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Resilient Governance for Resilient Cities – Assessing the Governance Context for Green Infrastructure Implementation in Hoboken

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Abstract

The question of flood resilience in the context of urban growth and climate change has turned the ability to adapt to and recover from flood disasters into a necessary asset for coastal cities like Hoboken. When hurricane Sandy hit Hoboken in October 2012, the social and economic loss was unprecedented. Hence, the city reacted with ambitious plans to install green infrastructure as a measure towards flood resilience, including the 'Green Infrastructure Strategic Plan' and the 'Resist, Delay, Store, Discharge' strategy under Rebuild by Design. A successful implementation of the green infrastructure measures proposed can be considered a necessary condition for increased flood resilience in Hoboken. As part of an interdisciplinary research project on Hoboken's green infrastructure plans, this paper examines the supportiveness of the city's wider governance context on the implementation process. A governance assessment tool is applied to evaluate the characteristics of the governance regime. The methodology combines documentary analysis with in-depth stakeholder interviews. Atlas Ti is used to organize the qualitative data, while an informed judgment takes place to arrive at predictions about the likely success of implementation. The research proved detailed empirical observations of those factors which are supportive of green infrastructure implementation as well as of those which are restrictive. A number of recommendations targeted at practitioners on how to improve the governance context are presented in the conclusion.

Keywords:
Resilience; flood risk management; governance assessment; green infrastructure; implementation

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1. Introduction

Rapid urbanization and increasing impacts of climate change pose enormous challenges to societies and the safe living of people. The question of resilience in the context of urban growth and extreme climatic events has turned the ability to adapt to and recover from disasters into a necessary asset. As more than half of the global population resides in urban areas, the concentration of people and economic activity increases disaster risk. Among all the various consequences of climate change, flood appears to be the most dangerous one, since it affects the highest number of people (Estrada et al., 2015). As a response to these societal needs, policy-makers need to find sustainable solutions towards climate resilience, particularly for urban areas.

1.1 Climate Change and Increasing Flood Risk – A Challenge for Hoboken

Flash floods have the potential to severely disrupt critical systems of a city. They pose enormous risks to human lives and structures while causing significant property damages (Hatzikyriakou et al., 2015; Perry, 2000). According to the 2014 National Climate Assessment, extremely heavy precipitation events have increased since 1958 by 71 % in the Northeast of the US, where Hoboken is located (Hoboken, 2017). As a consequence of climate change, flood-prone areas are expected to expand a shocking 100 percent around the Gulf of Mexico and the Atlantic coastline by 2100 (Postal, 2013). More than 13 million people in the US alone will be exposed to life-threatening floods by the end of this century, therefore depending decisively on competent disaster prevention and management (Lavelle, 2016).

Hoboken has partly experienced flood events of catastrophic impact. When Hurricane Sandy's heavy rains and unprecedented storm surge hit Hoboken and other major cities along the Atlantic coastline in October 2012, 13-foot storm surges were generated and 8 feet of water entered the city from its physically most vulnerably points along the waterfront (Hoboken, 2017). The low-lying areas of Hoboken, some of which are located less than three feet above sea level, are designated by the Federal Emergency Management Administration (FEMA) as a High Flood Risk zone (Bailin, 2014). It is thus no surprise that Hoboken's Mayor Dawn Zimmer said that during Hurricane Sandy, the streets of Hoboken have been 'filled up with water like a bathtub' (Zernike, 2013). Hence, increased flood exposure in Hoboken needs to be coupled with enhanced flood adaptation and mitigation to reduce losses and damage. The world's cities, among them Hoboken, need to become more resilient.

1.2 The Potential of Green Infrastructure for Urban Flood Resilience

The concept of resilience, especially in the context of urban flood exposure, recognizes that disaster risk reduction goes beyond preparedness and response; it requires effective strategic planning and smart design of spatial elements that are able to mitigate the effects of extreme flood events. Urban resilience is 'the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow

no matter what kinds of chronic stresses and acute shocks they experience' (100 Resilient Cities, n.d.). One way to increase urban resilience to flooding is to install green infrastructure (GI) measures in affected areas in order to absorb heavy downpours and reduce stormwater runoff. Such GI measures include parklands, constructed wetlands, basins, ponds, rain gardens, stormwater trees, subsurface storage or green roofs. The implementation of GI has a huge potential in building resilience through protecting floodplains. According to the United States Environmental Protection Agency (EPA), green infrastructure can potentially reduce stormwater runoff volumes by 99 percent (EPA, 2017). Through the absorption of rainfall and preventing water from overwhelming sewer systems, the implementation of GI measures can save millions of dollars in flood losses while protecting human security for relatively low costs (EPA, 2017). However, the success of such measures is not only dependent on their theoretical ability to absorb a sufficient amount of water from a technical perspective, but also on their efficient and adequate implementation in practice.

1.3 Hoboken as a Best Practice Model for Urban Resilience

Following the disastrous aftermath of the Hurricane Sandy, policy-makers in Hoboken seem to have understood the need for prioritizing disaster risk reduction and climate change adaptation in order to increase their urban resilience to floods. This made the different actors of Hoboken's governance context embrace the concept of GI into their resilience building efforts.

Long before Sandy, when the 'City of Hoboken Masterplan' (2004) was adopted, GI was already set as a desirable goal for the city that is characterized by impenetrable surfaces. After Sandy, in 2013, the city introduced its 'Green Infrastructure Strategic Plan' (Together North Jersey, 2013). The plan sets out ambitious goals regarding the implementation of different GI measures all around the city during the coming years. When Hoboken entered the Rebuild by Design competition, launched by the United States Department of Housing and Urban Development in 2014, the city incorporated the Green Infrastructure Strategic Plan in their proposal. The result was a comprehensive water management strategy, combining traditional measures like grey infrastructure and non-traditional approaches like GI in a multi-facetted approach. This approach consists of four components: Resist, Delay, Store and Discharge. Among measures for coastal defense (Resist), the plan suggests green urban infrastructure to slow stormwater runoff and store excess rainwater (DSD-components). Thus, the main documents laying out plans for green infrastructure in Hoboken are the Green Infrastructure Strategic Plan and the RBD-proposal, from here on referred to as ‘the plans’.

The city’s efforts paid off: the RBD strategy was awarded as one of six winning concepts. The federal government invested intensively in the strategy, granting $230 million, by far the highest amount among all winning projects, for the implementation of the plan. Moreover, as part of their ‘Making Cities Resilient’ Campaign, the United Nations Office for Disaster Risk Reduction (UNISDR) has designated Hoboken as a Role Model City for Resilience Planning, acknowledging particularly the city’s efforts with regard to

extensive GI implementation. This way, Hoboken became one of only 45 Role Model Cities worldwide, and of only two in the US, the other one being San Francisco. German Velasquez, representing UNISDR, has announced Hoboken's 'outstanding' performance along the lines of the UNISDR's 'Ten Essentials' laid out in the 'Resilient Cities UN Report' (UNISDR 2012). This image of Hoboken as a best practice role model for urban flood resilience makes it an interesting case to study the city's governance context for GI implementation.

Most of Hoboken's resilience strategy regarding GI up to now has just been 'talks and plans' – plans that have gained much international recognition. The fact that most measures still wait to actually become implemented however makes an investigation of the governance context that determines the success or failure of its implementation highly interesting and relevant. Hoboken's positive image when it comes to urban flood resilience, creates the following assumption, from which this research will originate: 'Being a city that is considered as best practice for urban resilience, Hoboken has a governance context that is highly supportive of the implementation of green infrastructure for flood resilience'. This assumption is being put to test by conducting a governance assessment of Hoboken's governance context for GI implementation, using the so called 'Governance Assessment Tool' (GAT). It is expected that Hoboken will perform satisfactory in most of the GAT assessment criteria as laid out in Chapter 2.

1.4 Scientific and Social Relevance

Societies can neither survive, nor strive if they are not governed well. When it comes to an effective climate adaptation process, governance is a crucial element, potentially determining not only how adequately policy-solutions are designed, but also how successfully they are implemented. While most attention is paid to the making of policy decisions, the carrying out of those decisions has proven to be the most problematic feature of the policy process (Pierson, 1993). The characteristics of the governance regime around a specific set of measures will either restrict or support their implementation, therefore determining the degree to which an area can realize effective adaptation to climate change.

The research informs recommendations on how to improve flood resilience for the particular governance context. More successful flood governance can become mainstreamed into daily practices of governments and stakeholders. Moreover, the assessment can provide stakeholders with an indication of the role they can play in improving flood governance and how they can contribute to positive spillovers. As Bressers et al. (2016) argue, 'governance assessment—the study of restricting and facilitating characteristics of a governance setting—can greatly aid implementation of drought adaptation measures' (Bressers et al., 2016). Accordingly, this study argues that a systematic assessment of Hoboken's governance setting can greatly aid implementation of flood adaptation and mitigation measures, thereby increasing flood resilience. In addition to this apparent societal relevance of governance assessment in the context of flood risk management, the

scientific relevance of the topic derives from the wide theoretical implications of the governance assessment framework and its contributions to academic literature on governance and governance assessment.

Firstly, the concrete application of a theoretical assessment framework through a case study has a scientific value in itself. For the goal of giving recommendations to practitioners, context-independent knowledge is inadequate (Flyvbjerg, 2006). Through a predictive application of the governance assessment, concrete, context-specific knowledge is acquired, which is the only way to address concrete, context-specific societal problems like floods. The practical knowledge gained from a case study applying a context-independent theory portrays a valuable contribution to theory development and will add to the collective process of knowledge accumulation on the field of governance assessment. The case of Hoboken's governance context for the implementation of GI presented here thus contributes to the academic concerns of implementation research and theory development of the GAT framework.

