Urban water management in Leeuwarden and EU guidelines;

a comparative policy analysis

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1 Abstract

Present global Climate Action – SDG 13 – falls short of what is needed to meet the Paris Agreement's and the 2030 Agenda for Sustainable Development's long-term goals. To benefit this process, there is necessity for regular evaluation of climate adaptation measures on a local scale in Leeuwarden as well as the assessment of top-down EU policies, in this instance via attribution to the field of urban water management. The relationship between EU policy on sustainable and climate-resilient urban water management and the local level of urban water management in Leeuwarden, a medium-sized city in The Netherlands, is investigated in this research. As a result, the central question of this research is: “To what extent are current aspirations and actions regarding urban water management in Leeuwarden aligned with EU guidelines as laid out in the EU Adaptation Strategy on local urban water management and other associated documents?”

This question gets addressed through systematic literature review, documental analysis and key informant interviews. Valid results are ensured by precise documentation of resources and transcribing of interviews. Current aspirations and actions of the municipality of Leeuwarden and the EU are laid out alongside relevant policy documents. Additionally, the relation between the local level of Leeuwarden and the international level of the EU is discussed. Furthermore, the Northern municipalities are well-informed of EU guidelines and policies due to representation in Brussels. Leeuwarden is engaged in EU programmes such as Horizon Europe and the LIFE Programme. Unlike the EU, which focuses on implementation through Member States, Leeuwarden is more concerned with practical issues, such as a lack of legal accountability for drought and heat stress effects.

Through suitable information exchange, the local level of Leeuwarden and the international level of the EU can surely benefit from each other.

As a result, urban water management is as much about tying existing threads together as it is about coming up with new ideas. Future research is suggested to look into knowledge gaps and comparisons with cities with more resources.

Ultimately, Leeuwarden's urban water management is influenced by EU regulations in both direct and indirect ways. These interactions and the overall purpose are aligned, however there are disparities in terms of pace and application of knowledge present in other regions.

Keywords: Urban water management, climate adaptation, EU Adaptation Strategy, climate governance, water storage policy, sewage regulation, urban drainage, urban heat stress, drought impact, urban catchments, North Sea Region, Deltaplan, spatial adaptation, Leeuwarden, ruimtelijke adaptatie.

2 Introduction

Climate change was officially regarded as an ‘existential treat to humanity’ by The Council of the European Union in 2021. Furthermore, between 2010 and 2020 the record for the hottest year was beaten eight times (European Commission, 2021). As the climate and our understanding of it is changing we are becoming increasingly aware of climate change consequences. Inadequate planning to address this issue has a detrimental impact on human health and socioeconomic well-being, of which the devastating impacts of the recent COVID-19 epidemic serve as a harsh reminder (Wolf et al. 2021). Climate adaptation towards the unpreventable outcomes should be in place since people, planet, and prosperity are susceptible to climate change.

De Roo et al. indicated that current global climate action falls short of what is required to achieve the long-term goals defined in the Paris Agreement and the 2030 Agenda for Sustainable Development (De Roo et al. 2021). Subsequently, climate change generates accumulating problems with temperatures rising at an alarming rate in recent years with projections of further increase (Peters, Jordan, and Tosun 2017). According to conservative lower bound calculations, exposing today's EU economy to global warming of 3 °C over pre-industrial levels would cost at least 170 billion euros (1.36% of EU Gross Domestic Product, GDP) per year (European Commission 2021). It should be mentioned that economic prosperity is but one expression of general welfare affected by lack of climate adaptation. Moreover, losses are dispersed unevenly, causing harm to places that may already be struggling with issues such as housing shortage, high unemployment or a low happiness level. Besides, the already wide climate adaptation gap is evermore increasing, stressing the necessity for a swifter bridging of this gap. The European Environment Agency (EEA) highlighted this matter frequently in assessment reports on adaptation (Wolf et al. 2021).

Climate adaptation is a problem in the EU that requires more attention, especially due to deep-rooted consequences of not acting swiftly. Gaining a better understanding of gaps present in climate adaptation policy would facilitate the process of adequate adaptation.

Urban water and urban water management are two important concepts within this research and thus will be briefly stated here. Urban water is understood as water contained within the hydrological cycle within an urban environment, including water supply, wastewater management, waterway health, flood management, and protection of urban amenity. This also encompasses water contained in built infrastructure, such as water supply, drainage and sewage systems, as well as natural systems (Aboelnga et al. 2019). Urban water management takes into consideration the total water cycle, facilitates the integration of water factors in the planning process, and encourages all levels of government and industry to adopt water management and urban planning practices that benefit the community, the economy and the environment (Aboelnga et al. 2019). It should be mentioned that neither urban water nor management of it refers to the classic idea of only getting rid of water via sewages and is thus much broader than commonly assumed. Future projections reflect periods where lack of water – e.g. drought or heat stress – could pose as much a problem as having too much water – e.g. flooding or salinization –(IPCC, 2022).

Urban water management is an essential part of effective climate adaptation. Specifically because the consequences of climate change primarily manifest themselves in changes in the water cycle such as in extreme events of droughts and floods. Additionally, more gradual, yet significant, effects on water availability, quality and water-related ecosystems arise as well (Özerol et al. 2020). It follows that adaptation towards water-related climate impacts sets out a core challenge for activities related towards the immediate water-sector as well as interrelated sectors.

This paper investigates the relation between EU policy on sustainable and climate-resilient urban water management and local level urban water management of the midsized city of Leeuwarden. This research occupies the niche of comparing city policy and EU policy on urban water management qualitatively, with the city of Leeuwarden being the city of interest. In addition, further practical relevance is found in the need for constant evaluation of climate adaptation policies both on the local scale in Leeuwarden as with the assessment of top-down policies of the EU, in this case by contributing to the field of urban water management. The city of Leeuwarden is situated in the Northern part of the Netherlands, in the province of Fryslân. Leeuwarden is situated in a unique geographical 'bathtub' – with high edges and low centre – setting, making urban water management more urgent than in other cities (Swart et al. 2014). Consequently, making it relevant as 'pilot' area when such urgency will be present in other areas, either transboundary or at the national level. As an example of how the urgency of water management is felt, this provincial capital developed itself to the Capital of Water Technology of Europe in 2018 (Ebbekink and Lagendijk 2017a). Leeuwarden, with its resourcefulness in water technology and unique geographical situation provides, beneficial conditions for further knowledge development in the urban water governance field.

Prior research in the field has been conducted regarding urban water management and climate change adaptation in several midsized cities in the North Sea Region (Özerol et al. 2020). In addition, research regarding climate-proof spatial planning and water management has been studied in local and regional projects in the Netherlands (Swart et al. 2014). Nevertheless, Leeuwarden has not been the sole subject to urban water management policy research in the past, despite being a city with formulated ambitions, short term concerns, and interesting conditions.

At the European level increased knowledge of urban water management of the local level is of importance as well. The European Commission stated that the local level is the bedrock of adaptation and supporting efforts to increase local resilience shall continuously be made (European Commission 2021b). Sustainable and climate-resilient water management policies need to be in place to effectively safeguard a stable foundation for economic sectors, ecosystems and broader society. Therefore, it is essential for achieving the 2030 agenda's Sustainable Development Goals (SDGs) with SDG 2, 6, 13 and 15 specifically (Jaramillo and Nazemi 2018; Picketts 2018). Efforts aimed at establishing climate-resilient water management can be further strengthened by means of policy, knowledge generation, capacity development, research and innovation. Implementation of efforts, involves coordinated action on all political levels, ranging from local, regional, and national to international (Aguiar et al. 2018). There is significance in appropriate knowledge of urban water management informed by the local level in order to uphold affiliated sectors, ecosystems and society, this is exactly where this research strives to contribute. There is significant benefit in sharing of knowledge and experience and alignment of policy and strategy between local and EU level parties. Besides, such alignment works bottom-up and top-down where both parties – ultimately multi-level and cross-scale overall – can benefit from increased alignment. Within this research possible points of improvement in alignment between the two levels are explored, since a mismatch is detrimental for people, planet, and prosperity, especially since building on weak bedrock is unsustainable (European Commission 2021b).

