

Addressing Social Vulnerability through Climate Adaptation Strategies in Fryslân

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ABSTRACT

This research paper provides insights into dimensions affected by climate change in Fryslân namely, natural management, infrastructure/urban environment & social vulnerability. Through the execution of interviews with local initiatives working on climate adaptation insights were gained. The research therefore provides a broad multi-dimensional perspective on the potential of coherently addressing several dimensions by the execution of climate adaptation strategies in Fryslân. The findings of this research showed that, although not all key actors are yet aligned on how climate adaptation is defined. It did become clear that the key actors in the diverse dimensions of climate adaptation are all willing to work together to address the implementation of climate adaptation.

PREFACE

This Bachelor thesis is part of the Capstone project which took place between February and June 2021. The Capstone project is the final product of the Bachelor Global Responsibility & Leadership.

As the motto of Campus Fryslân is; 'Global challenges, local solutions', this research is an example of the examination of a global challenge; implementing climate adaptation strategies, with a local solution regarding the province of Fryslân, the Netherlands.

The aims and objectives of this research are to gain insights in three dimensions affected by climate change namely, natural management, infrastructure/urban environment & social vulnerability, through looking at local initiatives working on climate adaptation. The main interest is to understand how the three aforementioned dimensions could be coherently addressed through climate adaptation strategies in the specific case Fryslân.

The final product of this research was obtained with the support of my supervisor Dr. Karsten Schulz. I would like to thank him for his input during the research process and for all his efforts and feedback to create this final report to its current form.

Joure, 20-06-2021

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INTRODUCTION

Changing climate conditions are one of the main challenges for contemporary society, current mitigation measurements are no longer adequate to prevent global warming from taking place (IPCC, 2014). Therefore, climate adaptation strategies are found to be essential to prepare for changing climate conditions (IPCC, 2014).

Challenges of climate change and the implementation of adaptation strategies could be linked to multiple scales in the form of the Sustainable Development Goals (SDG). The most prominent SDG in this case is SDG 13, which is concerned with opposing climate change. Target 13.1 is especially of interest for this research since it is focused on enlarging the adaptive capacity of countries (Goal 13 | Department of Economic and Social Affairs, n.d.). Of further importance are SDG 6 & 11. SDG 6 'Clean water and sanitation' becomes of importance regarding one of the dimensions of climate adaptation (water & nature management), which is elaborated on in the literature review. Another dimension (Infrastructure development, urban and landscape planning) that is touched upon in the literature could be related to SDG 11 'Sustainable Cities and Communities'.

The reason for making the connection between this research and the SDG framework is because the framework encompasses global challenges, which are in this research connected to local implications.

General challenges and solutions of climate change affect multiple geographical scales, in this research the case of Fryslân, a province of the Netherlands. A concrete local adaptation strategy plan in Fryslân is in place, namely, the Friese Klimaatatlas (2018). The Friese Klimaatatlas is a collaboration between different frisian governments such as the Wetterskip and various municipalities. It is a guideline for governance and other interested project developers, the main goal is to guide spatial planning towards climate adaptive usage.

While this Klimaatatlas is focusing on spatial planning, a concrete plan for the social and inclusive side of climate adaptation is still lacking. This lack of inclusion of the social dimension of climate adaptation could also



Figure_A: Climate adaptation projects in the Netherlands (Voorbeelden: Toepassing van klimaatadaptatie in Nederland, n.d.)

be noted from Figure_A. Figure_A represents climate adaptation related projects which are currently being executed or which are executed in the past in the Netherlands (Voorbeelden: Toepassing van klimaatadaptatie in Nederland, n.d.). On the Frisian mainland a total of three projects are or have been executed. One being the Friese Klimaatatlas, a second one being an implementation agenda targeting climate adaptation and biodiversity and the third one being an already executed project focused on strengthening the coastal area of the IJsselmeer (Voorbeelden: Toepassing van klimaatadaptatie in Nederland, n.d.). In order to find out about more socially oriented challenges to also be address through climate adaptation strategies this research addresses the following research question:

“How can multi-dimensional drivers of social vulnerability in the province of Fryslân be coherently addressed through locally embedded climate adaptation strategies?”

The aims and objectives of this research will be to gain insights in three dimensions affected by climate change namely, natural management, infrastructure/urban environment & social vulnerability, through looking at local initiatives working on climate adaptation. The main interest is to understand how the three aforementioned dimensions could be coherently addressed through climate adaptation strategies.

To reach these aims and objectives and to answer the research question the paper is structured as follows. Firstly, the second section of this paper contains a literature review, including a vulnerability assessment for Fryslân in which the specific adaptation scenarios and strategies for the province of Fryslân are described, as well as different approaches to the definition of climate adaptation strategies. The second section ends with describing three key dimensions of climate adaptation, water & nature resource management, infrastructure development, urban & landscape planning and social vulnerability. The third section includes a detailed description of the methodology. Section four contains an empirical description, categorized among key themes found during the interviews, further, the results are analyzed. The discussion section contains first a discussion of the results and is followed by a conclusion and recommendations. The last two sections include the appendixes and the references.

LITERATURE REVIEW

In the following section, first recent government reports and strategies are consulted and presented as vulnerability assessment of the province of Fryslân. Secondly, the body of literature regarding various possible definitions of climate adaptation is examined. In the last part of the literature review three key dimensions of climate adaptation are being considered.

Vulnerability assessment: Fryslân

Starting with the vulnerability assessment, future climate risk scenarios of the Netherlands in general are being regarded, as well as the specific adaptation scenarios for Fryslân. The reason for including and starting with the vulnerability assessment is because it seems important to, before diving into climate adaptation strategies to examine what the expected consequences of climate change are for. To make clear why it could be necessary to adapt and what dimensions of society are in need of adaptation measurements.

Netherlands

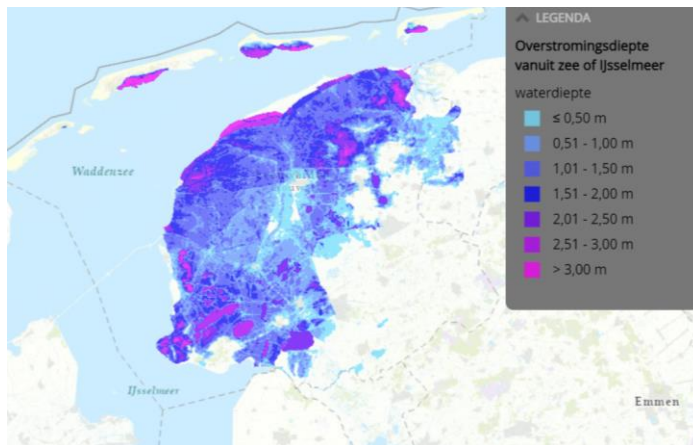
Before considering the specific situation in Fryslân it appears to be important to also regard the circumstances as for the Netherlands. One of the most pressing climate related challenges for the Netherlands is, and has been, the risk of flooding. Large parts of the Netherlands are located below sea level, with major rivers flowing through the country towards the sea. This means that around 60% of the Netherlands are vulnerable to flooding as presented within '*The National Flood Risk Analysis for the Netherlands*' by Rijkswaterstaat (Vergouwe, 2014).

Fryslân

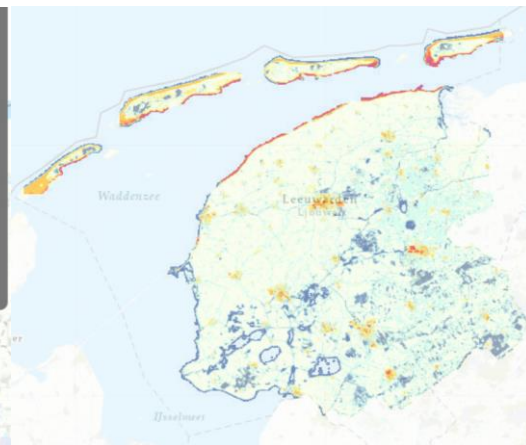
As flooding is a large threat to the Netherlands in general, this part considers more specifically the case of Fryslân. The Frisian municipalities in cooperation with other administrative bodies provide insights on the most important climate change challenges in Fryslân, which are flooding, water nuisance, heat stress, and drought. The Friese Klimaatatlas, in particular, provides a detailed overview of the regions that are most vulnerable to climatic risks (Friese Klimaatatlas, 2018).