Secondly, one of the goals of this study is to give a more contextual answer to the question of implementation success. The study therefore contributes to a scientific demonstration of the importance of context in a systematic manner. The complexity of flood governance implementation will be addressed, making use of a systematic theoretical understanding of 'governance' as not only multi-actor and multi-level, but also multi-faceted, multi-instrumental and multi-resource-based. In this sense, the case study also contributes to the important academic discourse on the nature of 'governance'.

Thirdly, the scientific relevance of the study becomes apparent considering the sparse practical application of governance assessment to actual governance settings, particularly in the context of urban flood management and resilience. For the issue of flood risk management and urban flood resilience, the wide majority of studies originate from engineering and natural sciences (Pacheco-Vega 2015). Social sciences have only explored the topic in a fragmented manner, often without comparative scope (Driessen, Hegger, Bakker, van Rijswick, & Kundzewicz, 2016). However, there is more to a policy measure than scientific evidence of its technical effectiveness. Flood risk management is a complex social problem and requires to be approached as such. Therefore, a governance assessment is needed, understanding the implementation of green infrastructure measures as an inter-subjective process involving complex systems of human interaction. As part of a broader research program within ‘Project Hoboken’, this study contributes a social scientist’s perspective to an interdisciplinary team examining Hoboken’s green infrastructure plans.

From a social scientist perspective, the context for (urban) water governance has been assessed previously using either the GAT or its predecessor, the CIT (Bressers et al., 2015; Casiano Flores, Vikolainen et al., 2016; de Boer, Vinke-de Kruijf et al. 2016; Flores and de Boer; 2015, Casiano, forthcoming). However, all these applications of GAT/CIT have focused on water governance aspects like drought (Bressers et al., 2015), water supply, demand and distribution or wastewater management (Flores and de Boer 2015; Casiano

Flores, Vikolainen et al. 2016; Casiano, forthcoming; Rouillard et. al., 2016). Only very rarely has the GAT been applied in the field of flood management and governance for urban flood resilience. This study seeks to fill this scientific gap.

Lastly, the study's most important scientific contribution lies in its innovate application of the GAT: a prescriptive element becomes added to a framework that has previously been employed for merely ex-post analyses of implementation processes (see section 2.7). Applying the GAT as a tool for prospective implementation analysis enlarges upon its scientific relevance by addressing the question whether the GAT can serve to produce meaningful statements about the future implementation of a policy-initiative. This way, the paper improves the understanding of how an assessment of the structural governance context needs to be understood as the first step for a prospective implementation analysis.

1.5 Research Question

As the study aims for an in-depth governance assessment of Hoboken with a focus on the implementation of GI, the main research question reads as the following:

> *'To what extent is the governance context in Hoboken supportive or restrictive for successful implementation of green infrastructure as a measure towards flood resilience?'*

In order to answer this main research question, two sub-questions will be addressed. First, the governance context of Hoboken for the implementation of green roof measures will be analyzed in a descriptive manner, using the GAT:

1. *'How are the four quality criteria of governance context for the implementation of green infrastructure in Hoboken described in terms of the following five dimensions of governance?'*

   1a. Levels and Scales
   1b. Actors and Stakeholders
   1c. Problem Perspectives and Goal Ambitions
   1d. Strategies and Instruments
   1e. Responsibilites and Resources

Answering the first sub-question provides a description of all relevant aspects of the governance context. Building on that governance assessment, an informed judgment, based on the theoretical framework, will come into play answering the second sub-question:

2. *'How can the likelihood of successful implementation of green infrastructure be predicted based on the four quality criteria of governance as described in sub-question 1?'*

The goal of this second sub-question is to identify those elements of the governance context that portray barriers or hindrances for the GI measures as well as those supporting or enabling their realization. Sub-question 2, contrasting sub-question 1, therefore contains a normative element, building on assumptions of 'what should be', instead of 'what is'. While sub-question 1 is descriptive, main question and sub-question 2 are of empirical and evaluative nature. They go further than analyzing the governance context on a descriptive level by also adding a judgment to the phenomena found in the data concerning their effect on the success of policy implementation. Answering the main research question of this study will help to understand whether the overall governance context for the green infrastructure measures is supporting or restricting its success. The recommendations derived from the assessment are case-dependent and tailored to the specific governance-situation of Hoboken.

2. Theoretical Framework

To evaluate the extent to which the governance context in Hoboken supports a successful implementation of GI as a means of flood management, theory is used in an applied manner. In applied research, existing theories are used to identify and analyze actual problems – in this case the context for GI implementation in Hoboken. The growing relevance of applied research in policy and governance studies is recognized to arrive at valuable recommendations (Niles & Lubell, 2012). The key theoretical framework that is applied in this study is the 'Governance Assessment Tool', or GAT (Bressers, Browne, & al., 2015). This section firstly discusses previous approaches to governance assessment in order to justify why the GAT (H. Bressers, Bressers, Larrue, & al., 2016) has been selected. Secondly, the key assumptions and concepts underlying this study of applied governance assessment are presented, elaborating on the core theoretical foundations of the GAT. Thirdly, the theoretical contribution of this study is demonstrated, elaborating on the way in which the GAT is applied in an innovative manner.

2.1 Theoretical Background: The 'Governance'-Discourse

The GAT is embedded in and based on the wider discourse on the concept of 'governance' – a term that becomes increasingly prominent and is intensively discussed in social science. In this growing body of literature, 'governance' is no longer understood as a synonym for 'government', but rather, the term entails a totally new meaning of how and by whom societies are 'governed'. It implies a paradigm shift, of which the GAT framework is an essential part.

The United Nations refer to governance as the 'institutional environment in which citizens and stakeholders

interact among themselves and participate' in the management of public affairs (UNESCO, 2017). Government as such is no longer the central actor of public decision-making, while other stakeholders become increasingly involved in the process. To Bellamy (2013: 100), 'traditional hierarchical governmental institutions [...] are increasingly identified as unable to cope with contemporary [...] problems', particularly when it comes to problems imposed by natural hazards. Bingham, Nabatchi and O'Laery (2005) identify 'horizontal networks of public, private, and nonprofit organizations as the new structures of governance as opposed to hierarchical organizational decision making' (Bingham, Nabatchi, & O'Leary, 2005). These definitions imply that governance refers to a multi-actor, multi-level approach to public challenges. Both formal government institutions as well as informal spheres of influence, including non-governmental, private sector and civil society actors, are involved in this concept. Traditional government can, within this multi-actor context, still play a dominant role, but will no longer solely determine the development of societies.

In addition to its multi-level, multi-actor character, several scholars have hinted to the multi-responsibility dimension of governance. Bellamy and Brown (2013) claim that governance refers to a situation in which 'it is often unclear where responsibilities lie and where traditionally no one sphere of government, agency, institution, or group of individuals has sole [...] responsibility, such that problem solving capacity is widely dispersed and few actors or decision-makers can accomplish their mission alone' (Bellamy & Brown, 2013: 98). Stoker confirms that 'governance identifies the blurring of responsibilities for tackling social and economic issues' (Stoker, 1998: 18)

An additional multiplicity in governance arises from the instruments and strategies that are used to solve the policy problems. As O'Toole (2000) addresses, the instruments and strategies available increase, because policy action becomes multivariate through grants, contracts, agreements or campaigns that enlarge the traditional government strategies based on authority.

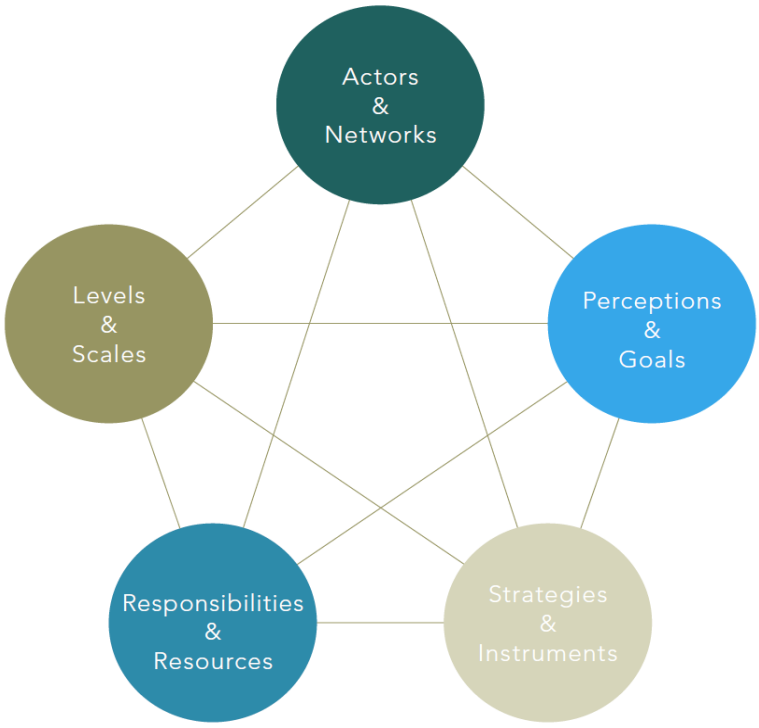
Lastly, a fifth element has been brought into the picture by academics like Blomquist and Schlager (1999) or Rosenau (2000). They claim that governance is always multi-faceted, in so far as in each governance setting, different maps of reality, different understandings of a problem as well as different objectives become merged.