Having now discussed the background, essence, and applicability of the topic, more information on the specifics of this research will be elucidated. The central question posed by this investigation is: "To what extent are current aspirations and actions regarding urban water management in Leeuwarden aligned with EU guidelines as laid out in the EU Adaptation Strategy on local urban water management and other associated documents?".

In order to fully understand and answer the central question several sub-questions ought to be addressed, namely: 1) What are the current aspirations and actions of the Municipality of Leeuwarden and the EU? 2) What is the relation between the two actors? 3) Does Leeuwarden optimally utilize EU guidelines and related funds? 4) To what extent do the focus areas of the Municipality of Leeuwarden and EU align?

Qualitative research has been conducted to address the aforementioned questions adequately by means of literature study, documental analysis and stakeholder interviews. The adopted overarching theoretical umbrella is 'rational choice institutionalism' which are discussed more in-depth in the 'Theoretical approach' section. Policy documents are discussed at the local, regional, national and international level with the research emphasis on how the local and international level align. Furthermore, the stakeholder interviews concern four interviews with people in a relevant knowledge position. The interviewees were chosen based on representation in the triple helix model of innovation. This model implemented in the research includes business, academics, and governmental parties. Each of these parties is represented by at least one interviewee in this research.

In order to contextualize the results some limitations of the study should be discussed. Firstly, this research only addresses the urban area of the city of Leeuwarden and not towns within the municipality of Leeuwarden. Secondly, complete generalizability might be complex due to differentiating considerations and preferences bound to different cities. Further elaboration of limitations will be discussed in the limitations section of this paper.

In the next section the methodology is laid out, after which the main body – i.e. literature review, documental analysis, results – will be initiated. Subsequently, a discussion- and conclusion section will be presented, in the latter section limitations and opportunities are discussed.

3 Methodology

The prerequisites for the research process are explained in this methodology section by going over methods, Validity & Reliability, instruments and inclusion criteria.

3.1 Comparative method

This paper utilizes *mixed methods* to evaluate the comparative aspects of the research question. The first approach is a thorough *systematic literature review & documental analysis* in which relevant literature is analysed regarding 1) EU policy and -law on – local – urban water management, 2) local Leeuwarden policy and 3) pragmatic maps on water flow and storage. This approach relates to the formal aspects which this paper explores. Informal patterns of behaviour are studied with the application of two qualitative methods. *Key informant interviews* were conducted individually with four urban water management experts, both at local- and European level. Furthermore, *exploration of informal documentation* such as minutes of meetings and other forms of reports has been carried out.

3.2 *Unit of analysis*

The objects of study in this research are the urban water storage actions and documented aspirations in the municipality of Leeuwarden, with reference to involved parties and related governments in Fryslân, e.g. Wetterskip or Rijkswaterstaat. Within the municipality of Leeuwarden the prominent urban environment consists of the city of Leeuwarden itself. Correspondingly, this study focusses on the city of Leeuwarden primarily and takes the several small villages within the municipality into account where relevant.

3.3 *Level of analysis*

The scope for the analysis is *Macro level policymaking*, throughout which this paper compares 'EU policy and -law on – local – urban water management and documented aspirations, -policy and -law within Leeuwarden on urban water management'. Current practices such as ongoing projects and – possible future – dedicated functions are caught under the umbrella of documented aspirations. Regarding policy on both levels, budget allocation and spending patterns are studied.

3.4 Validity & Reliability

Through accurate documentation of resources and transcription of the interviews, valid results are ensured. Furthermore, the transcribed interviews are thematically analysed based on the key themes identified in the documental analysis. This involves analysing all the data prior to identifying and reviewing these key themes. These themes were examined in order to gain a sense of the possible informal processes tied towards these themes.

In addition, since the topic is bound to specific locational conditions, the reliability can mostly be only ensured under these specific conditions. Translation of observed correlations and causations cannot be guaranteed to other contexts due to this locational nature. Nevertheless, on a case-by-case basis such relations can be further explored in other research, presumably in comparable contexts of that of Leeuwarden. Moreover, this method provides an in-depth understanding of the situation in Leeuwarden under the scope of EU guidelines. The methods, respective instruments and -scale have all been selected within the boundaries of the resource- and time allocation of a B.Sc. thesis paper.

3.5 Instruments

The acquired literature has been obtained by consultation of several online databases by reference to the keywords – and combinations – such as urban water management, climate adaptation, EU Adaptation Strategy, climate governance, water storage policy, sewage regulation, urban drainage, urban heat island, drought, urban catchments, North Sea Region, The Netherlands Deltaplan, spatial adaptation, Leeuwarden ruimtelijke adaptatie. The utilized databases were Worldcat, CORE, Mendeley, Smartcat and ResearchGate. These are each renowned databases of a notable scale. Applied key-words can be found in the abstract section of this paper.

Published policy information has been extracted from governmental open-source publishing points, hence no confidential information is included in the literature review. In addition, to further safeguard confidentiality, proper measures have been taken regarding the qualitative interviews. A form of consent has been shared with- and signed by the interviewees and the responses given in the interviews have been anonymized. The form of consent can be found in the appendix. In addition, the applied interview guide to semi-structure the interviews can be found in the appendix as well.

The underlying table provides a general overview of which method and data is related to each respective sub question. Consequently, the main question can be addressed properly by accumulating all this information.

	Sub-question	*Method*	*Data*
1	What are the current aspirations and actions of the Municipality of Leeuwarden and the EU?	Documental analysis	Leeuwarden- and EU- policy documents
2	What is the relation between the two actors?	Key informant interviews & Documental Analysis	Published data from expertise groups, Leeuwarden- & EU policy documentation, transcripts of interviews
3	Does Leeuwarden optimally utilize EU guidelines and related funds?	Key informant interviews & Documental Analysis	Leeuwarden- & EU policy documentation, transcripts of interviews
4	To what extent do the focus areas of the Municipality of Leeuwarden and EU align?	Documental analysis	Leeuwarden- and EU- policy documents

Table 1: Sub-question with respective method and data.

3.5 Inclusion Criteria

The interviewees were selected based on relevant knowledge position within the field of urban water management within the earlier introduced triple helix model. Per field – academics and governmental – at least one participant was interviewed. Multiple participants were selected based on their involvement and/or knowledge of urban water policy in the city of Leeuwarden, correspondingly being connected to the governmental field. The interviewee involved in academics has their expertise in adaptation governance with a good understanding of political science in general. Business was studied by way of involving an interviewee who is heavily involved in business networks of water technology and innovation in a multi-level and broad horizontal context. Before the execution of the interviews a signed consent form was required. All these interviewees are key actors within their respective fields, with involvement in Leeuwarden and knowledge of European influences.

4 Literature review

In the following section the theoretical approach which informs my analysis is laid out, which is a prerequisite towards answering the research question.

4.1 Theoretical approach

Rational Choice Institutionalism (RCI) has been adopted as the theoretical approach in this paper. RCI is a derivative of *Institutionalism*, in which the latter primarily focuses on structure and dynamics of governing institutions (McCormick, Hague, and Harrop 2019). Within this research an institution is understood as a structure that processes information and it is adopted that public sector institutions depend strongly on their capacity to gather, process and disseminate information (Jones and Baumgartner 2012). Additionally, RCI considers individuals under the assumption of rational choice through seeking to maximize our own interests given certain goals and strategies (Geddes 2003). Within the context of the paper – and under RCI – both formal and informal processes were studied. The main emphasis of this study lies on the formal procedures found in policy, informal patterns of behaviour serve an instrumental function in comprehension of procedural effects. In addition, these informal patterns are mainly observed in close relation towards the municipality of Leeuwarden and other local involved institutions, since these are accessibly observable.

Institutions are crucial for processing responses to pressures exerted by the environment (Gerlak et al. 2018; Ostrom and Basurto 2011). Additionally, RCI provides usefulness as an analytical tool for policy analysis and for the ‘new economics of organization’ effectively (de Nardis 2020). Peters, B. et al. employs RCI to evaluate different public policy responses to climate change and stresses that RCI provides the clearest expectation that proportionate policy responses are unlikely, stressing a behavioural influence (Peters, Jordan, and Tosun 2017).

