

Exploring Dependencies In Dutch Flood Risk Management

Integration of the Multi-Layer Safety Approach
and Strategic Spatial Planning
in the city of Zwolle



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Preface

The reason why I decided to carry out this research is my interest in how spatial interventions are made in situations of need, as the one the whole world is facing now with climate change. My awareness on the fact that dealing with climate change and flooding needs new types of approaches brought me to face myself with this topic which I believe to be extremely relevant.

The way how we shape our land affects not only the physical distribution of it, but also the way how society develops within it. Observing what kinds of dependencies are present amongst actors who are developing spatial plans to deal with flooding, gave me numerous insights and enriched my knowledge on the topics of spatial planning and flood risk management. The feeling to be in a country where the subject of spatial planning is taken seriously into consideration convinced me in choosing to conduct my research here in the Netherlands.

I truly want to thank my professor and supervisor dr. ir. Wim van der Knaap for his patience, punctuality and clarity along these months in which he has supervised me. I recognize that without him, writing this thesis would have been extremely difficult and different. All the moments in which I felt blocked and slowed down, his presence helped me to get back on track.

A special thanks goes to my family and friends, especially to my brother Nicholas and to my friend Emanuele. Even from abroad, they have always supported and inspired me. Another big thanks goes to my housemates who were always present when I needed them. I also want to thank Hector, Lily and Marco for their trust and confidence in me.

Mattia Bosoni

Wageningen, June 25, 2019.

Summary

Flooding, as well as many other extreme phenomena, is becoming more frequent with climate change. The Netherlands is a country with about 65% of surface lying below the sea level. The coastal protection measures against flooding combined with the inland ones protect the country from waterlogging and potential disasters. However, these structural measures are not sufficient to protect the country and to reduce the risk of flooding to zero. Water needs to be accepted on the land and seen more as a precious resource than a threat. In urban contexts where the risk of flooding is high, water needs to be taken into account through spatial adaptation. The Netherlands is subject to a transition towards an Integrated Flood Risk Management in which spatial adaptation plays an essential role. The Multi-Layer Safety Approach is a framework that mixes flood risk management with spatial planning and disaster management to decrease the risk of flooding through more adaptation; in the Netherlands it has been applied in different cities. This research focused on the state of integration between the Multi-Layer Safety Approach and Strategic Spatial Planning in the city of Zwolle.

A supportive theoretical framework of this study includes Transition theory, Strategic Spatial Planning theory and Dependency theory in governance and policy making. Transition theory is consulted since it is reflected in the Dutch transition towards an integrated flood risk management and it shares concepts with Strategic Spatial Planning theory. Principles of Strategic Spatial Planning such as trans-disciplinary collaboration and long-term thinking are reflected through the application of the Multi-Layer Safety Approach since it requires different expertises and combines defensive measures with spatial adaptation measures to flooding. Dependency theory in policy making gives insights about how processes of governance are shaped and what are the factors that affect and bring to a policy outcome. This theory is used to understand if and how an integration between the Multi-Layer Safety Approach and Strategic Spatial Planning is happening in the case of Zwolle. Such integration is studied by observing what the dependencies are between the actors involved in the development of the flood risk plan in Zwolle. Three kinds of dependencies are highlighted from the theory:

Path dependency, interdependency and goal dependency.

The observation of dependencies in the case of Zwolle is made through review of official documents related to the development of the flood risk plan, semi-structured interviews to some of the actors involved in the development of the plan and a survey for inhabitants. The first 2 methods give a clear overview of what the processes are, which actors take part in the development of the flood risk plan and how they develop the plan through the Multi-Layer Safety Approach. It is possible to observe what actors operate only within certain layers or in all of them, what actors work with a strategic approach that mixes water management with spatial planning and what concepts of dependencies are present between them. The survey for inhabitants gives insights to my research in understanding

how the 3rd layer of the Multi-Layer Safety Approach (Disaster Management) is taken into account, since they should be informed about what to do in case of flooding by the organizations that are developing the plan.

My findings show that the integration between the Multi-Layer Safety Approach and Strategic Spatial Planning is taking place since all the actors I focussed on played a role in the Multi-Layer Safety Approach (at least in one layer) and in Strategic Spatial Planning (all of them took part in at least one trans-disciplinary organization). Most of the processes related to the development of the flood risk plan in Zwolle involve multiple actors that work trans-disciplinary and with strong Interdependency between them. Interdependency is observed with more occurrence than path dependency and goal dependency. Goal dependency is observed between actors involved in strategic processes related with the 2nd and 3rd layer of the Multi-layer Safety Approach with stronger occurrence than path dependency. Path dependency is present between few actors which work as well on strategic processes but in processes related with the 1st layer of the Multi-Layer Safety Approach. Also, absence of dependency is observed between certain organizations.

This pattern of dependencies is reflected in the multiple coalitions created to deal with flood risk from multiple perspectives and with an integrated approach in the city of Zwolle. Different projects already realized show that spatial adaptation is adopted by combining defensive measures against flooding with spatial planning interventions that are waterproof and that use water as an element to enrich spatial quality. The observed dependencies in the case of Zwolle suggest that the transition towards an integrated flood risk management in the city is moving towards an acceleration phase which should bring to a new stabilization in which spatial adaptation to flooding will be entirely integrated.

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List of abbreviations

DM: Disaster management

FRM: Flood Risk Management

HWBP: High Water Protection Program

IFRM: Integrated Flood Risk Management

MLSA: Multi-Layer Safety Approach

MLSP: Multi-Layer Safety Perspective

SP: Spatial Planning

SSP: Strategic Spatial Planning

TM: Transition Management

TT: Transition Theory

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1 Introduction

In this chapter I introduce my research, starting from the global issue of climate change that causes flooding events, with some Dutch examples. Then, I point out the transition of Flood Risk Management (FRM) in the Netherlands during the last three decades towards a more integrated approach, with particular focus on the Multi-Layer Safety Approach (MLSA) and its linkage with Strategic Spatial Planning (SSP).

1.1 Climate change and flooding in urban areas

Water precipitations and other extreme meteorological phenomena are gradually increasing due to climate change, causing environmental disasters such as flooding (Voskamp & Van de Ven, 2015) that occur in different geographic contexts. Particularly, densely populated urban settlements located on deltas, coastal areas or rivers, own high level of flood risk due to their numerous infrastructures and economic activities (Pelling, 2003). In developed countries, 80% of the total population lives in cities (Bugliarello, 2006). The Netherlands is a densely populated country with previous flooding experiences such as in 1953 and flooding threats as in 1993, 1995 and 1998 (Ritzema & Van Loon-Steensma, 2018; Woltjer & Al, 2007). Without safety measures (dykes and dunes), 65 % of the country would be flooded (Van Baars, 2005). Beside coastal flooding and related protective measures, attention needs to be addressed on fluvial flooding. The presence of the rivers Rhine, Meuse and Scheldt represent fluvial flooding threats due to their high amounts of water discharges in case of water precipitations (Ritzema & Van Loon-Steensma, 2018; Vergouwe, 2016).

1.2 Overview of flood risk management transition in the Netherlands

In the Netherlands FRM has traditionally focused with safety measures to keep water away from the land, such as dikes and barriers, instead of thinking about adaptation measures (van Herk, Zevenbergen, Gersonius, Waals, & Kelder, 2014; Ritzema & Van Loon-Steensma, 2018; Woltjer & Al, 2007). Technicians, engineers and water boards have worked with these measures of protection, but without integration with any other practice. In 1953, a coastal flood from the North Sea caused the death of about 2000 people, with a consequent increase of safety measures disposal along the Dutch coasts. However, problems like extreme river discharges still remained an issue (Ritzema & Van Loon-Steensma, 2018). A transition from refusing to accepting water on the land has become a principle inserted in the planning practices of Europe and the Netherlands during the last 3 decades. The focus of FRM has moved from defensive measures to reducing flood impacts (van Herk et al., 2014). Two important facts can be identified within this transition:

- The flood directive of the European Union that adopts an Integrated Flood Risk Management (IFRM), which is sub-ordinated to the member states where the risk is relevant (van Herk et al., 2014)

- The Dutch government after the evacuation of about 200 000 inhabitants along the river Rhine in 1995 due to high amount of water discharge became more motivated to adapt its water safety policies, (Ritzema & Van Loon-Steensma, 2018)

The latter event moved the attention towards fluvial and pluvial flood risk management. Subsequently, initiatives such as “room for the river” were promoted with the aim to create water storage beside rivers (Woltjer & Al, 2007). In 2008 the MLSA entered the scene in FRM, with the integration of Spatial Planning (SP) and Disaster Management (DM) measures with the preventive ones (Pötz & Bleuzè, 2012). Whereas the 1st layer includes only defensive measures against water, the 2nd and 3rd layers in the MLSA enhance the linkage between water and SP (Ritzema & Van Loon-Steensma, 2018). SP has been subjected to a transition towards a more strategic approach when developing plans for regions, keeping in consideration the socio-economic development of areas besides the physical distribution only (Salet & Faludi, 2000). That transition brings to the concept of SSP, which embodies a holistic and integrated approach with involvement of different stakeholders, development of long-term views combined with short-term interventions and interaction between human and nature systems as main principles. These transitions in FRM and SP are happening due to the negative situations and predictions regarding climate, economy and population growth within the country; which also question the old traditional measures against flooding (Ritzema & Van Loon-Steensma, 2018). Such issues, referring to Transition Theory (TT), are part of persistent problems that resulted from the fallacy of policies and market that belong to our societal system (Rotmans & Loorbach, 2009).

1.3 A risk-based approach

FRM in the Netherlands has shifted from using traditional preventive measures to accommodate water on its land. The development and implementation of the European flood directive in 2007 sustained this direction towards measures to reduce probability and consequences of flooding (Kaufmann, Mees, Liefferink, & Crabbé, 2016). Hence, the Dutch government applies a risk-based approach for flood risk management, built on the formula (Vergouwe, 2016; Zandvoort & van der Vlist, 2014):

Risk = probability * consequences (exposure * vulnerability)

Zandvoort & van der Vlist (2014) point out that there is a lot of uncertainty regarding consequences of flooding and their related measures to reduce flood risk. The mobility of urban assets, transportation modalities and resources availability are factors linked to exposure. Exposure on the long-term can be reduced with local flood defence. Vulnerability is distinguished in social vulnerability and societal vulnerability. Social vulnerability refers to individuals, where the most vulnerable are, for instance, children and elderly people. Societal vulnerability refers to human assets, particularly how much they are damage prone (Zandvoort & van der Vlist, 2014).

Exposure and vulnerability incorporate multiple factors related to population, landscape design, infrastructures, society and economy of any area where flood risk is present. These are essential elements for the development of urban areas. Creating urban resilience can reduce the consequences of flooding (Voskamp, & Van de Ven, 2015). Urban resilience is defined as:

“The ability of a system (the city) to adapt and adjust to changing internal or external processes” (Pickett, Cadenasso, & Grove, 2004).

Ritzema & Van Loon-Steensma (2018) stress the importance of reducing social disruption caused by flooding rather than focusing on preventive measures against it. The water safety policy takes into account these considerations and focuses its practice on security for those people who live in flood-prone areas, prevention of social disruption caused by flooding and protection for vulnerable infrastructures (Ritzema & Van Loon-Steensma, 2018).

1.4 The Multi-Layer Safety Approach

In the shift towards an IFRM, the MLSA plays an essential role. According to Kaufmann et al. (2016), during the 1990^s, the discourse regarding protection measures against flooding started to be criticized and the concept of Multi-Layer Safety Perspective (MLSP) began to rise in FRM. In 2006, a MLSP became a consensus within the Dutch government. This concept was also integrated into a national program, the Delta Programme, in which a great number of actors are involved to deal with flooding (Kaufmann, Mees, Liefferink, & Crabbé, 2016). Reducing the impact of a flood through spatial adaptation and smart spatial design is amongst the main challenges of the Delta Programme (Staff of the Delta Programme Commissioner, 2017).

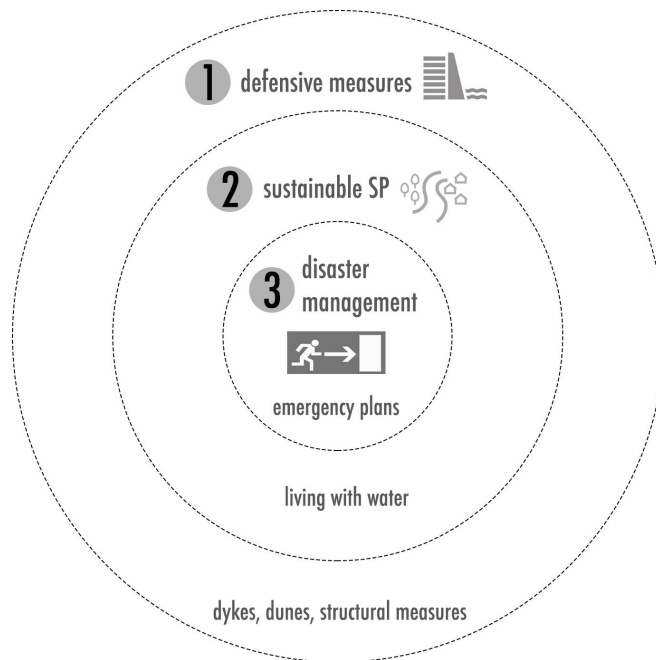


Figure 1. Schematic representation of the MLSA.

The MLSA schematized in **Figure 1**, embodies spatial planning and disaster management in addition to the structural measures always adopted, this forming 3 different layers, as follows (Pötz & Bleuzè, 2012; Ritzema & Van Loon-Steensma, 2018):

- Preventive measures such as dyke strengthening
- Sustainable spatial planning such as water-robust structures and buildings
- Disaster management and evacuation plans

This is a framework designed for an IFRM that takes into account the adaptation and reduction of flooding consequences (van Herk et al., 2014). The integration of the 2nd and 3rd layers created more collaboration between provincial, local and private parties in policy making (Pötz & Bleuzè, 2012). The 1st layer reflects the traditional defensive measures such as dikes, dunes and all those related ones to protect land from the water. The 2nd and 3rd layers represent the integration of SP and DM by thinking about non-structural measures to adapt water flows on the land caused by floods and by involving more stakeholders into a more strategic approach. Although, it is important to state that SP and DM cannot replace the preventive measures (Ritzema & Van Loon-Steensma, 2018). As seen before, flood risk is determined by probability and consequences. The concept of probability is strongly related to the 1st layer, because all the protection measures such as dikes are made to reduce the probability; differently, managers deal more with exposure and vulnerability through measures related to the 2nd and 3rd layer which, take into account possible consequences (Zandvoort, & van der Vlist, 2014). The MLSA shows that with a cautious SP it is possible to reduce vulnerability to

flooding, only if the decision makers involved are well informed about costs and benefits (Ritzema & Van Loon-Steensma, 2018). The emergence of the MLSA at the national scale is still in course due to the still present defensive approach which hinders the transition towards an IFRM, however at the regional scale it is already common to see adaptive strategies that also involve SP (Kaufmann et al., 2016).

1.5 Problem statement with scientific and societal relevance

As mentioned before, the consequences (exposure and vulnerability) of flooding are increasingly considered when a flood risk plan needs to be delivered. With the MLSA, exposure and vulnerability are taken into account in the 2nd and 3rd layers (sustainable SP and DM). The integration of the 2nd and 3rd layers with the 1st one, requires a holistic approach which includes collaboration amongst different experts. Such collaboration is reflected in the principles of SSP. The scientific relevance of the problem is about if and how the MLSA with SSP are integrated and can effectively reduce flood risk in an urban context through the involvement of multiple stakeholders, their interaction, the creation of long-term views with related short-term interventions. The societal relevance of the problem regards the implementation state of the MLSA as a tool for policy-making to deal with flooding, and how it is integrated with principles of SSP in terms of decision-making processes. By investigating what are the dependencies between actors that operate within the MLSA and SSP can give insights about their integration in FRM and about how the societal Dutch transition towards an IFRM is happening. The related theories are further discussed in the next chapter.

2 Theoretical Framework

In this chapter I review the theories I chose to link to this research, starting from general principles of TT with insights about transition towards sustainable development; then SSP follows with emphasis on its holistic approach in terms of stakeholders' involvement and creation of long-term visions. Lastly, dependency theory is consulted with the aim to understand the patterns of governance and policy-making processes and the interaction between their actors.

2.1 Transition theory

Managing flooding events is a constant and an evolving process which comprehends changes, such as introduction of new approaches to deal with this phenomenon (i.e. the MLSA). These changes are parts of a transition within the society. Transition is defined by Rotmans, Kemp & van Asselt (2001), as a radical and structural change of the societal system, derived from a coevolution of different developments such as economic, cultural, technological and institutional. This change is slow and complicated, since the society is characterized by multiple factors and variables which do not change at the same time and in the same way. As Loorbach & Rotmans (2006) underline, changes in transition do not follow a linear pattern. Our society faces persistent problems related to system failures, that consist in locked-in flaws such as dominant networks, institutional barriers and path dependencies (Rotmans & Loorbach, 2009). Transition can neither be solved nor controlled with short term policies, because those persistent problems are complex and uncertain (Maouche, 2016). However, Rotmans & Loorbach (2009) point out that by understanding transition dynamics it is possible to condition the different steps of a societal system change, towards a more sustainable direction. Loorbach & Rotmans (2006) highlight 3 shared concepts about transition given by the Dutch Knowledge network on System innovation and transition, which gives us a science perspective. The 1st is about the kinds of transition, that are:

- Evolutionary transition
- Goal-oriented transition

Whereas the 1st does not plan an outcome in a significant and precise way, the second one is guided by goals and visions; the Dutch water management is an example of the latter.

