centuries. People have lived on terpen (mounds) for one and a half millennia, the first dyke rings, sea dykes and polders were built in the 1100's and 1200's. The continuous draining of the peat soil (mostly in the west of the country) made the land subside, which meant that after a few centuries the system was no longer sufficient. The windmill provided the solution, water could now actively be pumped out of a polder. This then-new innovation also made it possible to 'reclaim' entire lakes, creating many hectares of usable land. Steam power made even bigger projects possible at the end of the 18<sup>th</sup> century. The Zuiderzeewerken and the Delta Works were two of the biggest water management projects made possible by these new developments (Kielen, 2009).

The short history of Dutch water management infrastructure above is indeed mostly focussed on the coastal area and areas that used to be swamp and heath. It does, however, serve to paint a picture of how water management became such a technocratic regime (van der Brugge et al., 2005). The sandy soils have also seen a lot of reclamation. The flood plains of creeks in Brabant were turned into farmland by canalising and dyking them and the same happened to the high moors by draining them with ditches. The sandy soils have been given the same Dutch treatment as the coast and the peat soils, but it happened

later, from the 1850's onward. As Interviewee G2 put it: "*We actually made the water system in the Dommel here like a racetrack, right?*" (Governance 2, personal communication, March 31, 2023, p.3)

Looking at the data for Technologies and Infrastructures it becomes clear that the regime actors, especially the Water Board, is proud of the infrastructure that has been built up (Waterschap De Dommel, 2021b). This infrastructure is the result of the area's natural dependency on rainwater, since there is no way to get water from the rivers into the Dommel's system (Interviewee G1; Interviewee G2). At the same time, both regime actors do acknowledge that current practises and infrastructure are unsustainable and that the Water Transition will ask for a switch in the mindset of the full organisation, which will take time, learning and cooperation.

De Dommel wants to push for digitalisation of data (collection) and automation of infrastructure, especially in the period from 2022 to 2027. In addition, the Dommel wants to give room to innovations in all ways and on all levels, because they found over the last years that these innovations yield better and smarter solutions. The province of Noord-Brabant also wishes to push for digitalisation and a climate-proof and water robust soil- and water system. To achieve this, they will also make use of the possibilities that innovation and knowledge development will bring (Provincie Noord-Brabant, 2021b). The provinces do not manage the water system themselves and do not possess any hydrological infrastructure. They do however, underscore that current water management infrastructure and our water management system are used to high water levels and discharges, not low ones. Nevertheless, they stress the need for the future-proof water system to be able to handle the peak discharges that extreme rain will bring as a result of climate change (Provincie Noord-Brabant, 2021c).

The push for automation by both water board and province does seem to be lacking in one field: monitoring. The Water Board does plan to set up a measuring system, which may be able to nullify a criticism that was found during the research: monitoring is not the regime's strong suit. Previous monitoring networks failed because of either budgetary reasons or because of a lack of data uniformity, existing mostly just for show (Witte et al., 2019; Interviewee U1).

### *Resources and Distribution*

For this dimension, the documents provided relatively little data and of different levels of specificity. Below we find the results that were gathered on the resources available to the regime actors and how those are distributed. To start with the province, they state that making Noord-Brabant climate proof will be expensive, but that doing nothing would be much worse (not specifying how much worse) (Provincie Noord-Brabant, 2021c). They do have an estimation for the costs and national money will also be allocated through the various Deltaplans; EU money will also be used (Interprovinciaal Overleg, 2022). The total cost will therefore be a lot higher than what the province invests itself. However, if budgets turn out to be insufficient, they state that they will lower their ambition. This seems like a contradiction: First they want to make Brabant climate proof, which will cost a large sum of money, then if they cannot manage to bring together the money, they will lower their ambition.

The Water Board is a lot less specific and does not give any numbers. They do state that they will share knowledge, advice and data, which was seen as one of the Water Board's responsibilities (Interviewee C2; Interviewee U2). De Dommel says that they will also help the water system's users with investments and that they will make maximum use of national, provincial and EU budgets and subsidies. In the analysed documents we only really found 2 criticisms with regards to Resources and Distribution, both of them were addressed to the national level in fact, not to the regional governments. Brockhoff et al. (2022) say that the budget for drought management is small compared to water safety, something that could be explained by our culture of fighting water and wanting to see it drained as soon as possible. Witte et al.

(2019) compare the national drought policy to the very controversial nitrogen policy: the national government leaves responsibility to the province (and in this case through them also to the water board) without providing them with the corresponding means.

The interviewees had quite a lot to say about the Resources and Distribution. For the Water Board, they tended to agree and add to each other. They said that it spends time, effort, manpower, budget and accommodating legislation. Additionally, good internal ideas are always stimulated at De Dommel (Interviewee G2) and external innovations can also be subsidised according to Interviewee G4. Interviewee G5 said that water board employees tend to be thorough and like to spend a lot of time on issues and questions. This reinforces the observation that capacity is a problem at the water board and that this lack of manpower inhibits innovation (Interviewee G4).

As for the province, they like to chip in for research (Interviewee U1) and they also like to give out subsidies for good ideas (Interviewee G1). It was also stated that they can acquire a budget from many EU, national and regional funds and that they have enough money and capacity to work with drought management innovations. However, Interviewee C2 and Interviewee C5 said that provinces generally have too little capacity for this. Interviewee C3 feels that forerunners in innovation may run into a lack of means or possibilities to influence others. It is for this reason that Interviewee C4 would like to see these forerunners be given more space and means.

### *Agency and Power Relations*

This dimension constitutes the action-taking and decision-making ability of the regime actors and the power relations between each other and the actors outside of the regime. This dimension follows partly from dimensions worked out earlier: Policy and Regulations, Guiding Principles and Resources and Distribution play an important role in what the regime actors are allowed to do, what they are able to do and what they want to do. From Policy and Regulations, we find that the provinces and water boards each have tasks that they are legally responsible for. The province translates EU and national goals and ambitions into regional policy, including their own regional issues and ambitions into it. The water boards are the ones who then actually execute this policy. From Guiding Principles, we find that both parties have translated these legal responsibilities into roles that they should and want to assume, already quite a bit broader than only what laws dictate them to do. In addition, we have seen how their principles have been changing the last few years, indicating that they also take their responsibility towards the future very seriously. Finally, from Resources and Distribution we find that manpower, money and knowledge are being allocated to innovations, but that the manpower capacity can be a limiting factor.

The results for Agency and Power can be brought under one of three broader topics: politics, individuals and responsibilities. With relation to the first one, interviewees found that the politics of both Water Board and Province slow down processes within and from the organisation. There is the 4-year cycle with new boards and parties in power every 4 years (Interviewee U2), the citizens and interests that they have to answer to and of course the endless nature versus agriculture debate that exists in politics (Interviewee G6). Overall, politicians do not like to make decisions that hurt interests in any way (Interviewee G3; Interviewee C4), which makes De Dommel's plan of starting to prohibit certain practises after 2030 very interesting and even daring. According to Interviewee G4, the sense of urgency within the water board was so prevalent that many politicians did indeed vote for the plan, even though farmers were not happy about it. Interviewee C4 supposed that national backing might help regional politicians to make more of these painful decisions, by providing them with higher-level policies and regulations.

For the topic of individuals: interviewees from all three groups pointed out that the agency and initiative to go and work with drought management innovations lie with the individual themselves. If a government

does not take its responsibility, starts pointing fingers or trivialises their role in drought management (Interviewee U1) this can many times be down to more conservative individuals, worried about budgets and politics. The interpretation of the legal tasks of these organisations can be done very narrowly or very freely (Interviewee U2; Interviewee C3) by corresponding individuals. Organisations need to give space to the more progressive individuals to fill in the practice of their interpretation (Interviewee C4). The Province of Noord-Brabant does do this by providing freedom, money and manpower (Interviewee G1). For Water Board De Dommel it was not specifically mentioned, but looking at the earlier findings about stimulating innovation internally and their progressive policy and reputation this is assumed to be the case.

Responsibility mostly relates to what task lies with what organisation and who takes the lead in a process, based on what. When it comes to drought management the water board has a big role to play as the system manager (Interviewee C2), it needs to bring the policies of province, national government and the EU together with the practical situation in their area (Interviewee G3). When it comes to spatial planning the Water Board does try to get its input into spatial processes, yet actual jurisdiction remains with the other governments (Interviewee G3). The cooperation is getting tighter however (Interviewee G5).

### *User Relation and Markets*

With regards to User Relation and Markets we find that cooperation with users seems to lie much more with the water board than the province. This is to be expected: the water boards were set up as cooperations to protect and serve communities, so in that sense it is in their culture and DNA to do so (Interviewee C4). When it comes to innovation the water board tends to be more technologically oriented as we have seen, for micro-scale innovations they cooperate a lot with (often local) companies. In addition, they also look a lot towards the agricultural world for innovations and solutions (Interviewee G6), they are quite used to the public/private cooperation (Interviewee G4).

As for the province, the interviews made clear that users and their representative organisations are involved in and part of the process of setting up subsidy regulations (Interviewee G1). The province also looks for users that are willing to participate in pilots. These users are usually forerunner or can be considered to be (Interviewee U1). On the other hand, they are still entrepreneurs, so they will generally participate because something is interesting to their business case (Interviewee C4).

Unfortunately, these participants are not always sufficiently taken along in a pilot or innovation, the information that they receive does not always correspond with their expectations, wishes and needs (Interviewee C2). According to the same interviewee, both governments tend to talk more about the users (i.e. farmers) than talk to them. When it comes to the holistic balancing of interest, think of economic, spatial and societal ones, the province tends to be more adept at this than the water board (Interviewee C2). The province has a broader set of tasks and focusses on a higher policy level, whereas the water board has a smaller and more specific set of tasks and a more technical focus.

Another thing that was pointed out was the lack of perspective provided by governments. Not just for drought management, but also for the various other crises and transitions facing The Netherlands now. Considering this, De Dommel is doing the right thing, providing users with the perspective that some things will not be possible anymore after 2030 (Interviewee C4). Interviewee G4 elaborated that providing perspective helps acceptance of measures, even if they are painful. This is in line with Interviewee U1 and Interviewee U2's wish of begin given perspective on the future as well as on how the burden will be spread. Part of this perspective should be to stop the upholding of the illusion that current practises will still be sustainable in the future through participation (Interviewee C4).