All the above theories and conceptualizations have impacted the development of the GAT framework and informed its understanding of governance. Governance in the GAT is characterized by 'multiple levels of policy implementation; multi-actor character of policy implementation; multiple perceptions of the problem and the objectives of policy implementation; multiple strategies and policy instruments for policy implementation; and a complex multi-resourced and multi-organisational basis for implementation of policy' (Bressers and Kuks, 2003). The GAT has built a complete model that acknowledges the wealth of aspects that have been brought to light by policy scientists.

2.2 The Five Dimensions of Governance and their Quality Criteria

Synthesizing various academic approaches to governance as elaborated on in section 2.1, Bressers and Kuks (2003) developed a 'governance pattern' characterized by the following five dimensions of governance systems:

1. **Levels and scales** refer to the relation between the administrative levels of government involved in conducting a policy as well as other types of spatial scales, such as hydrological levels; it addresses which levels dominate the process and how the interactions take place.
2. **Actors and networks** take into account the multi-actor feature of governance beyond government and addresses the ways the actors are involved, whether and how they establish networks, or what their accepted roles are.
3. **Problem perceptions and goal ambitions** refer to the actors' perceptions of reality, how serious they see the problem or which preferences they see at stake.
4. **Strategies and instruments** recognize that in each governance context, there will be multiple ways and instruments to reach a goal, and addresses the strategies employed, the target groups of that strategy and the requirements of instruments.
5. **Responsibilities and resources** address the issues of which organizations are responsible for implementation, what authority these organizations possess or what resources are available to them.



Source: DROP Governance Assessment Guide, 2015

For the GAT, Bressers et. al. (2016) identified four 'quality criteria' along which the dimensions of governance can be assessed:

1. **Extent** refers to the completeness of the regime: 'are all elements in the five dimensions that are relevant for the sector or project that is focused on taken into account?' (H. Bressers et al., 2016).
2. **Coherence** relates to interrelationship and interactions within and between the five dimensions: 'are the elements in the dimensions of governance reinforcing rather than contradicting each other?' (Bressers et al., 2016).
3. **Flexibility** addresses the importance of 'adaptive implementation', asking whether 'multiple roads to the goals, depending on opportunities and threats as they arise, are permitted and supported' (Bressers et al., 2016). This criterium acknowledges the reality of modern policy-making, full of unexpected obstacles as well as unprompted windows of opportunity that can contribute significantly to the success or failure of a project.
4. **Intensity** focuses on the issue of how deeply involved the project at stake is within the problem perceptions, goals, resources, etc., asking 'how strongly do the elements in the dimensions of governance urge changes in the status quo or in current developments' (Bressers et al., 2016).

By organizing the analysis along five dimensions and four criteria of governance, every governance setting can be described comprehensively for a certain policy or program in a given place and time. Moreover, the GAT explores up- or downward trends in either of the dimensions or criteria by asking of any of them have changed over time or are likely to change in the foreseeable future (Bressers et al., 2016).

The approach distinguishes the descriptive and the normative elements from each other, as the four quality criteria have been selected along the lines of what a governance regime *should* look like in order to 'contribute to a stimulating context for the implementation and realization' of measures (Bressers et al., 2016). The four quality criteria are derived from the normative goal of successful realization of a certain policy or program – in this case the promotion of urban flood resilience. Table 1 shows the GAT and the leading questions it is addressing.

Table 1: The Governance Assessment Tool

	Quality Criteria of Governance			
Dimensions of Governance	**Extent**	**Coherence**	**Flexibility**	**Intensity**

Levels & Scales	How many levels are involved and dealing with an issue? Are there any important gaps or missing levels?	Do these levels work together and do they trust each other between levels? To what degree is the mutual dependence among levels recognized?	Is it possible to move up and down levels given the issue at stake?	Is there a strong impact from a certain level towards behavioral change or management reform?
Actors & Networks	Are all relevant stakeholders involved? Are there any stakeholders not involved or even excluded?	What is the strength of interactions between stakeholders? In what ways are these interactions institutionalized in stable structures? Do the stakeholders have experience in working together? Do they trust and respect each other?	Is it possible that new actors are included or even that the lead shifts from one actor to another when there are pragmatic reasons for this? Do the actors share in 'social capital' allowing them to support each other's tasks?	Is there a strong pressure from an actor or actor coalition towards behavioral change or management reform?
Problem Perspectives & Goal Ambitions	To what extent are the various problem perspectives taken into account?	To what extent do the various perspectives and goals support each other, or are they in competition or conflict?	Are there opportunities to re-assess goals? Can multiple goals be optimized in package deals?	How different are the goal ambitions from the status quo or business as usual?
Strategies & Instruments	What types of instruments are included in the policy strategy? Are there any excluded types? Are monitoring and enforcement instruments included?	To what extent is the incentive system based on synergy? Are trade-offs in cost benefits and distributional effects considered? Are there any overlaps or conflicts of incentives created by the included policy instruments?	Are there opportunities to combine or make use of different types of instruments? Is there a choice?	What is the implied behavioral deviation from current practice and how strongly do the instruments require and enforce this?

Responsibilities & Resources	Are all responsibilities clearly assigned and facilitated with resources?	To what extent do the assigned responsibilities create competence struggles or cooperation within or across institutions? Are they considered legitimate by the main stakeholders?	To what extent is it possible to pool the assigned responsibilities and resources as long as accountability and transparency are not compromised?	Is the amount of allocated resources sufficient to implement the measures needed for the intended change?

2.3 Understanding the Relevance of Governance Contexts

A central assumption underlying this study is the crucial relevance of the wider governance contexts for the successful implementation of certain policies and programs. The application of the GAT starts from the premise that 'complex and dynamic multi-actor interaction processes […] require a good governance context to enable the realization of practice projects' (Bressers et al., 2016: 45). Among scholars and practitioners, there is a growing concern that issuing policies, however well-designed they may be from a certain perspective, does not guarantee the expected success (Meier and McFarlane, 1995). There is no automatism between the carefull drafting of a policy project and its expected outcome (Birkland 2014; O'Toole 2000, Birkland 2014). The successful or unsuccessful outcome of an intended program depends on an interplay between the mechanisms of a policy and, ultimately, the context into which the program is being introduced (Pawson & Tilley, 1997). Hence, the effectiveness of an (intended) policy will vary in different contexts of governance and its 'embeddedness' within this wider context. Programs and policy-initiatives, according to Pawson and Tilley, always contain build-in assumptions about the wider set of social institutions into which they will be introduced.

Floodwater management in Hoboken and the US in general provides a good example of this missing automatism between project design and successful outcomes. Especially since Hurricane Sandy, governmental agencies in Hoboken invested extensive amounts of effort and funds into flood resilience projects; however, the low-lying areas of the city still get flooded regularly (Bailin, 2014).

When comparing different flood risk governance arrangements, Hegger et. al. (2013) start from the assumption that 'a successful implementation […] requires that strategies […] are properly embedded, given the opportunities and constraints of their physical and social context' (Hegger, Green et al. 2013). They conclude that there are significant differences in the 'appropriateness of flood risk management strategies in specific contexts' (Hegger, Green et al. 2013: 7). In line with this central assumption, Driessen et. al. (2016) argue that 'governance research has the potential to provide crucial insights into the debate on how to

improve resilience' (Driessen, Hegger et al., 2016). In a large scale review of local, national and international literature in order to better understand why implementation of programs fails in the context of urban water- and flood governance, Brown & Farrelly (2009) have found out that barriers are 'largely socio-institutional' and hence governance-specific (p. 1). To sum up the academic argument presented above, the crucial task of evaluation is to include investigations on whether pre-existing governance structures enable or disable the intended mechanisms of a policy – which is exactly what the GAT intends to achieve.

2.4 From Diagnosis to Recommendations - Applying Contextual Interaction Theory

To draw a valid diagnosis about the likelihood of successful policy implementation from the characteristics of Hoboken's governance context, a sound theoretical explanation of the causal links between contextual factors and success or failure of implementation needs to provide the basis. How, in detail, does the quality of the dimensions of governance ultimately support or restrict the implementation and realization of a project or program?

There is a wide consensus in academic literature that contextual factors of a governance regime affect implementation success through influencing the actors involved. Edwards and Barker (2014: 158) explain how 'interventions are modified/adapted by patients, providers, organizations, and communities [actors] in response to shifting contextual circumstances', acknowledging the complexity of different implementation contexts. Implementation is an interactive and dynamic process, involving various types of actors that perform the role of 'implementers'. Therefore, their characteristics are the determinants of implementation success. These characteristics are in turn shaped by contextual factors. Pfadenhauer et. al. (2017) confirm this causal mechanism, stating that the success of program implementation critically hinges upon the 'buy-in of [...] key stakeholders in [...] the implementation effort' (p. 10). The traditional focus of content of a policy instead of its implementation context is also criticized by scholars from other research focus areas, like Agyepong and Adjei (2008), who assessed the success of failure of health policy implementation. According to them, 'actors and context can make the difference between effective and ineffective policy- [...] implementation' (Agyepong & Adjei, 2008).

The Governance Assessment Tool assumes the very same causal link between contextual factors of a governance setting and implementation success as discussed above. It builds upon a contextual interaction theory (CIT) which places the actors involved and their main characteristics at the centre of the policy implementation process (Bressers & de Boer, 2013). According to the CIT, the dimensions and criteria of governance affect the success of policy implementation through three core factors per actor involved:

1. **Motivations** are decisive for a process to succeed in so far as they spur the actors into action. The actors' motivations are, first and foremost (although among other factors), influenced by

their goals and ambitions.