Furthermore, the concept of studying processes which are first defined and consolidated in the EU policy process – respectfully Europeanization – largely relies on new institutionalism, RCI prominently (Drahn 2020). Generally, institutionalism has long been a central theme in political science in general, and comparative politics in particular (McCormick, Hague, and Harrop 2019). Briefly, previous literature reflects successful application of RCI in the policy analysis of fields such as climate change, -Europeanization and policy analysis in general. These points render RCI justifiably applicable towards this policy analysis research due to the involvement of the governing institutions Leeuwarden and respectively Europe and climate related theme. Moreover, this paper seeks to give informal processes a role in this research which is structurally included in RCI as well. To conclude, RCI suits the scope of this research through evidence in previous application and consideration of the concept of formal and informal processes, as examined in this research.

The *agency theory* is entwined with the theoretical approach of choice. This theory refers to the interaction between principals and agents and the interests of both parties separately. Incentives play a significant role in this theory since they serve as predictors of performed behaviour for the principals and agents. Wrongful incentives – for example asymmetric information in urban water policy – can generate difficulties acquiring optimal efficiency as principals and agents act within their own interest (Grossman and Hart 1992). The agency theory is applicable towards the practical relevance of this paper through highlighting the importance of informed incentives between policy on different levels.

In addition, RCI is highly entwined with the notion of *bounded rationality*. This refers to the idea that actors will attempt to find an optimal resolution within the confines of institutions situation when maximization of utility is impossible (Drahn 2020).

This reflects the conditions in which policymakers – or people in general – seek to find optimal solution for problems. Effectively, this draws attention to the set structure found throughout the different policy levels.

4.2 Climate resilience in the urban area

Severe weather events create an overwhelming pressure on the quality and quantity of water resources in the urban area of most European countries (Chesterfield et al. 2016; Quesnel, Ajami, and Wyss 2017). For instance, fluctuating groundwater levels can generate detrimental effects for buildings and ecosystems, whereas heatwaves and associated droughts can possibly imperil the quality of urban water (Quante and Colijin 2016). Besides, the growing population in the urban area increases pressure on water resources. In addition, urban areas are main spots of consumption and pollution of water globally and particularly in Europe (Boretti and Rosa 2019; Quesnel, Ajami, and Wyss 2017). The urban area is extremely dire towards climate change with Leeuwarden being no exception, the next section will elaborate on Leeuwarden its unique geographical situation.

4.3 Geographical situation of Leeuwarden

As laid out in the previous section, an urban environment puts pressure on water management. In order to grasp the assumptions of urban water policy in Leeuwarden, this section will lay out the background of the geographical situation. Fryslân – where Leeuwarden is situated – is a province which lies largely below sea level, rendering it no exception in The Netherlands. Additionally, the land is sinking due to both subsidence and contraction of the water. The large system of canals and lakes in place are still able to drain the water appropriately. Nevertheless, especially with westerly winds, the sea levels can rise to levels impossible to discharge.

The province of Fryslân consists of a variety of soil types, with each soil type in the landscape having their own vulnerabilities to more extreme weather (Rijkswaterstaat, Landelijk Informatiesysteem Water en Overstromingen). The Wadden Sea area consists of clay soil and is vulnerable to salinization, meaning seawater intrusion in drinking water, which is harmful to greenery as well (Mol and Keesstra 2012). Comparatively, the south-east part comprises sandy soils stretching all the way to Leeuwarden, which is particularly susceptible towards subsidence (Friese Klimaatatlas, 2022). Subsequently, the city of Leeuwarden locates itself in a geographical bathtub between these location elevations in the hinterland and the sea. The dykes protect Fryslân from incoming water and pose as the edges of the bathtub (Fries Bestuursakkoord Waterketen 2020). Consequently, if the edges get raised, the middle effectively gets lowered and becomes more vulnerable. This awareness provides the backdrop for raised concerns in Leeuwarden – especially on policy level – towards in-place urban water management.

5 Policy document analysis

As priorly mentioned in the methodology section, this paper derives a significant amount of input from policy documents in order to be able to compare the two levels of interest. This research considers a variety of policy documents and important instruments at different policy levels, as laid out in the following table:

International	National	Regional	Local
EU Adaptation Strategy (2021)	Deltaplan Ruimtelijke Adaptatie (2022)	Fries bestuursakkoord Water en Kwaliteit; Period: 2021-2025	Volhoudbaar (2018)
European Climate Law (2021)		Regional water programme of the province of Fryslân; Period: 2022-2027	Gemeentelijk Rioleringsplan; Period: 2019-2022
European Climate Pact (2020)		Climate stresstests	Municipal programme for climate adaptation; Period: 2021-2035
SDGs			Omgevingsvisie gemeente Leeuwarden (2021)

In order to get a complete overview of the relation between the local and international level – which are the levels of interest – all the levels located between the two are considered as well. This provides the clearest overview on how this relation translates throughout the several levels, in both ways. In the upcoming section the local documents will be discussed first, after which the subsequent policy level will be considered up until the international level.

5.1 Leeuwarden on Urban Water Management

The first focus point is on current relevant policy documents regarding aspirations and actions of climate adaptation in Leeuwarden. A participant of this study mentioned that climate adaptation emerged as a topic in The Netherlands around in 2015 and 2016. In Leeuwarden the foundation of climate adaptation policy was created in the programme ‘Volhoudbaar’ in 2018 by and for the municipality of Leeuwarden.

The aim of ‘Volhoudbaar’ is to ‘work together towards a more sustainable municipality’ through working on three themes. ‘Climate action’ – Sustainable Development Goal (SDG) 13 – is one of these main themes in ‘Volhoudbaar’ in addition towards ‘renewable energy’ and ‘responsible consumption’. The municipality states that to tackle these various adopted themes in an integrated manner, which will be discussed more thoroughly later under the ‘actions’ heading (Laws, Boersma, and Niehof 2018). In addition, the ambition stated in ‘Volhoudbaar’ regarding climate action is; “Leeuwarden is ready for periods of heat, more precipitation and more drought and is therefore climate adaptive”. This formulation found in ‘Volhoudbaar’ already lays out the themes which will later be observed in other policy documents of the municipality, namely themes of heat, drought and flood risk for climate adaptation.

In order to gain a better understanding of agreements made around urban water management, I will now discuss the ‘gemeentelijk water- en rioleringsplan (GRP)’ – which is the municipal water and sewage plan – of period 2019-2022 specifically. This edition of the GRP is the first version to clearly adopt climate adaptation in its contents. Within the GRP, increased extreme weather events are recognized with regard to limitations of current urban water management. The current sewage system of Leeuwarden is able to drain 20 millimetres of rain per hour, rendering any excessive precipitation to be handled differently. For example, if 60 millimetres rainfall occurs in one hour, there are 40 millimetres which can not be directly drained by the sewage system (Leusink and Horst 2022). Projections of increased precipitation are widely differentiating in numbers, however 100 till 150 millimetres is not unimaginable in the long run (Intergovernmental Panel on Climate Change (IPCC) 2022). The GRP 2019-2022 handles a 60 millimetres benchmark, which in itself is extraordinary rainfall according to current predictions (KNMI 2021).

Increasing amounts of more accurate projections of future weather scenarios are published by renowned institutes – e.g. IPCC, KNMI – and this research is assured that the upcoming GRP will be informed by this. The GRP and 'Volhoudbaar' served as important stepping stones towards the 'municipal programme for climate adaptation' period 2021-2035 of the municipality of Leeuwarden.

This 'municipal programme for climate adaptation' sets aspirations and actions in stone and creates a more detailed timeline for urban water management in the city of Leeuwarden. The programme distinguishes three threshold years when certain articulated goals have to be completed, the threshold years are 2025, 2030 and 2035 (Leusink et al. 2021). Additionally, these established targets were based on a climate adaptation risk assessment in the municipality where 28 informational area maps – so-called 'gebiedspaspoorten' – were created to map themes such as heat, drought and flood risk (Laws, Boersma, and Niehof 2018; Leusink et al. 2021). These themes can be linked back to the 'Volhoudbaar' programme. The 'municipal programme for climate adaptation' informs a vast part of the aspirations and actions in Leeuwarden, which is elaborated upon under the '*aspirations*' and '*actions*' headings later in this section.