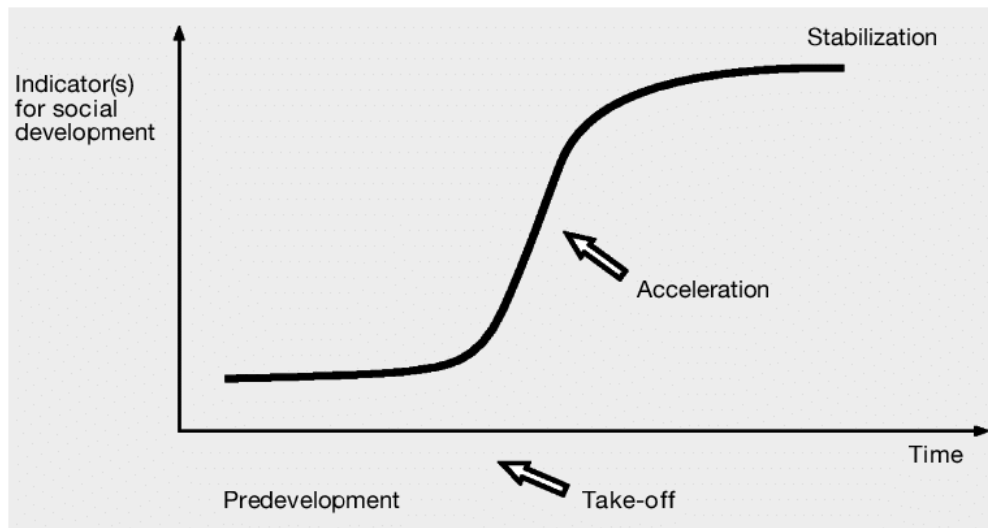


Figure 2. The multi-phase concept of a transition framework. (Rotmans et al., 2001).

The 2nd shared concept is about a transition framework based on a “Multi-phase concept” and “Multi-level concept”. The “Multi-phase concept” consists in 4 phases (**Figure 2**):

- A pre-development phase characterized by a small change at the system level and by experimentation at the individual level
- A take-off phase characterized by innovations and surprises which start to change faster the system level
- An acceleration phase where structural changes are evident due to implemented economic, socio-cultural, institutional and ecological changes
- A stabilization phase in which a new equilibrium after the acceleration phase is reached

The “Multi-level concept” makes a distinction between niches, regimes and the socio-technical landscape at 3 interacting scale levels: the micro, meso and macro-level:

- The micro-level or niche, that is characterized by individual actors and practices where changes occur from new ideas and initiatives
- The meso-level or regime, where social norms and interests of organizations and institutions operate
- The macro-level or societal landscape, in which occur slow changes within the society

The 3rd shared concept is the one of Transition Management (TM). It underlines that transitions can be influenced and adjusted but not controlled (Loorbach & Rotmans, 2006). TM is also defined, by Rotmans et al (2001), as promoting and aiming at sustainability. TM deals with transformative changes towards sustainable development through a combination of long-term visions and short-term actions, networking, experimentation and adaptation; in order to address persistent problems (Maouche, 2016).

2.2 Strategic spatial planning theory

TM shares with SSP principles related to the achievement of sustainable development (such as long-term visions combined with short-term interventions, networking and adapting). SSP arises from the development of SP during the 20th century. According to Salet & Faludi (2000), in the beginning of last century SP started with a tradition of master plans at the city level, especially in the European and American contexts. Architects and urban designers dominated the practice of SP with a main focus on the physical layout of the land. Later, in the 1960 's spatial plans started to encompass larger regions and to take in consideration economic and social trends of an area (Salet & Faludi, 2000). Strategic Spatial Planning (SSP) finds its roots in the need to make rapid changes by building visions for an uncertain future, with emphasis on making decisions to find and implement solutions (Albrechts, 2004).

Flooding is a phenomenon tightly related with the physical conformation of the space because this latter can determine the extent of water discharges in terms of speed and power. Besides the physical distribution of the space, regions located in flood prone areas need to take into account socio-economic trends and to adopt visions when developing their spatial plans with a strategic and holistic approach. Woltjer & Al (2007) proposed the integration of water management and SP in the Netherlands through 4 different approaches. They drew a regulatory and a strategic approach for regions which are exclusively defined by their water-related functions and for regions in which socio-cultural factors are present. These 4 approaches enhance water as a strategic planning instrument to tackle climate change and improve the quality of life (Woltjer & Al, 2007). In relation with the MLSA, as SP needs to be taken into account in water management in order to apply a more strategic approach, also DM need to be incorporated in it. As Pelling (2003) pointed out, within urban context, the low priority in dealing with environmental hazards brings to consequences such as the lack of information about them.

Spatial planners lacking a future-oriented vision, need to create more alliances by adopting long-term views together with best practices (Ratcliffe & Krawczyk, 2011). An important aspect to take into account when dealing with long-term visions in SP is uncertainty. Zandvoort (2017) underlines that uncertainty plays an important role in SP because it can change and condition the long-term impact of an intervention. A way to deal with uncertainty is to take into account adaptiveness in planning. An example of adaptive approach in planning is the interaction between human and nature systems, which brings water managers and planners together (Zandvoort, 2017). The alliances operating within the MLSA take into account adaptiveness through the 2nd and 3rd layers. Morrissey, Moloney & Moore (2018) argue that spatial policy increasingly takes into account sustainability measures, but still as a simple purpose. Nowadays, small-scale measures and short-term plans are still the most common measures to deal with urban and regional development. As a result, spatial planning remains full of uncertainties and it facilitates the economic development dominated by the market which constitutes a barrier when it is time to make plans, take decisions and implement measures (Morrissey, Moloney & Moore, 2018).

2.3 Dependency theory in governance and policy-making

The previous theories are related with the conformation of the societal system and how communities within the society are governed and shaped. Dependency theory gives more insights about the mechanisms of governing and shaping. According to van Assche, Beunen, & Duineveld (2014), in modern society governance is distributed on multiple levels, creating paths within a community. These paths can stay separated, interact or block each other; they are subjected to dependencies. Distinction is made between path dependence, interdependence and goal dependence (van Assche et al., 2014).

Path dependence can hold present and future choices through an initial event (Koch, Eisend, & Petermann, 2008). These preconditions such as self-reinforcing mechanisms can affect the outcome of a decision in policy making, by creating subordination between processes and actors involved in taking that decision. The path-dependence represents a restriction of choice for a decision-making system, by emerging along the involved processes and representing a collateral effect (Koch et al., 2008). The informal linkage between formal rules and the identity of a community can guide governance in a precise direction (van Assche, Beunen, & Duineveld, 2014). Van Assche et al. (2014), defined interdependence as the relation between different institutions and actors involved in a governance process. Along the governance path, each step is conditioned by the patterns of actors and institutions changed over time. Interdependence is particularly relevant for those actors when they act strategies to reach their own goals and when they promote common goals. With interdependencies, different actors can block or complement each other's strategies, but also change their role by giving contribution to common goods (van Assche et al., 2014). Goal dependence, according to van Assche et al. (2014), is defined as the dependence on the future, or rather the influence of shared visions or plans on changes. The shared visions of the future present in institutions have real effects on the actors. Goal dependence is particularly relevant when visions of the future are actually formed and translated into policies, able to bring this future closer to the present (van Assche et al., 2014).

Any governance path owns a unique pattern, represented by a combination of the 3 dependencies, where each of them constitutes an aspect of the rigidity of governance paths (van Assche et al., 2014). As governing in the modern society is done through a multi-level governance that creates governance paths in which dependencies are included (van Assche et al., 2014), the MLSA involves different actors and processes at different levels (national, regional and local) that draw a path of governance in which dependencies can be present.

2.4 Theoretical framework overview

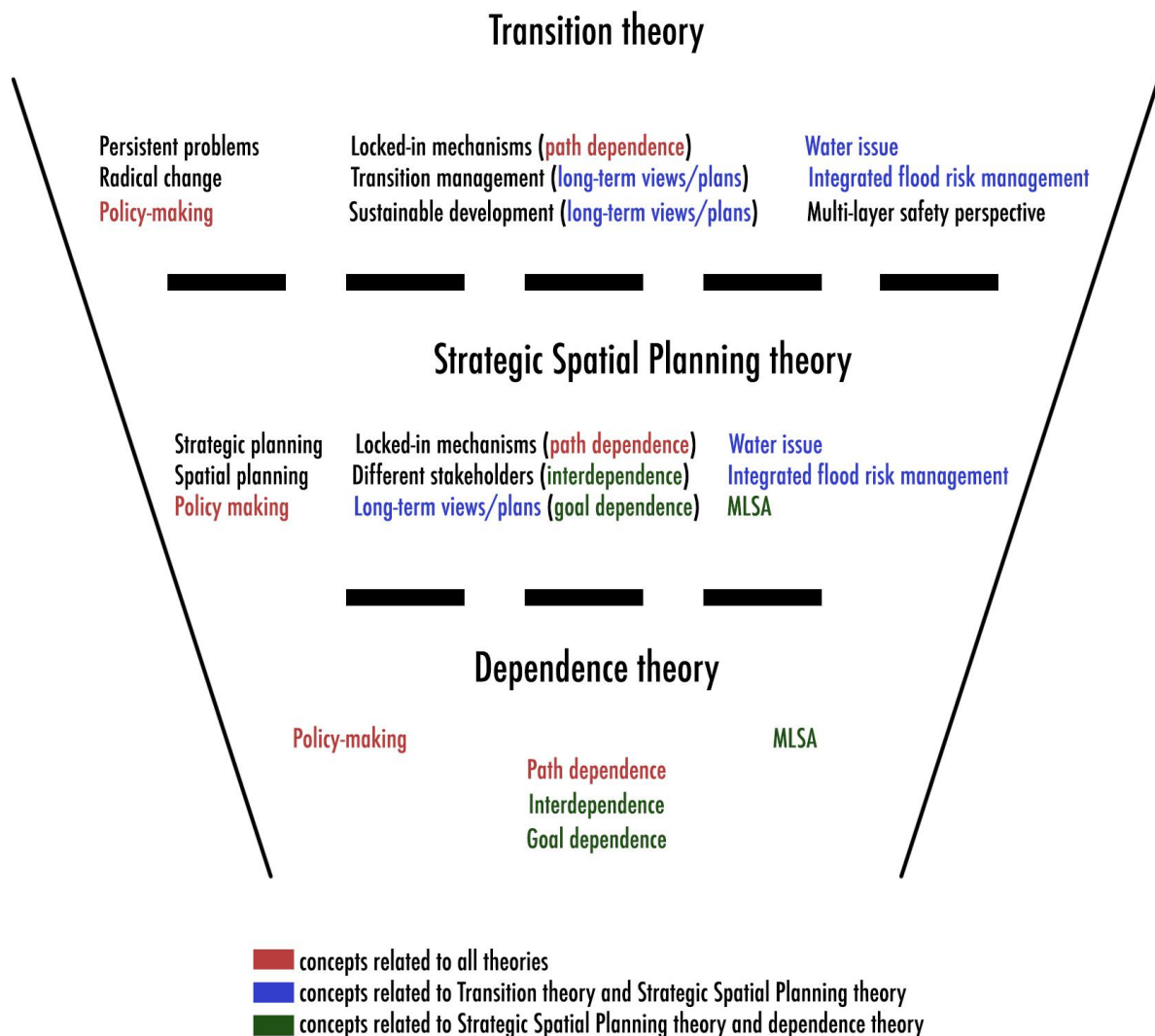


Figure 3. Funnel of the theoretical framework with related concepts.

Figure 3 summarizes the chosen theoretical framework with concepts related to the different theories which have similarities. On the one hand, some of these concepts (i.e. policy making and path dependence) are related to all the theories. On the other hand, some are concepts related to a single theory but incorporate others (i.e. sustainable development incorporates long term views/plans which incorporates goal dependence).

2.5 Conceptual Framework

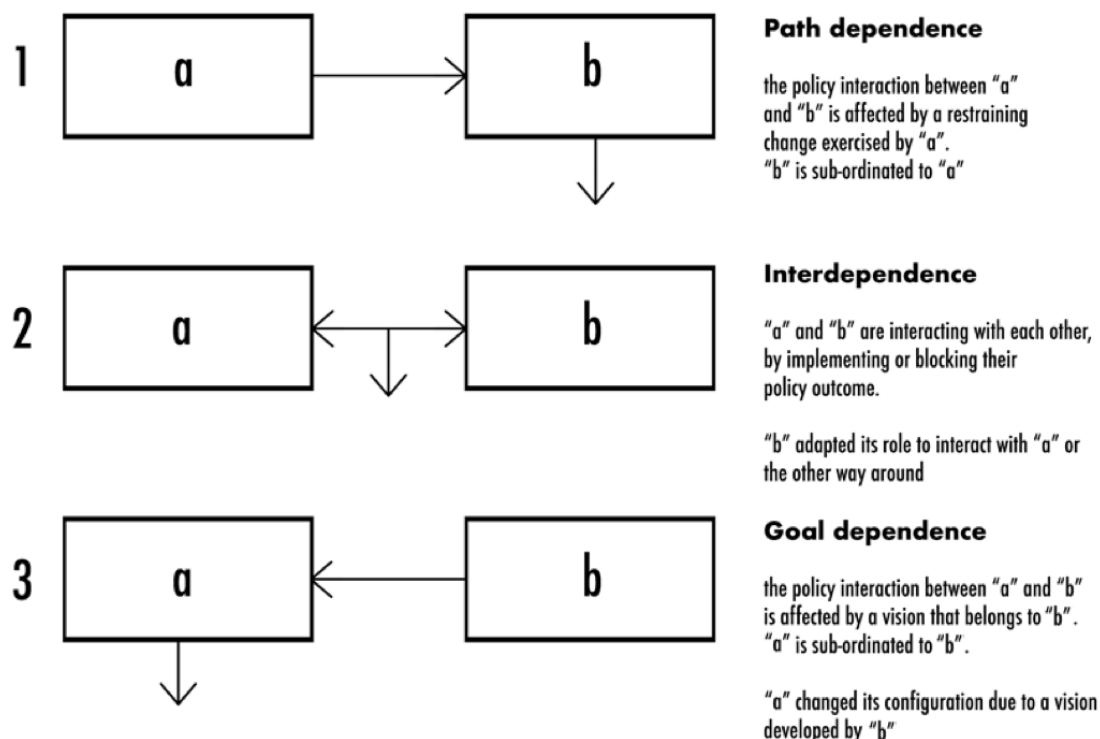


Figure 4. Schematization of dependencies between policy actors.

Figure 4 shows the 3 distinctions of dependency with relative explanations that comprehend concepts shown in **Figure 3**. (a) and (b) stand for different actors involved in the same governance/decision making process. More specifically, by integrating concepts related to dependency theory with SSP theory and TT, the 3 dependencies (path dependence, interdependence and goal dependence) can be identified respectively when:

- Path dependence can be identified when there is a presence of locked-in mechanisms exercised by policy, an actor or more actors, a restriction of choice in policy-making exercised by policy, an actor or more actors and/or subordination between actors
- Interdependence can be identified when there is a relation between different actors involved in a governance/policy process, when actors act collectively to reach their own goals or promote common goals and/or when they change role to contribute to common goods
- Goal dependence can be identified when certain shared visions of the future influence plans or changes of actors and processes and/or when these shared visions are translated into policy

3 Case study, research objective and questions

In this chapter I describe the case study I investigate to conduct this research, with the formulation of a research objective and research questions.

3.1 Case study of Zwolle

This research was conducted in the city of Zwolle where the MLSA has been applied to deliver an integrated flood risk plan.



Figure 5. Administrative boundaries and water bodies in Zwolle (source: <https://www.google.com/maps/place/Zwolle>, 2018).

This case is also chosen due to its geographic position, located beside the river IJssel. In **Figure 5** it is possible to observe the closeness of the river IJssel and the presence of other water bodies within the city. The administrative boundaries of the city (in red) represent the limits within which the municipality of Zwolle operates. These boundaries do not encompass the entire river IJssel and some water bodies, which are under competence of the water board “Drents Overijsselse Delta”.