2. **Cognitions** determine the actors' interpretation of reality and which information they perceive to be true as well as ideas of what does and what does not belong to a subject at hand (Bressers & de Boer, 2013). Such cognitions are influenced by the interactions with other actors.
3. **Resources** provide a stakeholder with capacity to act and determine its power relation to other stakeholders. The resources of an actor are fragile as soon as they are challenged by other actors, for example through responsibility-disputes or contrary interests.

To enable implementation processes to succeed, a sufficiently strong combination of motivations, cognitions and resources needs to be present (Bressers & de Boer, 2013). Consequently, the five governance dimensions unfold their impact through this set of core characteristics (Bressers & Kuks, 2003). All dimensions of the governance context that influence the implementation-process do so because and in so far as they influence the three decisive characteristics of the actors involved.

2.4 The GAT in Relation to other Tools for Governance Assessment

The GAT has impacted and contributed to academic literature in the area of policy implementation in four primary ways:

Firstly, as introduced in the previous section, the GAT puts forward a new and comprehensive understanding of the 'governance' term – one that incorporates all relevant dimensions and aspects of the concept. In the OECD's 'Inventory of Water Governance Indicators and Measurement Frameworks' (OECD, 2015), a total of 25 different approaches are identified and listed. For the specific context of water governance, the assessment tools listed by the OECD typically focus on specific aspects of a governance setting, such as law, economy and governmental action (OECD 2015). The field of (urban) water governance totally 'lacks a systematic theoretical understanding of governance systems' while 'methods to deal with the complexity of governance systems are missing in general' (Ostrom, Janssen, & Anderies, 2007: 20). The GAT integrates all relevant dimensions into one framework (Bressers, Bressers, Larrue, & al., 2016: 6). It did thus achieve to conceptualize governance in a way that enables a standardized assessment of its characteristics as well as a comparison across different governance arrangements. The newly established possibility of cross-case comparisons is one of the most significant contributions that the GAT has brought along to governance assessment and implementation research (Casiano Flores, Vikolainen et al. 2016).

Secondly, the GAT provides a new understanding of the relevance of the contextual issues for the success or failure or specific policies, plans and projects: it starts from the premise that management processes can only be handled with a strong attention for the restrictive or supportive nature of governance structures. The attention that scholars have previously paid to governance contexts when assessing the implementation of

agreements, regulations or policy plans has been limited. Rather, implementation -research has dealt with questions like in how far institutions have lived up to their goals, have met governmental targets, have implemented simplification efforts or are confronted with administrative burdens ('red tape'). Within this dominant research environment, the GAT shifts the focus of enquiry to a different aspect: the governance context into which a program is introduced.

Thirdly, the GAT successfully addresses the issue of normativity in previous approaches of governance assessment. Governance as a normative concept has been highly promoted by international organizations like the UN or the OECD. It is striking that many governance assessment approaches serve donors, targeting developing countries that receive financial aid, and focusing on issues like corruption, democratization or human rights. Consequently, many governance assessment tools and methods are 'closely tied to particular donor agencies' (Santiso, 2001). The GAT largely manages to distance itself from such normative conceptualizations and instead builds its understanding of governance on objective and descriptive dimensions, compiled by an intensive literature review and empirical applications. It is a framework with a highly academic character (Jacobsen, Meyer, Oia, Reddy, & Tropp, 2013). The GAT's normativity is limited to the given assumption that the implementation of the projects under assessment is important, useful and urgent.

Fourthly, the GAT is not only a theoretical way of understanding governance, but also a hands-on, straightforward and replicable methodology. The relevance of applying theory and empirical tools is acknowledged in order to ‘better understand social processes and determine the context in which policies work best' (Niles & Lubell, 2012: 41). The GAT is one of very few frameworks that integrate a clear scientific foundation and the wealth of aspects identified to be relevant in terms of governance and merges them into a hands-on and practical assessment guidelines (Bressers, Bressers et al. 2015). It therefore provides a good theoretical basis for this study as integrates the relevant governance concepts and suggests a directly applicable assessment method.

2.7 Theoretical Contribution: The GAT as a Basis for Ex-Ante Implementation Analysis

The study differs from previous applications of the governance assessment tool in the sense that the measures to be assessed have not been implemented yet. In this study, the GAT will be applied in a predictive manner, using a prospective or 'ex-ante' approach to policy implementation analysis. In this regard, the study follows the example of Vikolainen et. al. (2013), who have anticipated the prospects of successful implementation of a particular directive ('Building with Nature') within the governance contexts of different EU member states. Vikolainen et. al. (2013) share the understanding of structural contextual factors of a governance regime as decisive for successful implementation of an intended project. Moreover, their research aim – the prediction

and recommendation of adaptations required for increasing the likelihood of successful implementation – is comparable to that of this study (Vikolainen, Lulofs et al. 2013). However, Lulofs et. al. (2013) have not employed the GAT as a basis for their predictive analysis.

The attempt to assess the success of a policy or plan before it is put in place is referred to as 'policy transfer' analysis (Mossberger & Wolman, 2003). Primarily, such prospective policy analysis assesses the probable prospects of a policy program by transferring 'lessons learned' from other cases, mostly countries (Rose 1991). Other strategies for an ex-ante analysis follow from methods such as social experiments, formal modeling or the deduction from a set of behavioural premises (Mossberger & Wolman, 2003). This study will contribute to the methodological diversity of ex-ante analysis by building on an assessment of the contextual factors of the particular case at hand using the GAT.

3. Methodology

3.1 Research Design

The thesis is based on an evaluative single case study of Hoboken's governance context for the implementation of green infrastructure measures as a means for flood protection. According to Flyvbjerg (2006), 'more discoveries have risen from intense observation [of a single case] than from statistics applied to lager groups [of cases]' (p. 225). A single-case research design has therefore portrayed the appropriate research method, as it allowed to produce in-depth exploration and understanding of a complex social process – the process of effective policy implementation. The study is observational, evaluative and prospective. It investigates 'contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships' (Zainal, 2007). It goes further than simply analyzing on a descriptive level by adding a judgment to the phenomena found in the data concerning their effect on the success of policy implementation in the future (McDonough's, 1997).

3.2 Case Selection

In order to ensure that features of a broader population of cases can be elucidated through the case study, Hoboken was selected as a study area due to its high representativeness for other cases of flood-prone cities across the US. The selection method was therefore not random, but purposive along a number of selection criteria.

Firstly, Hoboken is a mid-sized city (50.000 – 1 million inhabitants) and thus representative of most urban areas across the globe in terms of size. The number of such mid-sized cities is rising across the globe, far more quickly than any other type of urban expansion (Chatterjee, 2016). It is projected that by the end of the century, the highest proportion of the world’s population will not live in the largest and most politically and

economically important of mega-cities, but mid-sized cities, such as Hoboken (Chatterjee, 2016). It is thus a more relevant case for the question of urban flood resilience than mega-cities such as nearby New York City.

Secondly, Hoboken is representative regarding its high degrees of vulnerability to social and economic damages and infrastructure losses. With 41.629 people per square-mile, Hoboken is the fourth most-densely populated city in the US, adding to the severity of flash flood events and the necessity for sustainable adaptation and mitigation (Town Charts, 2015). Population growth and a high density of inhabitants is a problem that cities like New York, New Orleans or Charleston face as well and that more and more cities across the globe will be facing in the future in the light of demographic developments (U.S. News, 2017).

Thirdly, Hoboken possesses a risk profile that is shared with most cities in the US, which have experienced significant damages from floods during the last decades. The city is located along the Atlantic coastline, while at the same time, it is flanked to the south, north, and east by the waters of the Hudson River. These factors, combined with a naturally low topography, expose Hoboken to two interconnected types of flooding: coastal flooding from high tides and storm surge on the one hand and flooding from excessive rainwater events on the other hand (Bailin, 2014). Like in most other cities across the US, Hoboken's manifold impervious surfaces – rooftops, streets, parking lots – exacerbate the flash floods. This 'double exposure', along with a lack of pervious surfaces, can also be discovered studying the risk profiles of cities such as Miami or San Francisco. Consequently, those major cities pose a particular challenge to policy-makers.

What shall be generalized to other flood-prone cities are not the features of the governance context that the study seeks to elucidate, but the recommendations for a successful implementation of green infrastructure that will be derived from this assessment. Therefore, Hoboken's representativeness in terms of size, population density and risk profile make the recommendations particularly valuable for other cities exposed to extreme flood events.

3.3 Data Collection

Analysis of documents, including laws and policy plans, administrative reports, stakeholder publications and organizational records, has constituted the first step of analysis. Secondly, an in-depth interview campaign was carried out, providing the primary source of data. In-depth interviews were selected as the main method for data collection because the holistic qualitative accounts created through such interviews help to explore the complexities of real-life governance situations – complexities that might not be revealed through quantitative (survey) research. Quantitative data quickly reaches its limits when required to provide holistic and in-depth understanding of a social situation. The qualitative data gained through in-depth interviewing allows understanding the governance context conditions through the actors' perspectives. The interviews conducted have been semi-structured following an interview guide (Appendix B). For the

interview guide, the GAT was used as a checklist to make sure that all relevant dimensions and quality criteria are dealt with during the course of the interview.