With 287.478 hectares of the province located at or below sea level, flooding is one of the most pressing climate related challenges in the region and, due to expected sea level rise, there is a high degree of vulnerability (Veiligheidsregio Fryslân, 2018). Regarding water nuisance, the main

risk is a more frequent occurrence of extreme weather events, including heavy rainstorms during the summer, which could result in multiple types of damages (Friese Klimaatatlas, 2018). Besides material and infrastructural risks, the consequences of heat stress can also negatively affect human health. As a result of higher air temperatures, the water temperature is rising as well, which could have negative effects on water quality. Moreover, it is necessary to pay close attention to socially vulnerable groups such as communities in low income areas and elderly populations.



Figure_B: Risk of flooding from the Waddenzee and the IJsselmeer (Friese Klimaatatlas, 2018)



Figure_C: Heat stress (Friese Klimaatatlas, 2018)

In order to overcome these challenges, it is first of all necessary to act decisively and in a timely manner. While public and scientific debates about climate change were for a long time focused on mitigation strategies, and specifically on the overall reduction of greenhouse gas emission concentrations in our atmosphere, the discussion now shifts gradually towards climate adaptation strategies to tackle the imminent risks posed by a climate that is already changing. The following subsection therefore focuses on what definitions of climate adaptation are apparent in the literature and what sets them apart.

Climate Adaptation

The implementation of climate adaptation strategies often focuses on the discourse of what practices we, as a society, should continue, and which practices are better performed when changed (Pelling, 2010). The economy and its growth are currently still seen as a priority in public debates, whereas ecological well-being and cultural development often take a backseat vis-à-vis current economic practices and economic 'business-as-usual'. However, instead of concentrating on adjustment of existing systems and practices, the literature demonstrates that the discussion

should also focus more closely on what society can do to improve and implement efficient and effective adaptation strategies (Pelling, 2010).

Adaptation strategies generally focus on both the political and societal spheres of society and thus require different actors to put the strategies into action, besides a diverse set of actors also different approaches to adaptations strategies could be identified (Pelling, 2010). According to Noble et al. (2014) two different approaches of adaptation strategies are distinguished namely 'incremental adaptation' and 'transformational adaptation', a third category is added by Pelling (2010), namely, 'resilient adaptation'. All three categories are discussed below.

Resilient adaptation

The aim of implementing an adaptation strategy based on resilience is to maintain the status quo. The goal is to adapt by adjusting and, wherever necessary, by improving societies without making (large) changes to our societal structures (Pelling, 2010). An example of a resilient adaptation strategy could be to apply new types of seeds in agriculture, or the use of resilient building techniques in the construction sector (Pelling, 2010).

Incremental adaptation

Incremental adaptation, or adaptation through transition, is focused on making modest changes to the existing societal structure, but the main intention of this strategy is still to preserve and make use of the structures that are already in place (Noble et al., 2014). Pelling (2010) further states that through transition, already existent and unclaimed rights as declared by citizens could be a means for adaptation. Through this process, current practices are questioned and new/different priorities can be set without changing the societal system as a whole.

Transformative adaptation

In contrast to the above mentioned strategies of adaptation a transformative adaptation strategy intends to permanently change the existing structures of society (Pelling, 2010) and exceeds the scale of change of a more incremental approach (Noble et al., 2014). Additionally, transformative adaptation reforms the understandings and paradigms regarding nature, climate change and human systems and the connection between them (Noble et al., 2014).

With regards to the research question of this project it seems important to make a distinction between the aforementioned different categories of adaptation strategies. Especially, when taking into consideration the key dimensions of climate adaptation, as discussed in the next section. To be able to coherently address all dimensions it seems also important to use the same means, as in the form of adaptation strategy, to reach this goal.

Key dimensions of climate adaptation

For this research project the adaptation sectors that are taken into consideration are; natural resource management, infrastructure development and social vulnerability. The reason for choosing these specific adaptation sectors is because of the broad spectrum they are covering regarding the aspects of society that are influenced by climate change.

Water & nature resource management

The first sector to be addressed is natural and water resource management, according to de Bruin et al. (2009) this is one of the key policy areas regarding climate adaptation strategies in the Netherlands. As already mentioned key challenges in Fryslân arise regarding water management in the form of floods, water nuisance, yet also droughts (Provincie Fryslân, Wetterskip Fryslân & Friese gemeenten, 2020).

Recently, in November 2020 Frisian governing organisations together presented the 'Friese klimaatadaptatiestrategie'. Within this strategy the main target is to be climate resistant before the year 2050. The general climate adaptation strategies regarding the dimension natural and water resource management are as follows (Provincie Fryslân, Wetterskip Fryslân & Friese gemeenten, 2020):

- To manage water surplus and water shortages
- To implement more green and blue (water & nature)

In addition, it has been determined for each specific natural landscape type (peatland, clay & sand) which adaptation strategy is required to adapt optimally to changing conditions.

To illustrate how the climate adaptation strategy looks per landscape type, here the example as for the landscape type 'clay' the main themes of climate adaptation, and concrete with coming strategies are outlined. The adaptation strategy contains the following:

Clay : main themes - strategies

- Water nuisance
 - Increase drainage capacity
 - Increase water storage capacity
- Flooding
 - Innovative dyke concepts
 - Sand replenishment
- Heat
 - Improve freshwater supply
- Drought
 - Climate adaptive agriculture
 - Salinization measures

(Provincie Fryslân, Wetterskip Fryslân & Friese gemeenten, 2020)

As water management in general is quite broad, sector de Graaf, van de Giesen & van de Ven (2009) have divided it by categorizing the challenges as 'flood defense' and 'water resources'. The category flood defense is very relevant in the case of Fryslân and is also referred to in the next section in the form of adaptive planning in the case of the Afsluitdijk. The challenges regarding water resources also involve the concerns concerning water quality, when due to climate change the average air temperature is rising; this in turn results in a rise of temperature of the water (Friese Klimaatatlas, 2018). High water temperatures result in a lower oxygen content which decreases the water quality and could over time result in several health risks (Friese Klimaatatlas, 2018).

Among others the water level and the risk of flooding of the IJsselmeer stands in close relation to the natural values of coastal areas of Fryslân. Therefore, in 2013 the project 'Natuurlijke klimaatbuffer Friese IJsselmeerkust' started to give a quality impulse to the coastal area by implementing adaptation strategies (It Fryske Gea, 2013). With one of the main goals of this project being to create robust and more biodiverse nature this project is a good example of a combination of water & nature resource management in Fryslân.

Infrastructure development, urban and landscape planning

The resistant buildings and infrastructure were besides natural and water resource management identified by de Bruin et al. (2009) as being an essential part of climate adaptation strategies and key political sectors within this field. For this research project this dimension is elaborated by including urban and landscape planning.

Infrastructure development is an important sector to consider because climate adaptation has to play a significant role in current infrastructure projects. The reason why this is of importance is because infrastructure is often built for the long term and is therefore most certainly exposed to changing climate conditions during its lifespan (Adger et al. 2007). This also means that when non-adaptive activities are continuously applied it becomes more difficult to adjust and apply adaptive strategies in the future (Adger et al. 2007).

Concerning infrastructure development a concrete example within Fryslân involving climate adaptive strategies is the Afsluitdijk. The main function of the Afsluitdijk is flood protection, however, it additionally has a function for traffic and transport by road and by water and thus has also economic value for Fryslân (Afsluitdijk | Rijkswaterstaat, n.d.). The current project 'Strategische klimaatbuffer De Nieuwe Afsluitdijk' is focused on creating a climate-proof dike through raising and strengthening it by use of concrete blocks (Strategische klimaatbuffer De Nieuwe Afsluitdijk, n.d.).

As well as infrastructure development, spatial planning in general, yet, especially areas that are exposed to risks of flooding and their built environment should be re-evaluated on their adaptiveness to events of climate change (de Bruin et al., 2009). The biggest challenges for the urban environment in the case of Fryslân is as stated in the 'Friese Klimaatadaptatiestrategie' the occurrence of water nuisance, heat, drought and flooding.

In order to adapt to these challenges the general goals within the urban environment are suggested to be focused on climate adaptive construction. The aim when constructing new buildings is among others to preserve space for water storage, which can be done through constructing taller buildings and through adjusting building regulations (Provincie Fryslân, Wetterskip Fryslân & Friese gemeenten, 2020).

Concerning water nuisance one of the combating strategies is the concept of de-stoning. A particular organization working on de-stoning is 'Stichting Steenbreek', the organization is operating in 7 out of 18 municipalities in the province of Fryslân. The main focus of the organization is to address individuals to de-stone their gardens and make especially urban environments more green (Operatie Steenbreek – Leeuwarden, n.d.). As stated by de Bruin et al. (2009) it is important to implement so-called natural cooling to avoid the regular occurrence of heat stress and heat islands within the urban environment. Examples of natural cooling are green areas, however, could also be implemented on buildings by creating green roofs and green walls (de Bruin et al., 2009).