The acceptance of drought management measures is something that cannot be enforced (Interviewee G5; Interviewee G6). The tools necessary for this task are not present at the moment, even though the sense of urgency is present for all actors. The users also know what needs to be done, but citizen participation in the sense of people appealing to the taking of measures is slowing the drought adaptation process considerably. Dealing with this consumes a lot of the regional governments' resources. On the other hand, if the governments want to stimulate and help users and market parties with their ideas there is a lot of regulation that makes it hard to take quick and decisive action (Interviewee G3). This regulation relates to contracting, anti-corruption, budget processes and such. It is good that this regulation exists, but it does become a liability if civil servants want to take decisive action.

Interviewee U1's contribution provides a very simple but striking summary of the upscaling of innovations and how they relate this to a system's users: it is more of a socio-economic challenge than a technological-innovative one. How does one get users to accept innovations? Of course, this is part of the very essence of upscaling, Interviewee C2 and Interviewee C4 acknowledge. This was not mentioned by the governance group however, that conscience may not yet have landed as much with those parties.

### *Visions and Expectations*

Both the Province's as well as the Water Board's documents provide a clear set of visions and expectations. From the perspective of soil and water, the vision for the province of Noord-Brabant is to be climate-proof and water robust in 2050 (Interprovinciaal Overleg, 2022). From an organisational point of view this means that they want to make the switch from a problem-oriented approach to a system-oriented approach, also referred to as the trend break (Provinciaal Noord-Brabant, 2021b). In their Regional Water and Soil Programme (2021b), they provide a set of conducts which they will use to achieve this vision:

1. Water storage in balance, both shallow and deep groundwater need to be at sufficient levels. No more can be pumped up from these than is being replenished, to provide for all the societal and ecological needs.
2. Every drop counts, rainwater will be drained as little as possible. Instead, it will be kept in the soil as much as possible to infiltrate into the groundwater.
3. Not everything is possible everywhere, function needs to follow from local water- and soil system possibilities, not the other way round.
4. Noord-Brabant is capable of handling extreme weather situations like extreme showers, high water or droughts. The future soil- and water system will provide 'space' to prevent damage and nuisance.

Furthermore, the Province states that they want to make use of the possibilities in innovations and knowledge development and that they want to connect with society (Provincie Noord-Brabant, 2021b). The spatial vision of the province is one of a more robust and high-quality water- and nature system, in which water storage and drought prevention are integrated and all parties are working together optimally in their role (Provincie Noord Brabant, 2014). For the sandy soils this vision will be focused on the stream valley landscape, almost a trademark of the Dutch sandy soils.

In the position paper (Interprovinciaal Overleg, 2022), they also have expectations from the national government, the water boards and society in general. From the national level they ask for a broad approach to climate adaptation, final responsibility on vital and vulnerable functions and adequate national resources that are flexible and useful for custom regional applications. They also ask Den Haag to work towards a common climate adaptive agricultural policy, to keep stimulating knowledge spreading and development and finally to secure climate adaptation policy. From the water boards the provinces ask

to be a partner in the working regions, to actively use information and knowledge, to use the financial resources together, secure climate adaptation policy, participate actively and take the lead in area processes and to keep playing a 'pulling' role in (water) innovations. The provinces ask society to involve themselves, take their own responsibility in climate adaptation, to be creative and innovative, to act climate adaptive in investing and finally to keep the provinces on edge and scrutinise them.

Water Board De Dommel has essentially the same vision for their area and they call it the Water Transition: a future-proof and robust water system in 2050 or earlier. They stress the same focus on integral area-oriented approaches, innovation and knowledge development and of course the trend break and the Water Transition. Just as with the other dimensions, the Water Board's more practical and technical expertise does enable it to be more specific, if even slightly. For 2027, they formulated the following expectations (Waterschap De Dommel, 2021b):

1. The trend break in drying-out is demonstrable, measures have been taken to conserve water in all ways.
2. Groundwater is in better balance and levels are showing a positive trend, the ambition is to have the average spring levels rise with 10cm compared to 2002 (stemming from the Water Framework Directive), but on higher soils this might rise to multiple decimetres.
3. Using smart and innovative techniques, De Dommel will be better able to steer and make adjustments in the water system. Data will be in order and accessible for users and partners.

The question of whether or not the Province's and Water Board's visions are sufficiently ambitious was met with various answers. Some thought that they were, some thought that they were not complete yet, others thought that the vision was good, but the process was going too slow and there were also those who felt that the regional visions were good, but that national policy was still lacking. Politics and the progressivity of the interviewees could account for these different feelings towards the drought management visions. Nevertheless, one picture again takes shape here: Brabant is comparatively progressive.

### 4.3 Steering & Acceleration Mechanisms

In this paragraph the results for the use of the mechanisms by the regime are presented. In this paragraph a certain order is not necessary and therefore not present.

#### *Collective Problem Structuring*

Cooperating, convening, collective problem structuring and many other concepts related to working together are prevalent in the data: the Dutch like to collaborate. It is being confirmed by Provincial documents (Provincie Noord-Brabant, 2021b, 2021c; Interprovinciaal Overleg, 2022), the Water Board's water management programme (Waterschap De Dommel, 2021b), national documents (Rijksoverheid, 2021b; STOWA, 2018), independent advice (Beleidsstafel Droogte, 2019) and in all the interview transcriptions. All these sources state in one way or another that the province and the water board have, want to and will work together with each other, other governments, users, companies and societal partners. Tangible examples of this are the groundwater covenant (Provincie Noord-Brabant, 2021a), the various Delta Programmes (Rijksoverheid, 2021a) and the KLIMAP-project that has been touched upon before in this thesis. When it comes to interests, stakes and negotiating between them we can even use a designated and internationally known term: 'Polderen'.

Polderen does also come with challenges of course, slowing down process because all stakeholders want to have their say, especially the ones with complaints rather than the ones that are enthusiastic (Interviewee G3). Overall, the interviewees did agree that both governments want to work together with the stakeholders to solve problems. Sometimes it is unclear however, who should lead the stakeholder process and on which basis this would be decided (Interviewee C3) and governments can be nervous to talk to stakeholders that have especially big interests and influence (Interviewee C2).

A few points were found that make successful collective problem structuring harder. For instance, drought and drying out are relatively intangible and invisible problems (Brockhoff et al., 2022). Yes, trees and plants will turn brown and lose their leaves, but most people will only really start to feel drought when rivers fall dry or when water does not come from their taps anymore. Then, if not all parties agree on something, there is not really a way or instrument to come to some kind of consensus (Interviewee G6). In a democratic process everybody wants to have their say and this leads to quarrels, not just with non-government stakeholders but also amongst governments themselves (Interviewee G1).

Additionally, when people contact the province with a drought management innovation, it can be hard for them to connect with the right people (Interviewee C2). There is at this moment not really a specific point or person that you can contact for these types of innovations. The Water Board does have this contact, which is the 'Innovator Watertransitie' (Waterschap De Dommel, 2023). Lastly, when it comes to pilots the users are not always adequately involved and more talked about than talked with (Interviewee C2). In extension it is important that people are more broadly involved in a pilot before it ends. So that a wider pool of people is looking at it than just the progressives, this can save innovations from still failing after completing a successful pilot because of encountering unexpected resistance (Interviewee C4).

### *Learning by Doing, Doing by Learning and Social Learning*

The data shows that the province and the water board learn via many ways, as many as possible it seems. They commission research at knowledge institutes, they do their own and also commission advisory reports with other independent parties. They send their employees to courses and workshops, they set up pilots and experiments and they share their knowledge and experiences with each other and the outside world through articles, conventions and the projects that they do. When the first dry year hit in 2018 a report was commissioned by the ministry of infrastructure (Beleidstafel Droogte, 2019) that would give advice on how to handle drought better, so learning was immediately initiated after the (first) shock event.

Both Province and Water Board have also included knowledge and learning into their water management plans (Waterschap De Dommel, 2021b; Provincie Noord-Brabant, 2021b). The Province mentions learning by doing, doing by learning and social learning, the Water Board say that they are "*a learning organisation*" (Waterschap De Dommel, 2021b, p.13) and that the Water Transition needs learning by doing, doing by learning and social learning in order to succeed. Furthermore, they wish to do more with data science and -engineering and they will actively look for new solutions and provide room for innovations.

From the Water Board's perspective Interviewee G4 felt that the policy department was leaning more towards the research into innovations, whereas the maintenance department had more of a trial-based approach. A water board is more of a practical organisation than a province, so for the province a comparable internal difference was not found. According to Interviewee G6 however, the province also does some trial and error. Interviewee U1 however, felt that in current times things are not allowed to fail. This contrasts with the other interviewees' feelings and also with what Province and Water Board say

in their vacancies, where they specifically state that you are allowed to make mistakes and learn from those.

When it comes to learning with regards to pilots there was one very important finding: governments are not properly learning how to actually upscale an innovation (Interviewee C2). While they learn all about the technical workings during the pilot, the economic, societal and practical effects are not fully known after having done a full-scale experiment on only one plot of land.

### *Keeping Options Open, encouraging a Wide Diversity of Innovations*

The Province of Noord-Brabant state that they will look for and consider a broad palette of measures with more diverse effects, this means that they will go beyond just technical measures and also investigate social, economic and policy measures (Provincie Noord-Brabant, 2021b, 2021c). This is beyond what the joint provinces agreed upon in their position paper, which discussed only water and space related measures (Interprovinciaal Overleg, 2022). In addition, Noord-Brabant wants to develop more instruments, also with broader effects. This caters to what Interviewee G5 and Interviewee G6 have stated: the lack of instruments that civil servants have when trying to tackle drought issues.

The Water Board makes quite a big point of looking for new solutions and answers in their water management programme (2021b), mentioning it in 3 separate parts of the document. They also stress that only technical measures will not suffice and that they have already booked results the last few years in finding new measures, they even provide a list of these. They made new innovative techniques a specific goal for 2027 and say that they will keep an eye on new developments at all levels. This means everything from the local farmer with a good idea to international research results. When it comes to regulations however, De Dommel say that they will limit themselves to only water-related ones. They purposefully exclude regulations on land-use. On the one hand this can be considered doing their designated duty, but it is per definition not compatible with Keeping Options Open and Encouraging a Wide Diversity of Innovations.