3.4 Subject Sampling

A total of twelve individuals, representing nine different organizations or institutions, were selected as the subjects of the study and interviewed as key informants. The inclusion criteria employed ensured that, firstly, all relevant types of stakeholders, including their diverse perspectives on the process of GI implementation, have been taken into account, and secondly, that only individuals with sufficient experience in their position within the respective organization have been addressed. The types of organizations involved in the study included a) governmental institutions from different levels, b) civil society organizations and community boards, c) research institutes and independent consultancies, d) enterprises from construction, development and engineering, e) architecture firms and f) media institutions.

3.5 Data Analysis

Atlas Ti was used as a tool for qualitative data analysis in order to systemize the data along the concepts laid out by the theoretical framework of the GAT. Following the transcription of the primary data, superfluous information was removed from the data set and the qualitative information was coded, arranged and assembled using the Atlas Ti software. The output of this analysis (Appendix E) was then analyzed based on an informed and inter-subjective judgment by the researcher, involving discussion and dialogue between interviewer, interviewee and observer. The inter-subjectivity ensures that the assessment does not overlook important aspects of the governance system and that concepts are understood and applied in a consistent manner.

The respondents' thoughts concerning design, assumptions, processes and outcomes of the proposed green infrastructure measures portrayed the primary basis for the informed judgment of the likelihood of successful implementation of green infrastructure in Hoboken. The theoretical assumptions of the GAT and the CIT concerning the mechanisms that connect certain qualities of the governance context as identified through the assessment with predictions about success or failure of policy-implementation gave crucial insights for the informed judgment. The assignment of the qualitative information obtained from the interviews to the different governance dimensions and criteria was organized along the leading questions of the GAT (see Table 1).

The secondary data analysis, particularly regarding policy – and planning documents, followed a similar informed judgment. The documentary data was scanned for indicators related to the five dimensions and four quality criteria of governance. This analysis adds evidence to the primary data obtained from the in-depth interviews. Moreover, it was used as a validation tool for the information obtained through the interviews.

The analysis followed previous applications of the GAT, particularly the most recent one by Cesar Casiano Flores, which applied the GAT to wastewater governance in Mexico (forthcoming). Similar to Casiano's (forthcoming) application, parameters for each cell of the GAT matrix (see Table 1) are operationalized, 'rating' and assigning 'values' to the four quality criteria of governance along a three-point scale: low, moderate and high. Moderate and high values indicate supportiveness for the implementation of green infrastructure, while low degrees of supportiveness can be regarded equivalent to 'restrictive' conditions for successful implementation (Casiano, forthcoming). Based on this matrix, standardized statements can be derived, interpreting the overall governance matrix as indicating high, moderate or low degrees of supportiveness for successful policy-implementation. Building on the assumption that Hoboken portrays a best practice model for urban resiliency planning (see Section 1.4), it is assumed that, as a result of this predictive analysis, high levels of supportiveness will be scored for most of the dimensions and quality criteria of governance.

The scores on the three-point scale are translated into graphical illustrations, showing the matrix with colors that indicate the value of each of the 20 cells. In case the interview data reveal significant past or future developments, these are included in the analysis and visualized through arrows in the GAT matrix. This visualization of the overall governance quality creates a quick glance on whether the governance context is supportive, restrictive or neutral for successful green infrastructure implementation. Moreover, it allows a comparison amongst cases. However, it is important to keep in mind that the colors portrayed are a 'simplification of the larger narrative' (Casiano, forthcoming).

3.6 Limitations and Threats to Validity

To ensure robustness of the research design, a chain of evidence was qualitatively recorded and archived during the interviews. However, even after controlling for an appropriate chain of evidence, (single) case studies face several threats to validity, which needed to be controlled for carefully.

Firstly, whenever interviewing is chosen as a method for data collection, the threat of researcher bias must be taken into account. Qualitative data collection is a transactional and inter-subjective process; therefore, the researcher might have a strong influence on the subject when conducting the interviews. The interview respondents might have been biased as well. As some of the respondents are directly involved in the governance context the research has investigated, they might want to 'prove' that this context is functioning or might be biased due to their stake in the process for other reasons (Boyce, Neale, & International, 2006). However, this threat was reduced to a minimum through a carefully designed interview guide, anticipating possible reactions, avoiding yes/no or leading questions and keeping personal opinions in check. Information elucidated from the interviews was validated as far as possible. It was important to emphasize that not the participants' deeds in the process were being evaluated, but rather that the context of the process is the issue

of interest.

Secondly, validity threats arising from the inter-subjective interpretation of data based on informed judgment needed to be taken into consideration. There might be a tendency for the researcher to follow a biased interpretation, based on the findings that are expected or wished for. This risk was minimized by a strong theoretical foundation as well as an appropriate size of the subject sample. Moreover, a second rater was consulted for analyzing the interview data and assigning values to the different cells of the GAT matrix. This way, a high interrater-reliability was ensured.

Most importantly, the strongest drawback of single-case designs is its often claimed a weak ability to provide generalizable conclusions (Zainal, 2007). As this study assesses the governance regime of Hoboken for the implementation of green infrastructure measures, the question arises in how far the results of this examination can provide insights to governance regimes in other areas. However, in how far you can generalize from a single case study depends on the case one is speaking of and how it has been chosen (Flyvbjerg, 2006). As Flyvbjerg (2006) points out, the strategic choice of a 'critical case' can 'add greatly to the generalizability' (p. 225). Section 6.2 shows that Hoboken is indeed a critical case for a governance assessment related to flood management, due to its extreme risk profile and exposure to floods and a high comparability to other flood-prone cities in the US regarding size, population and location.

Moreover, possible limitations to generalizability are compensated by the potential of single-case studies to achieve high conceptual validity and to address causal complexities better than any other research design (George and Bennett 2005). A trade-off is thus made between explanatory power across other cases on the one hand and explanatory richness on the other hand. As this study aims to illustrate specific features of a certain governance regime rather than uncovering the frequency with which these features occur, a clear choice was made towards explanatory richness.

4. Results

Answering sub-question one of how the four quality criteria of governance can be described in terms of the five dimensions of governance for the implementation of green infrastructure in Hoboken, the following chapter presents the results from the semi-structured interviews (see Appendix 8.3) as well as the document analysis.

4.1 Levels & Scales

Extent. All levels of government (municipal, regional/county, state and federal) are involved in the process of green infrastructure implementation in Hoboken. However, the municipal and the state level clearly dominate the process, while the county level plays only a minor role. Collaboration between the different levels of

government for green infrastructure implementation is institutionalized through the state's stormwater management regulation framework (Worstell, 2013). This legal and regulatory framework is highly complex, requiring both state and municipal review of development and redevelopment projects, including green infrastructure, as well as oversight from different levels of government.

As explained in Section 1.3, the green infrastructure measures proposed for Hoboken fall under the umbrella of the Rebuild by Design (RBD) project. RBD was launched by the Obama administration and funded through the federal US Department for Housing and Urban Development, which has granted Hoboken $ 230 million in order to implement their proposal for RBD. This way, the federal government plays a significant role in the funding of all measures proposed under RBD. However, the $ 230 million were not transferred to the municipality, but to NJDEP. Therefore, the state level acts as the administrator of the funds for project implementation in Hoboken.

The federal level is also involved through the United States Environmental Protection Agency (EPA), overseeing the National Pollutant Discharge Elimination System (NPDES). NPDES prohibits pollutants into the nation's waters except as allowed under an NPDES permit (Worstell, 2013). In New Jersey (NJ), the central department involved in green infrastructure implementation is the NJ Department of Environmental Protection (NJDEP). Based on NPDES requirements, NJDEP has enacted the Municipal Stormwater Regulation Program. Through this program, the state can issue New Jersey Pollutant Discharge Elimination System (NJPDES) permits to authorize the discharge of water into state water bodies. As many of the green infrastructure measures proposed for Hoboken fall into the 'Delay, Store and Discharge' element of Rebuild by Design, NJPDES permits are relevant for Hoboken in the process of their implementation (Worstell, 2013).

Moreover, in 2004, NJDEP adopted the Stormwater Management Rule (SWM Rule). The rules lay out requirements for municipal new development and redevelopment projects, addressing soil erosion, groundwater recharge and stormwater runoff (Worstell, 2013).The municipality of Hoboken is responsible for ensuring that their development and redevelopment projects meet the state's stormwater requirements. NJDEP has published the NJ Stormwater Best Management Practices (BMP) Manual to provide guidance on how to meet these requirements. The county level only comes into play when constructing green infrastructure on county roads as a permitting authority.

Hoboken is an exceptional case within this complex regulatory framework for two reasons. Firstly, Hoboken is one of only 21 municipalities in New Jersey that has a combined sewer system (CSS), carrying both storm- and wastewater in the same pipes to treatment facilities. This brings an additional regional actor into play: the North Hudson Sewerage Authority, which is the CSO permit holder for Hoboken. Secondly, Hoboken is a densely developed, highly built-out city with few large open spaces. Therefore, most green infrastructure

projects to be implemented in Hoboken are redevelopment projects on land that has already been built on for one purpose or another. This limits the applicability of the SWM Rules with effect on the coherence between municipal and state level.

Coherence. As a consequence of the complex regulatory framework, there are mutual dependencies between the different levels of government, in particular between the municipality of Hoboken and the state level. Both development and redevelopment projects in Hoboken frequently require permits from the municipality (such as the local planning board), the NJDEP or both. All actions of the municipality of Hoboken in terms of reviewing their development applications under those multiple ordinances are theoretically subject to the oversight of NJDEP (Worstell, 2013). NJDEP, in turn, is dependent on the oversight of the federal government under the NPDES rule. EPA frequently appears as a commenter on any legal adaptations with regard to green infrastructure that NJDEP is attempting to make. The dependencies between municipality and state level become intensified with regard to funding processes and the distribution of resources.