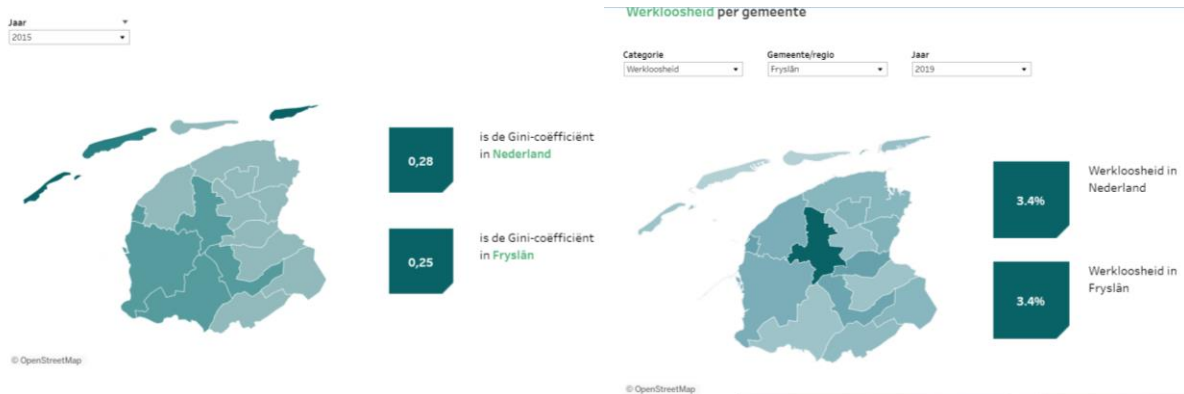
Social Vulnerability

Social vulnerability is added as the third dimension of climate adaptation. How social vulnerability is defined with regard to climate change is under debate, O'Brien et al. (2004) create a distinction between two separate approaches. The first interpretation which O'Brien et al. (2004) mention is the 'end-point' definition. Vulnerability as an 'end point' means, with regards to society, that without any type of adaptation strategy a certain group of persons would, eventually, become victims of the results of climate change. Therefore, in this context adaptation affects vulnerability (O'Brien, 2004). On the other side of the spectrum, vulnerability affects the extent of participation in climate adaptation, and vulnerability is the 'starting point'. In this case vulnerability is caused by various factors and processes and it affects the extent to which an individual is able to adapt or take part in adaptation strategies (O'Brien, 2004).

Adger & Kelly (1999) mention a definition of social vulnerability falling into the category of a 'starting point' approach. They state that social vulnerability applies to individuals or groups of individuals in society who are defined by their ability to manage situations that happen to them and their livelihoods because of external events, an example of such an external event could be climate change (Adger & Kelly, 1999). Further, to determine who is vulnerable, one should take into account the availability of different types of resource (human, economic, natural) yet, even more important is the right to make use of this resource (Adger & Kelly, 1999).

Identifying the specific social vulnerable groups in Fryslân regarding the economic dimension could be done by help of data as collected and presented by the Fries Sociaal Planbureau.

They created several maps regarding multiple economic dimensions, on the figures D & E income inequality and unemployment are presented.



Figure_D: Income inequality in Fryslân (De samenstelling en verdeling van inkomens in Fryslân - Fries Sociaal Planbureau, 2021)

Figure_E: Unemployment in Fryslân (De samenstelling en verdeling van inkomens in Fryslân - Fries Sociaal Planbureau, 2021)

The availability or unavailability of human resources could for example be addressed through governmental or voluntary organisations. An example of a voluntary organisation in Fryslân is 'Solidair Friesland' which supports and guides volunteers in their contribution to several social challenges such as poverty reduction, participation in society and social cohesion (Geloven op maandag – Mensen voor Mensen, n.d.). Further, with regard to economically vulnerable people often the municipalities have a certain responsibility to protect and support them.

METHODOLOGY

In this methodology section the execution of the research process is discussed. In the first part it is discussed on what base, and why, interviewees were selected. Further, in the second part it is described how the concrete interviews were executed.

Selection of interviewees

Selecting key actors in the field was, after the literature review, the first step of the research process, a total of four actors were interviewed. The interviewees were selected in different ways based on their expertise on the different dimensions. One interviewee was selected based on the appearance within multiple sources as used during the literature review. Two other interviewees were chosen on the basis of their organizations and key words appearing on the websites of their organization, examples of keywords are '(social) vulnerability', 'climate change', 'climate adaptation' and 'urban environment'. Lastly, another interviewee was selected by making use of the connections of the supervisor. All the interviewees were local key actors in Fryslân, the involvement of local expertise is important when establishing and executing climate adaptation strategies. Involvement of locality could result in better circumstances for making policy decisions concerning adaptive measurements (de Bruine et al., 2009).

Potential interviewees were contacted via email (Appendix_A), in which an introduction to the project and researcher and explanation of the purpose of research was included. Contacting potential interviewees via email gave them time to respond at their own pace. Interviewees were then asked to sign a consent form (Appendix_B) to be able to justify the research ethically and to inform them on how information gathered during the interviews would be used in the study. The consent form further ensured their anonymity and ensured that obtained data was treated confidentially.

Execution of interviews

For this study insights were collected through semi-structured interviews. The semi-structured interview as a method is specifically suitable to comprehend the perspectives of the interviewees while also staying focused on the subject of the research. Through making use of an interview guide (Appendix_C/D), formed on the basis of the literature review and the key concepts mentioned therein, the specific focus of the study was retained. Yet, when participants mentioned valuable information there was room to ask further questions and obtain more data of interest

(Williamson, 2013). Through this type of interviews, an in depth understanding of the local situation/perspective of local key actors/stakeholders in the fields of social vulnerability, water & nature resource management and Infrastructure development, urban & landscape planning were collected. The research focussed on a specific part of the Netherlands, namely, the province of Fryslân, the global challenge of implementing climate adaptation strategies and simultaneously addressing coherent dimensions subjected to climate change is in this study addressed on a local scale.

The interviews took place in dutch, the reason for interviewing interviewees in their native language is because it diminished the potential for misinterpretation and assured that information was retrieved accurately (Welch & Piekkari, 2006). The duration of the interviews was between 20 and 45 minutes. Afterwards, the interview recordings were transcribed and anonymized (Appendix_E), parts of the transcriptions were translated before being presented in the result section.

RESULTS

In this result section all information as collected through the interviews is presented. The results are first presented in Table_A, after they are further examined in the subsection; Result Analysis. The rows of the table contain several categories, the categories are based on the common themes that emerged during the separate interviews. The columns of the table contain the information as gathered from the interviewees, the results are presented in the form of both citations as well as paraphrases.

	<i>Representative Water Authority</i>	<i>Representative Municipality</i>	<i>Representative NGO-A</i>	<i>Representative NGO-B</i>
<i>Challenges of climate change / general challenges of society</i>	Sufficient fresh water for the future / salinization	Sufficient fresh water for the right purposes	Heat stress and water nuisance	<p>Sufficient income for every household, in a broader sense improving the social and economical situation of the vulnerable.</p> <p>Complex regulations which make it more difficult to escape a situation of being vulnerable should be made less complex.</p> <p>“Not everyone has sights on the effects climate change can have on them, they are preoccupied with other worries.”</p>
<i>Defining climate adaptation / Goal of climate adaptation</i>	Adapting means to adjust to changing circumstances, adjusting can mean 3 different	Climate adaptation means adjusting to the changing conditions, which means	“I think it is important that we make climate adaptation a low-threshold change,	

	<p>things; it can mean 'accepting' potential damage, 'reducing' the potential damage or 'preventing' the potential damage to happen</p> <p>All related to the costs and benefits of the amount of adaptation that is necessary</p> <p>Discussions revolve around striving to conserve what is already there or striving to develop new values and standards</p>	<p>changing the way we work right now. Normal would be to solve water nuisance within the sewer pipe system, enlarging these pipes underground will not be a solution. Solutions instead should be sought above the ground, where space use is already intensive.</p> <p>Cities and villages should be water robust and climate proof before 2050 → [municipality] strives to reach this in 2035</p>	<p>because climate change is a challenge to all of us. I think in this way we can make it easier for people to get involved."</p> <p>The goal is to make the city climate proof, which mainly focuses on water and water nuisance.</p>	
<i>Climate adaptation: water & nature management</i>		<p>"We have an agreement with the water authority with a clear demarcation. The water authority takes care of the water nuisance in the rural areas and seeks climate adaptive solutions for problems that arise there."</p>		
<i>Climate adaptation:</i>	"Applying water management in	'Leefstraat' is a project used to	"Now often when new construction	"Projects that focus on climate