The interview data paints an ambivalent picture. The interviewees do overall agree that there is variation in the innovations that are being considered, but that the governments are not always keeping an open mind, even if Brabant wants to be a forerunner (Interviewee G1). Interviewee C4 would like to see more out-of-the-box thinking as they feel that current pilots still connect to what occupies people now and not necessarily what will be necessary in the future. Interviewee C2 feels that there are very few economical innovations being considered and that the measure's effectiveness tends to lose at the hands of the financial aspect, even though the effect of the measure is what should primarily be the goal. This is understandable however, as transformative thinking is not easy (Interviewee C2).

Interviewee G4 shared that the Water Board does like to work with the same partners and Interviewee C5 pointed out that people in general like to focus on technological solutions or products, even if the real impact is better made through changing one's behaviour. Lastly, Interviewee G2 and Interviewee C3 agreed on the personal facet of keeping an open mind. Some people really keep holding on to their 'hobby horse', whereas others like to go and find new solutions and innovations and are always open to developments.

### *Courage, Leadership and Persistence*

It is known that the Water Transition, along with making Noord-Brabant climate proof, is not going to be quick, nor is it going to be easy to change a practice that has been embedding in Dutch water management since World War 2 (Witte et al., 2019). Two things seemed to be specifically important for this mechanism when it comes to upscaling drought management innovations: individuals and leaders. Data from all interview groups showed that the level of the individual is leading in innovations and

upscaling. It is about the individuals that are fighting for innovation from within their organisation (Interviewee C5), about the contact one has at the water board or province (Interviewee G1), about the individuals with broader visions and longer-term perspectives (Interviewee C4). It is not just the individual that needs to act however, their leaders and politicians must also act (Interviewee C5). The leaders and managers must be willing to trust an individual and give them room, this also takes courage (Interviewee C4). The question is then if these innovative and progressive individuals are present in the organisation or the Water Board and the Province, and if their managers do indeed give them sufficient room.

For the individuals the answer is short: yes. A few of the interviewees were among them in fact. Interviewee C1 actually provided the contact of Interviewee G5 as an example of one of these forerunner individuals. In addition, Interviewee G4 mentioned that a set of similar progressive individuals had formed themselves into a small-scale progressive group within Water Board De Dommel, that wanted to take on the challenge that drought poses integrally. Both Interviewee G4 and Interviewee G3 are part of this group. Interviewee G6 put forth that they (the regional governments) should have the courage to just try things and to make sure that damages are repaired or compensated if they occur. They added that this seems logical to the civil servants, but that it is difficult for the politicians to accept this possible hurt. This again points to the political nature of the regional governments and how it could hinder innovations and upscaling.

Interviewee G1, who has successfully worked with innovations, said that interest and drive is important. That you will encounter a lot of resistance, also within your organisation, but that you must persist to make change happen. Interviewee G5 underlines that lots of courage and persistence are needed to get to a climate-robust soil and water system, but that we are getting more and more of it. Concerning the leaders, little hard data was found on progressive managers being present. Interviewee G1 did state that they used to have a manager that was not keen on risks and innovations, which made working with them very hard. For the last few years however, their manager has been one that sees the urgency and importance. Which has made a big change in how much room was given to Interviewee G1.

Interviewee C1 confirmed a finding that we have seen earlier: Sand-based governments tend to be more progressive in drought management than those that are on clay and peat soils. Interviewee C2 felt that water boards were overall more courageous than provinces, possibly because they are less political and more practical. We also see this difference reflected between the Province of Noord-Brabant and Water Board De Dommel. The Water Board is already giving a hard deadline for 2030 to stop allowing certain practises, whereas the Province does not provide such a deadline. From the perspective of a regional government this can be considered a very brave move, because a sense of urgency and the need for change in a rigid system now supersedes the politics of it all.

In addition, it was found that if the Province's funds for making Noord-Brabant climate proof were not sufficient, they would lower their ambition and do less. This does indicate a difference in the level of courage between water board and province. Furthermore, Interviewee C2 feels that area quartermasters and policy makers are seeing and doing the right things, but that people like hydrologists do not dare to speculate and try innovations. Just like Interviewee C1 and Interviewee G6 felt: they keep to old standards that are based on mean meteorological conditions from the 80's that no longer exist. Interesting to mention then is that Interviewee G6 is a hydrologist, again showing that this is an overall picture and that individual interest and courage are paramount.

Interviewee G3 stated that there are colleagues within De Dommel without courage; that are always asking critical questions. The organisation as a whole however, feels that it has been too nice. They want to be more strict, but they will need courage to be clearer and invest towards the future. With regards to asking critical questions, Interviewee U2 provided insight as to where those may come from. There are many people within the regional governments with lots of experience and years of service. They can choose to use all of this experience to support innovation, but if they chose to do the opposite they can form serious blockades on the road to a climate-proof soil and water system.

So at the moment, courage, leadership and persistence are improving. Interviewee U1 explained how courage is not just in trying new ideas and taking risks, but also in changing from endlessly stimulating sustainable practises to simply prohibiting unsustainable practises. This is in line with De Dommel's 2030 plan. Interviewee U2 added that courage and leadership can come from the interpretation of one's task too and that civil servant on all levels do have some freedom in this interpretation. We should of course not forget to include here that the manager's role in this is again decisive. Lastly, speaking of the manager's role, Witte et al. (2019) are condemning of the national government and say that national leadership on drought management is lacking. A sentiment that is shared among the Governance group of interviewees. In fact, national drought management goals have been lowered in the past (Witte et al., 2019), underlining the insufficient amount of responsibility that Den Haag is taking in this issue.

### *Deepening, Broadening and Scaling Up*

Both the Province of Noord-Brabant and Water Board De Dommel mention the process of Deepening, Broadening and Scaling Up with varying levels of explicitness in their respective water management programmes. The Province mentions it quite extensively, but without any specifics. They speak of shaping new policy, stimulating different types of innovations, researching what to do differently, cooperating with different types of partners and connecting at different levels (Provincie Noord-Brabant, 2021b). The Water Board has a narrower view on the process and wants to keep their progressive trend going up. They want to give room to innovations, will actively search for answers and will keep an eye on developments on all levels (Waterschap De Dommel, 2021b). Again we see that the Province's view is broader and less specific than that of the Water Board, but it is the case for both here that they are not being fully specific about what they will actually do when it comes to Deepening, Broadening and Scaling Up.

There turned out to be a surprising amount of Deepening, Broadening and Scaling Up happening within the Water Board's maintenance department. In times of drought they have used ad hoc measures, which have sparked innovative ideas. These are now being experimented with and tested in practice (Interviewee G4). Point is however, that these are indeed ad-hoc measures, based on the same technical principles that have always been used. For other types of innovations it was said that water boards offer a lot of room to experiment (Interviewee C2). They rarely do anything alone however and find that it is easier to do pilots and experiments with smaller bureaus, as it leaves them more flexible in the researching of the effects.

The Province has gotten less restrictive in their ways of testing drought management innovations, Interviewee G6 explained. Do note here however, that this increase in freedom within both organisations only really goes for pilots and experiments. For upscaling these measures and actually putting them to broader use, the earlier criticisms on hydrological conservativeness still seem to be in place.

Quite a few interviewees said that applying an innovation does not happen without any testing (Interviewee C3), because it needs to be known what the effects are (Interviewee G1) and if it even works as intended (Interviewee G5), examples of this thoroughness were given (Interviewee G3). On the other hand, it is also true that innovation is an iterative process (Interviewee G1) in which application of the innovation leads to more data and findings, which leads to developments within the innovation (Interviewee G4). For this reason, there cannot only be testing, but there must also be experimenting and application. One reason is that circumstances differ everywhere (Interviewee G3) and might not be similar to that in the test site. Extensive testing (maybe even too much) is part of the Dutch risk-averse administrative culture (Interviewee C2). But it does beg the question: when has there been enough testing? Because the urgency to act is very high (Interviewee G3).

Interviewee U2 found that the internal resistance in an organisation forms a problem and thus connects to the theory behind this thesis: an innovation needs to be protected when it is still in the earliest stage of existence, it cannot be subjected to full pressure and public scrutiny right away. Interviewee U1 found that it is generally harder to set up a pilot if it is not connected to a physical project. However, this does not match with what we have seen before on how much room the Province of Noord-Brabant and Water Board De Dommel give to set up pilots.

Interviewee C4 provided the central criticism that exists when it comes to upscaling drought management innovations: strategic thinking about upscaling is missing. At the moment both organisations are only applying innovations. This implementation of measures does happen thoughtfully, but upscalability of an innovation remains a blind spot. In addition to this, the testing of innovations is really always on their technical functioning, with no attention to other facets like how to legally imbed it, how to make it economically feasible or how to get society to accept and implement it too.

## 5. Discussion

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In this section the results are interpreted and connected to each other, in preparation of the synthesis of the conclusion. Throughout the results section, there have been concepts, themes and points of attention that shed light on the influence that the regime has on upscaling drought management innovations. These require some discussion, to see how these insights add to the results from the last section. They have been ordered into five paragraphs: the first pertains to the roles and responsibilities that both regime actors have, the second considers the organisations' political and administrative cultures and practises, the third is about cooperation and the involvement of citizens and stakeholders, the fourth considers current laws and policies and the need for support on the different levels, the last one elaborates on what has been found on upscaling.

### *Roles & Responsibilities*

We have seen that the Water Board and the Province have different roles and responsibilities. These are in part determined by law, but also by perception. The laws supply the framework, how an organisation then chooses to use and interpret this framework is up to them, as long as they comply with its legal implications. This interpretation can in turn have a massive effect on how the organisation deals with innovation. The organisation can decide to only do what is necessary to fulfil their task, or it can take initiative and be progressive. The same goes very much for the individuals that make up the regime actors. There are conservative individuals who like to do things as they have done them for decades and there are expeditious individuals who also see the problems of tomorrow and try to tackle them before they manage to become an insurmountable issue.

If an organisation does choose to take a progressive route, the type of leadership also becomes crucial: room and trust must be given by managers and politicians to facilitate an innovative work environment. With the Noord-Brabant's and De Dommel's intentions and image of being progressive, they will need to interpret their responsibility as such and give room to their progressive individuals. This does happen, as we have seen, but it is not at an optimal level yet. Still there are employees that do not wish to deviate from their old, traditional task description, who are reluctant to change and who still keep to norms and standards that were set on the basis of meteorological conditions that do not exist anymore.