The majority of stakeholders interviewed perceived the variety of government levels involved in the process and the corresponding multiplicity of jurisdictions as a major barrier to the process of green infrastructure implementation. ‘There are all these cooks in the kitchen, so obviously that enforces trade-offs’, says Interviewee CS2. Interviewees from construction and engineering agree: ‘it can be a struggle to go back and forth between different jurisdictions; trying to meet the project goals that have been outlined for you while working within the rules of varying regulatory agencies, that is the biggest challenge’ (Interviewee CE1).

While NJDEP has expressed significant interest in the success of green infrastructure implementation during the interview, several regulatory barriers impede the process for the municipality of Hoboken. For example, the NJ SWM Rules provide multiple exceptions for redevelopment sites when it comes to runoff quantity or groundwater recharge. For areas where considerable impervious surfaces already existed before the redevelopment project, this implies that there is no required reduction and therefore no net benefit offered by green infrastructure for the developers. These exceptions are applicable to a large percentage of sites throughout Hoboken and the whole state of New Jersey.

Stakeholders from both architecture and civil society agree that a timely implementation of green infrastructure as planned is unrealistic due to the extensive regulatory and permitting requirements. For developers and builders, state regulations frequently function as a disincentive for including green infrastructure measures in their planning. To ‘balance what NJDEP would accept from a regulatory standpoint’ appears as one of the major challenges to them. Especially NJDEP’s involvement in terms of administering most of the funding complicates the interaction between developers and the government: ‘it is a little bit different than the norm - not only the permitting for NJDEP, but also going through the process of providing additional documentation, information, justifying costs, etc.’ (Interviewee CE2).

Examples like these show that the different levels of government most relevant for green infrastructure implementation, namely the municipality and the state, do not always provide for implementation in a coherent manner. However, city representatives from Hoboken perceive the relationship between the municipality and the state as less problematic than other stakeholders: ‘state and local governments have different roles and they apply regulations in different ways, but that does not mean that there is a lack of coordination’ (DC1). NJDEP agrees: ‘I don't necessarily think that the involvement of several layers of government is really going to be an impediment’ (Interviewee GS1).

Flexibility. There is only very limited flexibility to move up and down levels of government regarding their different roles in the process of green infrastructure implementation. A certain leverage originates from the wide variety of possible funding sources for green infrastructure projects, as elaborated on in Section 6.5.

Intensity. The interviews have shown that the impulse towards green infrastructure implementation varies greatly between the different levels of government. While the municipal government of Hoboken strongly pushes for the realization of its plans, the state level gives weak stimuli. Civil society organizations, consultancies as well as developers have repeatedly deplored a lack of strong leadership and encouragement at the state level for green infrastructure implementation.

The current SWM Rules do not mention green infrastructure specifically. In the NJDEP BMP manual, green infrastructure is not explicitly recommended either. It is arguable that certain practices mentioned in manual, such as the non-structural stormwater management strategies, including the minimization of impervious surfaces, the maximization of natural drainage features or the encouragement of native vegetation, can be considered as green infrastructure. However, the SWM Rules require these non-structural stormwater management strategies to be included in the design of projects ‘to the maximum extent practicable’. This vague formulation allows developers and engineers to dismiss green infrastructure components as ‘not feasible for engineering, environmental or safety reasons’ in order to fall back to more traditional grey infrastructure. A lack of clear guidance and clear, measurable standards has repeatedly been mentioned as a problem by the interview participants. Even though NJDEP is in the process of amending the SWM Rules, a timely adaptation that favors green infrastructure more intensively is unlikely: ‘that may or may not happen, and even if it did happen, that might take a year from now, we have not made any specific changes yet. There is certainly no guarantee for it‘ (Interviewee GS1).

According to Interviewee CS2, NJ Future, ‘the state still has to go a long way towards mainstreaming green infrastructure’. A lack of clear and comprehensive design guidelines at the state level makes engineers and developers hesitant to include green infrastructure in their designs when complete information on effectiveness and cost-efficiency are not easily available. Green infrastructure simply does not receive the credit as a stormwater management tool. ‘One of the issues we are wrestling with from the regulatory side is

the fact that current state stormwater management regulations are not sufficiently cognitive of GI as a way to address stormwater issues‘, says Interviewee CS1, NJ Future. Certainly, NJDEP is not an adversary of green infrastructure. However, its limited funds and staff power impede the adaptation of rules and regulations towards a stronger impetus for implementation.

While regulatory conditions on state and federal level appear as potentially troublesome, there is a strong pressure and impetus for change from the municipal government of Hoboken. There was a universal agreement between all different stakeholders interviewed on the outstanding and remarkable efforts of Hoboken’s municipal government for the overall success of their RBD proposal. Particular credit was given to Dawn Zimmer, who became mayor of Hoboken in 2009. ‘Hoboken is a model city, it has a visionary mayor’, states Interviewee RC1, Sustainable Jersey. For Hoboken, the first-hand devastating experience with Hurricane Sandy was so drastic that there was a ‘before and after Sandy’ (Interviewee CS2). The awareness of the need to act amongst municipal government officials is strong. Major Zimmer was able to gain reputation for her courageous leadership, working hard ‘to make her city a national model for preparedness’.

4.2 Actors & Networks

Extent. The process of green infrastructure implementation in Hoboken is generally perceived as highly inclusive. Particularly during planning and design of the green infrastructure measures within RBD, the process was characterized by an innovative approach to broad stakeholder engagement. ‘That was the vision for RBD: let’s do it comprehensive, let’s do in integrated, let’s have the planners, the engineers, the landscape architects, the administrators – lets have them all figuring this out‘, explained Interviewee CS3, Citizens Advisory Group. Again, particular credit was given to Major Zimmer for community-based planning and her willingness to ‘go the extra-mile‘. During the planning phase of the measures, the municipality engaged with stakeholders such as the Hoboken Historical Museum, the Community Emergency Response Team, or the Hoboken Catholic Academy. Residents have the chance to continuously become part of the process, both through regular community meetings within Hoboken, but also through direct input to the state level through the Community Advisory Board. The city of Hoboken states: ‘We spend a lot of time engaging our public and trying to work with them to foster a collaborative process’ (Interviewee GC2).

Developers and landscape architects are involved as essential parts of the construction team, for example for the Southwest Resiliency Park currently under construction in Hoboken. Research institutes like the Stevens Institute of Technology or the Sustainable Jersey Institute of the College of New Jersey provide knowledge input during the implementation process, for example on soil or hydrological conditions. NGOs and civil society organizations appear as educators, ‚hitting the pavement to inform the citizens of what is going on‘, as well as ‚bringing the different parties together as conveners‘ (Interviewee CS1). The media partly supports these efforts through spreading information and rising awareness about the progress of the projects.

However, two groups of stakeholders are still not involved in the process sufficiently. Firstly, according to city officials, ‚the business community has always been a hard one to engage'. This refers not only to real estate, but all sorts of private businesses which could potentially become involved through public-private-partnerships or their CSR-programs. Secondly, from the Community Advisory Board's perspective, families with children and young people are not sufficiently addressed, considering their essential role for maintenance and operation of the green infrastructure measures once they are built in the future. According to the Community Advisory Board, ‚there have been very, very few classroom and education efforts beyond anything other than the general public' (Interviewee CS3).

Coherence. The strength of interaction between the various stakeholders derives primarily from conflating efforts of NGOs and civil society organizations. Organizations like Sustainable Jersey or NJ Future cooperate very intensively with both government (state and municipality) and developers as well as among likeminded organizations all over the state. NGOs regularly organize forums and conferences on sustainable resilience building, putting emphasis on the essential role of green infrastructure. NGOs like NJ Future takes the lead within the umbrella organization 'Jersey Waterworks', bringing together architects, civil society, environmental foundations, funds, consultancies, researchers and many more. In order to connect these stakeholders with the government, both NJ Future and Sustainable Jersey cultivate their relations with NJDEP. According to Sustainable Jersey, 'collaboration is the key', the non-profit organization collaborates with 'all the different stakeholders in the arena […] in order to educate, promote and develop new tools' (Interviewee RC1).

While trust between NGOs, civil society and research organizations is big, there is a lack of trust between these organizations and the developers, engineers and builders ultimately responsible for the green infrastructure construction. They have frequently been mentioned as 'rather hesitant' to green infrastructure. When it comes to green versus gray infrastructure, the majority of engineering firms seems to 'avoid' green infrastructure, because they have been focusing on traditional gray infrastructure for the last decades. Sustainable Jersey agrees: 'the challenge right now is to get the developers on board, particularly the engineers'. Similar statements have been made about the majority of urban designers and architects. Media representatives have reported conflicting interests, especially in the context of reporting on the three big green infrastructure projects, namely the three City Resiliency Parks: 'Builders and developers, and they have a lot of power, can become real opponents; they don't want space on which they cannot build anymore'.

However, for the specific case of Hoboken, an upward trend in coherence between civil society, research institutes and the government on the one hand and developers, architects and engineers on the other hand is visible. This is due to the fact that the municipal government of Hoboken managed to identify both developers as well as architects who are different from the majority. Both organizations are perceivedas

‘unique’ and forward-thinking in their understanding of green landscaping and environmentally friendly building. Interviewee RC1, Sustainable Jersey, agrees that in Hoboken ‘the most sophisticated builders, the most forward thinking planners and design professionals are all part of a paradigm shift’ towards more green and less gray infrastructure.