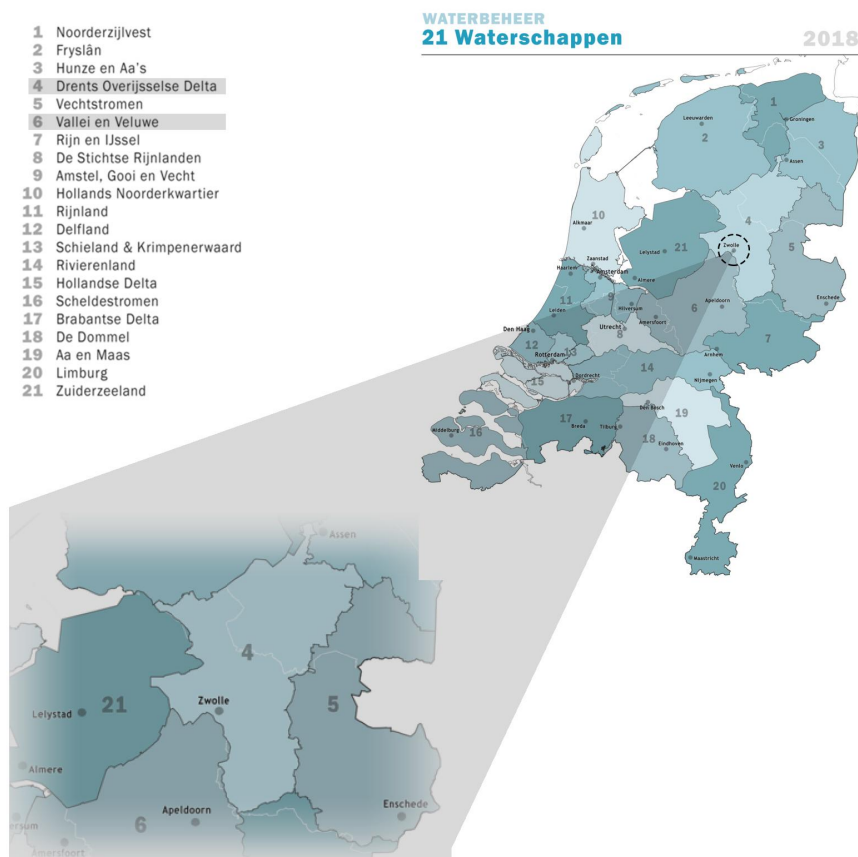


Figure 6. Water boards competence in the Netherlands (source: [http://www.wikiwand.com/en/Water_board_\(Netherlands\), 2018](http://www.wikiwand.com/en/Water_board_(Netherlands), 2018)).

Another water board (“Valley en Veluwe”) shares its competence on the river IJssel (on the other side of the riverbank) with the one previously mentioned. Both water boards are shown in **Figure 6**, respectively indicated as number 4 and 6.

3.2 Research objective and questions

The MLSA is a tool for an adaptive approach in FRM and it is linked with the principles of SSP because of its MLSP that requires a holistic approach with involvement of different stakeholders. Dependencies between multiple actors involved at different governmental levels play an essential role when decisions about long-term plans need to be made and implemented. The MLSA is still in an experimentation phase, thus insights about its effectiveness and integration with SSP need to be investigated through real cases.

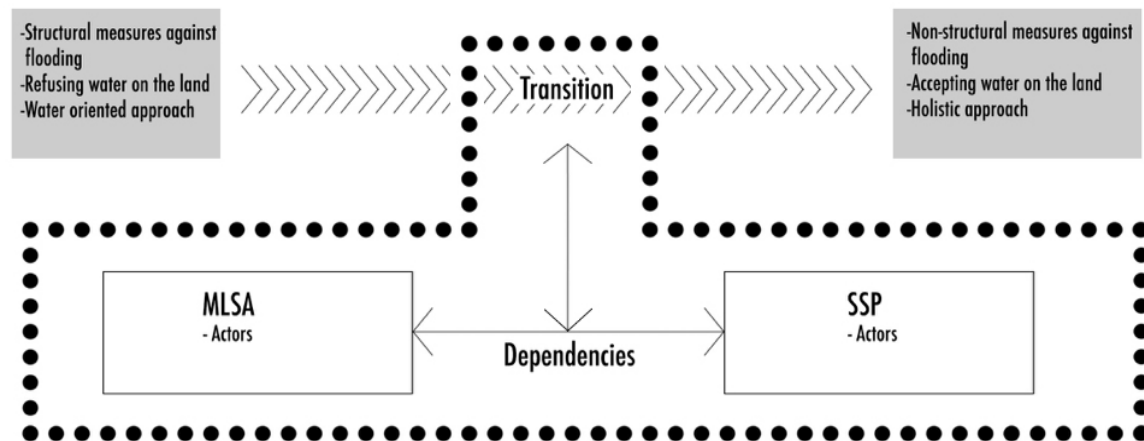


Figure 7. Schematization of the research objective.

The objective of this research is to explore the state of integration of the MLSA and SSP in the city of Zwolle towards an integrated flood risk management, by observing if there are dependencies and if so, what these dependencies between actors involved in both MLSA and SSP are (**Figure 7**). The word “actor” stands for a general term which includes the organizations but also individuals of such organizations involved in the development of the flood risk plan for Zwolle. Hence, the research question is formulated as follows:

What kind of dependencies can be observed between actors involved in the MLSA and SSP, aimed to deliver an integrated flood risk management plan in the city of Zwolle, the Netherlands?

The main research question is divided into four sub-research questions:

- *What kind of dependencies can be observed between actors involved in the MLSA?*
- *What kind of dependencies can be observed between actors involved in SSP?*
- *What are the common and uncommon dependencies between actors involved in the MLSA and SSP?*
- *At which phase of the transition towards an integrated flood risk management can be placed the integration between actors of the MLSA and SSP?*

4 Methodology

In this chapter I explain the methodology chosen to answer the research questions. Triangulation of sources was used as a research strategy to retrieve information necessary to answer the research questions and to improve the internal validity of the research. Data triangulation is a qualitative research strategy which tests the validity of a research through converging information from different sources (Carter, Bryant-Lukosius, DiCenso, Blythe & Neville, 2014). The different methods used are the following:

- Literature review
- Documents review
- Semi-structured interviews to actors
- Survey for inhabitants

4.1 Literature review

Literature about TT, SSP theory and dependencies theory (chapter 2) in governance and policy making was consulted to study their definitions and principles. The choice of the theoretical framework was done in concordance with the background information. The theories narrow down the broad topics of FRM transition towards an IFRM in the Dutch context until the observation of dependencies between actors/organizations involved in the MLSA for the development of the flood risk plan for Zwolle.

TT was chosen since flood risk management in the Netherlands is subject to a transition towards a more integrated approach. As mentioned in chapter 1, new initiatives (such as “room for the river”), new directives (such as the EU flood directive) and the introduction in FRM of the MLSA are changes and developments within this transition.

SSP theory was chosen to see if and how its principles are integrated in the MLSA and the other way around. The 2nd layer of the MLSA (sustainable spatial planning) mixes water related expertise and spatial planning expertise. Furthermore, managing flood risk deals with uncertainty and thus with the need to develop long term-views for creating spatial plans to decrease flood risk. Also, the 3rd layer (DM) requires different expertise and collaboration amongst different practitioners including spatial planners, police and fire brigades. Integration, trans-disciplinary collaboration and long-term views are all principles of SSP.

Dependency theory in governance and policy making was studied to gain insights about how different actors involved in the same policy making processes interact and condition each other. The MLSA implies collaboration and interaction between a multitude of actors. Dependency theory therefore helps to understand these patterns within the development of the flood risk plan for Zwolle.

4.2 Documents review

The 2nd chosen method was a review of official documents related to the flood risk plan in Zwolle. The reviewed documents cover the national, regional and local level (N, R, L). A list of these documents is provided below:

- 1) Delta Programme 2018 (D-N-1)
- 2) Water board Drents Overijsselse Delta website (D-R-1)
- 3) *IJssel-Vechtdelta: werken aan waterveiligheid en klimaatadaptatie* (IJssel Vecht Delta: working on water safety and climate adaptation) (D-R-2)
- 4) *Zwolle Klimaatbestendig* (Zwolle climate-proof) (D-L-1)

This review gives a clear overview of what the processes related to the development of the plan were and also to have a comparison with the results obtained from the interviews, to see if there is similarity or discordance between them. The attention is focussed on certain actors that operate at 3 levels (national, regional and local) and within the 3 layers of the MLSA. These actors are the Ministry of infrastructure and water management, Rijkswaterstaat, water boards Drents Overijsselse delta and Vallei en Veluwe, province of Overijssel, safety board of Overijssel and municipality of Zwolle. Some of the documents are available on websites of the institutions involved; some of them were suggested by interviewed actors. All the documents have a common pattern which is the relation between flood risk management and spatial adaptation to climate change and flooding, more precisely how the 2nd concept is integrated with the 1st. The translation of the Dutch documents to English language was done through google translate and with the revision of a Dutch native speaker.

The Delta Programme 2018 summarises the developments of the year 2017 and also looks at future perspectives. It includes 3 themes which are delta plan on flood risk management, delta plan on fresh water supply and delta plan spatial adaptation. This is the 1st Delta Programme report which includes delta spatial adaptation and it consisted in 3 parts:

1. National level
2. Regions
3. Delta plans

In part 2, more information about the IJssel-Vecht delta region and Zwolle are provided. The rest of the document does not give detailed explanation about the case of Zwolle but numerous insights about the flood risk management in Netherlands and the importance of including spatial adaptation into it. In this document it is possible to find information related to the development of its flood risk plan in Zwolle through the MLSA but also general information about FRM and its progresses in the Netherlands.

The water boards Drents Overijsselse delta website contains information regarding the projects in which the water board itself is involved. It is possible to find insights related to projects of the High-Water Protection Program (HWBP).

Within the 3rd document, even if it focuses on the entire IJssel-Vecht delta region, it contains numerous information regarding the flood risk plan in the city of Zwolle. It enhances the coalition between different parties and explains how within a short-term period (2011-2019) numerous developments took place in the region.

The last document reviewed is also the oldest (2013). It contains information about how the city of Zwolle started to set goals to adapt its spatial distribution to climate change, precisely to flooding and to urban heat. Particularly, it explains how these goals were inserted into a water agenda and within different interventions in the city.

4.3 Semi-structured interviews to actors

Semi-structured interviews were conducted to representatives of different organizations who work/worked in the development of the flood risk plan for Zwolle. Through the interviews I investigated what the different policy/governance processes related to the development of the plan were. The choice of the interviewed actors was done according to the three layers of the MLSA (preventive measures, sustainable spatial planning and disaster management), by selecting organizations working at the national (Ministry of infrastructure and water management and Rijkswaterstaat), regional (province of Overijssel, safety Board of Overijssel and water boards Drents overijsselse delta and Vallei en veluwe) and local level (municipality of Zwolle). It was asked to all organizations to attend the interview with 2 representatives, with the exception of the water boards (one member per each water board). Due to privacy reasons, I assigned a code to each of the interviewed actors as follows:

- Ministry of infrastructure and water management (N-M-1 & N-M-2)
- Rijkswaterstaat (N-R-1 & N-R-2)
- Province of Overijssel (R-P-1 & R-P-2)
- Water board Drents overijsselse delta (R-W-1)
- Water board Vallei en veluwe (R-W-2)
- Safety board of Overijssel (R-S-1 & R-S-2)
- Municipality of Zwolle (L-M-1 & L-M-2)

Even though 3 of the organizations (Rijkswaterstaat, province of Overijssel and municipality of Zwolle,) attended the interview with 2 members, the Ministry of Infrastructure and Water Management and the safety board did it only with 1 representant. The actor of the safety board of Overijssel answered the interviewed questionnaire via e-mail due to unavailability to attend the interview. Furthermore, the water board Vallei en veluwe did not attend the interview because the contacted actor denied their involvement in the development of the flood risk plan for Zwolle. Five questions were formulated in the interview questionnaire for actors:

- 1) *When and by whom were you involved the first time in the processes related to the delivery of the flood risk plan in Zwolle?*
- 2) *What is your role in the process of delivering the flood risk plan? Have you covered a role in the MLSA, SSP or both? Has your role changed along the processes?*
- 3) *What and how many processes related to the delivery of the flood risk plan have you taken part of?*
- 4) *With what actors have you interacted along the processes related to the delivery of the flood risk plan?*
- 5) *Are you still involved in some of those processes, and if yes with what actors?*

4.4 Survey for inhabitants

Besides the organizations previously listed, also the inhabitants are involved in this research, since the people and their vulnerability mainly represent the reasons why a flood risk plan needs to be developed. The survey to inhabitants is not meant to be part of the observation of dependencies but rather to observe if and how there is communication between people and the actors involved in the development of the flood risk plan. Four questions were formulated for the inhabitants' questionnaire:

- 1) *Would you know what to do in case of flooding of the river IJssel? If yes, how do you know that?*
- 2) *Do you perceive a risk of flooding? If yes to what extend?*
- 3) *Think about the approach against flooding in the city. Do you perceive it as a defensive only (building dykes, dunes and defensive measures)? Or do you perceive it as a more integrated approach (with water taken into account in urban planning)?*
- 4) *Do you know about the "Meerlaagsveiligheid" (multi-layer safety approach)? If yes, what do you know? Do you feel safe with this approach?*

The survey was conducted with only 20 people for 2 reasons:

- The relevance of the survey for inhabitants, which is mostly related to the 3rd layer of the MLSA, to see if inhabitants are informed about how to behave in case of flooding or about any emergency plan
- Time limitations

The selection of inhabitants was done by choosing 2 areas of the city of Zwolle, shown in **Figure 8**. I interviewed 10 people in each area. The survey took place on Saturday 30/3/2019 on a sunny day from 13.00h to 18.00h. In both areas, the people interviewed differ in terms of gender and age.



Figure 8. Overview of the city of Zwolle from a satellite image with the 2 areas chosen for the inhabitants' survey. (Source: <https://www.google.com/maps/place/Zwolle>).



Figure 9. The houses of Area 1 chosen for the survey. (Source: <https://www.google.com/maps/place/Zwolle>).

The 1st chosen area is a residential area located near the river IJssel and the canal *Willemsvaart* (**Figure 9**). The choice of people was done by choosing 1 house every 3 houses. I knocked to 16 house doors until I reached the number of 10 people. If they were either not there or not willing to answer the questions, it was noted. The chosen houses are shown in **Figure 9**. The houses built in this neighbourhood are all detached houses with multiple floors (at least 2) with an average monetary value of about 800 000 € (funda, n.d.).



Figure 10. The spots where the survey took place in Area 2. (Source: <https://www.google.com/maps/place/Zwolle>).

The 2nd area is the city center area *Binnenstad* (**Figure 10**). I asked pedestrians if they wanted to attend the survey by stopping them on the street. In order to reach the number of 10 people, I asked to 13 people to attend the questionnaire. I firstly asked them if they live in the city of Zwolle. Only in case of positive response I proceeded in conducting the survey. An illustration of the MLSA was shown to every participant, in order to support the understanding of question 4.

4.5 Data analysis

The results gathered from the documents review and semi-structured interviews were analysed by using the software for qualitative data analysis Atlas TI. With this software it was possible to assign codes to the different actors interviewed, to the different documents and to the concepts of dependencies of the conceptual framework (chapter 2). Then, these codes were put in relation with quotations of the text to analyse. In this way it was possible to see relations of different actor and documents with the concepts present in the theories used to conduct this research. Differently, the survey for inhabitants is directly discussed, since it is more quantitative and includes short answers with short notes only. These analyses are reported in chapter 6.

5 Results

In this chapter I present the results gathered from the documents review, the semi-structured interviews to actors involved in the development of the flood risk plan for Zwolle and from the inhabitants' survey.

5.1 Documents review

In this section I present the results gathered from the review of official documents regarding the development of the flood risk plan for Zwolle.

5.1.1 General information

The first part of document D-N-1 is a letter written by the Delta Programme Commissioner to the State Secretary for Infrastructure and Environment, in which is introduced the delta Programme 2018 with 3 financial recommendations about setting funds to the Delta fund. These recommendations are related to different projects and activities of the delta pan on spatial adaptation, the river widening and dyke improvement and for freshwater supply measures:

“Recent insights into climate change render the timely implementation of the Delta Programme even more urgent and call for additional efforts in several areas. For this reason, in addition to the measures set out in the Delta Plan on Flood Risk Management, aimed at protecting the Netherlands against flooding, and the measures pertaining to water availability as set out in the Delta Plan on Freshwater Supply, this Delta Programme 2018 is the first to comprise a Delta Plan on Spatial Adaptation. The Delta Plan on Spatial Adaptation comprises a strategy and measures for climate-proofing and improving the water resilience of the Netherlands, thus enabling the country to cope with extreme weather conditions.” (p.5).

This letter ends with an issue pointed out by local authorities:

“A sustainable approach to our delta requires the commitment of and close collaboration between (and among) all the parties concerned: not just governments, but also residents and businesses. This applies to all the taskings addressed by the Delta Programme: flood risk management, fresh water supply, and climate-proofing the Netherlands. In this regard, the Association of Dutch Regional Water Authorities UvW, the Association of Netherlands Municipalities VNG, and the Association of Provincial Authorities IPO note that any cutbacks affecting the local authorities will be at loggerheads with the realization of the urgent Delta Programme taskings.” (p.5).

Whereas FRM is defined on schedule and as proceeding as planned, spatial adaptation is in an expansion step with a lack of initiatives by the different parties while the urgency is increasing. The importance of an integrated approach by linking water with spatial planning is pointed out as follows:

“Since 2016, the Delta Programme has been placing projects that connect water and spatial planning on a map in order to encourage the exchange of expertise and experience.” (p.20).

The primary focus of the Delta Programme for an integrated approach is connecting FRM with other fields such as nature, recreation and regional economic development. To reach that connection the Delta Programme is making effort to link taskings related to FRM, fresh water supply and spatial adaptation. Security is taken more into consideration by mapping the effects of water crisis as a basis for evacuation and rescue operations. One result is the guideline for increasing the collective capacity which consists in helping each other (citizens) during a water crisis. A common goal for the central government, provinces, water boards and municipalities is to incorporate climate-proof and water-resilient action within policies by 2020. The first plan on spatial adaptation have been drawn by the central government, provinces, water boards and municipalities under the supervision of the delta commissioner. One highlighted aspect of spatial adaptation is sharing knowledge and exchanging expertise to use an integrated approach which links water and spatial planning.