Another example of responsibility is for who the water system is being managed. Is it to provide the agricultural world with an optimal working environment and production possibilities? Is it to keep houses safe from water damage? Or is it to make sure that the little bits of nature that are present in The Netherlands survive? Whichever the regime actors choose, the current way of water and drought management is not sustainable for any of the perceived responsibilities listed above. In fact, given the changes that we have made to the water system and the global and local climate, it is not sustainable; full stop. Therefore, the Water Board and the Province should take the responsibility to actually start prohibiting unsustainable practises, instead of endlessly subsidising more sustainable ones. In this spirit, both organisations should look at their tasks in a broader and more holistic way.

De Dommel purposefully limits itself to water-related regulations, but they have the power to regulate broader than that and so does the Province. To give an example: both organisations possess land, a part of which is agricultural and they lease out these plots to farmers to grow crops on. Through these leasing contracts restrictions could be imposed to only grow crops that do not use a lot of water and are therefore more attuned to the mostly rain-fed water system of Noord-Brabant. Again, this is just an example, but it is something that could and should be considered if the regional governments want to have a future-proof soil- and water system by 2050.

Developments of the past year do mean that responsibilities and roles of province and water board will change. The parliament letter 'Water en Bodem Sturend' (Rijksoverheid, 2022a) has called for more initiative from the provinces and for more spatial considerations in water and drought management. The extent to which the new principles from this letter will be put into practice is not yet known and the letter's contents have also received criticism. However, it is at least a start and also sends a message of change to all Dutch water managers. The parliament letter is an instance of much needed support from the national level. Unfortunately however, such instances are still too few and far between. The amount of national support is too little, as perceived by the interviewees, by previous research and by the one currently being read. The regional governments have been imposed more responsibilities, but have not been given the corresponding means and support from Den Haag. This severely limits their capacity to take decisive action, to act on the progressive interpretation of their responsibilities and to fulfil their role.

### *Cultures & Practises*

Cultures and practises are cornerstones of a regime. Both stem (mostly) from history and gradual development and they tend to be static and hard to change. This is also very much the case for Dutch water management. The current unsustainable practises in water management stem from our long history of altering the system to our wants and needs. This same history is also the cause of the diversity that exists between the separate water boards and provinces. Even with the new insights that have been introduced over the last years (though they were already known for over four decades), the regional governments still tend to stick to those old practises. This is also the case when working with innovations, however ironic this might seem. In pilot projects we keep seeing innovations that try to keep agriculture as it is now, possible in the future. This is without considering the availability of the amount water that the innovation uses, but also gives farmers and the other stakeholders involved the illusion that current practises will still be possible in the future. This leads us to another obstructing practise of Dutch governments: failing to provide perspective. Even though many times this lies with the national government, the regional governments can also have problems with providing citizens a coherent vision for the future and then following through.

De Dommel however, has provided such a perspective in the form of the 2030 plan. This move can be considered brave and atypical from the perspective of regional governance in The Netherlands, as it forces the Water Board to also move away from their own practises. This is something that could prove to be hard and scary for those that are part of the signature Dutch risk-averse administrative culture. Even though we have seen that De Dommel as well as Noord-Brabant want to join innovations and innovate themselves; this culture also makes it harder for these forerunner organisations to take decisive action.

A big part of the Dutch risk-averse culture is formed by the political side of both regional governments. Politicians are very resistant to damaging interests, especially their voters'. In addition, the 4-year cycle leaves them with only a limited amount of time to achieve their goals, before they have to be re-elected with these same voters' support. Lastly, doubt can arise as to how ambitious the regional governments' plans and intentions really are. Overall the organisations' own words radiate ambition, action and transition. Yet, we have found evidence in those words that this might not always be the case. The interviews have also pointed towards a more modest expectation of future water board and province actions and policies. The deadlines and goals set are ambitious, the rendition will be up to the political and administrative apparatus.

## *Cooperation & Involvement*

'Polderen' or the 'polder model', is something that is closely intertwined with Dutch governance. In fact, this form of cooperation and involvement is commonplace for all levels of Dutch administrations. The conception of the water boards, the first ones now seven and a half centuries ago, was even based on cooperation. This also makes them more adept at cooperation than the provinces, although this is mostly with the local stakeholders. However, this in some cases almost unbound opportunity for citizens to voice their opinions (read: complaints), obstructs decisive government action in many cases. It slows down processes, takes up a large part of the manpower capacity and frustrates civil servants. It is unfortunate that most of the citizen involvement happens in a negative way, through complaints, obstructions and appeals.

The positive side of citizen involvement is a lot less prevalent, even though it is incredibly valuable and necessary to successfully upscale innovations. The support, enthusiasm and expertise that separate stakeholders and future users may have for an innovation could be just what it needs to break through into the regime. Regrettably, the process of involving stakeholders with innovations is not always as smooth and effective as it needs to be. Their needs and interests are not always fully understood or even known to the regional governments. This leads to them not getting what they want out of an innovation or the innovation itself not being optimally explored.

Additionally, the stakeholders tend to be more talked about than talked to, leading to a lack of mutual understanding and mistrust. A cause of this is the fear or unease that exists with civil servants to talk to certain stakeholders that have sizeable interests. In conclusion, the stakeholder process is one of the most important parts of any project, they need to be adequately involved talked to and respected. There might however, need to be some kind of maximum to their influence or possibility to appeal. This would make decisive action by the regional governments much more effective. One approach or action that can be taken to smoothen out the stakeholder process is to provide them with perspective. If people now what the course of the government(s) will be, if they know why and if they know how it will affect them and what the government(s) will do to help them, a much more level field of conversation is created in which mutual understanding is reached much more easily.

## *Laws & Policies*

At this point in time, laws and policies for Dutch water management are forming an obstruction to upscaling innovations in drought management. That is not to say that regulations were intentionally made to do so, but current laws and policies are still very much aligned with traditional practises. Trying to fit in new insights on water management and drought adaptation leads to two-legged and sub-optimal policies. This in turn, makes it hard for innovations to fit in with regulations and to therefore receive permits and legislative support. This can, as an example, be shown by how easy it is to dig a ditch and create more surface water, versus how hard it is to fill up such a ditch. The first has a draining effect on ground water levels, but can happen without any form of compensation. The latter requires compensation of the lost amount of surface or volume of water and generally includes an extra percentage for climate purposes (i.e. more extreme rainfall, for which the traditional approach of more draining is not a sustainable solution).

The instance above is just one of many that exist to illustrate how current regulations can inhibit taking decisive action. Another one is the lack of clear and generic policy from the national level, to support the actions that the regional governments have to take. We have seen how regional policy follows national and EU policy, but this is only in a broad way. The regional governments have to adapt those higher-level policies to their own administrative regions and implement it there. Their own instruments however, are considered to be too weak and unsupported. In addition, they experience a lack of support from Den

Haag. The national government handed them all these responsibilities, but no means with which to take them. Moreover, the course of the national government also remains unclear, suffering from the same political predicaments of the 4-year cycle and voters' interests to guard. Certainly in light of the many crises that plague the national government in these times, providing perspective and supporting policy should be a main goal of the coming administration(s).

### *Upscaling*

The last concept to discuss is upscaling itself. Throughout this research we have tried to investigate and gather insights on the many different facets of upscaling, the actions that can be taken to upscale and the characteristics of the regime that the innovations need to be upscaled into. What we have found is that upscaling is not a clear-cut subject, nor is it easily understood. This accounts for the difficulties that are encountered in upscaling innovations. Upscaling processes seem to consist mostly of experimentation, or from a TM point of view: Deepening, Broadening and Scaling up. This means that overall, little attention is given to what comes after experimentation.

Deepening, Broadening and Scaling up has been mentioned extensively by many sources throughout the research. Experimentation with innovations happens. What is missing is a holistic view on learning and upscaling. The effects, implications and viability from the societal, financial, legal, et cetera, perspectives need to be known, not just the technical workings. This focus on the technical side of an innovation, the numbers and tangible effects on local hydraulic conditions, is inherited from the technical approach that was taken by traditional water management.

We know now however, that technical solutions will not provide us with a climate-proof soil and water system by 2050. Certainly not if we want to keep hanging on to our current unsustainable practises. Water managers will need to explore and implement a wide variety and holistic body of measures to achieve this goal. This will require more, but most importantly, different research and experimentation than is being done now. It will ask for a change of mindset in the organisations and a switch in how they view their responsibilities and powers. Individuals exist within the regional governments that are willing and able to. However, will the capacity of the Water Board and the Province suffice? At least for the Province of Noord-Brabant it seems that they can and want to free up capacity for this. For Water Board De Dommel it seems that freeing up capacity will be harder, but the will is also very much present.

## 6. Conclusion

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We now reach the conclusion. Firstly, we will answer sub-question one and two, stating what the dimensions are that form the regime and the mechanisms that the regime uses. Since these have already been explored in-depth in section 4, we will only summarise them here. Following this, the main question is answered, finding out how the regime supports or obstructs successful upscaling.

### 6.1 Sub-question 1

Sub-question one was posed as follows: *What are the dimensions that form the regime of Noord-Brabant's governance of drought management?* Below we give a short summary on what was found for each dimension. For the full overview, see paragraph 4.2.

#### *Regime Membership*

The Province of Noord-Brabant and Water Board De Dommel are the core parties of Noord-Brabant's governance in drought management, as codified in law. The province formulates their policy and ambitions and the Water Boards fill those in for their own area, whilst also taking the actual measures. There are other parties who have close ties to the regime or who represent regime actors. Additionally, the national and EU governments also have big influence on the Provinces and Water Boards through regulations, policy and subsidies. This influence may directly be coupled with supporting or obstructing effects on the upscaling of innovation in drought management, but the actual data on Regime Membership does not exhibit this.

#### *Cultural and Symbolic Meanings*

The origins of current practises originate mostly from history. The Dutch have moulded their water system to their needs and wishes. Through this however, they have made it unsustainable and issues faced by water managers now or in great part down to the changes that they and their predecessors made to the natural system. Noord-Brabant and De Dommel are considered to be progressive, but their decision-making is also inhibited by traditional practises and culture. As well as the way in which citizens are involved and how they involve themselves. These are all obstructing influences on the upscaling process, which is the tendency that this dimension has. The traditions, lock-ins and practices have a negative influence on the Water Transition as a whole and through this, on the successful upscaling of innovations.