While cooperation between the different governmental bodies as well as among civil society organizations and research institutes seems to be fairly institutionalized, direct communicative processes between government and civil society seem to have room for improvement. Community representatives, such as the Community Advisory Board, do not feel heard sufficiently by the government, especially by NJDEP: ‘I would give them a C. The response rate is very poor. They may respond in meetings, but they never give us written responses to our comments and suggestions’. In a written comment, submitted in April 2017 on the Draft Environmental Impact Statement (DEIS) of RBD, the group criticizes that ‘the fact that we still feel this way […] indicates that we are not being heard’ (Community Advisory Group, 2017, p. 1).

Flexibility. There are a number of non-traditional actors that can potentially become more involved in the process of green infrastructure implementation. These actors include insurance companies, small- and medium sized businesses as well as different financial institutions. Several participants have mentioned insurance companies as ‘increasingly aware of the problem’ of the need for flood mitigation measures and perceive them as ‘quietly influential’, particularly on real estate companies. Insurance companies do increasingly understand the value and potential of green infrastructure as more than just a measure for beautification and make the case for a more hands-on implementation process. Financial institutions and private businesses are interesting for the municipality in terms of alternative funding sources in terms of using their Corporate Social Responsibility (CSR) Programs: ‘look at smaller companies, they have CSR platforms, and they are interested in urban resiliency’ (Interviewee RC2).

Hoboken is currently at an interesting point of paradigm shift. New actors like those mentioned above do not play a prominent role in green infrastructure implementation yet, but the awareness of their potential for a more successful implementation process amongst government officials rises. For example, during the last two years, the Water Education Foundation as well as the National Institute for Coastal Harbor Infrastructure hosted conferences on resiliency and innovative funding mechanisms which have explicitly involved the insurance industry.

Intensity. Civil society groups as well as research institutions and consultancies have formed a coalition that is exerting strong pressures on governmental bodies to push green infrastructure implementation forward. ‘Our success in that particular space is really a function of getting the word out, promoting it, educating professionals, local officials and developers’ (Interviewee CS1). Their strong impulse for behavioral change takes place primarily through the sharing of important social capital with other stakeholders in the arena.

However, there are widely differing perceptions of in how far Hoboken's municipal government is prioritizing green infrastructure sufficiently. To the NGOs and civil society groups, the government's prioritization of green infrastructure implementation does not go far enough. According to the Community Advisory Board, Hoboken's municipal government has lost track of its original forward-thinking and comprehensive stormwater management strategy as laid out in RBD by focusing solely on the Resist-component. 'We have frequently emphasized green infrastructure in our positions during the last three years', says Interviewee CS3, Community Advisory Board, 'but now the city, led by their engineers, really focuses on resist, and we think that is the wrong approach'. In DEIS, the city states that 'funding should be used only for the Resist-component' and that 'the Delay, Store, Discharge (DSD) elements would be implemented separately as funding becomes available'. Civil society groups feel like this is too weak an impetus for behavioral change from the government side. However, the city disagrees with the accusations mentioned above: 'we have spent millions of dollars on green infrastructure already; so to say that we are not prioritizing it is very inaccurate'.

4.3 Problem Perspectives & Goal Ambitions

Extent. All stakeholders interviewed agree that there are three major problems for green infrastructure implementation, namely the challenge of resource allocation, the issue of continued operation and maintenance [MNO], and the large amount of privately owned space within Hoboken. However, all of these problem perspectives are taken into account by the municipal government of Hoboken as the main implementing body. For tackling the problem of MNO, the city is currently working on a 'Green Infrastructure Workforce' in collaboration with the Housing Authority, training high school students and engaging unemployed by teaching skills in green infrastructure maintenance. This embraces the idea of shifting MNO to the community through impact volunteering. The city is well aware of the problem of resource allocation and tries to diversify funding sources. When it comes to the large amount of privately owned space in Hoboken, the city has confirmed the use of eminent domain, which is the right of a government to expropriate private property for public use, with payment of compensation: 'the city has used eminent domain for park acquisition and GI development as a tool to get a more desirable outcome, ultimately resulting in better negotiations with the private property owners' (Interviewee GC1). Eminent domain is thus used as a negotiating tool to overcome the obstacles posed by private ownership.

While the city is actively addressing problems related to resource allocation, MNO and publicly owned land, other problem perceptions, particularly from NGOs and media, are not sufficiently taken into account. Both types of organizations see huge problems in awareness and a lack of social resiliency among the residents of Hoboken, which, according to them, will pose an underestimated challenge to successful green infrastructure implementation in the future: ‚I think the challenge in the future is less about our physical ability [to withstand], but much more about our social capacity. It is social resiliency we need' (Interviewee CS3).

NGOs and media representatives feel that this problem perspective is not sufficiently taken into account. Furthermore, the city does not always seem to be aware of the problem perspectives of developers and engineers related to site constraints and regulatory issues, due to shortcomings in detailed knowledge. This causes drawbacks in coherence between actors.

Coherence. The city's primary goal is to implement all green infrastructure measures as planned within the given timeframe (until 2022) in the most cost- and time efficient way. They want green spaces, highly efficient in stormwater management, and at the same time highly usable as a public space for the residents. The developer's goal is to serve the city as a client, however, doing this within the multiple regulatory and site constraints they are facing. These two goals do not necessarily support each other, but evoke conflict.

From a regulatory standpoint, developers have reported that they are frequently facing problems related to environmental contamination on the sites intended for green infrastructure implementation. 'This really limits what you can do', says Interviewee CE2, 'you are limited to how much water you can let infiltrate'. Additionally, developers face shallow groundwater in Hoboken, as well as the risk of ending up digging in archaeological areas. Taking into account the dense regulatory framework imposed by the state, developers sometimes find themselves compelled to build in a way that deviates from the city's plans: ‚you have a rain garden that infiltrates water directly into the ground […], but since both those scenarios were in place, we were actually forced to use an impermeable liner, which goes against really what a rain garden is' (Interviewee CE2). Moreover, the knowledge on urban soil conditions in Hoboken is very limited, and non-governmental institutions perceive that this problem has not been taken into account sufficiently. The whole RBD plan was based on only eleven soil borings. According to the NGOs interviewed, the actual turnout of implemented green infrastructure measures can be very different from the one anticipated while designing the plan when knowledge on urban soil is so limited.

Hence, balancing the city's goals with what NJDEP is accepting from a regulatory standpoint and what is possible given the respective site becomes challenging for developers and builders: 'trying to accommodate some of the overarching resiliency guidelines that were provided by the city, while working in an environment like that, that can be a struggle' (Interviewee CE2). Landscape architects have expressed similar concerns: 'Permitting is going to be an issue. The regulations are going to be an issue. Construction is going to be an issue. […]... all those small aspects add up to each other, making the implementation very, very complicated' (Interviewee A1).

Flexibility. Multiple goals communicated by the different stakeholders involved can be optimized through green infrastructure implementation simultaneously. The primary goal of NGOs, civil society organizations and research institutes is to push for green infrastructure through information-sharing, rising awareness and educating the public. Repeatedly, these stakeholders mentioned that even the smallest pilot projects of green

infrastructure serve this purpose better than any public forum or outreach initiative could: ‘we are trying to connect to the general public at large about the need for a plan, about the need for funding - so we should do green infrastructure in front of the parks and the schools and the houses of worship to make people learn and build the constituency for it’ (Interviewee CS3). Green infrastructure thus not only serves as a measure for flood mitigation, but also as an awareness tool. Immediate implementation of green infrastructure projects would furthermore contribute to the goal of developers, builders and architects to extent their knowledge about soil conditions and actual infiltration capacity. ‘This is why we should be doing more pilots sooner, because we have no idea what the soil capacity really is. We should start immediately […] to see what fails and see what works and learn from it as green infrastructure implementation is happening’, says Interviewee CS3.

Besides these stakeholder goals openly communicated, green infrastructure implementation has the potential to help governmental officials achieve less openly communicated goals at the same time. Concepts like resiliency, sustainability and climate adaptation become increasingly more prominent in public discourse as well as on political agendas. Therefore, actively pushing for green infrastructure implementation and advocating for it in the public can provide politicians an electoral benefit. Consultancies included in the interviews have communicated how emphasizing that electoral benefit would frequently convince political actors to take up the topic, even though resiliency and climate adaptation is not usually one of their core topics: ‘what we are trying to do is giving elected officials a new political identity that is based on resilience. It can be a selling point to their constituencies’ (Interviewee RC2).

When it comes to the opposing goal ambitions of conservative as compared to leftist or liberal ideological standpoints, as apparent, for instance, in Hoboken’s media landscape, green infrastructure can satisfy both mindsets and optimize both of their goals. For leftist ideologies, the case for green infrastructure is quite apparent, considering its positive effect on ecological sustainability and climate change mitigation. For rather conservative or market oriented players, green infrastructure implementation can be argued for as a business case: according to consultancies, every dollar that is invested in resiliency building measures will save about seven dollars in response. As Interviewee RC2 puts it: ‘the nice thing is, green infrastructure can be couched in more conservative business terms as well as in leftist sustainability terms’.

Intensity. The goal of large-scale green infrastructure implementation as a measure towards flood resilience and climate change adaptation highly deviates from the status quo, not only locally, but also nationally and internationally. Along the entire coastline of New York and New Jersey, there is a cultural lack of resilience-based thinking. Especially NGOs lament a lack of risk awareness considering the development patterns of New Jersey over the last 200-300 years: ‘you have different pushes pulls regarding how willing people are to confront this issue [of climate change and climate adaptation in general], because those are very fundamental

changes to make – whether or not they are allowed to continue to live and develop along the coast the way they always used to' (Interviewee CS1). Despite the devastating impact, media representatives perceive this mindset to prevail among most residents: 'People are very quick to forget what happened' (Interviewee M1). The Community Advisory Board has reported similar experiences with citizens as well as businesses and builders: 'Over the last 100 years, we have just been totally detached from reality in terms of flood vulnerability' (Interviewee CS3).