Organizations at different governmental levels (national government, district water boards, provinces, municipalities) embedded strategies proposed by the Delta Programme 2015 in their policy and management plans. The flood risk management policy is part of the law. The amended water act states how the measures needed, in conformity with new standard, are funded by the state grants and the contributions of the water boards to the High-water protection program HWBP. The HWBP consists into an alliance between the central government and the district water boards. It is an ongoing program with measures scheduled for a period of six years. The aim of the projects is to adapt the defensive systems to new standards by 2050, such as dyke improvements. The Delta fund gives long term basis for the funding of flood risk management. In terms of assessment, in 2017 the water boards, Rijkswaterstaat and the Ministry of Infrastructure and Water Management commenced the First Primary Flood Defense System Assessment Round. Rijkswaterstaat and water boards place assessments as a very important thing on their agenda. Provinces, water boards and Ministry of Infrastructures and Water Management protect the areas around major rivers against flooding with a powerful combination of dykes and river widening. The water boards make use of new standards while operating on maintenance plans, assessments and updates of dyke boundaries. Also, the water boards, provinces and the Rijkswaterstaat try to see what elements of the primary flood defense could be applied to the regional flood defense systems.

The central government allocated funds in the Delta Fund for investments in the fields of flood risk management, freshwater supply and water quality. This fund is available also for investments in management and maintenance done by the central government. Funds are available also from other partners since the Delta Programme was working on integrated solutions from that year, including spatial adaptation. Thus, non-central governments play an important role. The district water boards are responsible, together with the central government, to fund all the primary defensive measures against flooding. Also, the provinces play an important role in contributing to the Delta Programme. They contribute to research and co-funded programs. Provinces link taskings of the Delta Programme to regional taskings. The commitment changes according to the region. They are responsible for

incorporating water logging in the regional water plans. Municipalities spend their money to repay loans for past provisions, for the management of sewerage systems and other wastewater, ground water and rainwater facilities. They also invest money in tackling waterlogging.

Within document D-R-1 (website of the water board Drents Overijsselse Delta), in the section water projects, it is possible to have access to different projects related to the HWBP:

- IJsseldijk Zwolle - Olst
- Stadsdijken Zwolle (City dykes Zwolle)

Multiple solutions were investigated to reinforce the IJsseldijk Zwolle - Olst. Since 2017, costs, technical advantages and disadvantages and environmental impacts have been taken into account. The proposal that was made, needs to be confronted with the reactions of residents and others, before implementing the solutions.

“Before decision-making takes place, we would like to hear the reactions of residents and others to this proposal.”

An environmental impact assessment was made during the exploratory phase. At the end of 2019 the water board will decide which is the best alternative. Then, in the beginning of the plan definition phase, there will be another consultation with residents and stakeholders. The implementation will start in 2024.

According to the document D-R-2, the IJssel-Vecht delta program started in December 2011 and ended in March 2019. The area of interest covered the municipalities of Kampen, Zwolle and Zwartewaterland. The main focus of the projects are water safety and climate adaptation to climate change water level increase. The organizations involved were:

- Province of Overijssel
- Water board Overijsselse Delta
- IJsselland security region
- Municipalities of Kampen, Zwolle and Zwartewaterland

The coalition was made to work on a sustainable and climate-proof IJssel-Vecht delta. The main driver which brought to the coalition of these organizations and the realization of their projects was the need to deal with climate change and the raising of water levels within the region.

In the first section of document D-L-1 the issue of climate change is introduced by referring to the urban context of Zwolle in which extreme water precipitation and periods of drought are more frequent threatening the city. The attention is focused on shifting from water safety to climate adaptation of the urban area. Different governmental bodies were involved at the start:

- National government
- Water board Drents Overijsselse delta
- Province of Overijssel
- Municipality of Zwolle

They were working together on climate adaptation and specially to decrease flood risk. Based on these principles a water agenda was created in 2014 and brought together with the urban water plan to be reviewed.

5.1.2 Integration between FRM and spatial adaptation to climate change in the IJssel-Vecht delta region and Zwolle (state of implementation of the MLSA)

D-N-1 points out that an integrated approach for flood risk management has been applied in the IJsselmeer region, with studies related to the MLSA. Flood defense is focused on 2 measures:

- Drain water out by gravity
- Pumping it out if needed

SP and DM measures are in preparation for the IJssel-Vecht delta to raise the flood protection. Within an integrated approach, strategies were already implemented:

“The MIRT (The Dutch Multi-Year Programme for Infrastructure, Spatial Planning and Transport) Studies into multi-layer flood risk management in the IJssel-Vecht delta and Marken were completed in 2014/2015. In 2016, the outcomes were translated into a comprehensive implementation strategy for the IJssel-Vecht delta, aimed at improving the coherence between dyke improvement, spatial planning, and disaster management. An integrated approach has been applied in the flood risk management within the IJsselmeer region.” (p.59)

Collaboration between central government, provinces, water managers, business community and NGO's are intensified by the Delta Programme and the central government itself for the IJssel-Vecht delta region:

“In the Overijssel Living Lab, Zwolle, Kampen, Zwartewaterland, the Drents Overijsselse delta district water board, the IJsselland Security Region, and the province of Overijssel are collaborating on a flood-proof and climate-resilient IJssel-Vecht delta, including the protection of vital and vulnerable infrastructure. The parties are gaining experience by carrying out projects.” (p.62).

According to the document D-R-1, in 2017 the water board Drents Overijsselse Delta decided to strengthen the city dykes in Zwolle. This was a project of the HWBP in its elaboration phase along the year 2019. A contract for the preparation and implementation of the city dykes was signed in February 2017 by the water board and the dyke zone alliance. In February 2017 an agreement was made between the water board and the municipality of Zwolle. The 2 organizations together will explore the possibility to incorporate spatial planning within the implementation of the dykes, by constructing bicycle paths and walking paths along the dykes.

“Water board and municipality will use this to explore the possibilities for constructing cycle and walking paths along the Zwarte Water as part of the dyke improvement Zwolle city dykes.”

It should be clear within the end of year 2019 what the costs and the solutions will be. The implementation phase was expected to start in 2020 and to be completed in 2024.

As stated as follows in the document D-R-2, collaboration was the key aspect in the IJssel-Vecht delta coalition:

“The partners in the IJssel-Vecht delta are jointly responsible for solving the tasks in the area and are therefore working on a sustainably safe and climate-proof IJssel-Vecht delta.” (p.3).

Furthermore, 2 goals were settled for the program at the start:

- Bringing regional input to the Delta Programme
- Achieving a more sustainable spatial design by combining water tasks of the delta program with spatial regional tasks

The primary defensive measures against flooding do not reduce the risk to zero, therefore the partners worked together on solutions such as water-robust design, effective crisis management and water awareness amongst citizens and business community. Most of the funding came from the province of Overijssel, but all the partners invested in the projects. Approximately, 14,4 million euros were invested in the different projects. In the second section of the document there are insights regarding the dykes which were improved within the city of Zwolle. The improvements of certain dykes did not exclusively focus on the infrastructural aspects:

“In addition to the infrastructural changes related to water safety, the new layout of the Pannekoekendijk also focuses on the perception of the characteristic cityscape and the dynamics of the water. For example, a partly floating footpath has been constructed to experience the dynamics of the IJssel-Vecht delta in person.” (p.6).

Not only dykes’ reinforcements but also housing projects were realized enhancing the combination of water safety and design, where water becomes an additional value of the spatial quality:

“Weezenlanden Housing construction was realized in 2018 and 2019. The area is located southeast of the Zwolle city center and borders directly on the city canal. Weezenlanden is bordered on the west by the Groot Wezenland road. The edge of the area is part of the regional flood defense. These are reasons for designing this area climate-proof and water-safe. Experience of the water and spatial quality were also a starting point.” (p.8).

Another project underlined the relation between emergency and situation of crisis. In order to keep inhabitants and the human assets safe even in case of dyke breaking, a noise barrier which also avoids damages from flooding was built:

“The noise barrier also has the function of emergency water defense. The noise barrier is laid out more robustly, finished with clay and sown with special dyke grass. Thanks to the shore, the neighborhood can remain dry in the event of a flooding of the Mastenbroek polder.” (p.9).

In the last section of the document it is explained that communication, education and climate awareness within the topic of flood risk management were shared with the educational sector in the area of IJssel Vecht delta. The “Expeditie Wildernis” (Expedition Wilderness) is an example:

“The aim of Expedition Wilderness IJssel-Vecht delta was to bring children into contact with nature and water. We want them to experience how important it is to take water into account. Living in a delta means that we have to protect ourselves, our animals and our houses against possible flooding. The expeditions were made possible by the IJssel-Vecht delta program.” (p.27).

Also, inhabitants were involved with different types of events. The “Waterbewust Stadshagen” is an example:

“In 2017 and 2018 work was carried out on the Water-conscious Stadshagen project. In collaboration with the IJssel-Vecht delta program, the municipality of Zwolle has commissioned Arcadis to shape Waterbewust Stadshagen. At the beginning of 2018, a “DIY market” was held to see what opportunities there were in the neighborhood and to recruit people to take up those actions. The intention is that as many “ambassadors” as possible go to work to make residents enthusiastic about actions in the field of water safety and climate. Examples are the recruitment of volunteers for their own high-water brigade and the greening of gardens and roofs.” (p.28).

Within document D-L-1, it is explained that the urban water plan for Zwolle was not flexible and open, therefore the new water agenda had to bring statement about all domains of climate adaptation. The 2 pillars of the agenda were “water as a motor” and “water governance”, explained as follows:

- *“Water as a motor: water, water system, water management, water quality and water safety will be the engine for Zwolle for sustainable area development.”*
- *“Water governance: achieving that substantive ambition is only possible with a tailored organizational method. The water agenda will focus on a change of assessment towards influence, awareness, cooperation and direction. Clear regulations and division of roles remain important, as well as a strategy that leads to implementation. The agenda will facilitate that with tailored solutions on the one hand and process agreements on the other hand.”*

(p.17)

From these 2 points there was a set of strategic goals stated for the agenda such as water as a vital condition for health and identity, safety in regard of flood defense and tackling the issues of urban water management through cooperation between governments, citizens and companies. Long-term thinking was enhanced and considered as a principle to improve the spatial adaptation of the city to climate change. These strategic goals were translated into five themes for the water agenda, stated as follows:

“The water agenda has five major themes in which citizens, companies and organizations work together on water and climate in the city.”

- *“Thanks to the dykes”*
- *“Living and playing with water”*
- *“Prepare for extremes”*
- *“Zwolle underground”*
- *“Water as a raw material”*

(p.21)

In addition to the maintenance and intervention instruments, the tools to actually work on the agenda were mapping and modelling tools to identify where the risk of flooding is high in the city, where the hottest spots in terms of temperature are and how the soil is formed in different areas. The “Deltaprogramma Nieuwbouw en Herstructurering” (DPNH) (Delta Program New Construction and Restructuring) supported the agenda with the “roeftuinen methodiek” (living lab methodology) which explored measures for climate adaptation in the city. This became an assignment divided into 2 workshops in collaboration with the municipality of Zwolle, the Water board Drents Overijsselse Delta, a housing corporation and experts in urban planning, climate change and water. This report contains the summary of the 2 workshops. Two test cases were investigated (the Isala clinics on Weezenlanden and the location Assendorp-Deventerstraatweg). The Municipality of Zwolle became

one of the firsts municipalities in the Netherlands with a strategy for climate adaptation. The success stands in the coalition of Municipality and water board, explained as follows:

“A strategy that effectively affects the daily dynamics of building and renovating the city. That succeeds when the municipality and water board Groot Salland (Drents Overijsselse Delta) managed to hold the course together. A course that has its roots in the long-term prospects of IJsselmeer Vecht delta, which was picked up in this Climate-proof experimental garden city and which will have formal policy frameworks in the new one in 2014 Urban Water Agenda.” (p.36).





Document 1	Document 2	Document 3	Document 4
Delta Programme 2018	Water board Drents Overijsselse Delta website	IJssel-Vecht Delta report 2019	Zwolle Climate Proof 2013
			

Fig.11. Integration of FRM and spatial adaptation to climate change in the IJssel-Vecht delta region and Zwolle.

Figure 11 shows to what extent the integration between FRM and spatial adaptation to climate change takes place in the IJssel-Vecht delta region and in the city of Zwolle, according to the reviewed documents. The happy emoji indicates that the integration is explained through different points and examples. The emoji with a neutral expression means that the integration is present in some points but not in all of them and/or with some counter arguments. The disappointed emoji means that integration between FRM and spatial adaptation to climate change is not mentioned within the document and/or many counter arguments are present.

5.2 Semi-structured interviews to actors

In this section I present the results of the interview questionnaire for actors involved in the development of the flood risk plan for Zwolle.

5.2.1 Answers to question 1 (*When and by whom were you involved the first time in the processes related to the delivery of the flood risk plan in Zwolle*)?

N-M-1, member of the Delta Program representing the Ministry of infrastructure and water management was indirectly involved in the project of Zwolle. N-M-1 spoke for a colleague who has been directly involved in the project of Zwolle for a longer time period, but who could not attend the interview.

N-R-1 and N-R-2 work respectively as senior advisor and relations manager at the Rijkswaterstaat. In 2015, they were involved in the development of the flood risk plan for Zwolle by the waterboard Drents Overijsselse delta when the HWBP was taking place, defined by them as “The dyke project”.

R-P-1 is a senior advisor for rural areas working for the province Overijssel who was involved in 2015 by the province itself when the project “Zwolle city barriers” * started. He took part in the reconnaissance phase of the project. R-P-2 (member of the IJssel-Vechtdelta coalition) was involved as an external actor by the province of Overijssel. R-P-2 worked within the IJssel-Vecht delta in the last 5 years and the area of Zwolle is one of the many locations where this coalition made projects.

*for “Zwolle city barriers”, R-P-1 means the project “Stadsdijken Zwolle”.

R-W-1 is an environmental manager who works at the water board Drents Overijssel Delta. In the last 2,5 years R-W-1 have had a role within the HWBP. The Water board Drents Overijssel Delta was involved for the first time in 2014 in the development of the flood risk plan for Zwolle. R-W-1 was involved by the water board itself.

R-S-1 is a crisis management advisor that was involved the first time in the flood risk plan for Zwolle in 2011 by the team leader of the safety board “veiligheidsbureau”, to work on the delivery of the flood risk plan for the safety region IJsselland.

L-M-1 is a civil engineer consultant that works at the municipality of Zwolle, who was involved in the development of the flood risk plan by the municipality itself and together with the water board for the first time in 2010, by being part of the Veerman Committee*. L-M-2 was involved the first time in 2018 by invitation of another member of the municipality who was in contact with the water board. L-M-2 also works within the HWBP.

*The Veerman committee issued a report in 2008 which has been elaborated and responded by the Delta Program

5.2.2 Answers to question 2 (What is your role in the process of delivering the flood risk plan? Have you covered a role in the MLSA, SSP or both? Has your role changed along the processes)?

	N-M-1	N-R-1	N-R-2	R-P-1	R-P-2	R-W-1	R-S-1	L-M-1	L-M-2
Layer 1									
Layer 2									
Layer 3									
SSP									
	Main identification of the role								
	Secondary, indirect identification of the role								
	No identification of the role								

Figure 12. Identification of the different actors within a certain layer of the MLSA or within SSP.

Figure 12 schematizes all the answers given to this question.

The role of actor N-M-1 within the Ministry of Infrastructure and Water Management is to develop stress test standard for the Delta Program at the national level about the whole country. The role is indirectly related to the flood risk plan in Zwolle:

“...I do have a Multi-Layer Safety Approach role, but it is on the national level...”

Part of the role was developing maps about flood risk. Referring to the MLSA, it is a 1st layer role at the national level but also related to the 2nd and the 3rd because these maps help to understand whether to invest on defensive measures or adaptive measures and they work as an informing tool for people. Before that the role, N-M-1 was only focused on the 1st layer.

From the Rijkswaterstaat, actor N-R-1 worked mainly in the reconnaissance phase within the HWBP project, looking for several solutions to improve a dyke or make a barrage. This was a task that mainly belongs to the 1st layer:

“...what we do is looking at the first layer because for the second and the third, especially for the second, they role belongs to the province and the water board.”

N-R-1 took part in that process until 2017, when there was a switch with N-R-2. The role of N-R-2 consisted in arranging written agreements between water board Drents Overijsselse Delta and the Rijkswaterstaat. N-R-2 recognized this task as a 1st layer task, which was still covering.

From the province of Overijssel, the role of R-P-1 changed along the process. At the beginning the role was trying to get all the developments for the flood risk plan together in scope with engagement of other parties like water board and municipality. Then, after the water board took the lead during the reconnaissance phase, R-P-1 became part of a project team formed by people from all organizations (municipality, water board and Rijkswaterstaat). The roles covered are within both MLSA and SSP. R-P-2 dealt with communication between different partners of the project team,

specifically about how to merge different initiatives together to reach common goals. Besides this, R-P-2 also worked on another communication part related to the website and newsletter. Within this communication role, R-P-2 tried to involve also entrepreneurial organizations, inhabitants and students from primary and secondary school to let them think about their safety. This role is very trans-disciplinary and mostly related to SSP, but it is also related to the MLSA in general, since the IJssel-Vecht delta is a pilot area for its implementation. R-P-2 always covered the same role.

Within the water board Drents Overijsselse Delta, R-W-1 has the specific role of being sure that the dikes in Zwolle are safe enough. R-W-1 points out that it is a 1st layer role:

“Well my role is actually for the whole project in the first layer.”