#### *Guiding Principles*

The traditional principles of draining water in favour of agricultural production are and were not sustainable. Water managers are starting to let go of these principles, albeit slowly. Both regime actors' principles are progressive, wanting a future-proof soil- and water system by 2050 and investing in innovations.; they call this the Water Transition. This transition is happening on the strategic levels, but practise is lagging behind still. The influence of this mechanism goes two ways then, depending on the principle in question. Older principles will tend to obstruct successful upscaling and the newer ones may have a more supporting character.

#### *Policy and Regulation*

The responsibilities and decision-making powers of both regime actors are codified in law, part of which trickles down from the EU level. The Water Transition is starting to make its way into policy and De Dommel even has an impactful plan to only facilitate the Water Transition until 2030 and to then start turning to obligations. Most of current policy is still attuned to the traditional practises and therefore inhibit effective and decisive action-taking. Even the policies and regulations designed with the purpose of supporting innovations and upscaling does not achieve its full intent. This is because it clashes with the

policies that are still in place, making for opposed legislation. This leads us to conclude that Policies and Regulations have an obstructing effect on the upscaling process.

### *Knowledge Base*

The body of knowledge of the regime has been accumulated over centuries. Research from the last 50 years, commissioned after multiple shock events, has shown that the water system was not ready for the future. Yet, only limited action has been taken up until 5 years ago. Knowledge on dealing with an abundance of water is more than sufficient. How to combat drought however, is something that still needs more research. The regime actors now want to focus on digitisation, knowledge sharing, experimentation and innovation. The Knowledge Base supports upscaling, even though it may not be complete yet and more knowledge is needed. Nevertheless, the knowledge that is present helps to innovate and to let these innovations grow, expand and scale up.

### *Technologies and Infrastructures*

These have also been accumulated over centuries, with innovations making it possible to reclaim even more habitable and workable land. They are however, very focussed on draining the land and preventing floods using technical solutions, disregarding how the natural system worked. The regime actors are proud of this infrastructure, but also acknowledge that it is no longer enough. They therefore want to be open to innovations and consider automation and digitisation an important factor in this. They should also invest in monitoring, which has been lacking for a long time.

The Technologies and Infrastructures themselves have no real effect on the upscaling process, but the fact that these are in place and that they have to be changed or replaced does pose an extra hurdle for an innovation to come in and change the system. This means that the current Technologies and Infrastructures form a barrier for innovations to be upscaled. However, we see that this barrier is not a very impactful one, as the regime has proven willing to invest finances and capacity into changing and replacing them.

### *Resources and Distribution*

Money is available from many different sources and both organisation stress that they will need a lot of it. Other than just budget, they spend time, effort, manpower and accommodating legislation on innovations. Manpower however, can be an issue. It seems that the Province might have enough capacity, but for the Water Board, this is doubtful. We feel that Resources and Distribution are a minor obstruction to upscaling innovations, just like Technologies and Infrastructures. The current allocation may not suffice, but the regime has proven to be willing to change this and invest.

### *Agency and Power Relations*

This dimension seems to centre around politics, individuals and responsibilities. The first has a slowing effect on taking decisive action, therefore forming an obstruction to upscaling innovations. The second stresses the importance of individuals and their convictions, both for those doing the work as well as their managers. This is vital for innovations and may well be the most supporting factor of them all within the regime dimensions. The last pertains to taking responsibility for what and how one interprets their task. In the case of the Province of Noord-Brabant and Water Board De Dommel we consider this to be supportive towards upscaling drought management innovations, since the strategic level of both organisations is fully aware of what needs to happen and is also willing to act.

### *User Relation and Markets*

Both organisations are used to cooperation with each other as well as with stakeholders and citizens. However, they are not always providing enough perspective, nor are they always involving them in a process effectively. Moreover, citizen involvement does cause a lot of delays as does it consume precious resources. It is felt that Noord-Brabant and De Dommel may comparatively be better in their relation to users and markets than other provinces and water boards. With regards to upscaling drought management innovations however, it is not yet sufficient enough to conclude that dimension support this upscaling. Therefore we still deem it to be an obstruction.

### *Visions and Expectations*

The Province and the Water Board have clear visions and expectations, which back each other up. The quality of these visions was debatable, but the overall feelings about them were cautiously optimistic. Together with the awareness of the Water Transition of the strategic level, the new generation of guiding principles and the willingness to spend resources it is concluded that the Visions and Expectations of the regime support the successful upscaling of drought management innovations.

## 6.2 Sub-question 2

Sub-question two was posed as follows: ***Which steering and acceleration mechanisms are used by the regime?*** Below we give a short summary on what was found for each mechanism. For the full overview, see paragraph 4.2.

### *Collective Problem Structuring*

The Dutch do a lot of cooperation in general, therefore this mechanism is essentially used everywhere you look. The need for water management is one of the things that fostered this cooperation from the very beginning; the word 'polderen' is normally used for this. It is a slow, hard, complicated and costly process, but if done right, it does secure a better end result for all parties. This mechanism is used both successfully and unsuccessfully. It seems that in upscaling drought management innovations, there tend to be more unsuccessful than successful cases.

### *Learning by Doing, Doing by Learning and Social Learning*

The Province and Water Board do a lot of learning and they use many ways to do so, also stressing this in their plans. We found that different departments lean towards different approaches, which leads to this mechanism being applied in an overall successful way. The one exception is however learning about innovations and upscaling in a holistic way. Learning about this essential facet seems to be lacking, unfortunately.

### *Keeping Options Open, encouraging a Wide Diversity of Innovations*

Both organisations stress in their own words that they want to keep options open and consider a wide diversity of measures and innovations. Other data paints a more ambivalent picture however, with current practises still being favoured in pilot projects. The regime actor's actions are still lagging behind their intentions. This mechanism is being applied more and more, but there is still a long way to go until it is being applied fully and successfully.

### *Courage, Leadership and Persistence*

This mechanism is being used by both organisations, but in a limited way. However, it is a very important mechanism for two groups within the organisations: (progressive) individuals and leaders. The individuals need to apply it because they have the right intentions and need to follow through with them to make a change. The leaders need to have it to allow these individuals to do their work and to give them space and

resources. The Province and Water Board themselves show this mechanism in their newest plans and policies, but the more conservative individuals and leaders, who do not apply this mechanism, cause the organisations' actions to not mirror their newest courageous intentions. Just like with the previous mechanism, there is still a lot of work ahead before we can consider this mechanism to be applied in full.

### *Deepening, Broadening and Scaling Up*

The Province and the Water Board mention this mechanism in their plans, with varying levels of explicitness. Innovations are not just being applied without any empirical evidence for their effectiveness. However, this evidence is almost always limited to the technical facet. The upscalability of an innovation is rarely investigated, meaning that a holistic view on the innovation was never adopted. Knowledge on the societal, economical and legislative effects and repercussions of an innovation is therefore seldom present. So this mechanism is being used effectively, but only when looking at the technical functioning of an innovation. For all the other facets, the application of it is very much unsuccessful.

## 6.3 Main Research Question

The main research question of this master's thesis was: ***In what ways does Noord-Brabant's governance support and obstruct the successful upscaling of drought management innovations for sandy soils?*** We can now finally synthesise the answer to this question. We start with how Noord-Brabant's governance supports upscaling, which will be followed by how it obstructs the successful upscaling of drought management innovations for sandy soils.

### 6.3.1 Supporting Factors

How is the upscaling process ***supported***? First off, the Province of Noord-Brabant and Water Board De Dommel are considered to be progressive organisations when it comes to drought management. The soil conditions and dependency on rainwater in this part of the country however, make it especially susceptible to droughts. The higher sense of urgency that comes with experiencing the brunt of the problems is considered to be a reason for this relative progressiveness. In fact, the urgency is felt by all parties in Brabant. The letter 'Water en Bodem Sturend' in addition, has made it clear on the national level that water management needs to change on more than just the technical level.

Drought management meanwhile, has made it into policy now and with this newest generation of plans both governments are starting to take their role. De Dommel has even provided a future perspective, which helps to collectively structure the problem with users. What also supports the upscaling of drought management innovations is their familiarity with cooperation and the vision that both governments share. It is sufficiently detailed and ambitious, includes innovation and is also long-term whilst still providing an adequate amount of freedom. Additionally, these plans and visions project action, ambition and transition. Courage, leadership and persistence is in an upward trend at the moment, the policy departments of both organisations are willing to act and also in other parts of both governments we find individuals and leaders that want to innovate and prepare the region for the future. Even if it does mean getting out of their comfort zone and breaking with the past.

The difference between the two organisations in the level at which they operate and the depth of their knowledge into certain fields is something that can support upscaling. They can fill each other's knowledge gaps through sharing and cooperating, something that they are quite adept at. They also learn in as many ways as possible; trial and error is an approach that is allowed and used and proper monitoring is now also in their water management plans. The two regional governments support and stimulate innovation with money, research and manpower, the last of which is a precious resource which is often in limited supply. They also want to join innovations as well as innovate themselves. Knowledge, expertise and accommodating legislation are also used for innovation, albeit more exclusively on the technical level. As drought management, innovations and monitoring have made it onto the agenda, deepening, broadening and scaling up have also done so.

### 6.3.2 Obstructing Factors

What does then **obstruct** the upscaling process? The focus on draining water as quickly as possible has left a lasting effect on the mindset of water managers after decades of being the regime's central way of thinking. This makes keeping water inside the system a lot harder than getting it out. It also means that the governments, with their risk-averse culture, will go to great lengths to prevent water damage as a result of drought management interventions. The fear of this risk is very present still and makes it harder to take decisive action. This fear also causes unease in talking to certain stakeholders.

The historical focus on technical solutions with questionable sustainability towards the future is another obstructing characteristic. We have to change the complete water system (again), so an open mind needs to be kept towards solutions and innovations. Both governments say that they do this, but there is still quite some progress to be made here. The more conservative and sometimes nervous individuals, test against standards and regulations that are not applicable anymore to the current meteorological situation. They can be stuck in their ways and are unwilling to speculate and try innovations. In some cases, these individuals may have a very narrow interpretation of their organisation's or their own tasks and responsibilities, making it hard to get them on board for taking measures towards the future.

What also follows from the traditional mindset is the current policies and regulations. At the moment this still stands in the way of quick and decisive action, because of its rigid framework and of how it reflects the interest that certain sectors have in the water system. It also makes it more difficult for the governments to stimulate users and companies to innovate, as they run into stiff regulations on government support and anti-corruption laws. Voices from within and outside of the governments are calling for this to change and work is being done on it. However, the practice of the Water Transition is lagging behind the plans.