<p><i>infrastructure development, urban and landscape planning</i></p>	<p>the city to overcome water nuisance will also result in the reduction of heat stress and will improve the quality of the groundwater and will increase biodiversity in the city.”</p> <p>The city is often the responsibility of the municipality, and they are planning to implement more blue & green zones which influence the tasks of the water authority, which therefore require coordination and cooperation</p> <p>To adapt in the build environment one should choose a ‘natural’ moment, as for example during new constructions or during refurbishment.</p> <p>Cities or villages need smaller places for fresh water storage.</p>	<p>get citizens involved in a discussion about how they think their street/neighborhood should look like. It is a pilot to get citizens involved in shaping their street, and potentially changing it for the long term, by for example implementing facade gardens.</p>	<p>takes place, in the first instance everything gets tiled, the roads, the parking lots. However, in my opinion half of the tiles could have been green areas, after construction a lot of the tiled space is also often not used.</p>	<p>adaptation as for example projects focused on de-stoning the city are often not under attention among the socially vulnerable, I believe.”</p>
<p><i>Climate</i></p>	<p>When thinking</p>	<p>Elderly are</p>	<p>Elderly are</p>	<p>“People who are</p>

<p><i>adaptation and social vulnerability</i></p>	<p>about people living in deprived neighborhoods or social renting housing, where people are happy to reach the end of the week with their financial means. It is understandable that they are not as concerned with climate adaptation, in this case a housing association could play a role to invest in their houses and surroundings to make them more climate adaptive.</p> <p>Elderly are more vulnerable to heat stress and periods of extreme heat are to occur more often in the future.</p> <p>Economically farmers especially will be hit, and have a high risk of potential damage</p>	<p>especially vulnerable to heat stress and withcoming excess mortality. And for people with more money it is often easier when they are hit by the effects of climate change to overcome this than for people with little to spend.</p> <p>Regions in the city are indicated as containing vulnerable people, such as retirement homes but also school yards.</p> <p>“We are now slowly starting up a project in which we discuss risks with citizens and in which we also include the greening process of the city, this is mainly targeted towards citizens with a lower income.”</p>	<p>among the most vulnerable groups to climate change.</p> <p>“I think that they (people with less economic/social resources) are more difficult to motivate to participate in these projects, however, I do think they benefit from such de-stoning projects since it is a low-threshold way of getting them involved.”</p>	<p>socially vulnerable are people who have a, temporary or lifelong, difficulty to make ends meet. (...) The reason for this could be accumulated circumstances, for example a child growing up in poverty, with parents that recently lost their job or deal with debts. For others it is the result of intergenerational poverty or the lack of skills to be self-reliant.”</p> <p>In Leeuwarden the social vulnerable are located in some neighborhoods also ranked among the poorest of the Netherlands (...) such as Heechterp-Schieringen. However, poverty also occurs in ‘good’ neighborhoods.</p> <p>In the villages social vulnerability is sometimes more hidden.</p> <p>Also, farmers can be quite</p>
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				vulnerable due to strict regulations and the need for them to earn a living.
<i>Opportunities for addressing multiple dimensions at once</i>	<p>Yes, in the case of urban environment (see above)</p> <p>However, direct contact with citizens is still lacking, yet upcoming.</p>	<p>Yes, when 'greening' the city by removing tiles and planting back trees, this will result in shadow and more evaporation which will help to combat water nuisances.</p> <p>This 'greening' process is also applied in areas around retirement houses. However, coordination/ distribution of information between the municipality and retirement houses is not yet optimal, while the municipality is greening the areas around these houses to cool down, the inhabitants seek other solutions such as footbaths and ice cream to cool down. Inhabitants in this case are not yet aware that they also do</p>	<p>Yes, implementing more green in the city will also affect water drainage and intake.</p> <p>"We did one project in collaboration with a foundation for single mothers (FEM) in 3 different neighborhoods in Leeuwarden, Heechterp-Schieringen, Vrijheidswijk and Bilgaard during which we offered an education program about greening the garden to single mothers</p>	<p>Yes, although we are depending on volunteers I think that together with other organisations we could play a role in this.</p> <p>Texts or information regarding other projects are often difficult to understand or to find for people that are sometimes (functional) illiterate.</p> <p>Involving socially vulnerable people in other projects requires low-threshold and simple information activities, and making them aware that it is necessary that they get involved and emphasize how they can benefit. Best would be to talk 1 to 1 to them, only this would</p>

		need a spatial approach to use the shadow of trees for example.		be extremely time consuming. Potentially we as a foundation could play a role in this process.
<i>Responsibility for implementing and participating in climate adaptation strategies</i>	“I do not think you can expect that (same responsibility for every individual), however, people should be aware that they are responsible to some extent and that the challenges of climate change can not be solved by the government”	<p>“Not everyone is in a position to take their responsibility. In the basis everyone has the same responsibility however, then follows a list with many exceptions”</p> <p>“Someone with a lower income, in a ‘bad’ neighborhood that experiences nuisance does have the same, or even more, responsibility than someone in a ‘good’ neighborhood that does not experience similar problems.”</p>	Yes, everyone is responsible to the same extent, everyone uses the earth as a place to live, and we do not only have to take from the earth. We should realize we are part of nature ourselves, not everyone is aware of that. Someone doing something small could already have big consequences, the responsibility stays the same for everyone, the amount of influence might be different.	<p>No, I think people who are higher educated and with well-paying jobs have more responsibility, to work on climate adaptation themselves and to also support others to work on it, which I think could be stimulating for less wealthy people to also get involved.</p> <p>Schools or social workers can play an important role in making people aware of climate change and adaptation</p>
<i>Important stakeholders/ partners for cooperation mentioned to implement climate adaptation strategies</i>	Society as a whole / farmers - LTO (entrepreneurial organisation for farmers) / individuals in the city / nature organisations / MKB (entrepreneurial organisation) / housing	Municipality, water authority, citizens and businesses within the municipality and on the background the province / housing associations / IVN (nature education) /	Citizens / big companies / governments	Social district teams / social workers in villages / churches / volunteers / schools / housing associations / municipality

	associations	schools / Operatie Steenbreek		
<i>*other interesting thoughts</i>	Another challenge is a behaviour change to get people involved in climate adaptation strategies	<p>“Citizens sometimes adjust in different ways, they buy jacuzzis or pools for the summer”</p> <p>“A real challenge is making people and businesses aware that they should act climate adaptive”</p> <p>“More coordination between different parties (such as municipality and retirement houses) is necessary however, I am not yet sure how this should look like”</p> <p>“Cooperation with and between neighborhoods, schools and sports clubs to make more areas greener.”</p>	<p>“One of the visions of the foundation is to create awareness, to get people excited and to activate them.”</p> <p>“You can not force people to like biodiversity or to find climate adaptation important, I think that when you bring it in a nice way it will eventually spread to the wider community.”</p> <p>“Social vulnerable groups of people are in general not part of the conversation or targeted for specific projects within our foundation, often we collaborate with already existing other parties interested in greening the city.”</p>	<p>Projects of our foundation focus on the socially vulnerable, as for example, status holders, people living in poverty, people dealing with loneliness.</p> <p>“Many people find it difficult to link climate change with social vulnerability. (...) I think this is because they have the idea that adapting to changing climate conditions is something that costs a lot of money, which often is lacking for socially vulnerable people, while they often do benefit from it. It becomes difficult to imagine how they could play a role.</p>

Table_A: Results from interviews (Appendix_E)

Result Analysis

This subsection is structured around the key themes, similar to the table, which emerged during the separate interviews and in broad lines corresponds to the structure as presented in the literature review.

Challenges of climate change - general challenges of society

Regarding the challenges that we face as a result of climate change, one of the main findings is that water related issues are the biggest challenges for society as for the key actors in the three different dimensions. Among others 'sufficient freshwater resources' and 'water nuisance' came up during the three interviews. During the interview with the representative of NGO-B, another societal challenge came to light, namely, social and economical challenges for socially vulnerable groups within society, and the challenges to escape their already vulnerable situation.

Defining climate adaptation and determining the goal of climate adaptation

How climate adaptation is defined was found to be different among each interviewee. The representative of the water authority provided the broadest answer to the question on how climate adaptation is defined in the field of water & nature resource management, in the definition three different descriptive words were included, namely, accepting, reducing and preventing. It was further added that current debates within the dimension of water & nature management evolve around "striving to conserve what is already there in contrast to striving to develop new values and standards". Other interviewees were found to be on both ends of this definition. The representative of the municipality expressed climate adaptation as "changing the way we work right now", including changes to what we now identify as being normal in among others spatial usage. In contrast, climate adaptation, as by the representative of NGO-A, was described as to be important to be a low-threshold change as it would make it easier to get people involved in climate adaptation strategies.