The 'omgevingsvisie gemeente Leeuwarden' compliments the priorly discussed programme and GRP because it sets out a broader vision, yet adopts urban water management themes throughout. Furthermore, this document sets out a vision with a dynamic horizon to generate a long term vision of a climate adaptive city of Leeuwarden. The document stresses the importance of a green-blue structure in the city, referring to nature – green – and water – blue –. Furthermore, current green-blue structure should be recovered-, strengthened and extended where possible in order to safeguard a sustainable living environment.

This environment should serve humans, animals and plants in order to create a stimulating environment for biodiversity, healthy living and climate adaptation (Gemeente Leeuwarden 2021b). To conclude, the ‘omgevingsvisie gemeente Leeuwarden’ introduces the idea of climate adaptation in terms of a green-blue environment for urban Leeuwarden.

Now that most important local policy documents have now been discussed, regional policy arrangements will be addressed. The ‘Fries bestuursakkoord water en klimaat (FBWK 3)’ is a regional collective decision in water and climate in the region. The FBWK 3 was published in 2020 and was set up by the ‘provinciaal bestuurlijk over water (PBOW)’ in order to address the themes of climate adaptation and consciousness surrounding water usage in the province of Fryslân. The FBWK adopts the climate adaptation goals as set out in the national programme ‘Deltaplan Ruimtelijke Adaptatie (DPRA)’, which will be discussed later. The goals are all formulated around the target year of 2050, whereas the municipality of Leeuwarden has its targets formulated around 2035. In addition, an integral approach is stressed, which was observed in ‘Volhoudbaar’ and the ‘municipal programme for climate adaptation’ as well (Fries Bestuursakkoord Waterketen 2020). It should be noted that prior versions of the FBWK 3 exists, consequently ‘Volhoudbaar’ is presumably informed by a prior version. Furthermore, the DPRA sets out three main ideas for climate adaptation. Firstly, there is importance in gathering information, with with special attention to stress tests, to make informed decisions. Secondly, there should be a desire to carry out climate action by including climate adaptation in strategies, ambitions, policy, plans and law. Local governments are encouraged to formulate their ambitions surrounding stress tests, conducted risk dialogues and the ‘Frisian Climate Adaptation Strategy’. The latter consists of the ambitions set out in the FBWK 3 with information suited towards policymakers on the local level. Finally, there exists the carrying out phase of urgent matters for climate adaptation.

Within the group of the FBWK 3 there are indicated developments towards a ‘regional programme for climate adaptation’. Additionally, it is indicated that coordinated communication within the region is of interest to develop to create and stimulate bottom-up initiatives (Fries Bestuursakkoord Waterketen 2020). Within this FBWK 3 some reoccurring themes of earlier discussed local policy documents are observed, and interesting developments are mentioned.

In order to gain a full understanding of the regional policy, the regional policy document ‘Regional water programme (RWP)’ of the province of Fryslân will be considered. The RWP was constructed in 2021 and concerns the period 2022 till 2027. The existence of this programme is required by law in article 3.8 of the Dutch ‘omgevingswet’. This law demands provinces to have delivered a regional water programme and enters into force on the first of July 2022, which the province of Fryslân already delivered upon (Ministerie van Infrastructuur en Milieu 2018). Furthermore, the RWP sets the boundaries for regional water authorities and local municipalities for regional water management and climate adaptation. In addition, the RWP references European guidelines as laid out in the ‘Water Framework Directive’ – quality of water –, ‘Habitat Directive’ – green preservation – and ‘Flood-risk management directive’ – river basins and coastal regions – in addition to a few smaller directives. These directives are similarly covered in the EU Adaption Strategy, nevertheless the EU Adaptation Strategy is not explicitly mentioned in the RWP. In addition, the RWP dedicates a chapter to climate adaptation, with formulated ambitions of achieving optimal climate- and water resilience by the target year of 2050. Climate adaptation is entwined throughout subsequent chapters and gets addressed for the rural areas mostly, with occasional guidelines for water-resilient construction. New living areas are for example not preferred to be built in areas susceptible to subsidence such as peat soil, and should be aimed for land at the highest suitable altitude or other options such as floating residences (Provinsje Fryslân 2021).

Moreover, within this context, heat stress and a green-blue environment get mentioned in a small section. In general, the RWP is more concerned with flooding threats and salinization, which is understandable given the province's priorly described geographic location. Urban water management is touched upon in the RWP, however it is by no means a key focus.

Having discussed the most important local and regional documents, the national level will be concentrated on. The Dutch governmental climate adaptation programme 'Deltaplan Ruimtelijke Adaptatie (DPRA)' is mentioned in a significant part of the aforementioned policy documents, hence I will discuss it here. The DPRA was introduced in 2018, and has since received annual updates till this date. This nationwide plan concerns spatial adaptation to limit waterlogging, heat stress, drought and the consequences of flooding in the Netherlands. The intention of this plan is for the Netherlands to be climate-proof and water-robust by 2050 (Ministerie van Infrastructuur en Milieu 2022). The DPRA is structured according to seven ambitions, which can be observed in figure 1. The sustainability programme 'Volhoudbaar' structures its several ambitions in accordance with this national plan in addressing its three overarching themes. Furthermore, the regional stress tests were conducted in line with the vision of the DPRA (Laws, Boersma, and Niehof 2018). The DPRA mentions the climate stress tests to be conducted focussed on the themes of water logging, heat stress, drought, and flooding in a standardized format (Ministerie van Infrastructuur en Milieu 2018). It is noticeable that the tests for drought in Leeuwarden provided less concrete targets in comparison with the other focus areas.

Figure 1: 7 Ambitions to make The Netherlands water-robust and climate-proof (Ministerie van Infrastructuur en Milieu 2018).

In addition, the DRPA calls for the creation of a regional programmes for climate adaptation, as I discussed earlier regarding the RWP. In addition, the DRPA offers a variety of instruments and knowledge sharing initiatives within the seven themes. To summarize, the DPRA lies at the heart of climate adaptation policy in The Netherlands today and introduced principles observed in policy at multiple levels throughout the country.

5.1.1 *Aspirations*

Having discussed the most important documents for urban water management in The Netherlands, the next section will go more in-depth with the aspirations for the city of Leeuwarden. These aspirations are informed by the policy documents and the interviews. Aspirations within this research are understood as articulated goals which affirm identities and values, and structures action at all levels of social life (Finnemore and Jurkovich 2020). In this paper, special attention is paid towards aspirations which are adopted in official governmental documents. The end goal aspirations on the local level in Leeuwarden are set out to be completed in 2035, concerning water storage, heat stress and drought (Gemeente Leeuwarden 2018). The overarching target is to address the identified bottlenecks, and with that not creating additional problems, i.e. avoiding maladaptation. The three themes of urban water management, heat stress, and drought will subsequently be discussed per paragraph.

Aspirations surrounding urban water storage are set out in the following manner. The first aspiration regarding urban water storage is that an area of 65.000m^3 urban water storage has to be realized in the vicinity of bottleneck areas, this is 1% of the total urban area of the municipality of Leeuwarden. The bottleneck areas were determined based off the stress tests (Gemeente Leeuwarden 2021a). Additionally, the GRP provides concrete conditions for creating a climate adaptive physical living environment in 2035.

It should be noticed that the current GRP has been formulated along the then most recent projections of precipitation in the face of climate change when it was enforced in 2019. Regarding flooding and water-related issues, several conditions have been set out. One condition being that a rainstorm of 60 millimetres in one hour must not lead to water entering buildings, water in the streets and/or gardens is permitted (Leusink and Horst 2022). Such heavy rainfall is extremely rare and is estimated to only occur once every century according to current predictions (KNMI 2021). Structures that serve as housing are favoured to keep water out more than buildings that have a non-housing role, according to an interviewee. Furthermore, for urban water management the hold-store-drain principle is applied (Leusink et al. 2021; Leusink and Horst 2022). 'Holding' refers to keeping water in the soils where it is able to infiltrate. Sandy soil is suitable for holding water, yet is rare in Leeuwarden. Clay and peatland are very common in Leeuwarden, however not very suitable for holding water (Mol and Keesstra 2012). Storing water refers to locations on the surface, which the municipality of Leeuwarden logically chose to do at locations where this water inflicts minimal harm. Surface water is the first option and identified roads, parking area, parks, and green areas have been appointed and designed to temporary store water when necessary. Ultimately, if water holding and/or storing the water is not possible, water should be drained by guiding water to areas where water can flow out of the city (Leusink and Horst 2022). The current GRP will no longer be in force after this year and with that provide opportunities for urban water management in the newer and updated version for the upcoming period. Moreover, an interviewee stated that in 2023 'rainwater regulation (hemelwaterverordening)' will be enforced through the 'Environment and Planning Act (omgevingswet)' and adopted in the 'Local Strategy on Spatial Planning and the Environment (omgevingsvisie)'. Additionally, this rainwater regulation will apply climate adaptations measures to housing associations and new construction-from-demolition.