The Province is said to have adequate capacity, but the Water Board, with its thorough people, certainly needs to choose where they invest their energy into. This limited supply of manpower is an obstruction, but politics have turned out to be much more of a problem for civil servants who want to act. Even if they do vote for serious action, like those of De Dommel did, their 4-year political cycle and fear of risks and damaging interests makes them a difficult actor to get on board with rigorous and systematic changes.

Another actor that can slow down drought management and the upscaling of innovations is the citizen. The 'polderen' that needs to be done also stands in the way of action-taking and complaints and appeals to decisions are a considerable hindrance to the implementation of drought management measures and innovations. Collective problem structuring is also being made harder by the fact that drought is relatively hard to see until it is in an advanced state. Add to that a failed participation process and it is going to be almost impossible to effectively take measures as a government.

During pilots it is important to consult users more actively and involve other stakeholders more broadly. What currently tends to happen is that a pilot is being executed in a rather closed way. When it is then finally put forward it runs into all doubts and scrutiny at once. By allowing these reactions earlier in the process, pressure is increased gradually. This will make the innovations less likely to 'crack' and easier to implement on a bigger scale. Unfortunately, both governments tend to talk more about the users than to them. This leaves them unable to come to a good balance of interests and to give the users what they want and need from an innovation. To these same users it is also unclear what they can expect from their governments, they are not given a clear perspective in many cases. Yes, De Dommel's 2030 plan does provide some, but this still leaves many issues still without a clear future.

From the perspective of the innovator, it can sometimes be hard to find the right connection with the regional governments, which hinders an innovation's entry into these organisations. Another tendency of the regional governments when it comes to pilots is to focus on innovations that offer a technological solution to keep a current way of farming possible on a piece of land where it is really not sustainable. The mind must be kept open here and it must be recognised that not everything will be possible anymore: function follows water level.

Another thing that obstructs successful upscaling is actually out of the regional government's hands. It is the absence of national leadership on drought management and the deplorable lack of responsibility that Den Haag is taking. Provinces, and through them the Water Boards, are tasked with tackling drought issues, but are not given adequate means. The regional civil servants request more powerful tools to take actions and want the national government to take its responsibility as well.

Apart from more national responsibility, more knowledge is also needed for the Water Transition to be successful. A lack of adequate and comprehensible monitoring in the past means that some data might have been wasted. The main type of knowledge that is missing however, is on how to upscale an innovation. The technical aspect is clear and tested time after time, but the economical, social, organisational and practical details are rarely known and seldomly tested. A more holistic view on upscaling has to be implemented during the pilot phase and maybe even during the conception of an innovation. This strategic and holistic thinking on innovations and upscaling is currently missing within the regional governments. It is generally a little understood topic as well.

## 7. Recommendations

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In this section, recommendations are made for subsequent research. This master's thesis is limited to the utilised methods and theories, whereas more or others are available. In addition to the recommendations for research, there are also the recommendations for the Province of Noord-Brabant and Water Board De Dommel. This research has focused on them specifically and they are therefore to know what they can do to support successful upscaling of drought management innovations.

### 7.1 Recommendations for Research

The great diversity that was found to be present between separate provinces and water boards mean that the conclusions drawn in this master's thesis are not generalisable. One research recommendation that follows from this is to also research other situations of regional governance in drought management, such as one of the other three water boards that operate within the province of Noord-Brabant. Perhaps the situation on the eastern sandy soils could also be researched, to see if the supporting and obstructing factors are the same there. It might also be interesting to see how the regional governments on clay or peat soils work with innovations in drought management. Their problems are different and for the most part less prevalent, except for issues with peat oxidation and the concurrent damage to structures that this can cause of course. It is within the expectations to find factors that match between all the different water boards and provinces, but it is even more anticipated that big dissimilarities and contrasts exist in their approaches to the problem, in their feelings towards innovations and in their ability to take decisive action.

Another way to expand the knowledge on how the regional governments support or obstruct upscaling innovations would be by utilising another theoretical approach. A different transition-oriented approach could be chosen, like Strategic Niche Management. The Policy Arrangement Approach could shine a more policy-focused light on the subject. In addition to these, section 2 already listed Practice Theory, the Theory of Change and Actor Network Theory. Any of these five theories, or maybe a combination of them, could form another framework to investigate the issue of upscaling drought management innovations with. Even then, there is still a wealth of other perspectives and paradigms that could be applied.

The above two recommendations serve to provide broader knowledge on the subject. The third recommendation pertains to deepening the knowledge that has been gathered during this thesis process. Section 5 discussed a quintet of points that were prevalent during the research and therefore deserved attention. It is felt that all of these five points can be dived into and explored further. From a governance perspective the Roles & Responsibilities, Cultures & Practises, and Laws & Policies would be interesting to study; to see how these influence upscaling innovations, decisive decision-making and action-taking. From a societal point of view, Cooperation & Involvement could provide incredibly useful insights that could possibly be of great value to the regional governments to ensure successful stakeholder processes. Lastly, Upscaling must be studied more deeply. This is starting to happen of course, also through KLIMAP. Looking at the findings however, we can clearly see that a holistic and strategic approach to upscaling is not being applied yet. In fact, one might go so far as to say that it does not exist at all. A lot of additional research is still necessary to be able to determine how to upscale innovations successfully in a holistic way. Until it is clear how to actually do this, we urge the people that are trying to upscale innovations in drought management to look further than the technical workings, but to also incorporate the societal, financial, legal and sustainability facets of an innovation.

## 7.2 Recommendations for Province and Water Board

After the conclusions it is time to provide some recommendations to make upscaling drought management innovations more successful. They follow from the conclusions as well as from the body of data as a whole. Ten recommendations have been determined for the Province of Noord-Brabant and Water Board De Dommel to contemplate:

1. Norms and standards for the dimensions of waterways need to be revised to cater for drought, in addition to the current singular focus on draining water as quickly as possible. The current ones are outdated and can rule out effective innovations that do not fit in.
2. 'Function follows level' should actually be practised instead of just preached. The Province and Water Board should recognise that not everything is possible anywhere, anymore. This message has made its way into policy, but it is not yet being practised enough yet.
3. Use extreme drought scenarios to make perspectives for the future to ensure that we are not surprised later. This will also provide room for more innovations to fit into the scenario, providing a broader base of solutions to choose from when the time comes to implement them.
4. Do not isolate a pilot from its surroundings or the rest of the organisation, let everyone get used to it progressively to prevent receiving too much sudden resistance. Speak to the users and find out what they need and want to gain from the experiment and later on, the implemented innovation.
5. Reduce regulations to make the system more flexible and innovations easier to implement, streamline legislation and adjust the available instruments to each other. More freedom in regulation will allow the progressive individuals to flourish and will mean that conservative individuals that simply follow the written rules are less likely to write off good solutions because of legislation.
6. Invest in a good stakeholder process, it can make or break a project. Having people on your side is instrumental to the course of any project. If stakeholders have the feeling of ownership instead of alienation, a project is a lot more likely to be successful too.
7. Invest more in drought awareness and make clear what the problem is and how and why we need to tackle it. A lack of understanding is likely to cause resistance and should therefore be forestalled.
8. Deepen and broaden the holistic knowledge on upscaling, the central theme of this thesis is still a massive knowledge gap. The technical aspect of innovations is sufficiently covered, now is the time to see how an innovation relates to the rest of its environment.
9. Educate employees on transition's thinking, the Water Transition is happening and you will need all of your employees to understand it in order for it to be as effective and successful as possible.
10. Give room to innovative employees. The individual component has proven to be instrumental in upscaling innovations. Therefore, innovative individuals should receive room and resources to pursue (their) innovations. Managers and leaders should also facilitate this.

We urge regional civil servants to absorb as many of the recommendations and findings from this research as they can. It might not be enjoyable to receive criticism but for the sake of this country's sustained existence, it is vital.

## 8. Reflection

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### 8.1 Research Reflection

This paragraph reflects on the results and how valid and reliable they are. Firstly, the document selection will be discussed, the interviews thereafter, followed by the coding and analysis of the data. Lastly, the theoretical framework will also be reflected upon.

#### 8.1.1 Document Selection

For the document selection there is an obvious question to ask: were all relevant documents found? For the policy documents the answer to that is a positive affirmation. The different government's websites were thoroughly searched through until all relevant information had been exhausted. During the interviews there was no mention of any policy document for the EU level, national level, Province of Noord-Brabant or Water Board De Dommel that had not yet been considered. For the research documents the answer is less confident because there are many more channels to find these documents on. However, searching using both Web of Science (mostly for the documents in English) and Google (mostly for Dutch documents) it seemed that the supply was eventually exhausted as well. There was no more to be found that looked into the upscaling of drought management innovation, but if a new search were to start now (about 14 months after starting the search for documents) it is likely that new ones would be found.

#### 8.1.2 Interviews

As mentioned in paragraph 3.2.2, 13 interviews were conducted. Two notes are to be made with regards to the interviewee distribution between the groups. One note relates to having 4 water board interviewees against 2 province ones. Unfortunately, it was not possible to get more province interviewees within the timespan reserved for the interviews, resulting in having to make do with the data from just two. Having had another province interviewee would have been fruitful for this research, nevertheless it seems that the data obtained from province sources has been valid and reliable. In addition, the Users and Consultants group also fill in data for both organisations, which softens the impact of one province interviewee missing. I am specifically stating one here because four water board interviewees seemed more than enough, saturation was felt to be achieved at approximately three interviewees for each government.

The second note was the relatively low amount of user interviewees, a glaring gap here was the absence of an interviewee representing agriculture; quite a few different candidates for this had been contacted but eventually none of them had time or followed through. The agricultural sector is not the only type of user that is confronted with drought management innovations and the two regional governments, but it is an impactful stakeholder. Again the impact of this missing interviewee is softened by the presence of both governance and consultant interviewees, but this does not fully take away the 'hole' in the data that this leaves.