Climate adaptation: water & nature management

Other than during the interview with the representative of the water authority, water & nature management was brought up by the representative of the municipality. During this interview it was raised that there is an agreement between the water authority and the municipality, this agreement states, among others, that the water authority takes care of water nuisance in rural

areas and therefore is responsible for searching for climate adaptive solutions to challenges posed by water.

Climate adaptation: infrastructure development, urban and landscape planning

Concerning this second dimension of climate adaptation three out of four of the interviewees made relating statements. The representative of the water authority referred to the agreement with the municipality (as discussed in the category above), and stated that the municipality is responsible for water challenges related to climate adaptation within the urban environment. Also, there was shed light on the fact that the municipality is planning on implementing more blue and green zones within the city. This could influence the work done by the water authority, therefore, some extent of coordination and cooperation is required. The representative of the water authority further mentioned that in order to adapt the built environment, it is important to choose a so-called 'natural' moment for this, this natural moment could be during reconstruction or during new construction. The representative of NGO-A stated something similar regarding searching for a 'natural' moment to change infrastructure and buildings. It was mentioned that, currently, when construction takes place implementing more green and blue areas is not taken into account yet, changing this built environment afterwards takes higher efforts. The representative of the municipality explained another idea regarding the built environment, 'Leefstraat', a project to involve citizens into the creation process of more sustainable and climate adaptive neighbourhoods, was described. By involving citizens in this project the potential for making changes for the longer term was, as by the representative of the municipality, stated to be higher.

Climate adaptation: social vulnerability

Finding an organization that was involved in the dimension of social vulnerability as well as climate adaptation was proven to be difficult. At first contact with an organization involved with socially vulnerable people, the representatives were not sure if they could be adding onto making a linkage between these two dimensions due to their lack of knowledge of climate adaptation.

Elderly people and people living in deprived neighbourhoods with less social and economical resources are among others identified as being vulnerable, by all interviewees. The representative of NGO-B gives a more elaborate description of social vulnerability and describes them as being people that are having a lifelong struggle to make ends meet. As a

reason for these struggles it was mentioned that among others it could be a situation of accumulated circumstances or a lack of skills to be self-reliant, which brought people into poverty.

When connecting socially vulnerable people to challenges of climate change, the representative of NGO-B stated that, it could be noticed that people have a hard time connecting these concepts with each other. The reason for this, as thought by the representative of NGO-B, could be that climate adaptation is, for these people, related to something that costs a lot of money, while socially vulnerable people often lack money. Because of this lack of money, it becomes difficult for these people (actors active within the dimensions of climate adaptation) to imagine how socially vulnerable people could contribute to climate adaptation, while they realize that this group especially has the potential to benefit.

Also, the representative of NGO-B mentioned that socially vulnerable people themselves often do not have sight on the potential effects climate change could have on them, “they are preoccupied with other worries”.

The representative of the municipality described that certain regions in the city are being indicated as containing vulnerable populations. Furthermore, the municipality is starting up a project, targeted towards lower income populations, in which they are included in projects aimed at greening the city.

Opportunities for addressing multiple dimensions at once

All interviewees indicated that they saw opportunities for addressing multiple dimensions of climate adaptation at once and they stated that some were already coherently addressed. Both the representative of the municipality and of the water authority indicated that they were cooperating and coordinating challenges of water nuisance and heat stress, for both representatives this was also, currently, the main focus of collaboration.

On the other hand, the representative of NGO-B, raised the concern that current projects (such as de-stoning the city) with potential to involve the third dimension, social vulnerability, are not always under attention among the socially vulnerable people themselves. Also, it was mentioned that other projects, often are difficult to find and/or to understand, taking into consideration that some part of the socially vulnerable population are (functional) illiterate. As a suggestion to solve this, the representative of NGO-B suggested that one-on-one conversations

about climate adaptation would be more effective, however, noting that this is an extremely time consuming approach.

Further, the representatives of NGO-A and NGO-B both stated that the socially vulnerable do benefit from a low-threshold way of getting involved in climate adaptation within a de-stoning project. The concern the representative of NGO-A raised in this case was that socially vulnerable people would be more difficult to motivate to participate in de-stoning projects.

The representative of the municipality further brought forward that between different stakeholders coordination and distribution of information are not always aligned. Areas indicated as containing vulnerable populations (surrounding retirement houses) are targeted by the municipality for executing greening in the city to overcome heat stress. However, inhabitants are often searching for other options to reduce the heat, yet, they are thus not on one line regarding adapting by use of a spatial approach or by mitigating the short term heat.

Responsibility for implementing and participating in climate adaptation strategies

When the representatives were asked about who is responsible for the execution of climate adaptation, three out of four provided a similar answer and stated that one could not expect the same responsibility of every individual in society.

The representative of the water authority mentioned that, although not everyone could participate in climate adaptation to the same extent they should be aware of climate adaptation and should also be aware that not all the challenges of climate change could be solved by the government. Although the representative of the municipality does think that there is a list of exceptions to the responsibility of adapting to climate change, it was also stated that for example people in relative 'bad' neighborhoods, living in areas that are hit by water nuisance, do have a larger responsibility than people living in 'good' neighborhoods that are not hit by this same water nuisance. The representative of NGO-B, expressed that people with a higher education and a higher income were more responsible for adapting to climate change than others, they also should support others to get involved, which could stimulate others to also get involved in climate adaptation.

The representative of NGO-A disagrees with the fact that not everyone has the same responsibility. It was stated that everyone uses this earth as a place to live and takes certain things during their living, therefore, it is important to realize that we are part of nature and earth

ourselves. There is still a lack of awareness there, also doing something small could have big consequences, everyone is thus responsible for adaptation however the influence one might have with his/her actions could differ.

Important stakeholders/ partners for cooperation mentioned to implement climate adaptation strategies

During the interviews multiple other stakeholders came forward which could play a role in climate adaptation strategies. Stakeholders that were mentioned by various interviewees were among others:

- Society and its citizens
- Schools
- Housing associations
- Entrepreneurs and businesses

Other interesting thoughts by the interviewees

During the interviews with the representative of the municipality and the representative of the water authority a common theme was brought up by the interviewees individually, namely the challenge to make citizens (and businesses) aware of climate adaptation and to with coming make them change their behaviour. The representative of NGO-B suggested that potentially social workers (in the situation of socially vulnerable people) and schools (in general) could play an important role in the awareness process regarding climate change and adaptation.

DISCUSSION

In this discussion section first the results are discussed in relation to the theory as in the literature review. With this discussion as a basis concrete recommendations are given, which is followed by a conclusion and answer to the research question.

Challenges of climate change / general challenges of society

In the FrieseKlimaatatlas (2018) main challenges such as flooding, water nuisance, heat stress, and drought were mentioned, direct or indirect these challenges could be related to water. The key challenges mentioned by the interviewees were mostly also related to water, such as water nuisance and concerns for freshwater resources. These findings correspond to the information as found in the vulnerability assessment for Fryslân.

Defining climate adaptation and determining the goal of climate adaptation

In order to coherently address the different dimensions of climate adaptation it is necessary to make use of the same means, as in the form of adaptation strategy and how these strategies are defined. By Pelling (2010) and Noble et al. (2014) three different categories were distinguished, namely, resilient, incremental and transformative adaptation.

As could be concluded from the results there is a wide range of definitions used among the interviewees. Three different descriptive words were included, namely, accepting, reducing and preventing, within the definition of the representative of the water authority, further explanation of these descriptive words bring to light that discussion in water & nature management evolve around “striving to conserve what is already there or striving to develop new values and standards”. “Striving to conserve what is already there” could be linked to ‘resilient adaptation’ as by Pelling (2010) which means to improve societies without making tremendous changes to the societal structures. On the other hand “striving to develop new values and standards” could be interpreted as being related to the definition of incremental adaptation as well as transformative adaptation, in the case of incremental adaptation it involves small changes in societal structures, while for transformative adaptation it is intended to permanently change the existing structures of society (Pelling, 2010). The definition as by the representative of the municipality, also is in line with transformative adaptation as, it was stated that adaptation involves changes in the current way of working and usage of space.

As the representative of NGO-A defined climate adaptation as necessary to be a low-threshold change this fits more with ‘resilient adaptation’.