Another participant sees limitations to this rainwater regulation because it has only a minor impact on transformative building, such that business parks remain grey if the site-infrastructure is not drastically altered. I.e. rainwater regulation is hardly applicable if the building already existed and the area of the lot does not change tremendously. The city of Eindhoven addresses this problem through the creation of a 'umbrella destination plan (Paraplubestemmingsplan)', which applies complimentary as an umbrella over other destination plans. This plans anchors water storage in law, which enables a powerful governmental instrument for inquiries of water storage in the urban area (Gemeenteraad Eindhoven 2022). It follows that urban water storage is still a dynamic theme in Leeuwarden with plenty of opportunities on the horizon.

Within the vicinity of the second theme, heat stress, 10% more shadow is aspired to be created in big urban areas, which is approximately 25% of the cities heat stress bottlenecks – such as local schoolyards – as identified in the informational area maps (Gemeente Leeuwarden 2021a). It should be noted that 'Volhoudbaar' mentions the 10% shadow creation to be accomplished by 2025, which has been changed to 2035 in later documentation such as the GRP and the municipal programme for climate adaptation. Heat stress is predominantly tackled by creation of shadow areas through planting trees, in order to deliver enhance the green-blue urban area in Leeuwarden.

The final theme is that of drought, extensive research of the consequences of drought in the urban area conducted in 2021 should form the basis to address drought more precisely (Laws, Boersma, and Niehof 2018). This relatively unexplored theme lacks more clear formulation in comparison with the other themes, despite it being emphasized upon in the DPRA. Drought predominantly manifest its effects in damage to green areas, infrastructure and residences, which became apparent from the interviews. Moreover, damage to green areas are hard to put into concrete terms, and in turn to create aspirations for.

An online climate damage estimator estimated a tremendous 600 million euros of damage to drought in the period up to 2035, as indicated by an interviewee. This is an estimation made on a shallow basis of information, hence further research was requested. The most recent research was conducted with 200 measuring devices throughout Leeuwarden, and indicate damage so insignificant that adaptation for this theme is unwarranted, even on the long run. Whereas, the contrast between the two estimations raise some questions, the latter estimation is made based on more detailed information. Drought is still a theme which appears to be lacking in concreteness due to its hard-to-estimate nature.

5.1.2 *Actions*

More concrete steps to achieve the aspirations reflected in the previous paragraph are formulated in concrete actions which are already in process or are planned. The actions phases are distinguished by three threshold years and three respective periods. These will be discussed chronologically.

The actions which are closest to the upcoming threshold year of 2025 are categorized are period 2021-2025. These actions are formulated to address waterlogging in a variety of locations. Four areas in the inner urban area of the city will become more green and contain roads which can store water. Furthermore, in collaboration with primary school Oldenije in St. Antonystraat a schoolyard will be designed and made more flood resistant. In addition, three business parks – Hemrik, Zwette and Stiens – are collaborating in workgroups to generate more green areas and increase biodiversity. Moreover, the area of the new- and old stadium and surrounding of the local football club Cambuur will be made climate adaptive (Leusink et al. 2021).

Additionally, events such as BOSK – trees being moved throughout the city –, ‘steenbreek’ – replacing grey areas with green on the individual level –, and pilots with self-organised green on street level are all ongoing events which stimulate social engagement with- and climate adaptation itself (Gemeente Leeuwarden 2021a). The threshold year which we are currently in addresses the first bottlenecks and incorporates a social aspect in its approach.

The next five years mark the second and intermediate period, beginning in 2026 and ending in 2030. Several bottlenecks are planned to be addressed, 29 in regard to waterlogging and 27 related to heat stress. These selected bottlenecks are mainly located within the neighbourhoods ‘Bilgaard’ and ‘Rengerspark’. In addition, another overarching aim is to extend addressing waterlogging at schoolyards as in the prior period, in addition to including healthcare institutions as well. Actions regarding drought are still to be determined by outcomes of unfinished – or to be conducted– research (Leusink et al. 2021). The second threshold already poses a limitation which has been indicated by an interviewee as well. Despite that a planning has been made, there are still a lot of uncertainties and situations to be flexible towards, such as actions of other parties or climate change. Budget allocation and promises are still required to be politically justifiable, since they require resource allocation and reservation. Additionally, such resource allocation pose a trade-off with current issues such as the housing shortage, especially when it concerns millions of euros.

The following period in run-up to final threshold year 2035 is 2031-2035. This area poses more of a grey area in terms of actions. A concrete action is that the municipality wants to address water resilience of the Harlingerstraatweg, which is a long road which connects the ring road of the city to the outer east side. Furthermore, the latest plans mentioned in the municipal programme for climate adaptation for this period address 28 bottlenecks for waterlogging, 20 bottlenecks for heat stress (Leusink et al. 2021).

Similarly to prior period, drought is still planned to be formulated more precisely on the basis of yet to be published research. All the actions in this period are not set in stone thus far and reflect the need for flexibility, as stated in the previous paragraph.

5.3 European Union on Local Urban Water Management

Now that the local level and all subsequent levels up to and including the international level have been discussed, the focus is on the most important policy documents of the international level. The EU formulated their long term vision on climate adaptation to climate change in the EU strategy on adaptation in February 2021. The prominent long-term goal is that in 2050 the EU will be a fully adapted climate-resilient society in regard to the unavoidable impacts of climate change. Furthermore, adaptive capacity is aspired to be reinforced, and vulnerability to climate impacts should be increased, in accordance with the Paris Agreement and the European Climate Law (European Commission 2021b). Multiple policy documents reflect this long-term goal, first the most prominent document will be discussed.

5.3.1 EU Adaptation Strategy

The EU Adaptation Strategy sets out the following four principles; 1) Smarter adaptation; 2) Swifter adaptation; 3) Stepping up of international action on adaptation to climate change; and 4) More systematic adaptation. To begin with, smarter adaptation refers to gathering- and using data more efficiently in order to boost the frontier of knowledge on adaptation. Climate-ADAPT serves as the European platform regarding adaptation expertise and substantiates this ‘smart’ principle. Secondly, this ‘faster’ principle stresses the urgency of climate adaptation in the face of already present consequences. Thirdly, international action for climate resilience is aimed to be scaled up by means of international finance through engagement and exchanges on a global level.

The final principle states that a more systematic adaptation is required, since impacts address all levels of society and across all segments of the economy. To realize this, the Commission will provide support for the progression of development and implantation of adaption plans and strategies at all level of governance. In addition, amongst the governmental levels, three cross-cutting priorities have been distinguished. The first being to integrate adaptation into macro-fiscal policy, followed by implementing nature based solutions for adaptation. The third prioritization focusses on enhancing local adaptation action, which is where this research situates itself.

Member states are recognized as the primary implementation partners in the strategy, with the EU stepping in for more ambitious and proactive action to satisfy adaptation demands (European Commission 2018). It is recognized that the EU adaptation strategies sets out a solid foundation, it should be further developed by the national, regional, and local level.

The Commission offers support to create administrative capacity in Member States for implementation through provision of the Technical Support Instrument (TSI). The TSI is part of the Multiannual Financial Framework (MFF) 2021-2027 and serves as an instrument to provide technical support to bring about technical reform in EU Member States (European Commission 2021b).

The need for more EU-level support is substantiated by complementary impact assessments by the EU released in official publications. Furthermore, the Commission will work closely together with Member States to work on the implementation of the strategy through alignment of international and EU adaptation action. Regional and local-levels are stated to be benefitting from this aligned vision, and thus stimulated to contribute. Moreover, the local level is even indicated as the bedrock of adaptation and the EU accordingly takes responsibility for proving support to provide local resilience.