The government allocated funds for the HWBP exclusively for the 1st layer. R-W-1 says that such role also consists in bridging collaboration between stakeholders outside and inside the water board. That is the role that R-W-1 has covered since the beginning, with also a side step which was more about the 2nd and 3rd layer, when some companies located outside the protection of a dyke asked to the water board for more information about what to do in case of high water levels.

R-S-1 from the safety board of Zwolle had the role of crisis management advisor within a team that is responsible for the multidisciplinary operational plans of safety region IJsselland. R-S-1 covered the same role when was working within the development of the flood risk plan for Zwolle. This role is for definition linked to the 3rd layer, but within a team operating at the regional level and that deals with operational plans that are multidisciplinary. Therefore, it also belongs to SSP and it did not change along the processes until R-S-1 was not involved anymore.

L-M-1 from the municipality of Zwolle started in 2011 to be part of the IJssel-Vecht delta coalition together with R-P-2 from the province of Overijssel. Initially, L-M-1 covered a strategic role as advisor for the adaptation projects to be built in the city. At that time, L-M-1 worked on projects related to the 1st and 2nd layer of the MLSA, when the province of Overijssel had the lead within the corporation. When the municipality became in charge, the role of L-M-1 changed by getting more responsibilities. L-M-2 from the municipality covered a role mainly about working on the dykes and therefore focused on the 1st layer. L-M-2 always covered this role.

5.2.3 *Answers to question 3 (What and how many processes related to the delivery of the flood risk plan you have taken part of)?*

N-M-1 from the Ministry of infrastructure and Water Management was involved in the discussion phase of the flood risk plan for Zwolle about matters related to the 1st layer of the MLSA.

From Rijkswaterstaat, both N-R-1 and N-R-2 recognized as processes of the flood risk plan in Zwolle the ones related to the HWBP projects:

“Most of the processes are related to the HWBP program...”

Besides, they mentioned other projects within the same region such as the “Apeldoorn Kanaal” which was also part of the HWBP and other ecological projects along the river IJssel.

The first process indicated by R-P-1 from the province of Overijssel is defined as an inventory of all the developments that needed to be done in the area. It was described as a very inclusive step where a lot of stakeholders (e.g. municipality and areas’ owners) had to reach an agreement. After there was the executive process, or rather when the projects related to the flood risk plan started to be realized. R-P-1 pointed out the different roles of the province of Overijssel and water board Drents Overijsselse delta:

“We as a province are the authority, but in practice the waterboard is executing it...”

R-P-2 mentioned that in the 1st phase the IJssel-Vecht delta coalition was setting common goals for different before starting their execution. Some of those projects were already realized by combining water safety with housing developments.

R-W-1 was involved in a process about the safety of the dykes in the area of Zwolle and in the plan of “water robust Zwolle” regarding how the city can be safe in a long-term perspective, together with the municipality of Zwolle. This was happening when some owners of certain areas asked to be informed on what to do in case of flooding.

The only process in which R-S-1 took part was in a multi-disciplinary team to design an emergency plan to be used by the safety region IJsselland:

“Our job was to develop a dedicated plan with can be used in an effective and efficient way by the crisis organization of the Safety region IJsselland.”

From the municipality of Zwolle, L-M-1 identified 3 processes. The 1st the activity within the HWBP in which also L-M-2 was present. Secondly, L-M-1 worked on other projects in the region of Zwolle together with other municipalities around Zwolle. Thirdly, L-M-1 was involved with the national government on financial matters for the implementation of the MLSA. L-M-2 mentioned its

"But we also want to realize some plans that we have as a municipality such as walking paths or biking paths."

[illegible]

Figure 13 shows the different interactions between the interviewed actors.

"...but there is not a direct role for the national government to play in the plan for Zwolle, I think that Zwolle mainly has to do with the water board and with the province of Overijssel on this subject which is why we are only indirectly involved."

N-R-1 worked together with the water board Drents Overijsselse Delta, the province of Overijssel, the municipality of Zwolle and the Ministry of Infrastructure and Water Management. N-R-2 mentioned the same actors but mainly recognizes the water board:

The ship movement "*Schuttervaard*" was mentioned by actor N-R-2.

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Overijsselse Delta and the municipality of Zwolle. Staatsbosbeheer is another actor mentioned by R-P-1.

Actor R-W-1 says that the three main political organizations the waterboard Drents Overijsselse Delta is working with are the province of Overijssel (mentioning actor R-P-1), the municipality of Zwolle and Rijkswaterstaat. Moreover, since the water board does not own all the dykes, sometimes they have to interact with inhabitants and companies which own the areas where the dykes are located. Also, actor R-W-1 specifies that the water board Vallei en Veluwe is not working for the flood risk plan in Zwolle but they are only responsible for the requirements of other dykes:

“...you do not have a lot to do with the other side, that water board is responsible of the requirements of other dykes. “

In the team in which actor R-S-1 was part of, there were water experts, colleagues of the fire brigade, medical services, police, municipalities and other relevant crisis partners as the water board Drents Overijsselse Delta.

Actor L-M-1 of the municipality of Zwolle mentions the province of Overijssel, the water board Drents Overijsselse Delta and Rijkswaterstaat. Actor L-M-2 also mentions the same organizations but also inhabitants and other municipalities, pointing out that it does not mean that they actually work together, but that they are only working within the same project.

Furthermore, electricity companies, telecommunication companies, the hospital and also the railway station of Zwolle were mentioned by actor L-M-1 and Staatsbosbeheer was mentioned by L-M-2.

5.2.5 Answers to question 5 (Are you still involved in some of those processes, and if yes with what other actors)?

The Ministry of Infrastructure and Water Management was still involved with a colleague of N-M-1 previously mentioned. N-M-1 mentioned amongst other organizations Rijkswaterstaat, which developed mapping tools and stress tests about the MLSA for the whole country.

From Rijkswaterstaat, N-R-1 was not formally involved anymore. N-R-2 was still part of the development of the plan, by working mainly together with the water board Drents Overijsselse delta.

The province of Overijssel was still involved with R-P-1 together with the same other parties mentioned before (water board Drents Overijsselse Delta, municipality of Zwolle, Rijkswaterstaat, Staatsbosbeheer and inhabitants of Zwolle). There were still a lot of decisions to be taken and also informing the inhabitants about them. R-P-2, as last task, had the role of summarizing all the developments made by the IJssel-Vecht delta coalition, which was ending within few months. R-P-2 mentioned a last step of the IJssel-Vecht delta activity:

“Within two months one of the ministers of Infrastructure and Water Management will visit the area, especially this project in Zwolle. It is also part of the wrap up, what we reached.”

The waterboard Drents Overijsselse delta was still involved and focused on the dyke reinforcement. Until 2024, R-W-1 will work on that, especially about the design of the dyke reinforcement and then about the actual realization.

Even though the safety board of Overijssel was still active in the development of the flood risk plan, the actor R-S-1 was not part of it anymore.

The municipality of Zwolle was still involved in the development of the flood risk plan with L-M-1 who mentioned the presence of other organizations (water board Drents Overijsselse Delta, province of Overijssel, Rijkswaterstaat, safety board of Overijssel and other municipalities around the city). L-M-2 was also still involved by covering the same role with the same organizations mentioned before (water board Drents Overijsselse Delta, province of Overijssel, Rijkswaterstaat and Staatsbosbeheer).

5.3 Inhabitants' survey

As to the survey for inhabitants, in area 1 half of the interviewees (5 out of 10) answered that in case of flooding they would go upstairs in their house, a person answered that she would go away with the car and another person answered that she would either go upstairs in her house or would go away with the car depending on the impact of the flood. Three people answered that they would not know at all what to do in case of flooding. In area 2, likewise, the most often given answer was that they would go upstairs in their house (4 out of 10), 2 people answered saying that they would go away with the car and 4 people did not know at all what to do in case of flooding. Regarding question 2, in area 1 most of the people answered saying that they do not perceive the risk of flooding in the city of Zwolle (9 out of 10), only 1 person perceives it. In area 2, similarly, only 2 people said that they perceive the risk of flooding in the city. About question 3, in area 1 most of the people answered that they perceive flood risk management in the city of Zwolle as a practice that deals with defensive measures only against flooding (9 out of 10), 1 person only perceives flood risk management as a practice integrated with SP. In area 2 this was different, 6 people perceived flood risk management as something related to defensive measures against flooding only, such as dykes and dunes. On the other hand, 4 people perceived flood risk management as something integrated with more practices, mainly SP and also urban aesthetic. In relation to question 4, nobody between the interviewees from both areas knew anything about the MLSA, even with the help of a translated explanation of the three layers with their relative illustration.

	Area1	Area2
What to do in case of flooding	Going upstairs or away with the car	
	7/10	6/10
Perception of flood risk	No perception of flood risk	
	9/10	8/10
Perception of flood risk management	Practice that deals with dykes only	
	9/10	6/10
Awareness of the Multi-Layer Safety Approach	Negative Response	
	10/10	10/10

Fig.14. Results of the survey for inhabitants summarized.

Figure 14 summarizes the answers of the inhabitants' survey. Only the most given answers are written down.

6 Discussion

In this chapter I discuss the findings of my research. The obtained results are compared with the research questions, starting from the documents review, then proceeding with the semi-structured interviews to actors, the survey for inhabitants and concluding with the combination of these three. After, I discuss the findings in comparison with the theoretical framework and I conclude with the discussion between the results and the methodology used in order to obtain them.

6.1 Discussion between documents review and research questions

In this section I discuss the comparison between the results gathered from the documents review and the research questions. Amongst the actors on which I focused, the water board Vallei en Veluwe was never mentioned in relation with the flood risk plan in Zwolle and IJssel-Vecht delta region. Also the Rijkswaterstaat was not directly mentioned, however this organization is part of the Ministry of infrastructure and water management which the responsible ministry of the Delta Program coalition. According to the results, all the other actors were mentioned and involved both in the MLSA and SSP, since all of them operates/operated within coalitions.

6.1.1 Discussion between results and sub-research questions 1 and 2

Through the review of documents all dependencies are observed between actors. **Figure 15** shows the concepts related to dependencies mentioned in the documents.

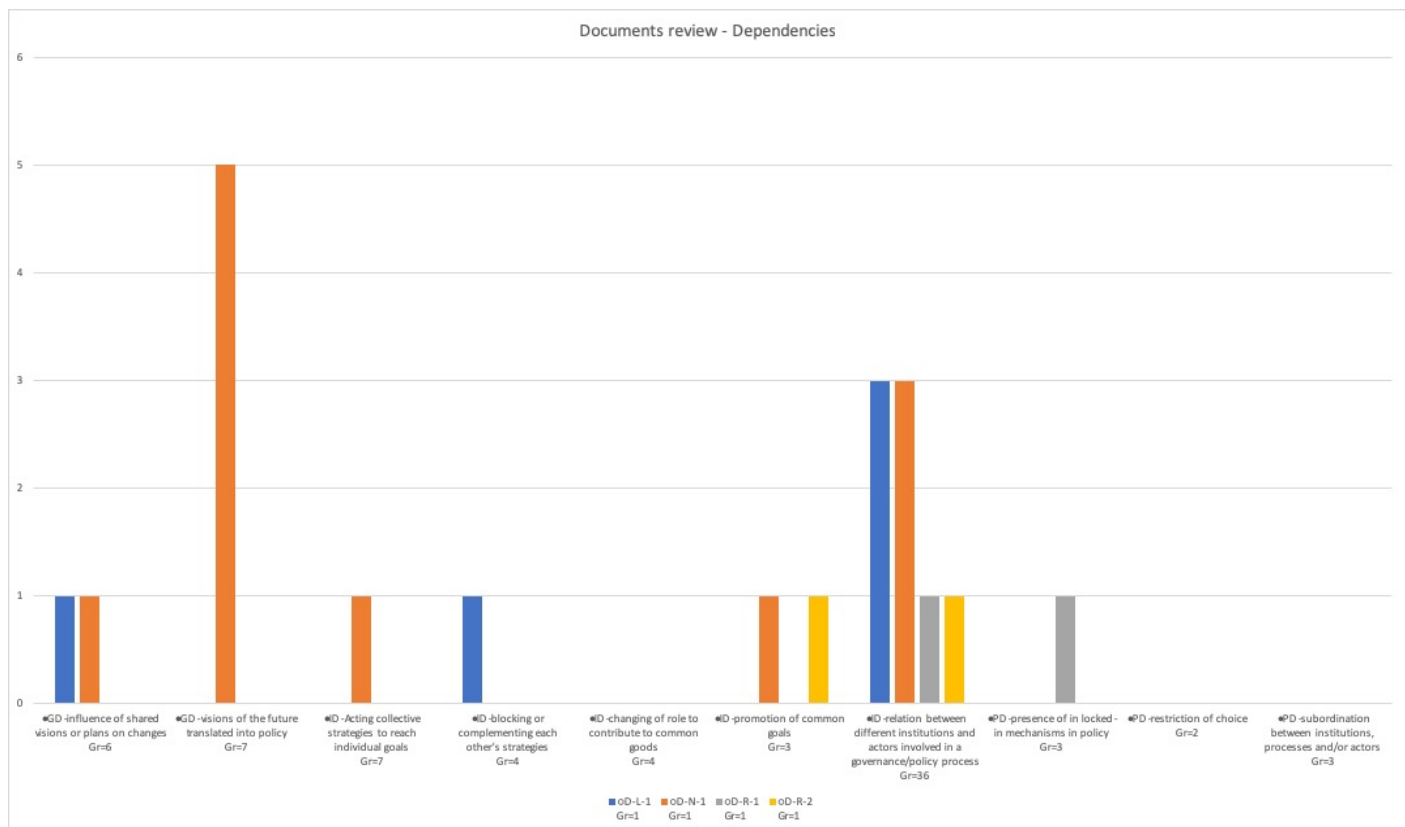


Figure 15. Concepts related to dependencies mentioned in the documents. The x axis refers to the different concepts. The y axis says how many times the documents mentioned the concepts.

Path dependency

From the results analysis I found a concept related to path dependency in document D-R-1 which focuses on HWBP projects mostly related to the 1st layer of the MLSA.

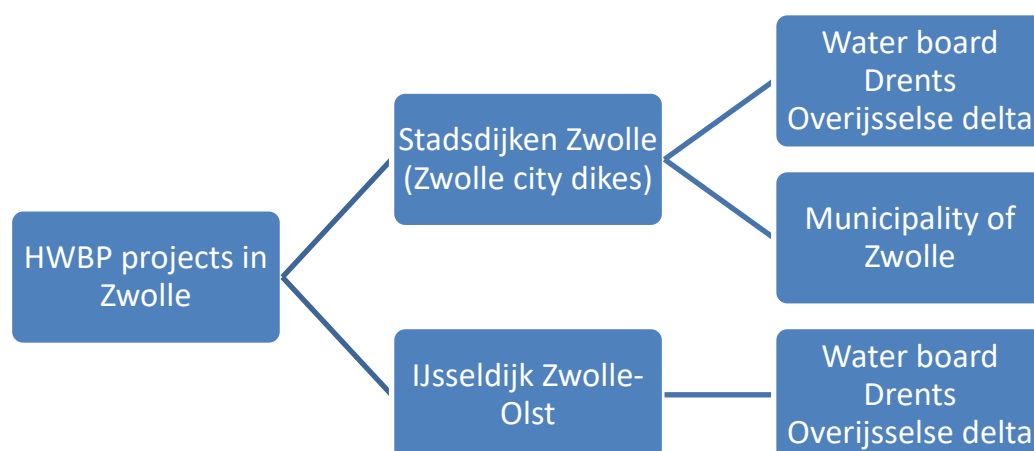


Figure 16. Schematization of the HWBP projects in Zwolle according to the website of the Water board Drents Overijsselse delta.

Figure 16 shows that the HWBP projects in Zwolle are mainly led by the water board Drents Overijsselse delta. HWBP tasks belong to the water board and there is almost no addition to these defensive development from other organizations, such as interventions related to spatial adaptation to flooding. The only collaboration mentioned is with the municipality of Zwolle for developments of biking and walking paths along the dikes in the city. None of the documents mentioned the other 2 concepts related to path dependency “restriction of choice” and “subordination between institutions, processes and/or actors.

Interdependency

There is a concept related to interdependency that was present in all documents, which is the “relation between different institutions and actors involved in a governance/policy process”. According to documents D-N-1 and D-R-2 this relation is a key aspect of the Delta Program and the IJssel-Vecht delta coalition. The Delta Program at the national and the IJssel Vecht delta coalition at the regional scale, are initiatives formed by different parties that collaborate and promote common goals.

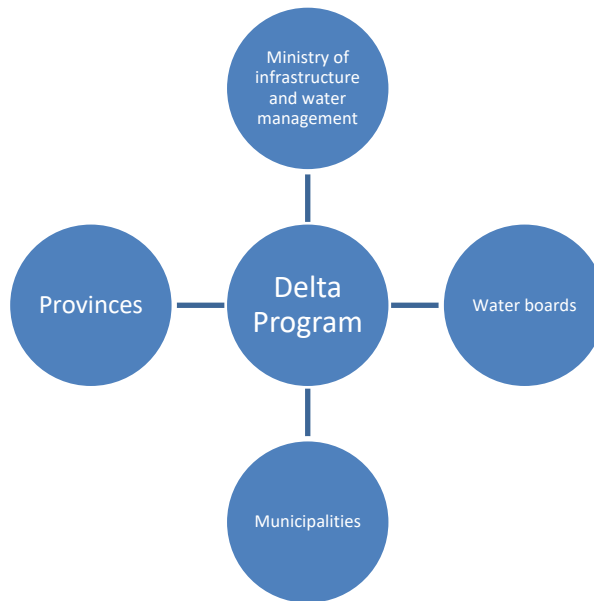


Figure 17. Schematization of the different organizations involved within the Delta Program according to the document D-N-1.