Climate adaptation: water & nature management

Similar to de Bruin et al. (2009) most of the interviewees identified water management as one of the key dimensions of climate adaptation strategies. All interviewees acknowledged that water related challenges were a key problem. De Graaf, van de Giesen & van de Ven (2009) categorized the challenges into ‘flood defense’ and ‘water resources’. The challenge of water resources emerged most during the interviews with freshwater resources as the main factor of concern regarding the implementation of climate adaptation strategies. As was also brought up during the interview the water authority and the municipality have regulations in place which determine who takes responsibility of what area regarding water. The water authority was identified as one of the key actors in the rural landscape, while the focus of the municipality would be on water within the urban landscape.

Climate adaptation: infrastructure development, urban and landscape planning

De Bruin et al. (2009) described the infrastructure and urban landscape also as being an essential part of climate adaptation strategies and key political sectors within this field. During the interviews with the representative of the municipality and the representative of NGO-A, especially the urban landscape was at the forefront of the conversation. Adger et al. (2007) emphasize the importance of applying climate adaptation strategies in the built environment and this was also recognized by both representatives. The representative of the water authority further opted for a ‘natural’ moment to adapt within the built environment, as it is a long-term spatial use. This is supported by Adger et al. (2007) who stated that buildings as well as infrastructure both are within their lifespan, most certainly, exposed to changing climate conditions, therefore adaptive building is necessary. Furthermore, the representatives of NGO-A commented in line with de Bruin et al. (2009) in a sense that it is important to implement more natural cooling, to prevent regular periods of extreme heat in the urban environment, by implementing more green (and blue) areas within the city. The fact that the built environment needs changing for the longer term was also under attention of the representative of the municipality who is planning a project (Leefstraat) in which citizens can get involved to design their neighbourhood which would ensure a higher change on long term adaptive changes.

Climate adaptation: social vulnerability

The distinction between the two interpretations of social vulnerability as by O'Brien et al. (2004), could also be noticed from the results of the interviews. At first when being asked about who are vulnerable to changing climate conditions, farmers were mentioned by more than one interviewee. Farmers in this case fall under the interpretation of vulnerability as an 'end-point', meaning that they would become one group of victims at the result of climate change without the implementation of any kind of climate adaptation strategy. The interpretation of vulnerability as a 'starting-point', in this situation vulnerability is caused by various factors and processes and affects to what extent a person is able to adapt. The definition of social vulnerability provided by the representative of NGO-B fits with this 'starting-point' definition, as vulnerability in this case was described as an accumulation of circumstances that brought people in a position of not being able to make ends meet or who lack the ability to be self-reliant. This description is in line with the description of Adger & Kelly (1999), who include the lack of resources (human, economic, natural) into their definition.

The fact that economical factors are still seen as a priority within the public debate (Pelling, 2010) instead of among others ecological well being, also came forward in the conversation with the representative of NGO-B who stated that climate change and adaptation is often directly related to potential monetary costs. As a result this inhibits socially vulnerable people to participate, while also with low monetary input one could contribute to climate adaptation. The debate should rather focus on what society can do or can improve by implementing climate adaptation strategies (Pelling, 2010) was likewise made clear by the representative of NGO-A. The representative of NGO-A promoted a low-threshold manner for people to get involved in climate adaptation by simply removing tiles and replacing them with plants.

Opportunities for addressing multiple dimensions at once

What became clear is that the first two dimensions water & nature management and infrastructure development, urban and landscape planning are at multiple different levels addressed coherently. The municipality and the water authority indicated that they were cooperating and coordinating challenges of water nuisance and heat stress, for both representatives this was also, currently, the main focus of collaboration. When greening an area by planting more trees for example this could prevent regular periods of extreme heat in the urban environment while at the same time more water could be absorbed into the ground which could overcome challenges of water nuisance.

However, with regard to the third dimension, social vulnerability, only one future project of the municipality was targeted towards lower income populations to get them involved in greening the city. Although all interviewees recognized that 'society and its citizens' as a whole are important for implementing climate adaptation, the socially vulnerable are not automatically reached in the scope of their projects or in other cases climate adaptation is not included within their projects. Reasons for this given by the representative of NGO-B are; the information is too hard to find, the information is written in too complicated language, and they are simply not aware of the problem due to being occupied by other worries.

Pelling (2010) already stated that various actors are required to undertake action to put climate adaptation strategies into practice, in which different types of actors are of importance. With all these representatives of the key dimensions of climate change being far apart on the spectrum of definitions of what climate adaptation in the basis means, some problems could evolve in communication between parties. While different types of definitions of climate adaptation might be necessary in different contexts, the practical execution is also different (Pelling, 2010). Stakeholders involved in the conversation should be aligned on what climate adaptation means when working together to be able to apply climate adaptation effectively and without talking past each other or misunderstanding the goal of applied climate adaptation strategies.

Furthermore, to get to a diverse set of actors and to also include stakeholders which are not yet part of the conversation, it is important to create more awareness and to provide more (low-threshold) information on the meaning and practical execution of climate adaptation strategies.

CONCLUSION

For this concluding section, first an answer to the research question is examined, which is followed by some limitations to this study, as well as opportunities that came forward during the research are taken into account. The section ends with some concrete recommendations for stakeholders working or planning to work on climate adaptation.

This paper investigates the following research question: “How can multi-dimensional drivers of social vulnerability in the province of Fryslân be coherently addressed through locally embedded climate adaptation strategies?” When taking into consideration the discussion in the previous section, it becomes clear that the key actors in the diverse dimensions of climate adaptation are all willing to work together. In some formats collaboration is already taking place between the municipality and the water authority. Other collaborations might yet not be examined by the stakeholders themselves. One of the key themes of this research is to include the socially vulnerable into the conversation during the planning and execution of climate adaptation strategies. The municipality especially had some ideas and plans to include more socially vulnerable people in their projects. NGO-B could also envision a role for their organisation in getting more involved in getting socially vulnerable communities informed and involved in climate adaptation.

What further became clear as an important factor is that all actors involved in climate adaptation, or planning to get involved, should be on one line to what climate adaptation means. When they work together to be able to apply climate adaptation effectively and to a broader public, including the socially vulnerable, they should overcome that they are talking past each other or misunderstanding the goal of applied climate adaptation strategies.

Limitations

Although the information that was gathered during the interview was, I believe, of sufficient quality to cover the research question, interviewees might have felt limited to express themselves due to the inability of a physically executed interview. Also, interpretations of the statements could be different due to not being able to read the other person's facial expressions and body language, which could be critical for communicating a message.

Another, additional restraint of this research would be that some key actors were difficult to find, organisations do not always use keywords such as ‘climate adaptation’ ‘social vulnerability’ or

even 'climate change' themselves on their websites. Therefore, some actors might have been excluded on the lack of presence of these keywords, while they potentially would have had an interesting perspective to add to the research end perspective.

Opportunities

For further research it could be important to also include more and other stakeholders such as housing associations or schools. Both of these stakeholders were mentioned by multiple participants as key actors for a more effective and efficient implementation of climate adaptation strategies to cover a broader range of perspectives.

Additionally, it could be interesting to not only talk about socially vulnerable people with experts on the different dimensions of climate adaptation, yet to also talk with the vulnerable people themselves and to find out how they think they could get involved and what it takes for them to participate.

Lastly, awareness of climate adaptation strategy was not part of this current research, however, it was brought forward by multiple interviewees that a lack of awareness is one of the main challenges for them to include more citizens into climate adaptation strategies. It therefore seems to be important to address awareness to a further extent to be able to include more citizens in climate adaptation strategies. Multiple studies already focus on awareness related to climate change and adaptation among others a study by Uittenbroek et al. (2013), focussed on two different cases in the Dutch provinces North Holland and South Holland. Yet, it is proven to be difficult to find a case in the specific context of Fryslân.

Recommendations

- Involving a more diverse set of actors into the conversation about climate adaptation is important to cover both the political and societal spheres of society to implement climate adaptation strategies more effectively. Concrete actors to think about for this instance are schools and housing associations.
- The general concept of climate adaptation should be spread more widely and more awareness should be created among a more diverse set of actors, citizens in general, yet, socially vulnerable populations especially should be informed better about climate adaptation and in a way that fits with their understanding.

- While different types of definitions of climate adaptation might be necessary in different contexts, the practical execution is also different. Stakeholders involved in the conversation, currently, mainly governmental bodies, should be aligned on what climate adaptation means when working together to be able to apply climate adaptation effectively and without talking past each other or misunderstanding the goal of applied climate adaptation strategies. This becomes even more important when different stakeholders are getting involved.
- To reach the socially vulnerable, more coordination between the planning of climate adaptation strategies, which is often done by governing bodies, and organisations which are in close contact with socially vulnerable populations, often NGOs or social workers, is important.

REFERENCES

Adger, W. N., Agrawal, S., Mirza, M. M. W., Conde, C., O'Brien, K. L., Pulhin, J., ... & Takahashi, K. (2007). Assessment of adaptation practices, options, constraints and capacity.