Support in terms of finances is becoming increasingly available through the ‘European Structural and Investment Funds’, the ‘Common Agricultural Policy’, the ‘LIFE Programme’ and the ‘Recovery and Resilience Facility’. In addition, the Commission takes responsibility to enact upon the principle of ‘Smarter adaptation’ by building upon existing initiatives such as ‘EIP-SCC Marketplace’, the ‘Digital Europe Programme’, ‘Horizon Europe’ and the ‘Intelligent Cities Challenge’. Relevant initiatives regarding financing and knowledge-sharing will be elaborated upon under the ‘Usage of EU guidelines and -funds’ heading. Additionally, the EU- and Global Covenant of Mayors will be strengthened to assist local and regional authorities to move from planning to action. The Covenant of Mayors originates from 2008 and consists of a vested network of thousands of local governments voluntarily committed to implementing EU climate and energy objectives, Leeuwarden is part of this initiative (European Commission 2018; Laws, Boersma, and Niehof 2018). Furthermore, this initiative is innovative in being a bottom-up approach to energy and climate action. The Global Covenant of Mayors will provide direct technical assistance for developing and implementing adaptation strategies and plans. Additionally, the EU will stimulate further involvement of regional bodies in adaptation setting through the Urban Agenda for the EU and the involvement of the Regions representatives as part of the EU Covenant of Mayors. The EU provides a variety of tools and support for climate adaptation aimed at the local level, even actively initiating bottom-up approaches (Aguiar et al. 2018).

Furthermore, citizens will play a key role in the success of the adaptation strategy as recognized in the ‘European Climate Pact’ and the ‘Education for Climate Coalitions’, which empowers citizens accordingly. The Education for Climate Coalitions consists of a participatory community for stakeholders and initiates of the educational sector to work collectively on innovative education solutions for environmental sustainability.

The European Climate Pact creates a platform for individuals from all walks of life to interact and work together on big and small climate solutions. The Pact emphasizes raising awareness and encourages climate action. These initiatives consider social consideration, which can be observed in all levels of policy.

The European Climate Law sets an integrated framework in order to achieve climate neutrality and ambitions on adaption – as set out in the adaptation strategy – by 2050. This law provides the EU law foundation for ambition and policy coherence in relation to adaptation, e.g. SDG 13 and Article 7 of the Paris Agreement. The European Climate law commits the EU and its Member States to making continuing progress in improving adaptive capacity, strengthening resilience, and reducing climate change vulnerability. The EU Adaptation Strategy paves the road and offers options to help this development become a reality. Because adaptation policy is systemic, it was implemented in tandem with other European Green Deal initiatives such as the Biodiversity Strategy, Renovation Wave, Farm to Fork Strategy, the Circular Economy and Zero Pollution Action Plans, Forest Strategy, Soil Strategy, Smart and Sustainable Mobility Strategy, and Renewed Sustainable Finance Strategy, all of which will came into force in 2021 (European Commission 2021a). To conclude, the European Climate Law provides the legal foundation for the implementation of the Eu Adaptation Strategy.

6 Stakeholders & relations

With an established overview of the actions and aspirations throughout the policy levels and -documents, I will delve into the stakeholders and relations at all levels in order to appropriately assess the policy relation between Leeuwarden and the European Union in the successive section.

The municipality of Leeuwarden is regarded – by an interviewee – as the convener of stakeholders of business, social and academic, which united should serve as co-creators. Business is not directly linked towards urban water management, and serves as an audience, as indicated by another interviewee. Urban water management is indicated by an interviewee to be entwined predominantly with utility businesses, e.g. companies handling drinking water, waste water and sewage management. Furthermore, urban water management is less entwined with business due to urban water management not yielding any short-term profit, accordingly a more long term vision is required. Additionally, another interviewee indicates that the water-business sector in Leeuwarden has a good clout in the community and labour market. Nevertheless, at the municipal level there is an indicated lack of personnel occupied with urban water management daily. In accordance with the interviewees, this research suggests that urban water management should be regarded as an overall investment in the quality of life, which provides a good signalling function for business and individuals in general. Subsequently, profits and goals of a sustainable nature are combined.

Academics, on the other hand, are increasingly linked with municipal urban water management efforts. Campus Fryslân, the university campus of Leeuwarden, already works on this subject in close relation with the municipality. This cross-sectoral collaboration relates closely to the Frisian concept of ‘mienskip’ often found in regional policy document, which refers to a collaborating society (Provinsje Fryslân 2021).

Overall, the conditions for collaboration between business, academics and government appear to be promising in Leeuwarden.

Leeuwarden works within the workgroup FBWK, which consists of the Frisian municipalities, Wetterskip Fryslân, drinking water company Vitens and the province, in order to ensure a sustainable Frisian water chain (Laws, Boersma, and Niehof 2018). This group is responsible for carrying out tasks on the themes of climate adaptation and conscious water use. The workgroup of the FBWK reports to the PBOW, and carries responsibility of reporting the developments of working region Fryslân to the Regional Administrative Consultation (RBO) of Water (Fries Bestuursakkoord Waterketen 2020). In turn, the RBO of the region informs the national Delta, who is closely entwined with the DPRA (Ministerie van Infrastructuur en Milieu 2018). Within this process between the aforementioned actors, mutual influence takes place in interactions, throughout the whole chain influence travels both ways. The following figure reflects this chain of information.

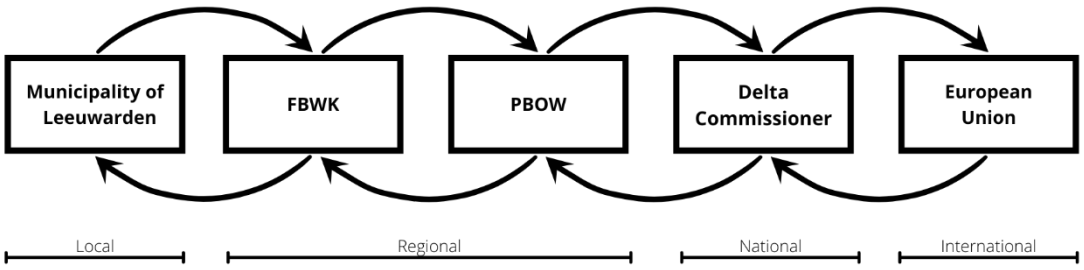

Figure 2: Simplified version of information traffic of urban water management policy, local to international.

7 The relation between Leeuwarden and the European Union

Since the levels within The Netherlands has been established in the previous section, the direct relation between Leeuwarden and the European Union will now be examined. This relation has been described by interviewees as Leeuwarden being a breeding grounds for innovation, both technical and policy-wise, for the European Union. The European Union acts as a quality manager and connector, by means of knowledge sharing and special incentive arrangements, and indirect arrangements such as the corona support fund. Hence, it is important to link all levels back towards the EU level. The priorly discussed Climate-ADAPT unites and provides findings regarding climate adaptation specifically, direct use in Leeuwarden of this programme is not indicated by the interviewees, however. Since, the platform is still broad in nature, more specific knowledge on local urban water management can benefit expertise in the EU. Correspondingly, usage of such platforms enforces the mutual influence between both levels. Subsequently, Europe can provide a better vision while taking into account the different contexts of countries, regions and local areas. Future expectations – by the interviewees – is for this relation to remain rather stable, while foreseeing more financial measures from Europe becoming available through increased budget allocation towards climate adaptation.

Because Leeuwarden is Europe's 'Capital of Water Technology', the urban water business is in an interesting position. In this area, the European market initiates a large number of initiatives, serving as an essential organisational and financial player (Ebbekink and Lagendijk 2017).

8 Usage of EU guidelines and -funds

This section provides insight into guidelines and funds, either stimulated directly or indirectly from the EU policy level, in order to provide insights on the relation between Leeuwarden and the EU.

Throughout the interviews, some connections with the EU level of guidelines and -funds were established. The northern municipalities have three people who actively lobby in Europe for northern interest, as identified by one of the interviewees. Consequently, the northern municipalities – with that Leeuwarden – are presumably well-informed about European knowledge and -subsidies. The 'LIFE Programme' and 'Horizon Europe' are the predominant connections with EU, with both these programmes contributing to the Climate ADAPT platform. The LIFE Programme stimulates the implementation, updating, and development of EU environmental and climate policies and laws. Furthermore, Horizon Europe is the EU's main research and innovation funding initiative. Whereas the LIFE Programme focusses on environmental ends more, Horizon Europe concerns a more general fund. Climate adaptation, despite being included, does not take a key position in either of the two initiatives. Nonetheless, the European Commission intends to increase resources and mobilize large-scale adaptation financing through bilateral channels and EU Member States (European Commission 2021b).