Figure 17 represents the Delta Program coalition with the involved actors. In document D-N-1, the Delta Programme is defined as follows:

“The Delta Programme is a national Programme involving an innovative collaboration between the central government, the provinces, municipalities and district water boards, with input from civic society organizations, knowledge institutes, citizens, and the business community. The aim is to protect the current and future generations of the Netherlands against flooding, to ensure a sufficient supply of freshwater and to climate-proof our country in order to prevent major damage.” (p.152).

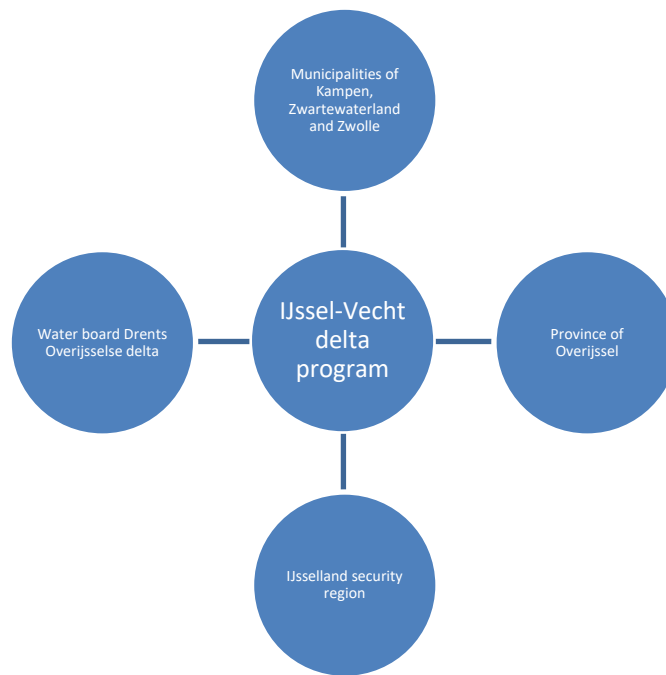


Figure 18. Schematization of the IJssel-Vecht delta coalition according to the document D-R-2.

The IJssel-Vecht delta coalition represented in **Figure 18** was formed by the province of Overijssel, municipality of Zwolle, water board Drents Overijsselse delta and IJsselland security region. Document D-R-2 describes how thanks to this coalition it was possible to realize multiple projects that combined flood risk and spatial adaptation to climate change in the IJssel-Vecht delta region and especially in Zwolle. On the website of the water board Drents Overijsselse delta (D-R-1) a little collaboration is mentioned for specific projects about the city dikes of Zwolle only between 2 actors:

“Water board and municipality will use this to explore the possibilities for constructing cycle and walking paths along the Zwarte Water as part of the dyke improvement Zwolle city dikes.”

In D-L-1 interdependency is pointed out also through the concept “blocking or complementing each other strategies”. Since 2013, an agenda with strategic plans that included water connected to spatial planning was settled through collaboration of different parties. None of the documents mentioned the concept “changing of role to contribute to common goods”.

Goal dependency

Goal dependency is enhanced within the document D-N-1 and D-L-1. Especially the concept of “visions of the future translated into policy” is pointed out multiple times within document D-N-1, for instance:

“In 2016, the central government and the provinces organized regional dialogues concerning the spatial interconnectivity between themes such as climate adaptation, energy transition, and nature. These discussions are used to underpin the Regional Agenda for the IJsselmeer Region 2050: a

comprehensive perspective featuring an adaptive implementation agenda as well as a knowledge and innovation agenda.” (p.60).

Goal dependency seems to be strongly present in the Delta Program amongst all the parties involved. It is pointed out in D-N-1 that within the province of Overijssel the drawn outlines for a water resilient city are translated into regulations. This fact recalls the concept of goal dependency “influence of shared visions of plans on change”. The same concept is present within D-L-1 when it is explained that long-term thinking together with a strategic approach adopted by the organizations involved in the process (national government, province of Overijssel, water board Drents Overijsselse Delta and municipality of Zwolle) were at the basis of the settlement for the water agenda to be introduced in the urban water plan in Zwolle.

6.1.2 Discussion between documents review and sub-research question 3

Path dependency

Even if only in few cases, path dependency is present amongst actors operating in the MLSA and SSP, holding their integration. According to D-R-1, path dependency is present in projects of the HWBP related to the 1st layer of the MLSA, on which the water board has the lead. Even within the collaboration between water board and municipality of Zwolle, this lead of the water board represents a locked-in mechanism which hinders the integration of the 2nd and 3rd layers on the 1st.

Interdependency

Interdependency is observed between all actors involved in the MLSA and SSP very often. Within documents D-N-1 and D-R-2, all the actors mentioned (national government, Province of Overijssel, Water board Drents Overijsselse delta, municipality of Zwolle and the safety board of Overijssel) work all together with a strategic approach following SSP principles, trying to cover all the 3 layers of the MLSA. Many projects were realized in Zwolle with the collaboration of different parties and others are on schedule. In D-R-1 Interdependency is observed between the municipality of Zwolle and the Water board through their collaboration on dykes’ projects related to the HWBP focused on the 1st layer of the MLSA. In document D-L-1 the development of the agenda for the city of Zwolle was possible through a multi-disciplinary collaboration amongst national government, water board Drents Overijsselse delta, province of Overijssel and municipality of Zwolle.

Goal dependency

Goal dependency and its concepts are mentioned amongst actors involved in the MLSA and SSP. It is present between all the parties of the Delta Program (Ministry of infrastructure and water management, water board Drents Overijsselse delta, province of Overijssel and municipality of Zwolle. as found in document D-N-1. Furthermore, as stated in document D-L-1, goal dependency occurs in the development of the urban water plan for Zwolle in which national government, Province of Overijssel, water board Drents Overijsselse Delta and municipality of Zwolle worked together strategically.

The dependencies observed through the review of documents are summarized as follows in **Figure 19**.

Goal Dependency	Interdependency	Path Dependency
Ministry of Infrastructure and Water Management	Ministry of Infrastructure and Water Management	
Water board Drents Overijsselse Delta	Water board Drents Overijsselse Delta	Water board Drents Overijsselse Delta
Province of Overijssel	Province of Overijssel	
	Safety board of Overijssel	
Municipality of Zwolle	Municipality of Zwolle	Municipality of Zwolle

Fig.19. Dependencies amongst actors of the MLSA and SSP observed through the documents review.

6.1.3 Discussion between documents review and sub-research question 4

From the documents review it was possible to observe an integrated and holistic approach for flood risk management used by the multiple coalitions of actors (Delta Program, IJssel-Vecht delta and HWBP). Document D-R-2 is the most recent and sums many projects in the city of Zwolle in which SP and DM were integrated with FRM. The focus of defensive measures only, is shifting towards an acceptance of water on the land and a conception of seeing water as something that enriches the spatial distribution of the city. Path dependencies are present but less frequent than goal dependencies. The expertise on water and flood management to improve measures related to the 1st layer of the MLSA is starting to be combined with adaptive spatial SP and DM. Collaboration and exchange of knowledge showed that is possible to develop long-term visions with short-term intervention. Even though in document D-N-1 it is pointed out that spatial adaptation needs more consideration at the national level, within the section related to the IJssel-Vecht delta region, it is specified that the province of Overijssel is one of the 1st provinces moving towards the integration of spatial adaptation to climate change:

“...the province of Overijssel sets out the outlines of a water-resilient design and translates these into the environmental regulations. This commitment ties in with the ambition of being among the first provinces to realize a climate adaptive design.” (p.62).

As stated in D-L-1 not only the province of Overijssel but also the municipality of Zwolle, already since 2013, became one of the 1st municipality with a strategy for spatial adaptation to climate change and flooding. From this documents analysis it is possible to argue that the transition towards an integrated flood risk management in the case of Zwolle is entering into the acceleration phase of the multi-phase concept of Rotmans et al. (2001).

This placement is shown as follows in **Figure 20**.

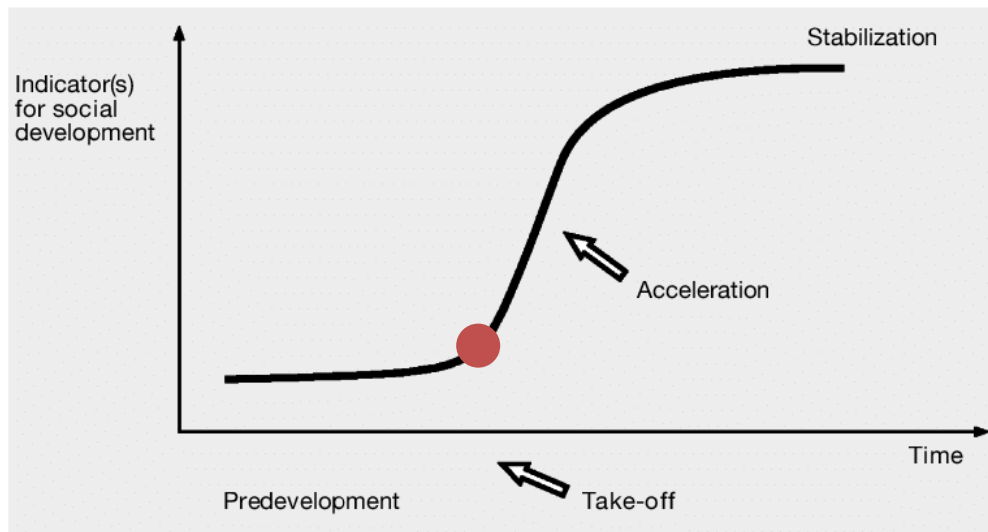


Figure 20. Position of the case of Zwolle towards an integrated flood risk management along the multi-phase concept, according to the documents review.

6.2 Discussion between semi-structured interviews and research questions

In this section I discuss the comparison between the results gathered from semi-structured interviews and the research questions. According to the results, all actors were mentioned and involved both in the MLSA and SSP, since all of them operated within coalitions.

6.2.1 Discussion between semi-structured interviews and sub-research questions 1 and 2

Absence of dependencies is observed for the water board Valleij en Veluwe, whose representative denied any collaboration and involvement for the flood risk plan in Zwolle. The different concepts related to dependencies mentioned by the interviewees are shown in **Figure 21**.

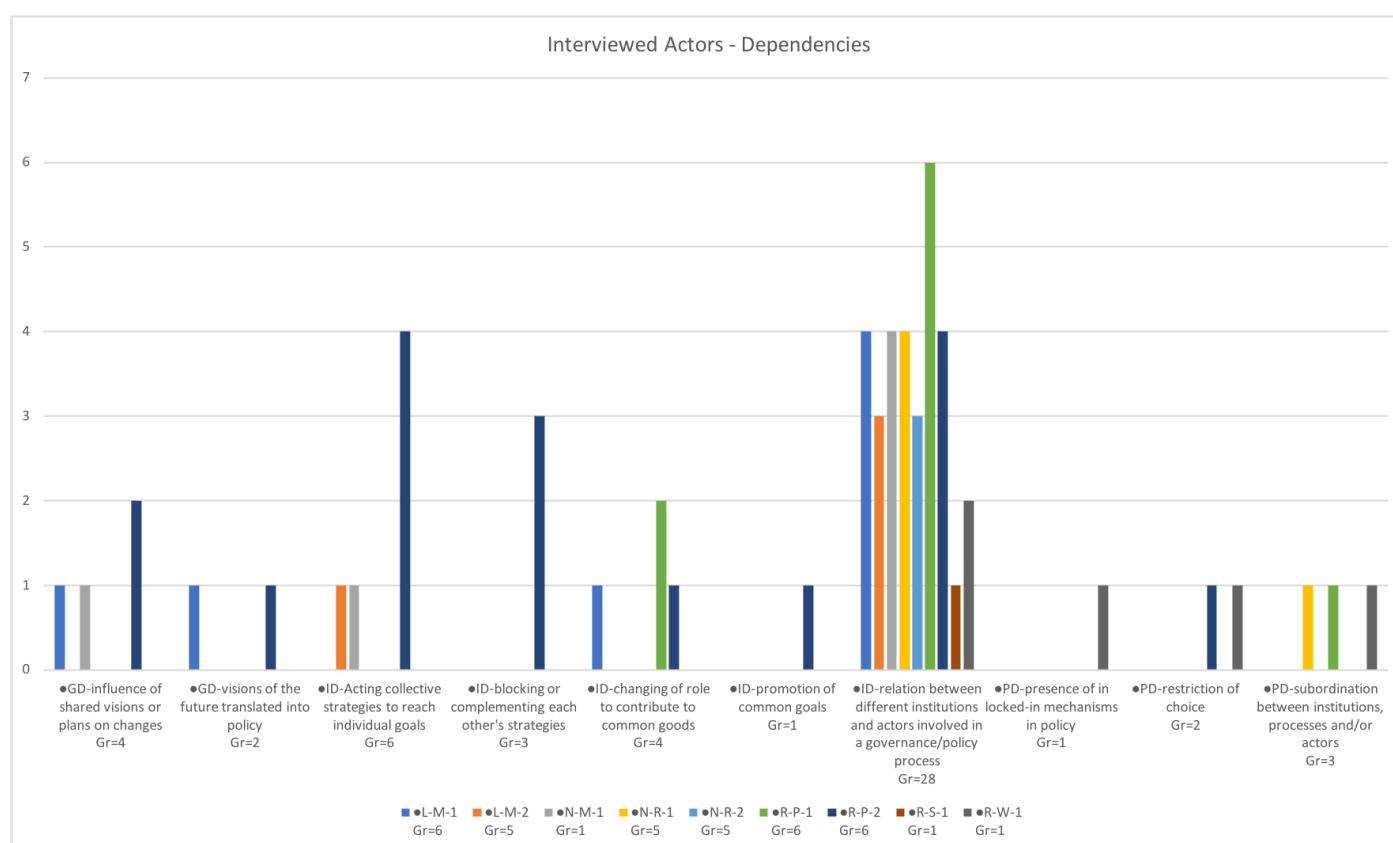


Figure 21. Concepts related to dependencies mentioned by the interviewees. The x axis refers to the different concepts. The y axis says how many times the organizations mentioned the concepts.

Path dependency

Path dependency is present between multiple actors involved in the flood risk plan for Zwolle. The water board Drents Overijsselse delta is partly subordinated to the national government. A “locked-in mechanism”, a “restriction of choice” and a “subordination between actors” are represented by the fact that for the HWBP project there are no funds from the national government that can use for implementation within the 2nd and 3rd layer of the MLSA. According to R-W-1, sub-ordination between the water board and the municipality of Zwolle occurred when this latter could not choose to implement the construction of a lock instead of renewing a dyke because the water board owned the power to decide and allocate money for that intervention:

“...the municipality of Zwolle really liked to build a lock but it was too expensive so that is why we decided not to do it.”

The other interviewees N-M-1, N-R-2, R-P-1, R-P-2, R-S-1, L-M-1 and L-M-2 did not mention concepts related to path dependency.

Interdependency

The most mentioned concept “relation between different institutions and actors involved in a governance/policy process” belongs to interdependency. The Ministry of infrastructures and water management is partly detached from the other organizations. As N-M-1 explains, the ministry is not directly involved in the flood risk plan for Zwolle, only long time ago in a discussion regarding separating the inner water of Zwolle from the water outside (1st layer of the MLSA). Although, it is relevant to underline that the development of stress tests for the whole country within the Delta Program is a very trans-disciplinary and multi-layer role that implies the relation with other parties in any areas where these stress tests are developed, including Zwolle. Examples of more direct interdependency amongst the different actors, as mentioned by N-R-1, N-R-2, R-W-1 and R-P-1, are the coalitions formed within the high water protection program (HWBP) composed by different actors (Rijkswaterstaat, water board Drents Overijssel delta, province of Overijssel and the municipality of Zwolle); and the IJssel Vecht delta (water board Drents Overijsselse delta, province of Overijssel, safety board of Overijssel and municipality of Zwolle) of which actors R-P-2 and L-M-1 were part of. R-S-1 from the safety board “veiligheidsregio IJsselland”, worked in a different multi-disciplinary team that comprehends police, fire brigades, medical service, municipality and the water board Drents Overijsselse Delta. Within this team they were developing strategies for situation of crisis due to flood events. L-M-1 describes the collaboration within the IJssel-Vecht Delta as follows:

“...it was like working together in one governance. I work for the municipality and R-P-2 for the province but it does not matter, we worked for the area together.”

As in the review of documents, other actors like Staatsbosbeheer were collaborating with the ones represented by the interviewees.

Goal dependency

The Ministry of infrastructure and water management, according to N-M-1, included future visions in the creation of new stress tests on flooding to study the vulnerability between different future scenarios. This fact relates to the concept of goal dependency “influence of future plans on changes”. R-P-2 member of the IJssel Vecht delta coalition underlined the attention on facing the future and applying strategies to look for solutions in Zwolle, but also within the entire region. A combination of a strategic approach and long-term visions within the IJssel Vecht delta were the means to identify what are the best investments and interventions to be done. Through these visions the policy can be shaped and adapted to climate change and flooding. An example is the development in the city where housing and water safety are combined and, therefore, the 2nd and 3rd layer are taken into account:

“The trick is to combine goals, so there are several projects here in the city area of Zwolle where new housing projects will be built, they changed the rules to build houses, they will be safer, they can have higher water levels.”