With regards to the interviewee groups, two aspects on the part of the 'Governance' group stood out to me. Firstly, it was clear that the people I was speaking to were generally the progressive kind with regards to drought management. They wanted to innovate, to change and to make the water system sustainable. This progressiveness might give the research results a relatively critical twist, however this might also be a good thing, considering the drought-related challenges that are still ahead. The second aspect pertains to age, experience and service years. It seemed to me that there were relatively few young people within these organisations. This became clear both from the interviews as well as from visits to their offices on other occasions, where I saw quite a few grey hairs. It is common for Water Board and Province

employees to have a relatively high amount of service years. Those can be interpreted as a bonus to the quality of the data I got. If progressive people with a lot of experience say the things they say it can be assumed that their views are well-considered and rooted in practice. From the other groups it was notable that, even though they can be critical of the regional governments, they do understand that it is not an easy position to be in. Still, they feel a lack of courage and persistence from these organisations as a whole.

Lastly, we state that all interviews were conducted via Teams, at first it was unclear how this would affect the quality but it did not seem to make much of a difference. All interviewees spoke freely and with enthusiasm and only had to be left to speak and kept on the subject with the appropriate questions.

### 8.1.3 Data Analysis

The coding of the data was done over a period of a few months in which the documents were coded first, the interviews were conducted and then the interview were coded in the transcripts. The coding turned out to be surprisingly consistent, the only thing that was noticeable during the formulating of the results was that in the first few documents I started slightly overactive, coding things that were interesting to the topic of drought management but that were beyond the influence of the regional governments. documents and also held more information, which was to be expected since the interview questions were much more specific and targeted than the documents were. Changes made in the codes stemmed either from this or from theoretical simplifying that happened after the documents were coded, in which some dimensions and mechanisms were put outside of the scope of this research.

The formulation of the results was a three-step process in which first the codes were collected and translated, then grouped and synthesised together to thereafter turn them into the comprehensible paragraphs of section 4, this was done separately for all of the 15 Dimensions and Mechanisms. Ultimately it can confidently be said that the results are valid and of sufficient quality, that they are reliable and repeatable and that the conclusion that will be drawn in the next section will therefore be representable as well.

### 8.1.4 Theoretical Framework

I feel that combining the MLP and TM was a practical and tangible way of conducting this research, after I finally find out how to actually combine them and which dimensions and mechanisms I should investigate. Doing it this way has meant a lot of work, but also a rich dataset I believe. One thing I did feel was missing from both theories was something resembling the sense of urgency. I think that feeling the need to act will influence the innovation climate. I also recognise that it can be housed under multiple dimensions and mechanisms, I have mentioned it for several of them. Still I think that urgency, needing to act or some outside force pushing for change out of necessity, could be considered in both the MLP and TM.

## 8.2 Personal Reflection

This thesis has been a long process. Longer than I hoped it would be and longer than it should have been. Partly because of my work/study combination, partly because of cautiousness and overthinking. Now that the research is finished, I look back on a master's thesis that I think may feel like it contains many open doors. However, looking at the knowledge gaps that I set out to fill, it does seem like this is the first research that kicks in these open doors, using a hybrid theoretical approach that did not seem to have been used before on this specific subject.

We have already reflected on the results: additional research will have probably been published by now, the interviewee representation was not optimal and the data has been leaning more towards a progressive philosophy. I think using two methods and being able to triangulate results helped to take the edge off of the criticisms above. I have been able to find supporting results as well as contrasting results, the latter one could always be explained by findings that were collected by using other method.

One important question does remain for the regional governments. We know now how they influence the upscaling process, but the actual process of upscaling an innovation holistically is still not clear. I hope that the KLIMAP-programme succeeds in shedding more light on this, so that we may indeed have a future-proof soil and water system by 2050 or earlier. Through this thesis research I have gained many new insights. Apart from the findings I have also learned a lot about the process, about both organisations and about Dutch water management in general. All of this experience will be put to good use for my upcoming career and I have a feeling that this is not the last time I will be working on this topic.

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# Appendix 1: Elaboration on Analysed Documents

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This appendix elaborates on the analysed documents, how they were selected and what they actually entail.

## Policy documents

The Netherlands' strong connection and long history of water management has led to a strongly institutionalised system, in which different parties on various levels have a clear division of tasks and responsibilities that is codified in law: the Waterwet or Water Law (Rijksoverheid, 2022b). In this law, the division is as follows:

- The **National Government** is responsible for national policy and measures, in addition they also set the standards for water safety concerning the primary flood prevention systems such as the dikes that protect the country from the rivers and the North Sea and they manage the primary waterways. The executive branch for this is Rijkswaterstaat. EU policy on water (such as the Water Framework Directive) is translated or copied to policy by the national government as well.
- The **Provinces** translate national water policy to a regional one and they test if the Water Boards actually meet these targets and standards. The Provinces are also responsible for providing enough clean groundwater and appoint swimming locations. They do all of this in close cooperation with the other parties involved, such as Rijkswaterstaat, the Water Boards, municipalities and the drink water companies.
- The **Water Boards** manage water in their area, they translate the provincial policy and they execute it. In addition, they are responsible for the regional flood prevention systems; the dikes that protect from canals and smaller rivers as well as wastewater purification. Together with the Province of Noord-Brabant, Water Board De Dommel forms the regime. The documents relating to their policy are therefore the primary interests in this part of the document analysis.
- **Municipalities** take care of groundwater in the built-up area as well as the waste- and rainwater drainage through the sewers. These tasks are however not of interest to the research and therefore there will be no specific analysis of documents pertaining to the municipality.

This division of responsibilities leads the different government levels to make laws, regulations and policy documents that form the basis to the regime dimensions. Of all the listed documents, the most modern iteration filling in the same function was used. The new version of a certain document could occasionally have a different name than its predecessor (for instance the Regionaal Water- en Bodemprogramma used to be called the Provinciaal Milieu- en Waterplan (Provincie Noord-Brabant, 2021a)). Below is specified per level which documents will be analysed, along with a short elaboration.

### NATIONAL AND INTERNATIONAL DOCUMENTS

- **Deltaprogramma 2022 (Rijksoverheid, 2021a)**. This document elaborates on the progress of water management in The Netherlands, it gives updates, new insights and budget information among other things. It is illustrative of the direction that Dutch water management will be going in over the next 7 years.
- **Handreiking KRW-doelen (STOWA, 2018)**. This is the translation of the Water Framework Directive (WFD) into its consequences and responsibilities for Dutch Water managers on all levels. It speaks of the procedures, structures and regulations that need to be followed and elaborates on both the administrative as well as the official aspects of these.
- **Nationaal Waterprogramma 2022-2027 (Rijksoverheid, 2021b)**. This document outlines the national water policy of The Netherlands and its implementation in the national waters.

- **Provinciewet (Rijksoverheid, 1992).** This law is the legal basis on which the Province as a governmental body stands.
- **Waterschapswet (Rijksoverheid, 1991).** This law is the legal basis on which the Water Board as a governmental body stands.
- **Waterwet (Rijksoverheid, 2009).** This law regulates a wide scala of water-related issues, ranging from responsibilities and fines to water defence standards and permits.

#### PROVINCE DOCUMENTS

- **Provincial Position Paper on Climate Adaptation (Interprovinciaal Overleg, 2022).** This document outlines the provinces' view, as agreed on by all the provinces, on their role in climate adaptation.
- **Structuurvisie Provincie Noord-Brabant (Provincie Noord-Brabant, 2014).** This is the vision of the province on spatial developments for the period until 2025.
- **Regionaal Water- en Bodemprogramma (Provincie Noord-Brabant, 2021b).** This programme outlines how the province will be working on water and soil issues, connecting them to climate adaptation.
- **Visie Klimaatadaptatie (Provincie Noord-Brabant, 2021c).** This is the province's vision on the implementation of climate adaptation measures on a regional level.
- **Grondwater Convenant (Provincie Noord-Brabant, 2021a).** In this document, the Province of Noord-Brabant, the water boards within the province, water companies, nature organisations and agricultural association agree on a set of action points to protect the groundwater balance of the province.

#### WATER BOARD DOCUMENTS

- **Keur Waterschap de Dommel (Waterschap De Dommel, 2015).** This is the document for the area under the Water Board's supervision, containing all the general laws for it.
- **Algemene regels Waterschap De Dommel (Waterschap De Dommel, 2021a).** This document expands on the laws in the 'Keur' with more (technical) specificity.
- **Waterbeheerprogramma 2022-2027 (Waterschap De Dommel, 2021b).** The water board details its course and ambitions for the period from 2022 to 2027 in this document.

## Research documents

Research exists on drought governance which can help to shed light on this thesis' specific issues as well. The following articles will also be analysed and coded as part of this research:

- ***Drought Governance in Transition: a Case Study of the Meuse River Basin in the Netherlands (Brockhoff et al., 2022)***. This paper looks into what the future of Dutch drought management should look like, identifying several mechanisms that should be used to transition to this new way of managing droughts.
- ***Eindrapportage Beleidstafel Droogte (Beleidstafel Droogte, 2019)***. This report reflects upon the 2018 and 2019 droughts and formulates the lessons into 46 recommendations for water managers.
- ***The Transition in Dutch Water Management (van der Brugge, Rotmans, & Loorbach, 2005)***. This paper utilises Transition Theory and TM to analyse the changes that have happened in Dutch water management over the 30 years before the publication of the paper. It holds valuable information pertaining to the regime dimensions.
- ***Leerpunten voor gebiedsprocessen (Veenweiden in Beweging, 2021)***. This document contains learning points from 'gebiedsprocessen' (a multi-level process in which stakeholders from a certain area work together to solve the different problems that an area has, such as nitrogen, biodiversity etc.) with farmers. It sheds light on the relation that the regime can have to the users.
- ***Op Waterbasis: grenzen aan de maakbaarheid van ons water- en bodemsysteem (Deltares, BoschSlabbers, & Sweco, 2021)*** is an essay that serves as a guide to dialog on the future of Dutch water management. It sketches the future of The Netherlands on five different points concerning water and soil and illustrates with maps what functions will and will not be sustainable in which part of the country.
- ***Verdroging van de Nederlandse natuur: Bijna een halve eeuw goed onderzoek en falende politiek (Witte et al., 2019)***. This article investigates why, despite decades of solid research, Dutch water management still has not managed to change enough. It also includes suggestions as to what needs to change.
- ***Water management in The Netherlands in transition (Kielen, 2009)***. This article looks at the transition in Dutch water management over the last decades and the role that water experts will be playing in this transition and afterwards.