Fundings are observed within and between other levels of policy for climate adaptation as well. Approximately 15 million is allocated for the province of Fryslân for a coordinated regional approach for climate adaptation by the national government (Fries Bestuursakkoord Waterketen 2020; Provinsje Fryslân 2021). The main local income – approximately 30 million euros – for urban water management in Leeuwarden derives from annual municipal sewer tax paid by residents, which is formulated within the GRP.

Consequently, this comes with the limitation of spending only being applicable to cases directly linked with water (Leusink and Horst 2022). Consequently, measures countering heat stress – e.g. planting trees in urban areas – and forms of drought are drawn from general sources of income, such sources of income are susceptible to other problems which might be more urgent on the short run. As a consequence, measures linked to urban water management but not directly tied to water are hard to address financially. Especially in the absence of a long term vision, which secures budget allocation.

9 Alignment of focus areas Leeuwarden and the European Union

First, it should be stated that climate action is a difficult agenda item with the current geopolitical climate, despite its recognized importance. The overall systemic idea for adaptation is not fully present yet, especially the much required gain of momentum. There is a contradiction between short and medium-term economic interests and long-term political interests, which manifests itself in various degrees among regions and Member States. Nonetheless, as long as there is a political will to do so, climate adaptation will become a reality. Still, adaptation inhabits a social issue in which local support by inhabitants is essential. Social stratification poses a challenge for this and varies in intensity between the Member States as well (European Commission 2021b). Welfare states such as The Netherlands still have disadvantaged neighbourhoods, which might be represented less well than the advantaged neighbourhoods. Europe has a broader area of interests and stakeholders to cover, thus a bigger puzzle presents itself. Reality is that adaptation knows no borders, which we should regard as an opportunity for solutions rather than expansion of the problem. Hence, such an opportunity is that creative solutions can be found everywhere, throughout different climates and with different – levels of – resources. Adaptation can best be tested, or even already observed in settings – e.g. higher temperatures, and more extreme weather – which are predicted to occur (IPCC 2022). In terms of alignment, the international scope provides necessary challenges, yet yields access to more knowledge.

If we zoom in on Leeuwarden, such an opportunity presents itself. An interviewee mentions that ‘The Netherlands is reinventing the wheel’, unnecessarily, since we are adapting to climate which is already present in other countries, some of which even EU Member States. Lack of a more EU systemic approach is a notable frustration here.

Additionally, within this relation the interviewee feels that the EU is mostly facilitating pilots, whereas the interviewee likes to see more upscaling of the local implementation, such as making all school yards in the city more adaptive. An example of where this EU support for wider implementation is noticed is for wind energy generation in the North Sea area. The interviewee affiliated with business mentions that there is still a favour for economic ends – short and middle term –, rendering water tech and innovation to be most effective cross-sectoral, i.e. with the food sector. Whereas, Leeuwarden and the EU overlap in terms of pronounce aim to become climate adaptive, a better link back to the EU could be established to connect the areas, and knowledge, even better.

Another point of confusion is the legal uncertainty around direct responsibility for urban water management in the themes of heat stress or drought. For example, who has the responsibility and associated expenditures if a building's foundation is damaged by drought - notably in the case of timber foundations? Generally, the municipality carries responsibility for risk assessments and reparations of foundations, financing completely new foundations is where the line is drawn. Support from national or international level to initiate climate adaptive foundations would definitely benefit home owners and housing corporations. Additionally, the ‘association of Dutch municipalities (VNG)’ argues that provinces and water boards are responsible for preventing pole rot and subsidence through proper groundwater management. When focussing on Leeuwarden we find a focus area more concerned with practical matters, which would definitely benefit from EU support.

10 Discussion

Urban water management in Leeuwarden sets out the ambitious goal of becoming climate adaptive in 2035, which is generally 15 years earlier than most other actors. This raises the concern of how Leeuwarden will develop itself in the urban water management scene. In the context of Leeuwarden as a breeding ground, this research argues that Leeuwarden has the facilities to positively distinguish itself with urban water management.

The urgency is present, and the conditions are favourable in terms of knowledge on the business-, academic- and governmental level. Nevertheless, such developments can only come about if the new GRP and -rainwater regulation allow for implementation, through offering dedicated funding for example. It is recommended that the new GRP considers including funding a wider area of urban water management, such as heat stress and drought. Furthermore, an overarching Umbrella destination could be considered to facilitate this process.

The Capital of Water Technology is a title Leeuwarden could connect towards urban water management more. By adopting iconic projects and involving local state-of-the-art water tech companies, Leeuwarden can become a pin on the map for urban water management. An exemplary function in the field of urban water management provides an even better image towards the EU market for local businesses.

Urban water government requires an holistic approach, throughout all the levels of policy. The task for coordinating this at the international level lies with the EU, with a significant responsibility for its Member States. Having a clear target and integration of knowledge are a requirement to mobilize all levels of society. Within this vision there lies a challenge in separating – yet addressing – short and long term priorities, especially with the current geopolitical climate. This study considers urban water management to be a long-term concern that should be addressed as soon as practicable. Moreover, short term priorities should not become a blindfold for acting upon long term interests.

Connection between areas – either global or within Europe – is presumable beneficial for both areas due to experience in different climates. Presenting climate adaptation as a general investment in – continuation of – quality of life can increase social- and financial support. Furthermore, this makes it more justifiable for a broader sphere of stakeholders.

10.1 Limitations and opportunities

Limitations and opportunities will be discussed together to immediately provide solutions to explore past the limitations of this research.

This research focusses on urban water management in Leeuwarden specifically. However, climate adaptation knows no boundaries, so urban water management can be discussed at a wide variety of scales. Additionally, other cities within The Netherlands can be taken into account to provide a relative view. Cities with more resources for urban water management – such as Amsterdam – could be considered for an interesting comparative view of urban water management. Furthermore, a specific look can be taken at the low levels of personnel dedicated to urban water management in governmental organisations at the local level.

Furthermore, most of the interviewees their knowledge was formulated around Leeuwarden, and they did not have extensive expertise of the EU policy level of urban water management. To address this further research by means of EU expertise is an opportunity to increase understanding of the relation. This research proposes that a closer look should be taken at the knowledge gaps of Climate ADAPT and how they can be filled in by local knowledge, such as in Leeuwarden. In addition, this qualitative research might yield results which are contradicting views of other people in the field. Since the field of urban water management is still actively shaped through policy, further research on urban water management in general is suggested.

11 Conclusion

Before a conclusion to the main question is posed, each sub-question will be addressed per paragraph.

11.1 Current aspirations and actions of Leeuwarden and the EU

Throughout this research, the actions and aspirations for urban water management have been discussed for the local level of Leeuwarden and the international level of the EU. Furthermore, policy documents have been laid out at the regional and national level in order to examine indirect relations more closely. Leeuwarden recognizes the urgency of adaptation by aspirations set in the ambitious final target year of 2035. Actions and aspirations informed by priorly conducted stress tests are formulated around the themes of heat, drought and flood risk. Social inclusion and participation is required and the theme of drought is still undergoing development. European ambitions are formulated around 2050, as with most other institutions. The EU Adaptation Strategy sets out the aspirations and actions which are grounded in the EU Climate Law.

11.2 The relation between Leeuwarden and the EU

Both parties acknowledge mutual importance and are related in direct – support programmes, Covenant of the Majors – and indirect – travel of information through the policy levels – manners. It should be stressed that this relation concerns both bottom-up and top-down processes. The EU serves as the quality manager and connector for urban water management policy. Knowledge sharing initiates such as Climate ADAPT facilitate this role, and are increasingly important to avoid reinventing the wheel.

11.3 Usage of EU guidelines and funds by Leeuwarden

Lobbyist of the Northern municipalities ensure awareness of relevant EU guidelines and -funds for the local level. Correspondingly, guidelines and funds are used optimally, such as throughout the LIFE Programme and Horizon Europe. The European Commission aims at scaling climate adaptation funding, as stated in the EU Adaptation Strategy. The municipality, on the other hand, does not lack financial capability, but rather staff to work on urban water management. Consequently, this addresses a need which should be filled in.