Also, L-M-1 from the municipality points out the adoption of long-term visions within the IJssel Vecht delta for the projects for spatial adaptation to climate change and flooding. The creation of goals for the future inspired the climate adaptation strategy for Zwolle and the whole IJssel-Vecht delta. The interviewees N-R-1, N-R-2, R-W-1, R-P-1, R-S-1 and L-M-2 did not mention concepts related to goal dependency.

6.2.2 Discussion between semi structured interviews and sub-research question 3

Path dependency

Path dependency is common between actors involved in the MLSA and SSP. Even though these actors are also involved in different coalitions and strategic processes, the Ministry of infrastructure and water management, water board Drents Overijsselse delta and municipality of Zwolle are the actors more subjected to path dependency especially for processes related to the 1st layer of the MLSA.

Interdependency

Interdependency is common between all actors. Trans-disciplinary coalitions like the Delta Program, the HWBP project and the IJssel-Vecht delta included all the actors I focused on which are promoting common goals and inspiring strategies between them. Interdependency occurs more amongst actors involved in strategic processes mostly relate to the 2nd and 3rd layer of the MLSA but also between actors involved in processes more related to the 1st layer (e.g. HWBP).

Goal dependency

Goal dependency is present between actors involved in the MLSA and SSP. N-M-1 mentioned the development of stress tests and maps and stressed the importance of future scenarios and long-term visions in such processes. R-P-2 and L-M-1 mentioned goal dependency especially in relation to the strategic approach of the IJssel Vecht delta coalition for processes related mostly to the 2nd and 3rd layers of the MLSA. Goal dependency occurs more in processes related to SSP.

Goal Dependency	Interdependency	Path Dependency
Ministry of Infrastructure and Water Management	Ministry of Infrastructure and Water Management	Ministry of Infrastructure and Water Management
	Rijkswaterstaat	
	Water board Drents Overijsselse Delta	Water board Drents Overijsselse Delta
Province of Overijssel	Province of Overijssel	
	Safety board of Overijssel	
Municipality of Zwolle	Municipality of Zwolle	Municipality of Zwolle

Fig.22. Dependencies amongst actors of the MLSA and SSP observed through the semi-structured interviews.

The dependencies observed through the review of documents are summarized as follows in **Figure 22**.

6.2.3 Discussion between semi structured interviews and sub-research question 4

The results gathered from the interviews present situations in which locked-in flaws are recognized in the case of Zwolle. The presence of path dependencies between actors and coalitions involved in the MLSA and SSP shows that processes can be changed or hindered under the state of a subordination. FRM is still partly seen as a resistance to water in the spatial distribution and therefore in some cases the approach is still focus on the 1st layer of the MLSA, with no integration with principles of SSP. These path creations are capable to slow down the transition towards an IFRM by keeping it out from the acceleration phase. However, a strong interdependency and the presence of strategic approaches conditioned by goal dependencies suggest that path dependencies can be broken. The water authorities are interdependent with the administrative ones and the presence of trans-disciplinary coalitions are increasingly including strategic approaches with holistic and integrated views towards the future. The work of these coalitions shows that especially the 2nd and 3rd layers of the MLSA are integrated with principles of SSP. From the analysis of interviews, I argue that the case of Zwolle can be placed in the beginning of the take-off phase of the multi-phase concept of Rotmans et al. (2001).

This placement is shown as follows in **Figure 23**.

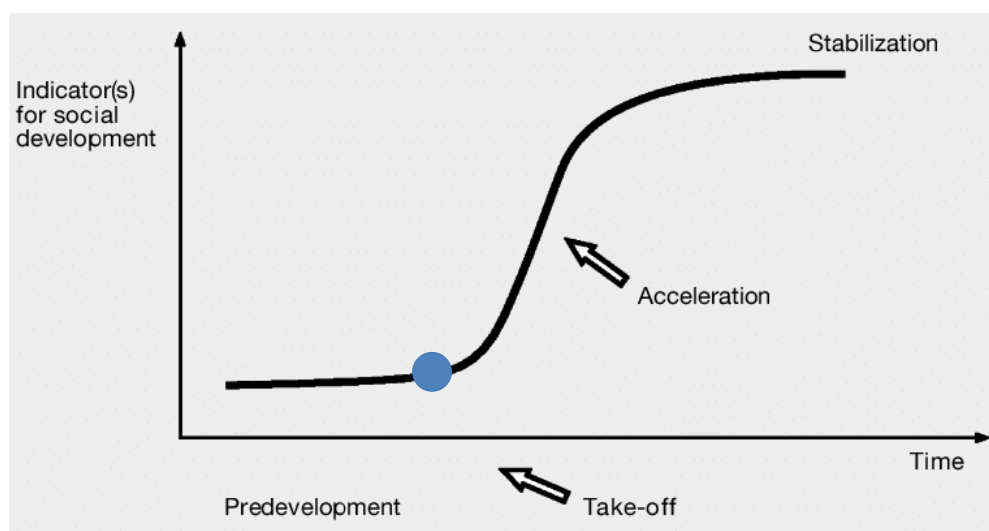


Figure 23. Position of the case of Zwolle towards an integrated flood risk management along the multi-phase concept, according to the interviewed actors.

6.3 Discussion between survey for inhabitants and research questions

There are 2 main points identified in the results gathered from the interview questionnaire for the inhabitants which are valid for both areas. Firstly, in relation to question 1 none of the interviewees was informed about how to behave in case of flooding by organizations or in any other way. Although, a lot of them were able to give an answer about what they think would be the best way to behave. Secondly, none of the interviewees knew what the MLSA is, even with the drawing used as a support. The fact that none of the interviewed inhabitants knew about the MLSA and most of them perceive flood risk management as a matter of defensive measures only, also mean that the societal awareness regarding the change in approaching flooding is low. It was expected to interview inhabitants who were informed about how to behave in a situation of crisis due to flooding, especially in Area 1 which is located near to the river IJssel. These lack information and communication represent a lack of focus on the 3rd layer of the MLSA.

6.4 Discussion between all the results combined and research questions

From both the interview questionnaires and the documents review, all the dependencies were observed. Overall, there is concordance between witnesses of the interviewees and the content of the documents, however the information retrieved from the interviews were richer than the ones found within the documents. Generally, interdependency is observed with more frequency and amongst all the actors. As stated by van Assche et al. (2014), all the dependencies interact with each other and build a pattern. The pattern found in the case of Zwolle there is a strong interdependency which is more conditioned by goal dependency than path dependency. All the coalitions created between actors do have the willingness to set common goals and acting in order to reach them. Path dependency is manifested through actors who own more power than others affect the development of the plan is present in processes related to the 1st layer of the MLSA but these actors are adapting

their configuration towards a more collaborative and holistic approach. The features related to path dependency were found more through the interviews. Instead, the documents stress more on goal dependency. A contradiction is found between documents review and interview questionnaire; whereas in the documents review the safety board of Overijssel took a role within the IJssel-Vecht delta corporation, from the interviews there is no clear information about it. Generally, my findings show that the MLSA integrating with SSP in Zwolle, although some processes are still focused on the 1st layer only, with presence of subordination and lack of collaboration.

6.5 Discussion between results and SSP and TT

In this section I discuss the gathered results in comparison with the theoretical framework of my research. SSP theory and TT are consulted. Differently, dependency theory is not taken into account in this section, since it was already discussed within the comparison between results and research questions.

Results compared with SSP theory

With the gathered results, it is possible to observe numerous concepts related to SSP theory. The strong presence of interdependency between the actors involved in the development of the flood risk plan is a factor that enhance SSP. Amongst the actors interviewed and within the documents reviewed there is a strong awareness about the fact that a strategic approach in flood risk management is necessary. Spatial interventions such as housing and infrastructures are made through a strategic approach that combines water management and SP in the city of Zwolle. The different coalitions created for developing and acting plans within the city and its surroundings, such as the IJssel-Vecht delta, were created to tackle climate change and flooding from different perspectives. The way how these plans are developed looks at the future, trying to decrease uncertainty by including adaptation in them. However, processes related to defensive measures against flooding such as improvement of dykes lack of an integrated approach. The presence of path dependencies in such processes suggests that the 1st layer of the MLSA still needs to be integrated with SSP. Another point in contrast to SSP is the lack of attention and focus on DM which seems to be neglected from the results gathered within this research, especially from the survey for inhabitants.

Results compared with TT

By referring to the multi-phase and multi-level concepts of TT of Loorbach & Rotmans (2006), the case of Zwolle plays a role between the meso-scale and the micro-scale because individual actors, but also multiple organizations are involved together with a wide set of legislation and directives. The transition towards an IFRM in the city of Zwolle was overall discussed in the discussion between results and the 4th research question, both for the documents review and for the interview questionnaire. On the one hand, according to the documents review the strong interdependency affected by goal dependency regarding spatial adaptation to climate change places the case of Zwolle at the beginning of the acceleration phase of the multi-phase concept of Rotmans et al. (2001) towards an integrated flood risk management. On the other hand, from the interviews this transition

is placed at the beginning of the take-off phase due to a greater presence of path dependencies than in the documents. In the multi-phase concept, the take-off phase and the beginning of the acceleration phase are effectively close to each other, this fact confirms that there were not strong contradictions or between the results gathered from the documents and the ones from the interviews. By complementing the results, the case of Zwolle is positioned at the take-off phase, as shown in **Figure 24**.

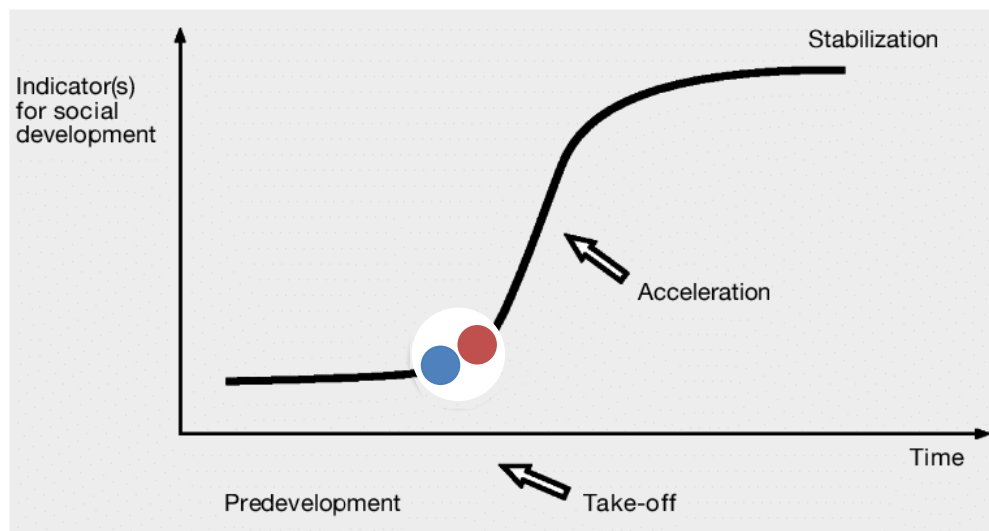


Figure 24. The placement of the case of Zwolle towards an integrated flood risk management according to the documents review (in red) and the interviewed actors (in blue).

6.6 Discussion between results and methodology

In this section I discuss the comparison between my results and the different methodology used to gather them. Triangulation increased the internal validity of the research by retrieving the same information from different sources.

6.6.1 Literature review

Through literature review it was possible to identify what are the principles and concepts that need to be studied in order to fully understand the scope of this research. Moreover, TT theory, SSP theory and dependency theory in policy making are all connected to each other; therefore, it was possible to create a narrative between them to help answering the research question. The shift within flood risk management is very recognizable in TT, especially in the Dutch context where it represents an essential practice in the country. TT shares multiple concepts with SSP which, is related with the MLSA, especially with the 2nd and 3rd layer. SSP Involves a holistic and integrated approach that include a multitude of actors. These actors are involved in the same policy processes and therefore they are subjected to dependencies. The literature chosen gave an essential support to develop this research. The materials which contain the chosen theories were all accessible and available in English language.

6.6.2 Documents review

Some of the documents reviewed were suggested directly for the actors interviewed, one of them was written by one of the interviewees. The documents allowed to have an official source with a clear overview of some processes related to the development of the flood risk plan in Zwolle. The review of documents, combined with the interviews, increased the internal validity of this research and made it possible to see if there were contradictions between official documents and witnesses. A lot of useful information were found in the documents, however there is no document which directly relates to the application of the MLSA in Zwolle. The document at the national level contains numerous information which are not relevant for this research. The documents found in Dutch language were translated with google translate and the help of a Dutch native speaker.

6.6.3 Interview questionnaires

The interviews made to the actors played the most important role in this research. The research question made the interviews necessary in order to have the most direct access to information and to enable a dialogue with which it was possible to gathered numerous insights about the case. All the interviewed actors were able to speak English. Some of them with more difficulties, but even in that case it was possible to translate the information gathered in Dutch with the help of google translate and a Dutch mother tongue person. The interview questionnaire for organizations covered all the points necessary to answer the research questions. One point in contrast is the difficulty in scheduling all the different interviews. It was possible to conduct them within a month, but it took 2 months to arrange an appointment with most of them, since one of the actors answered via e-mail. This latter fact did not allow to get information form the actor R-S-1 as from the others.

6.6.4 Survey for inhabitants

The survey for inhabitants, even if with limited relevance, allowed to get more insights about how the 3rd layer of the MLSA is embedded in the flood risk plan for Zwolle. The limitation of this method lays in the number of interviewees which was relatively low. By choosing 10 people of an area located close to the river IJssel and 10 random people who live somewhere else in the city, could have put into evidence a distinction of perceptions according to where people live. However, according to the results, this was not the case.

7 Conclusion and recommendations

7.1 Conclusion

The application of the MLSA in FRM implies the involvement of different organizations with different knowledge and expertise which operate together. The approach is not focused on defensive measures against flooding only, instead it embeds spatial adaptation and emergency plans in case floods will occur. Principles of SSP such as collaboration between different experts, holistic and integrated approach and adoption of long-term views while developing plans are fundamental for the MLSA. With this research it was possible to investigate how the principles of SSP are integrated in the application of the MLSA in the case of Zwolle by observing the pattern of dependencies between actors involved. In the case of Zwolle SSP is integrated in many processes related to the 2nd and 3rd layer of the MLSA but still absent in others mainly focused on the 1st.

As discussed in the results, the dependencies observed between the actors of the MLSA and the actors of SSP are all the ones found through the literature (path dependency, interdependency and goal dependency). According to the official reviewed documents and partly from the semi-structured interviews most of the actors were involved in the same processes and programs for the development of the flood risk plan for Zwolle.

Path dependency is present in the subordination of the water board to the national government and of the municipality to the water board, present especially in processes related to the 1st layer of the MLSA, in which SSP principles are not really applied.

Interdependency is present between all the actors, since all of them have collaborated with others, not all of them to the same extent but in at least 1 process. The 3 program/corporations highlighted (Delta Program, HWBP and IJssel Vecht delta program) are interconnected with each other and embed all the actors I focused on. However, some collaboration is stronger than others and applies a more strategic approach within its governance/policy making processes.

Goal dependency is present within all the actors, particularly the ones involved the Delta Program and the IJssel-Vecht delta coalitions, and it is more enhanced than path dependency for all the actors especially in processes related with the 2nd and 3rd layers of the MLSA in which principles of SSP are reflected.

The pattern of observed dependencies between actors can be defined as a strong interdependency conditioned by goal dependency to an extent greater than path dependency. According to my analysis, this observed pattern placed the transition of the city towards an IFRM close to the acceleration phase.

7.2 Recommendations

The investigation of dependencies within the MLSA in real case studies can be further developed in order to understand how the transition towards an integrated flood risk management is taking place at the national scale. The compatibility of TT with SSP theory can be further investigated, as well the compatibility between the MLSA and SSP principles. Within dependency theory, there is a lack of

research on interdependency and goal dependency in governance and policy making and on how they are compatible with SSP. Theory of Power in governance and policy making can be added to studies similar to this research and connected with the dependency theory. Are certain kinds of dependencies compatible with certain kinds of powers?

The same methodology used in this research can be applied in other case studies. Although, the choice of documents to review can be made with more accuracy and specifying beforehand what it is expected to find in them. The number of documents can also increase, as well as the number of interviewees. The choice of actors to interview can be done after the documents review in order to better choose what are all the organizations involved in the development of a flood risk plan. Furthermore, with more time available it would have been relevant that more participants could attend the survey to increase its importance and validity.