# Appendix 2: Interview Guide Consultant

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**Interviewer: Edward van Erp**

**Interviewee (Consultant):**

**Location:**

**Time and date:**

*In what ways does Noord-Brabant's governance support and obstruct the successful upscaling of drought management innovations for sandy soils?*

- 1. What are the dimensions that form the regime of Noord-Brabant's governance of drought management?*
- 2. What does the regime do to influence the process of upscaling drought management innovations?*

## Introduction

*Short introduction of myself, depending on previous communication*

My thesis is on the upscaling of drought management innovations, from the perspective of regional governance. This essentially means that I am investigating what the Province and the Water Board do in relation to drought management innovations and how they influence the upscaling of these innovations. From now on I will refer to both of those parties together as the 'regional governments'. For my research I will be looking into the things that these governments do or do not do to influence the upscaling process, which is why I am conducting this interview with you. Do you have any questions before we start? Are you okay with me recording this interview so I can transcribe it later? The data will only be used for this thesis and I can also make it anonymous if you wish.

## Interview Questions

I will ask a few questions on how the regional governments work. After these I have some questions on their actual actions, regarding the upscaling process. Firstly however:

- Can you tell me something about your experience with the province and water board? *(follow up on these with questions on innovations or policy)*

### **DIMENSIONS**

*User Relations and Markets*

- How do you feel that the regional governments relate the users and the market to upscaling innovations? What role do users and the market play in the upscaling process?

*Knowledge Base*

- Do you think that the regional governments have enough knowledge at this point to work with innovations in drought management?
- How do/did they get this information?

*Cultural and Symbolic Meanings AND Guiding Principles*

- Are there any traditions or ideas within the field of water management that you think help or hinder the upscaling process?

- Do you think that the regional governments have principles of their own that influence the upscaling process?

#### *Agency and Power Relations*

- Do you feel that both governments have enough decision-making power to support the upscaling of drought management innovations?
- Is this power distributed equally?

#### *Resources and Distribution*

- Do you have an idea of how and which resources are allocated to upscaling innovations?
- How are these resources then distributed, both between the Water Board and Province as well as any other parties?

#### *Visions and expectations*

- Do you know what the province's vision is for the future?
- And how about that of the water boards?
- How do you feel about these visions? (*possible follow-up:*) are they reasonable/doable/realistic/ambitious enough?

### **MECHANISMS**

#### *Collective Problem Structuring AND Learning by Doing, Doing by Learning and Social Learning*

- From my document study I found that both governments want to solve problems together with the stakeholders, do you feel that this is indeed the case for upscaling innovations in drought management?
- How do the regional governments learn? (*possible follow-up:*) Do they use research? Or do they learn through experimenting and/or looking at others?

#### *Deepening, Broadening and Scaling Up AND Keeping Options Open, encouraging a Wide Diversity of Innovations*

- Are the regional governments testing innovations sufficiently before trying to use them on a bigger scale?
- Do you feel that they are keeping an open mind towards the types of drought management innovations that are being tested and used? Are they considering a wide diversity of them?
- On the other hand, are both governments considering completely new drought management innovations alongside innovations that upgrade the current system?
- We tend to focus on technical innovations when we speak of upscaling, but are other types of innovations also being considered? (*Possible follow-up, explain:*) Think of financial, policy or social innovations?

#### *Courage, Leadership and Persistence*

- Are the Province and the Waterboard showing enough courage and persistence in the upscaling process?
- Are there any people, roles or departments that stand out in this, both positively and negatively?

Lastly, what do you think the Water Board and Province can do better to make the upscaling process more successful and what are they already doing well?

## Closure

# Appendix 3: Interview Guide Governance

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*Interviewer: Edward van Erp*

*Interviewee (Province/Water Board):*

*Location:*

*Time and date:*

*In what ways does Noord-Brabant's governance support and obstruct the successful upscaling of drought management innovations for sandy soils?*

- 1. What are the dimensions that form the regime of Noord-Brabant's governance of drought management?*
- 2. What does the regime do to influence the process of upscaling drought management innovations?*

## Introduction

*Short introduction of myself, depending on previous communication*

My thesis is on the upscaling of drought management innovations, from the perspective of regional governance. This essentially means that I am investigating what the Province and the Water Board do in relation to drought management innovations and how they influence the upscaling of these innovations. For my research I will be looking into the things that these governments do or do not do to influence the upscaling process, which is why I am conducting this interview with you. Do you have any questions before we start? Are you okay with me recording this interview so I can transcribe it later? The data will only be used for this thesis and I can also make it anonymous if you wish.

## Interview Questions

I will first ask a few questions on how the Province/Water Board works. After these I have some questions on its actual actions, regarding the upscaling process. Firstly however:

- Can you tell me something about your experience with the province/water board? *(follow up on these with questions on innovations or policy)*

### **DIMENSIONS**

*User Relations and Markets*

- How does the Province/Water Board relate the users and the market to upscaling innovations? What role do users and the market play in the upscaling process?

*Knowledge Base*

- Do you think that the province/water board has enough knowledge at this point to work with innovations in drought management?
- How do/did you get this information?

*Cultural and Symbolic Meanings AND Guiding Principles*

- Are there any traditions or ideas within your organisation that you think help or hinder the upscaling process?

- Do you think that your organisation has principles of their own that influence the upscaling process?

#### *Agency and Power Relations*

- Do you feel that you have enough decision-making power to support the upscaling of drought management innovations?
- Is this power distributed equally throughout your organisation?

#### *Resources and Distribution*

- Which resources are allocated to upscaling innovations and how does this happen?
- How are these resources then distributed, both between the Water Board and Province as well as any other parties or departments within your organisation?

#### *Visions and expectations*

- Do you know what the province's vision is for the future?
- And how about that of the water boards?
- How do you feel about these visions? (*possible follow-up:*) are they reasonable/doable/realistic/ambitious enough?

### **MECHANISMS**

#### *Collective Problem Structuring **AND** Learning by Doing, Doing by Learning and Social Learning*

- From my document study I found that both the Province/Water Board wants to solve problems together with stakeholders, do you feel that this is indeed the case for upscaling innovations in drought management?
- How does the Province/Water Board learn? (*possible follow-up:*) Does it use research for instance? Or does it learn through experimenting and/or looking at others?

#### *Deepening, Broadening and Scaling Up **AND** Keeping Options Open, encouraging a Wide Diversity of Innovations*

- Is the Province/Water Board testing innovations sufficiently before trying to use them on a bigger scale?
- Do you feel that your organisation is keeping an open mind towards the types of innovations? Is it considering a wide diversity of them?
- On the other hand, is the Province/Water Board considering completely new innovations alongside innovations that upgrade the current system?
- We tend to focus on technical innovations when we speak of upscaling, but are other types of innovations also being considered? (*Possible follow-up, explain:*) Think of financial, policy or social innovations?

#### *Courage, Leadership and Persistence*

- Is your organisation showing enough courage and persistence in the upscaling process?
- Are there any people, roles or departments that stand out in this, both positively and negatively?

Lastly, what do you think the Province/Water Board can do better to make the upscaling process more successful and what is it already doing well?

## **Closure**

# Appendix 4: Interview Guide Users

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**Interviewer: Edward van Erp**

**Interviewee (User):**

**Location:**

**Time and date:**

*In what ways does Noord-Brabant's governance support and obstruct the successful upscaling of drought management innovations for sandy soils?*

1. *What are the dimensions that form the regime of Noord-Brabant's governance of drought management?*
2. *What does the regime do to influence the process of upscaling drought management innovations?*

## Introduction

*Short introduction of myself, depending on previous communication*

My thesis is on the upscaling of drought management innovations, from the perspective of regional governance. This essentially means that I am investigating what the Province and the Water Board do in relation to drought management innovations and how they influence the upscaling of these innovations. From now on I will refer to both of those parties together as the 'regional governments'. For my research I will be looking into the things that these governments do or do not do to influence the upscaling process, which is why I am conducting this interview with you. Do you have any questions before we start? Are you okay with me recording this interview so I can transcribe it later? The data will only be used for this thesis and I can also make it anonymous if you wish.

## Interview Questions

I will first ask a few questions on how the regional governments work. After these I have some questions on their actual actions, regarding the upscaling process. Firstly however:

- Can you tell me something about your experience with the province and water board?  
*(follow up on these with questions on innovations or policy)*

### **DIMENSIONS**

#### *User Relations and Markets*

- How do the regional governments relate the upscaling of innovations to you as a user?
- What role are you given?
- Do you agree with this or would you rather see it differently?

#### *Knowledge Base*

- Do you think that the regional governments have enough knowledge at this point to work with innovations in drought management?
- Do you know how they get this information?

### *Cultural and Symbolic Meanings*

- Are there any traditions or ideas within the regional governments that you think help or hinder the upscaling process?
- Do you think that the regional governments have principles of their own that influence the upscaling process?

### *Agency and Power Relations*

- Do you feel that both governments have enough decision-making power to support the upscaling of drought management innovations?
- Is this power distributed equally?

### *Resources and Distribution*

- What resources are distributed to the user(s) regarding the upscaling of drought management innovations? (*follow-up:*) What do you receive and does this match what you need?

### *Visions and expectations*

- Do you know what the province's vision is for the future?
- And how about that of the water boards?
- How do you feel about these visions? (*possible follow-up:*) are they reasonable/doable/realistic/ambitious enough?

## **MECHANISMS**

### *Collective Problem Structuring AND Learning by Doing, Doing by Learning and Social Learning*

- From my document study I found that both governments want to solve problems together with the stakeholders, do you feel that this is indeed the case for upscaling innovations in drought management?
- How do you see the regional governments gathering data and experience on innovations?

### *Deepening, Broadening and Scaling Up AND Keeping Options Open, encouraging a Wide Diversity of Innovations*

- Are the regional governments testing innovations sufficiently before trying to use them on a bigger scale?
- Do you feel that they are keeping an open mind towards the types of innovations? Are they considering a wide diversity of them?
- On the other hand, are both governments considering completely new innovations alongside innovations that upgrade the current system?
- We tend to focus on technical innovations when we speak of upscaling, but are other types of innovations also being considered? (*Possible follow-up, explain:*) Think of financial, policy or social innovations?

### *Courage, Leadership and Persistence*

- Are the Province and the Waterboard showing enough courage and persistence in the upscaling process?
- Are there any people, roles or departments that stand out in this, both positively and negatively?

Lastly, what do you think the Water Board and Province can do better to make the upscaling process more successful and what are they already doing well?

## Closure