11.4 Alignment of focus areas

Both levels have the same target of enhancing climate adaptivity through effective urban water management. The focus areas are found to be different in terms of pace and upscaling in some areas. It is debated that lack of short- or middle term economical gain could obstruct more rapid execution of urban water management. Social stratification in different dimensions are within the focus area of both levels. The EU focusses on wider – and a more complex – area of interests, Leeuwarden is concerned with more practical difficulties, such as lack of clearance of juridical responsibility for results of drought and heat stress.

11.5 Answer to the research question

This section concludes the following main question: “To what extent are current aspirations and actions regarding urban water management in Leeuwarden aligned with EU guidelines as laid out in the EU Adaptation Strategy on local urban water management and other associated documents?”.

Urban water management in Leeuwarden is connected with EU guidelines in direct and indirect manners.

Alignment is present in these interactions and the overall aim, deviations are put forward in terms of pace, and implementation of the knowledge present in other geographical areas. The local level of Leeuwarden and the international level of the EU can definitely benefit from each other through appropriate knowledge exchange. Consequently, urban water management is as much about connecting existing dots as it is about coming up with new innovations.

12 Resources

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Appendix 1: Interviews: Consent Form

Project:	Comparative policy analysis of Urban Water Storage Management in Leeuwarden in comparison with EU guidelines

Onderzoeker:	Duco Sven Pietjou	d.s.pietjou@student.rug.nl
Begeleider:	Tim Huiskes	m.c.huiskes@rug.nl

Naam geïnterviewde:	[…]
Datum interview:	[…]

Bij voorbaat dank voor uw deelname en daarmee bijdrage aan dit onderzoek. Ter bewerkstelliging van dit onderzoek zullen diverse interviews worden uitgevoerd in het kader van een Capstone-project. De looptijd van dit project is van 4 februari 2022 tot en met 10 juni 2022. De nadruk van dit project ligt op het verkrijgen van inzichten in het stedelijk waterbeheer van Leeuwarden in relatie tot Europese richtlijnen en handreikingen binnen ditzelfde thema. Het betreft een onderzoek dat voornamelijk naar de formele beleidsprocessen kijkt in het kader van aspiraties – wat willen we bereiken – en acties – hoe gaan we dat doen –. Dit onderzoek streeft er naar een beter beeld te scheppen van de verhoudingen en relaties tussen het stedelijke beleidsniveau in Leeuwarden en Europees beleidsniveau met betrekkelijk tot klimaatadaptie gefocusseerd op stedelijk waterbeheer. Inzichten zullen onder andere worden verworven door middel van interviews met personen binnen een relevante kennispositie in het kader van dit onderzoek. In dit onderzoek wordt er geen 'sensitive data' verkregen of verwerkt. De verwachting is dat het interview circa 45 minuten van duur zal zijn. Ik voorzie geen verdere risico's die gepaard gaan met uw deelname aan dit onderzoek. Desalniettemin heeft u ten allen tijde het recht om het interview stop te zetten of u terug te trekken van het gehele onderzoek, dit verzoek kunt u indienen bij de onderzoeker. Hiernaast heeft u het recht een klacht in te dienen bij academisch supervisor Tim Huiskes of de Functionaris Gegevensbescherming van de Rijksuniversiteit Groningen indien nodig. Voor vragen kunt u contact opnemen met de onderzoeker middels het emailadres bovenaan in dit document.

Door ondertekening van dit document gaat u akkoord met onderstaande punten:

- Deelname aan dit onderzoek is geheel vrijwillig;
- De audio van het interview wordt opgenomen en getranscribeerd, deze gegevens worden opgeslagen op een beveiligde externe harde schijf;
- Het transcript van het interview zal worden geanalyseerd door Duco Sven Pietjou;
- Toegang tot de opnames en transcripties van het interview zijn voorbehouden aan Duco Sven Pietjou en diens academisch begeleider Tim Huiskes;
- De opnames en transcripten van het interview zullen worden opgeslagen tot uiterlijk 1 september 2022 en nadien worden verwijderd;
- Indien van toepassing kan vóór 1 september 2022 bij de betrokken geïnterviewde een aanvraag worden gedaan de opnames en transcripten langer op te slaan;
- Alle informatie die tijdens het interview besproken wordt, is vertrouwelijk;
- Geanonimiseerde directe citaten kunnen mogelijk worden gebruikt in het onderzoeksverslag;

- Dat er kennis is genomen van de informatie in dit document en deze als begrepen worden beschouwd;
- Veranderingen in de bovengenoemde condities zullen alleen plaatsvinden met uw expliciete toestemming;

Contactgegevens Functionaris Gegevensbescherming van de Rijksuniversiteit Groningen:

Mr. A.R. (Arjen) Deenen (a.r.deenen@rug.nl)
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Postal address: P.O. Box 72 9700 AB Groningen
An. Central Privacy Desk
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Geïnterviewde:	Onderzoeker:
[…]	Duco Sven Pietjou
Datum: […]	Datum: […]
Handtekening Geïnterviewde:	Handtekening Onderzoeker:

Appendix 2: Interviews: Interview Guide

Introductie:

Goedemiddag, mijn naam is Duco Pietjou en ik studeer ‘Global Responsibility and Leadership’ en doe onderzoek voor mijn bachelor scriptie. De centraal omvattende vraag binnen mijn onderzoek is: “In hoeverre zijn de huidige ambities en acties op het gebied van stedelijk waterbeheer in Leeuwarden in lijn met de EU-richtlijnen zoals deze zijn vastgelegd in de ‘EU Adaptation Strategies’ voor lokaal stedelijk waterbeheer en andere geassocieerde documenten?”.

Graag wil ik u nog wijzen op het feit dat alle informatie die tijdens ons gesprek wordt besproken anoniem zal worden verwerkt en confidentieel behandeld zal worden. Verdere afspraken zijn terug te vinden in het eerdere gecommuniceerde ‘consent form’.

- Heeft u nog vragen voordat we officieel van start gaan?
- Dan start ik nu de opnames en beginnen we het formele gedeelte van het semigestructureerde interview

Openingsvragen:

- Om te beginnen; zou u uzelf kort willen introduceren?
- Bij welke organisatie bent u werkzaam?
    - Wat is u functie binnen deze organisatie?

Hoofdvragen:

- Welke doelen heeft uw organisatie met betrekking tot lokaal stedelijk waterbeheer?
    - Binnen welk tijdsbestek moeten deze doelen behaald worden?
    - Wat zijn de grootste uitdagingen in het behalen van deze doelen?
- Welke acties worden op dit moment al ondernomen?
    - Welke acties staan er op de planning?
    - Welke obstakels voorziet u – of zijn er al – in huidige en toekomende acties?
- Hoe wordt stedelijk waterbeheer volgens u hoofdzakelijk bekostigd?
    - Denkt u dat er nog onbenutte kansen zijn? Zo ja, welke?
- Wie zijn volgens u de belangrijkste spelers in het stedelijk waterbeheer?
    - Met betrekking tot de realisatie?
    - Met betrekking tot het vormen van aspiraties?
- Wat voor rol denkt u dat de EU speelt in het stedelijk waterbeheer op lokaal niveau?
    - Op het gebied van financiering en beschikbare fondsen?
        - Hoe wordt hier op ingespeeld?
    - Op het gebied van handreikingen d.m.v. kennis en richtlijnen?
        - Hoe wordt hier op ingespeeld?
    - Hoe zou u deze relatie omschrijven tussen de EU en het lokale niveau?
        - Hoe verwacht u dat deze relatie zich ontwikkeld?
        - Vind u de focusgebieden van beide niveaus overeenkomen?

Afsluitende vragen:

- Welke beleidsstukken identificeert u als leidend in het stedelijk waterbeheer?
    - Welke steden en/of externe stukken dragen volgens u een voorbeeldfunctie?
- Zijn er nog dingen die uzelf graag kwijt wil die van bijdrage zijn voor het onderzoek?

- Dan dank ik uw nogmaals hartelijk voor uw medewerking en tijd en stop ik hier de opnames van ons gesprek