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Annexes

Annex a - Interview questionnaire for inhabitants (with Dutch translations)

- 1) *Would you know what to do in case of flooding of the river IJssel? If yes, how do you know that?*
(Zou je weten wat je moet doen bij overstromingen van de IJssel? Zo ja, hoe weet u dat)?
- 2) *Do you perceive a risk of flooding? If yes to what extend?*
(Zie je een risico van overstroming? Zo ja, in welke mate)?
- 3) *Think about the approach against flooding in the city. Do you perceive it as a defensive only (building dykes, dunes and defensive measures)? Or do you perceive it as a more integrated approach (with water taken into account in urban planning)?*
(Denk aan de aanpak tegen overstromingen in de stad. Beschouw je het alleen als een verdedigingsmiddel (bouwen van dijken, duinen en verdedigingsmaatregelen)? Of zie je het als een meer geïntegreerde benadering (met water in aanmerking genomen in de stadsplanning)?
- 4) *Do you know about the "Meerlaagsveiligheid" (multi-layer safety approach-MLSA)? If yes, what do you know? Do you feel safe about it?*
(Kent u de "Meerlaagsveiligheid"? Zo ja, wat weet u hiervan? Voel je je er veilig over)?

interviews notes (Area 1)

house n.1

House n.1 did not respond due to absence of people.

house n.2

An inhabitant of the house n.2 responded negatively by saying that he did not have time for the interview.

house n.3

- 1) In case of flooding he would move upstairs, nobody informed him about what to do in case of flooding.
- 2) He does not perceive a risk of flooding at all.
- 3) He perceives flood risk management as something that deals only with dykes and defensive measures against flooding. Although he thinks that the management of defensive measures should be integrated with more practices.
- 4) He never heard about the Multi-layer safety approach.

house n.4

House n.4 did not respond due to absence of people.

house n.5

House n.5 did not respond due to absence of people.

house n.6

House n.6 did not respond due to absence of people.

house n.7

- 1) In case of flooding he would move upstairs, nobody informed him about what to do in case of flooding.
- 2) He does not perceive a risk of flooding at all.
- 3) He perceives flood risk management as something that deals only with dykes and defensive measures against flooding. Although he thinks that the management of defensive measures should be integrated with more practices.
- 4) He never heard about the Multi-layer safety approach.

house n.8

- 1) In case of flooding she would act in 2 ways according to the extent with which the flood will occur. She would either move upstairs or go away with the car. Nobody informed her about what to do in case of flooding.
- 2) She does not perceive the risk of flooding because she trusts the defensive measures against it, such as dykes.
- 3) She perceives flood risk management as something that deals with dykes and defensive measures only.
- 4) She never heard about the Multi-layer safety approach.

house n.9

- 1) She looked for information about what to do in case of flooding by herself on a website that she saw on television. She did not remember the name of the website. What she saw is that it is suggested to go upstairs. She also owns a boat on the 1st floor that she can use to escape from the house. Nobody informed her about what to do in case of flooding.
- 2) She perceives that a flooding event is possible. However, she would not be able to understand when or how the flood occurred.
- 3) She perceives flood risk management as a fight against water. She mentioned dykes and dunes as measures. She pointed out that she trusts the institutions that deal with flood risk management.
- 4) She never heard about the Multi-layer safety approach.

house n.10

- 1) In case of flooding, he would not know what to do. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive the risk of flooding.
- 3) He thinks about flood risk management as a practice that deals with defensive measures only, such as dykes and dunes.
- 4) He never heard about the Multi-layer safety approach.

house n.11

House n.11 did not respond due to absence of people.

house n.12

- 1) In case of flooding, he would not know what to do. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive the risk of flooding.
- 3) He thinks about flood risk management as a practice that deals with defensive measures only, such as dykes.
- 4) He never heard about the Multi-layer safety approach.

house n.13

- 1) In case of flooding, he would not really know what to do, but he would go upstairs. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive the risk of flooding.
- 3) He thinks about flood risk management as a practice that deals with defensive measures only, such as dykes.
- 4) He never heard about the Multi-layer safety approach.

house n.14

- 1) In case of flooding, he would go upstairs. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive the risk of flooding at all.
- 3) He thinks about flood risk management as the defensive systems to protect areas against flooding.
- 4) He never heard about the Multi-layer safety approach.

house n.15

- 1) In case of flooding she would go away with her car. Nobody informed her about what to do in case of flooding.
- 2) She does not perceive the risk of flooding because she thinks that if a flood event occurred, she would have time to think about what to do.
- 3) She perceives flood risk management as a more integrated practice with spatial planning, especially in the inner city of Zwolle.
- 4) She never heard about the Multi-layer safety approach.

house n.16

- 1) In case of flooding, he would not know what to do. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive the risk of flooding at all.
- 3) He thinks about flood risk management as something that deals with dykes.
- 4) He never heard about the Multi-layer safety approach.

interviews notes (Area 2)

Person1 (who lives in Zwolle south not close to the river)

- 1) She does not what to do in case of flooding, nobody informed her about that.
- 2) She does not perceive the risk of flooding because she is aware that the institutions involved in flood risk management are creating a lot of room beside the river IJssel, in order to expand the river basin.
- 3) She perceives flood risk management as a practice that deals only with defensive measures against flooding such as dykes and dunes.
- 4) She never heard about the Multi-layer safety approach

Person 2 (who does not live close to the river IJssel)

- 1) She would move upstairs in her house in case of flooding. Nobody informed her about what to do in case of flooding.
- 2) She does not perceive the risk of flooding.
- 3) She perceives flood risk management as a practice that deals only with defensive measures against flooding such as dykes and dunes.
- 4) She never heard about the Multi-layer safety approach

Person3 (who lives close to the river IJssel)

- 1) He does not know what to do in case of flooding, nobody informed him about that.
- 2) He perceives the risk of flooding especially during heavy rainfalls. Although, he does not perceive it as a life risk.
- 3) He perceives flood risk management as a practice that mainly deals with defensive measures against flooding such as dyke and dunes.
- 4) He never heard about the Multi-layer safety approach.

Person 4 (who does not live close to the river IJssel)

- 1) He does not know what to do in case of flooding, nobody informed it about that.
- 2) He does not perceive the risk of flooding at all.
- 3) He perceives flood risk management as a practice that deals only with defensive measures against flooding.
- 4) He never heard about the Multi-layer safety approach.

Person 5 (who does not live in Zwolle)

Person 6 (who does not live close to the river IJssel but close to a canal connected to it)

- 1) In case of flooding, she would go upstairs. Nobody informed her about what to do in case of flooding.
- 2) She does not perceive the risk of flooding at all.
- 3) She perceives flood risk management as a practice which integrates spatial planning into account, especially in urban design. This is what she observes in the urban development in the city.
- 4) She never heard about the Multi-layer safety approach

Person 7 (who does not live close to the river IJssel)

- 1) In case of flooding, he would go away as far as possible with his car. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive a big risk of flooding in the city of Zwolle because, according to him, there are a lot of flood plains beside the river.
- 3) He perceives that flood risk management has moved his practice also in the development of the city, especially within the practice of urban design.
- 4) He never heard about the Multi-layer safety approach.

Person 8 (who does not live in Zwolle)

Person 9 (who did not want to attend the interview)

Person 10 (who lives close to the river IJssel)

- 1) She does not know what to do in case of flooding. If she was alerted in case of flooding, she would go away with her car. Nobody informed her about what to do in case of flooding.
- 2) She does not perceive the risk of flooding at all.
- 3) She perceives flood risk management as a practice that deals only with defensive measures against flooding such as dykes and dunes.
- 4) She never heard about the Multi-layer safety approach

Person11 (who does not live close to the river IJssel)

- 1) In case of flooding he would go upstairs in his house. Nobody informed him about what to do in case of flooding.
- 2) He does not perceive the risk of flooding at all.
- 3) He perceives flood risk management as a practice which is integrated with spatial planning. He points out that water can be used as aesthetic element in the city.
- 4) He never heard about the Multi-layer safety approach

Person12 (who does not live close to the river IJssel)

- 1) He does not know what to do in case of flooding, nobody informed him about that.
- 2) He does not perceive risk of flooding at all.
- 3) He perceives flood risk management as a practice integrated with spatial planning.
- 4) He never heard about the Multi-layer safety approach.

Person 13 (who does not live close to the river IJssel)

- 1) In case of flooding he would go upstairs in his house. Nobody informed him about what to do in case of flooding.
- 2) He perceives the risk of flooding because he thinks that flood risk management is not all the same in all the areas it passes. He thinks that this fact can have flooding consequences.
- 3) He perceives flood risk management as a practice that deals only with defensive measures against flooding such as dykes and dunes.
- 4) He never heard about the Multi-layer safety approach.

Annex b – Illustration and explanation of the Multi-Layer Safety Approach (in Dutch)



Annex b. Illustration and explanation of the MLSA used during the interviews to inhabitants. Source: (<https://www.wur.nl/en/newsarticle/New-floodprotection-strategies-for-the-north.htm>).

Annex c – Links of the documents chosen for the review

- 1) Delta Programme 2018 (D-N-1):
https://www.google.com/search?q=deltaprogramme+2018&rlz=1C5CHFA_enNL843NL843&oq=deltaprogramme+2018&aqs=chrome..69i57j0l5.3983j0j8&sourceid=chrome&ie=UTF-8
- 2) Water board Drents Overijsselse Delta website (D-R-1):
<https://www.wdodelta.nl/>
- 3) IJssel-Vechtdelta: werken aan waterveiligheid en klimaatadaptatie (D-R-2):
<http://www.overijssel.nl/thema's/water/waterprojecten/ijsselvechtdelta/>
- 4) Zwolle Klimaatbestendig (D-L-1):
https://www.google.com/search?rlz=1C5CHFA_enNL843NL843&biw=1280&bih=597&ei=z3YbXaKRLof4wALH6pn4CQ&q=Zwolle+Klimaatbestendig+&oq=Zwolle+Klimaatbestendig+&gs_l=psy-ab.3..0i30.15712.19365..19958...1.0..0.167.338.3j1.....0....1j2..gws-wiz.....10..35i39j0i13i30.N-Kl2Ns5biE

Annex d – Translations of quotes from the documents review for the results

Quotes from Document 2 (D-R-1) - Waterschap (water board) Drents Overijsselse Delta website

“Voordat besluitvorming plaatsvindt, horen we graag de reacties van bewoners en anderen op dit voorstel.”

Translated:

“Before decision-making takes place, we would like to hear the reactions of residents and others to this proposal.”

“Hiermee gaan waterschap en gemeente de mogelijkheden verkennen voor de aanleg van fiets- en wandelpaden langs het Zwarte Water als onderdeel van de dijkversterking Stadsdijken Zwolle.”

Translated:

“Water board and municipality will use this to explore the possibilities for constructing cycle and walking paths along the Zwarte Water as part of the dyke improvement Zwolle city dikes.”

Quotes from Document 3 (D-R-2) - IJssel-Vechtdelta: werken aan waterveiligheid en klimaatadaptatie (IJssel Vecht Delta: working on water safety and climate adaptation) (2019)

“De partners in de IJssel-Vechtdelta staan gezamenlijk voor het oplossen van de opgaven in het gebied en werken daarmee aan een duurzaam veilige en klimaatbestendige IJssel-Vechtdelta.” (p.3).

Translated:

“The partners in the IJssel-Vecht delta are jointly responsible for solving the tasks in the area and are therefore working on a sustainably safe and climate-proof IJssel-Vecht delta.”

“Naast de infrastructurele aanpassingen en de aanpassingen op het gebied van de waterveiligheid staat in de nieuwe inrichting van de Pannekoekendijk ook de beleving van het karakteristieke stadsgezicht en de dynamiek van het water centraal. Zo is een deels drijvend wandelpad aangelegd om de dynamiek van de IJssel-Vechtdelta in levende lijve te ervaren.” (p.6).

Translated:

“In addition to the infrastructural changes related to water safety, the new layout of the Pannekoekendijk also focuses on the perception of the characteristic cityscape and the dynamics of the water. For example, a partly floating footpath has been constructed to experience the dynamics of the IJssel-Vecht delta in person.” (p.6).

“Op de locatie Weezenlanden is in 2018 en 2019 woningbouw gerealiseerd. Het gebied ligt ten zuidoosten van de Zwolse binnenstad en grenst direct aan de stadsgracht. Aan de westkant wordt Weezenlanden begrensd door de weg Groot Wezenland. De rand van het gebied is een onderdeel van de regionale waterkering. Redenen dus om dit gebied klimaatbestendig en waterveilig in te richten. Ook waren beleefbaarheid van het water en ruimtelijke kwaliteit een uitgangspunt.” (p.8).

Translated:

“Weezenlanden Housing construction was realized in 2018 and 2019. The area is located southeast of the Zwolle city center and borders directly on the city canal. Weezenlanden is bordered on the west by the Groot Wezenland road. The edge of the area is part of the regional flood defense. These are reasons for designing this area climate-proof and water-safe. Experience of the water and spatial quality were also a starting point.” (p.8).

“De geluidswal krijgt ook de functie van noodwaterkering. De geluidswal is robuuster aangelegd, is afgewerkt met klei en ingezaaid met speciaal dijkgras. Dankzij de wal kan de wijk droog blijven bij een overstroming van de polder Mastenbroek.” (p.9)

Translated:

“The noise barrier also has the function of emergency water defense. The noise barrier is laid out more robustly, finished with clay and sown with special dyke grass. Thanks to the shore, the neighborhood can remain dry in the event of a flooding of the Mastenbroek polder.” (p.9).

“Doel van Expeditie Wildernis IJssel-Vechtdelta was kinderen in contact te brengen met de natuur en het water. We willen hen laten ervaren hoe belangrijk het is om rekening te houden met water. Leven in een delta betekent dat we onszelf, onze dieren en onze huizen moeten beschermen tegen eventuele overstromingen. De expedities zijn mogelijk gemaakt door het programma IJssel-Vechtdelta.” (p.27).

Translated:

“The aim of Expedition Wilderness IJssel-Vecht delta was to bring children into contact with nature and water. We want them to experience how important it is to take water into account. Living in a delta means that we have to protect ourselves, our animals and our houses against possible flooding. The expeditions were made possible by the IJssel-Vecht delta program.” (p.27).

“In 2017 en 2018 is gewerkt aan het project Waterbewust Stadshagen. In samenwerking met het programma IJssel-Vechtdelta heeft de gemeente Zwolle Arcadis opdracht gegeven om Waterbewust Stadshagen vorm te geven. Begin 2018 is een ‘klussenmarkt’ gehouden om te bekijken welke kansen er liggen in de wijk en mensen te werven op die acties op te pakken. Het is de bedoeling dat zoveel mogelijk ‘ambassadeurs’ aan de slag gaan om bewoners enthousiast te maken voor acties op het gebied van waterveiligheid en klimaat. Voorbeelden zijn het werven van vrijwilligers voor een eigen hoogwaterbrigade en het vergroenen van tuinen en daken.” (p.28).

Translated:

“In 2017 and 2018 work was carried out on the Water-conscious Stadshagen project. In collaboration with the IJssel-Vecht delta program, the municipality of Zwolle has commissioned Arcadis to shape Waterbewust Stadshagen. At the beginning of 2018, a “DIY market” was held to see what opportunities there were in the neighborhood and to recruit people to take up those actions. The intention is that as many “ambassadors” as possible go to work to make residents enthusiastic about actions in the field of water safety and climate. Examples are the recruitment of volunteers for their own high-water brigade and the greening of gardens and roofs.” (p.28).

Quotes from Document 4 (D-L-1) - Zwolle Klimaatbestedig (Zwolle climate-proof) (2013)

- “Water als motor: water, watersysteem, waterbeheer, waterkwaliteit en waterveiligheid zullen voor Zwolle de motor voor duurzame gebiedsontwikkeling zijn.”*
- “Watergovernance: het realiseren van die inhoudelijke ambitie kan alleen met een toegesneden organisatorische werkwijze. De wateragenda zal inzetten op een verandering van toetsing naar beïnvloeding, bewustwording, samenwerking en regie. Heldere regelgeving en rolverdeling blijft daarbij belangrijk, evenals een strategie die leidt tot uitvoering. De agenda wil dat faciliteren met toegesneden oplossingen enerzijds en procesafspraken anderzijds.”*

(p.17)

Translated:

- “Water as a motor: water, water system, water management, water quality and water safety will be the engine for Zwolle for sustainable area development.”*
- “Water governance: achieving that substantive ambition is only possible with a tailored organizational method. The water agenda will focus on a change of assessment towards influence, awareness, cooperation and direction. Clear regulations and division of roles remain important, as well as a strategy that leads to implementation. The agenda will facilitate that with tailored solutions on the one hand and process agreements on the other hand.”*

(p.17)

“De wateragenda kent een vijftal grote thema’s waarin burgers, bedrijven en instanties samenwerken aan water en klimaat in de stad.”

- *“Dankzij de dijken”*
- *“Leven en spelen met water”*
- *“Voorbereiden op extremen”*
- *“Zwolle onder de grond”*
- *“Water als grondstof”*

(p.21)

Translated:

“The water agenda has five major themes in which citizens, companies and organizations work together on water and climate in the city.”

- *“Thanks to the dikes”*
- *“Living and playing with water”*
- *“Prepare for extremes”*
- *“Zwolle underground”*
- *“Water as a raw material”*

(p.21)

“Dat lukt wanneer gemeente en Waterschap Groot Salland gezamenlijk de koers weten vast te houden. Een koers die zijn wortels heeft in de lange termijn perspectieven IJssel-Vecht delta, die is opgepakt in deze proeftuin Klimaatbestendige stad en die in 2014 formele beleidskaders krijgt in de nieuwe Stedelijke Wateragenda.” (p.36).

Translated:

“A strategy that effectively affects the daily dynamics of building and renovating the city. That succeeds when the municipality and water board Groot Salland (Drents Overijsselse delta) managed to hold the course together. A course that has its roots in the long-term prospects of IJsselmeer Vecht delta, which was picked up in this Climate-proof experimental garden city and which will have formal policy frameworks in the new one in 2014 Urban Water Agenda.” (p.36).