Afsluitdijk | Rijkswaterstaat. Retrieved 5 May 2021, from <https://www.rijkswaterstaat.nl/water/waterbeheer/bescherming-tegen-het-water/waterkeringen/dijken/afsluitdijk#:~:text=De%20Afsluitdijk%20is%20een%2032,Nederland%20te%20beschermen%20tegen%20overstromingen.>

de Bruin, K., Dellink, R. B., Ruijs, A., Bolwidt, L., van Buuren, A., Graveland, J., ... & Van Ierland, E. C. (2009). Adapting to climate change in The Netherlands: an inventory of climate adaptation options and ranking of alternatives. *Climatic change*, 95(1), 23-45.

de Graaf, R., van de Giesen, N., & van de Ven, F. (2009). Alternative water management options to reduce vulnerability for climate change in the Netherlands. *Natural Hazards*, 51(3), 407-422.

De samenstelling en verdeling van inkomens in Fryslân - Fries Sociaal Planbureau. (2021). Retrieved 5 February 2021, from <https://www.fsp.nl/monitoren/inkomen/>

Friese Klimaatatlas. (2018). Retrieved 5 February 2021, from <https://klimaatatlas.maps.arcgis.com/apps/MapSeries/index.html?appid=252834a5ca1f4d4b85d23001e87c60c0>

Geloven op maandag – Mensen voor Mensen. Retrieved 6 May 2021, from <https://solidairfriesland.nl/geloven-op-maandag/>

Goal 13 | Department of Economic and Social Affairs. Retrieved 20 June 2021, from <https://sdgs.un.org/goals/goal13>

IPCC, 2014: Summary for policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

It Fryske Gea. (2013). *Natuurlijke klimaatbuffer Friese IJsselmeerkust*. It Fryske Gea.

Noble, I.R., S. Huq, Y.A. Anokhin, J. Carmin, D. Goudou, F.P. Lansigan, B. Osman-Elasha, and A. Villamizar, 2014: Adaptation needs and options. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 833-868.

O'Brien, K., Eriksen, S. E., Schjolden, A., & Nygaard, L. P. (2004). What's in a word? Conflicting interpretations of vulnerability in climate change research. *CICERO Working Paper*.

Operatie Steenbreek – Leeuwarden. Retrieved 9 March 2021, from <https://leeuwarden.steenbreek.nl/>

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*. Routledge.

Provincie Fryslân, Wetterskip Fryslân & Friese gemeenten. (2020). Friese klimaatadaptatiestrategie: Een handreiking voor klimaatbestendig ontwikkelen. Retrieved 19 Februari, from https://klimaatadaptatienederland.nl/publish/pages/184684/friese_klimaatadaptatie_strategie_de_finitief.pdf

Strategische klimaatbuffer De Nieuwe Afsluitdijk. Retrieved 6 May 2021, from <https://klimaatadaptatienederland.nl/@158002/strategische-klimaatbuffer-nieuwe-afsluitdijk/>

Uittenbroek, C. J., Janssen-Jansen, L. B., & Runhaar, H. A. (2013). Mainstreaming climate adaptation into urban planning: overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies. *Regional environmental change*, 13(2), 399-411.

Veiligheidsregio Fryslân. (2018). *Regionaal Risicoprofiel 2018-2021*. Veiligheidsregio Fryslân.

Vergouwe, R. (2014). *The National Flood Risk Analysis for the Netherlands*. Rijkswaterstaat VNK Project Office.

Voorbeelden: Toepassing van klimaatadaptatie in Nederland. Retrieved 6 May 2021, from <https://klimaatadaptatienederland.nl/voorbeelden/>

Welch, C., & Piekkari, R. (2006). Crossing language boundaries: Qualitative interviewing in international business. *Management International Review*, 46(4), 417-437.

Williamson, C. (2013). Questionnaires, individual interviews and focus groups. *In Research methods: Information, systems, and contexts* (pp. 349-372). Tilde University Press.

APPENDIX

APPENDIX_A_Email to interviewees

Beste meneer/mevrouw,

Mijn naam is Rikst Leenstra, student van de Bachelor Global Responsibility & Leadership aan de Campus Fryslân in Leeuwarden. Op dit moment zit ik in mijn derde jaar en werk ik aan het zogenaamde Capstone Project, of ook wel de eindschrijft.

De kern van mijn eindschrijft is samengevat in de onderzoeksvraag:

“Hoe kunnen verschillende oorzaken van sociale kwetsbaarheid in de provincie Friesland tegelijkertijd worden aangepakt met strategieën voor klimaatadaptatie?”

Het doel van het onderzoek is om inzicht te krijgen in 3 verschillende dimensies die beïnvloed worden door klimaatverandering, namelijk:

natuur en water management;
infrastructuur & de stedelijke omgeving en
sociale kwetsbaarheid.

Door te kijken naar lokale organisaties en initiatieven wil ik onderzoeken hoe de 3 voornoemde dimensies tegelijkertijd aangepakt kunnen worden door middel van klimaatadaptatie strategieën.

Het onderzoek zal bestaan uit een herziening van de al bestaande literatuur over klimaatadaptatie in de 3 genoemde dimensies. Daarnaast hoop ik mijn onderzoek te kunnen verrijken door middel van interviews met mensen die betrokken zijn bij diverse organisaties en initiatieven, om zo mogelijk meer te weten te komen over bestaande lokale inzichten met betrekking tot klimaatadaptatie strategieën.

De bevindingen die volgen uit deze interviews zullen vervolgens anoniem worden verwerkt, of, wanneer u vooraf schriftelijke toestemming hebt gegeven, zal niet-geanonimiseerde data op worden genomen in de resultatensectie van het onderzoek. Middels deze mail wil ik u vragen of u mogelijkheid ziet om deel te nemen aan het onderzoek.

Rekening houdend met de huidige omstandigheden, zal het interview online plaatsvinden via een nader te bepalen online platform.

Het onderzoek zal uitgevoerd worden gedurende de maand mei. Verder wil ik benadrukken dat het ten alle tijden mogelijk is om uzelf terug te trekken uit het onderzoek.

Graag verneem ik uw reactie.

Met vriendelijke groet,
Rikst Leenstra

APPENDIX_B_Consent form interviewees

Project titel: Addressing Social Vulnerability through Climate Adaptation Strategies in Fryslân

Onderzoeker(s): [...]

Naam geïnterviewde: [...]

Bedankt dat u deel wilt nemen aan dit onderzoek! De interviews zullen uitgevoerd worden als onderdeel van het Capstone-project, welke plaats vindt tussen februari en juni 2021.

De focus van dit project zal liggen op het verkrijgen van inzichten in de dimensies van de maatschappij die beïnvloed worden door de effecten van klimaatverandering in de specifieke situatie van Friesland. De betreffende maatschappelijke dimensies zijn natuur- en watermanagement, infrastructuur & de stedelijke omgeving en sociale kwetsbaarheid. De verwachting is dat dit onderzoek zal bijdragen aan een breder multidimensionaal perspectief om gelijktijdig meerdere dimensies te omvatten bij de uitvoering van specifieke klimaatadaptatie strategieën. Inzichten zullen worden verworven door middel van interviews met lokale organisaties en initiatieven die werken aan klimaatadaptatie.

Het interview zal tussen de 30 en 60 minuten in beslag nemen. Ik voorzie geen risico's die gepaard gaan met deelname aan dit onderzoek, maar u heeft te allen tijde het recht om het interview te stoppen of u terug te trekken van het gehele onderzoek.

Hierbij vragen wij bevestiging dat u akkoord gaat met de volgende punten:

- Het interview wordt opgenomen en getranscribeerd;
- Het transcript van het interview zal worden geanalyseerd door [*naam onderzoeker*];
- Toegang tot de opnames en transcripties van het interview zijn voorbehouden aan [*naam onderzoeker*];
- De opnames van het interview zullen worden opgeslagen tot eind juni 2021;
- Alles wat wordt besproken tijdens het interview is vertrouwelijk;
- Mogelijk worden geanonimiseerde directe citaten gebruikt in het onderzoeksverslag;
- Veranderingen in de bovengenoemde condities zullen alleen plaatsvinden met uw expliciete toestemming.

[Naam Geïnterviewde]

[Naam Onderzoeker]

Handtekening Geïnterviewde:

Handtekening Onderzoeker:

APPENDIX_C_Interview guide I

Introductie:

Goedemiddag, mijn naam is Rikst en ik studeer Global Responsibility & Leadership aan Campus Fryslân en zit op dit moment in het derde jaar. Ik ben bezig met het zogenaamde Capstone project, of ook wel de bachelor thesis. De onderzoeksvraag die ik probeer te beantwoorden is "Hoe kunnen verschillende oorzaken van sociale kwetsbaarheid in de provincie Friesland tegelijkertijd worden aangepakt met strategieën voor klimaatadaptatie?". Het uiteindelijke doel van het onderzoek is om inzicht te krijgen in 3 verschillende dimensies die beïnvloed worden door klimaatverandering, namelijk: natuur en water management; infrastructuur & de stedelijke omgeving en sociale kwetsbaarheid. Door te kijken naar lokale organisaties en initiatieven wil ik onderzoeken hoe de 3 voornoemde dimensies tegelijkertijd aangepakt kunnen worden door middel van klimaatadaptatie strategieën. Daarnaast hoop ik mijn onderzoek te kunnen verrijken door middel van onder ander dit interview, om zo mogelijk meer te weten te komen over bestaande lokale inzichten met betrekking tot klimaatadaptatie strategieën en sociale kwetsbaarheid.

Voordat we het interview beginnen wil ik u nog wijzen op het feit dat alle informatie die worden verstrekt tijdens het interview anoniem verwerkt wordt en confidentieel behandeld zal worden.

Verder voorzie ik geen risico's die gepaard gaan met deelname aan dit onderzoek, maar u heeft te allen tijde het recht om het interview te stoppen of u terug te trekken van het gehele onderzoek.

Heeft u nog vragen voordat we beginnen?

Dan start ik nu de opname en dan kunnen we wat mij betreft beginnen.

Openingsvragen:

- Kunt u iets over uzelf vertellen?
- Voor welke organisatie werkt u op dit moment? Kunt u hier iets over vertellen?
 - Wat is uw positie binnen de organisatie?
- Hoe staat uw beroep in relatie tot klimaatadaptatie?
- Waarom vindt u het interessant om te werken aan klimaatadaptatie?
 - Wat is u persoonlijke motivatie om aan klimaatadaptatie te werken?

Hoofdvragen:

- Hoe zou u klimaat adaptatie definiëren in uw werkveld?
 - Wat betekent klimaat adaptatie in uw werkveld?
- Wat is volgens u het doel van de huidige klimaat adaptatie strategieën?
- Wat zijn volgens u de grootste uitdagingen met betrekking tot klimaatadaptatie in Friesland?
- Wie zijn volgens u de belangrijkste spelers in Friesland die werken aan klimaatadaptatie?
 - Wat weet u over deze spelers/organisaties/initiatieven?
 - Weet u ook non-gouvernementele organisaties?
- Wat zijn volgens u de grootste uitdagingen die gepaard gaan met klimaatverandering?
- Welke kansen ziet u voor het tegelijkertijd aanpakken van uitdagingen die ons worden gesteld door klimaatverandering?

- Worden sommige uitdagingen al tegelijkertijd aangepakt?
 - Kunt u hier voorbeelden van noemen?
 - Bijvoorbeeld projecten gericht op infrastructuur?
 - Stedelijke omgeving en planning?
 - Zo ja wat denkt u hiervan?
 - Zo nee, vindt u dat dit moet veranderen?
- Ervaart iedereen de gevolgen die klimaatverandering heeft op onze samenleving hetzelfde? (in Friesland)
 - Welke verschillen zijn er?
 - Voor sociaal kwetsbaren (mensen met minder geld, ouderen)
- Wat kan de samenleving doen om klimaat adaptatie strategieën meer effectief en efficiënt te implementeren?
- Wat kunnen individuen doen/Welke rol hebben individuen in de samenleving om dit te bereiken (meer effectieve en efficiënte implementatie)?
 - Heeft elk individu dezelfde verantwoordelijkheid?
 - En wat betreft de sociaal kwetsbaren?
- Zijn de sociaal kwetsbaren onderdeel van het gesprek bij uw organisatie wanneer u praat over klimaatadaptatie?
 - Ziet u mogelijkheden om hen (meer) er bij te betrekken?

Afsluitende vragen:

- Ziet u voor de toekomst meer samenwerkingsmogelijkheden tussen uw organisatie en andere spelers in het veld die werken aan klimaatadaptatie?
- Is adaptatie alleen genoeg? (om de potentiële gevolgen van klimaatverandering op te vangen/tegen te gaan/ op te lossen?)

APPENDIX_D_Interview guide II

Introductie:

Goedemiddag, mijn naam is Rikst en ik studeer Global Responsibility & Leadership aan Campus Fryslân en zit op dit moment in het derde jaar. Ik ben bezig met het zogenaamde Capstone project, of ook wel de bachelor thesis. De onderzoeksvraag die ik probeer te beantwoorden is "Hoe kunnen verschillende oorzaken van sociale kwetsbaarheid in de provincie Friesland tegelijkertijd worden aangepakt met strategieën voor klimaatadaptatie?". Het uiteindelijke doel van het onderzoek is om inzicht te krijgen in 3 verschillende dimensies die beïnvloed worden door klimaatverandering, namelijk: natuur en water management; infrastructuur & de stedelijke omgeving en sociale kwetsbaarheid. Door te kijken naar lokale organisaties en initiatieven wil ik onderzoeken hoe de 3 voornoemde dimensies tegelijkertijd aangepakt kunnen worden door middel van klimaatadaptatie strategieën. Daarnaast hoop ik mijn onderzoek te kunnen verrijken door middel van onder ander dit interview, om zo mogelijk meer te weten te komen over bestaande lokale inzichten met betrekking tot klimaatadaptatie strategieën en sociale kwetsbaarheid.

Voordat we het interview beginnen wil ik u nog wijzen op het feit dat alle informatie die worden verstrekt tijdens het interview anoniem verwerkt wordt en confidentieel behandeld zal worden.

Verder voorzie ik geen risico's die gepaard gaan met deelname aan dit onderzoek, maar u heeft te allen tijde het recht om het interview te stoppen of u terug te trekken van het gehele onderzoek.

Heeft u zelf nog vragen voordat we beginnen?

Dan start ik nu de opname en dan kunnen we wat mij betreft beginnen.

Openingsvragen:

- Kunt u iets over uzelf vertellen?
- Voor welke organisatie werkt u op dit moment? Kunt u hier iets over vertellen?
 - Welke projecten zijn er?
 - Wat is het doel van deze projecten? Voor wie zijn de projecten?
 - Wat is uw positie binnen de organisatie?
- Wat is uw persoonlijke motivatie om te werken met sociaal kwetsbaren?

Hoofdvragen:

- Hoe zou u sociale kwetsbaarheid omschrijven in uw werkveld?
- Wie zijn volgens u de belangrijkste spelers in Friesland die werken met sociaal kwetsbaren?
 - Wat weet u over deze spelers/organisaties/initiatieven?
- Waar zijn de sociaal kwetsbaren gesitueerd in Friesland?
 - Kunt u een omschrijving geven van hun leef/woon situatie?
- Wat zijn op dit moment in het algemeen de grootste maatschappelijke uitdagingen in Friesland?
 - En voor de toekomst?
 - En wat zijn specifieke uitdagingen huidige/toekomstige voor sociaal kwetsbaren?
- Is het klimaat (verandering)/klimaatadaptatie onderdeel van gesprek bij uw organisatie wanneer u projecten opzet?
 - Waarom wel/niet?

- Welke kansen ziet u voor het tegelijkertijd aanpakken van uitdagingen die ons worden gesteld door klimaatverandering zoals hittestress en wateroverlast in de stad in combinatie met de uitdagingen voor sociaal kwetsbaren die u net heeft beschreven?
 - Worden sommige uitdagingen al tegelijkertijd aangepakt?
 - Kunt u hier voorbeelden van noemen?
- Wanneer we het hebben over klimaatverandering, draagt iedereen dezelfde verantwoordelijkheid om zich hieraan aan te passen?
 - Of zijn er verschillen sociaal meer/minder kwetsbaren?
- Zijn sociaal kwetsbaren zich bewust van potentiële gevolgen die klimaatverandering op hun leven kan hebben?
 - Waarom wel/niet?
 - Wie is verantwoordelijk voor hun bewustwording? De overheid, zijn ze dat zelf?
- Zijn projecten/acties van de gemeente en andere organisaties gericht op klimaatadaptatie zoals NK tegelwippen, geveltuintjes en bomen weg geef acties van de gemeente Leeuwarden onder de aandacht bij de sociaal kwetsbaren?

Afsluitende vragen:

- Ziet u voor de toekomst meer samenwerkingsmogelijkheden tussen uw organisatie en andere spelers in het veld die werken aan klimaatadaptatie?

APPENDIX E Transcripts interviews