Green infrastructure as a practice to deal with natural disasters like floods deviates from the global status quo as well. According to Interviewee RC2, 'prior to 2015, we tended to look at how do we manage risk - how to we respond, how do we organize humanitarian response. Now, we are moving away from managing risk, to targeting risk – risk reduction, including climate change adaptation and sustainability practices'. Hoboken's RBD plan, introduced in 2013, was therefore a successful anticipation of what was going to come.
Hoboken's plan became part of a global tendency that deviates highly from the former status quo.

4.4 Strategies & Instruments

Extent. The policy-strategy for green infrastructure implementation as presented through the Green Infrastructure Strategic Plan and RBD is highly comprehensive and includes a wide variety of instruments. The strategy is multi-hazard based, taking into account both storm surge and rain-based flash floods. The four components for the strategy – Resist, Delay, Store and Discharge – combine hard infrastructure for coastal defense (Resist) with a wide range of green infrastructure measures to store and direct excess rainwater (DSD). The green infrastructure measures included in the strategy range from 'large site projects', such as parkland, permeable paving, cisterns, bio-retention basins, and constructed wetlands, to small-scale 'right-of-way' projects, such as green roofs, bio-swales and rain gardens. Non-governmental institutions have repeatedly lauded the strategy for its comprehensiveness in terms of instruments: ‚the plan is fascinating, it includes all different scales - from rain gardens to under-ground storage, it is a brilliant plan' (Interviewee RC1).

As an instrument for enforcement, different programs for incentivizing public and private builders to include green infrastructure have been launched. For example, the municipality together with the North Hudson Sewerage Authority, have adjusted the city zoning code in favor of green roofs and have made it possible for builders and developers to include green roofs in their stormwater calculations, no longer considering green roofs as an impervious coverage: 'it is very helpful for developers, the green roof is becoming a standard for essentially managing your stormwater requirements for new buildings' (Interviewee CE2). Enforcement measures for implementation are included for some of the green infrastructure measures proposed such as the use of of eminent domain.

To promote green infrastructure implementation more efficiently, the city of Hoboken has also strategically partnered with experts, including the Dutch government as well as UNISDR to close its knowledge gaps. These partnerships are viewed as extremely beneficial for successful implementation by consultancies: 'they partnered with the right people – the Dutch government is an automatic signal for investors' (Interviewee RC2). City-to-city partnerships continue to build on these strategic partnerships: currently, the city is in the proceedings of setting up a partnership for resiliency-building with the city of Cozumel in Mexiko for sharing best practices.

Coherence. The instruments included in the policy-strategy for green infrastructure implementation are largely based on synergy, mutually reinforcing each other's effectiveness. The OMA team designed the strategy as the hybrid model it is now, because the DSD components could not serve their purpose without the Resist-component and the other way around. Thus, even the gray-infrastructure components of the city's plan reinforce green infrastructure: 'just because it is ‚Resist', does not mean it is not green infrastructure – it will be a mixed use park area, with terraces and flood lines, but they will all have green spaces', explains Interviewee RC2. Every green infrastructure project of whatever kind will boost the implementation of further measures, an upward trend in coherence is therefore clearly visible: ‚we are seeing a lot more green infrastructure projects now', reports Interviewee CS2, 'the more we see towns do the projects, and the more we can showcase them and share with the developers, the more it will actually kick-off'.

However, a number of trade-offs considering cost-benefit considerations as well as the multiple impediments mentioned by developers and builders (see Section 4.3) are being made while implementation proceeds. These trade-offs are attributed to the limited flexibility in terms of choice of instruments for implementation.

Flexibility. Despite the fact that the instruments intended for implementation are so numerous, the actual choice of instruments for each particular site is highly constrained. A central factor limiting the implementers' flexibility in terms of instruments is the extreme time pressure under which they are operating. The $ 230 million of federal money are not only bound to a specific project, but also require to be spent by 2022 – 'there is an aspiration date of the money' (Interviewee A1). Initially, the money was granted until 2020, the deadline was already pushed once. However, 'if they try to push the deadline again, the money is going to disappear', thinks Interviewee A1. An implementation in time is considered unrealistic by civil society organizations as well as architects who participated in the interviews. As a consequence of the pressure under which the city is operating, architects and developers are constrained in which locations and which instruments to consider for implementation. According to Interviewee A1, the sites considered for green infrastructure implementation need to be free of existing infrastructure and feasible in terms of property ownership along with issue like topography, sidewalk width or traffic of vehicles and pedestrians. In particular the ownership of available land (public or private) significantly impacts the feasibility of most

measures proposed. In the so-called ‘Feasibility Report’, in which Interviewee A1 was involved under the lead of the engineering firm Dewberry, it is stated that ‘due to the urban density of the project area with limited public property, siting opportunities to address stormwater are restricted’ (Dewberry, 2017, p. 3). For all small-scale ‚right-of-way‘ green infrastructure measures proposed, from rain gardens to green roofs, the architects started off with 400 possible sites, but ended up with only 61 actually feasible in terms of time. Due to unexpected soil conditions on the sites, a trade-off that had to me made very early after the start of the implementation is to desist from relying purely on natural infiltration through adding pre-cast concrete tanks to the right-of-way green infrastructure measures.

An additional factor limiting flexibility in terms of instruments is the scarcity of land for construction. This scarcity has implications for the types of green infrastructure instruments as proposed: green roofs and rain gardens. When it comes to green roofs for newly constructed buildings, the impact of any system for green roofs will likely be low for Hoboken, due to the limited availability of space for new constructions. For existing buildings, according to Interviewee CE1, ‚it becomes difficult, green roofs don’t really fall into the category if what is being used for an existing property‘. The fact that Hoboken is such a densely populated and built-out urban area makes every remaining parcel highly valuable for public usage. Therefore, an additional barrier for a number of instruments like rain gardens is their limited functionality and usability beyond stormwater storage: ‚at the end of the day, you take land that could possibly be used for other purposes […], you are limited with how much room […] you can use, basically creating a feature that does not have much other use than just looking at it‘ (Interviewee CE1). In a densely populated area, public spaces need to be highly functional for public usage, which adds a layer of complexity to the choice of instruments and strategies.

Intensity. Even though the landscape architects, builders and developers commissioned with the implementation in Hoboken strongly support green infrastructure measures per se, their approach differs significantly from the majority of practitioners in the field. Interviewee A1 is aware of the status quo: ‘We are very unique among firms, our approach to projects is very unique in general’. The green infrastructure measures intended for implementation in Hoboken thus strongly require behavioral change on all levels of society.

4.5 Responsibilities & Resources

Extent. Roles and responsibilities between different levels of government as well as between stakeholders beyond government clearly assigned. The state of New Jersey, through NJDEP, and the federal level become involved in terms of funding, permitting and review of plans, while the implementation in terms of construction, operation and maintenance is the sole responsibility of the municipality of Hoboken. Moreover, the municipality’s efforts to clearly assign responsibilities *within* their own level of government are to be

highlighted positively. The United Nations have emphasized the necessity to define functional roles responsibilities in order to institutionalize resiliency planning in all local policy-making processes (UNISDR, 2012). In line with these recommendations, Hoboken has not only a 'Resiliency Task Force', but also a Green Infrastructure Manager to enforce implementation.

When it comes to stakeholders beyond the governmental bodies, responsibilities are perceived to be 'fairly well defined' (Interviewee CS1). Developers and builders, with LANGAN in particular, are responsible for management and project implementation regarding the three big resiliency parks contained in the plan. NGOs and civil society organizations form a coalition cooperatively taking up responsibility as educators and conveners. 'We are trying to educate folks about the benefits of building in more environmentally responsible ways', explains the US Green Building Council of NJ. Similarly, Interviewee CS1 puts emphasis on how his NGO is 'trying to embed the though-process of green infrastructure in everybody's minds while development moves forward'. Academia from research institutes and consultancies see their responsibility primarily in 'doing the research and providing examples of how it can be cost effective' in order to make green infrastructure more attractive for developers and builders (Interviewee RC1).

While active media support for green infrastructure implementation in Hoboken is very fragmented, some media are taking up their responsibility as public opinion formers and support NGOs and academia in informing the public about the green infrastructure plans and its implications. 'We do not want to push people in a certain direction', says Interviewee M1, 'but we want them to be aware and interested'.

Coherence. While responsibilities seem to be clearly assigned between different levels of government and different non-governmental stakeholders in the arena, a high number of different units and departments is involved in green infrastructure implementation on the state level, leading to minor drawbacks in coherence. These different units include enforcement, community relations, municipal finance and construction, stormwater management or water quality. According to the City of Hoboken, 'you will have different experiences with the NJDEP in the sense that there are many arms that regulate, and there are other arms that manage programs. So there is a lot of coordination that is required, not just between the local and the state government, but within the different aspects of the state government'. However, the assigned responsibilities as laid out above are considered legitimate by all relevant stakeholders. According to the municipal government of Hoboken, the fact that administration of the federal funds for RBD implementation is assigned to the state instead of the municipality is even perceived as a chance for positive change: 'it is a good thing, because if there is awareness at different levels of government, that means that we have more sources of potential funding' (Interviewee GC1). Therefore, the complexity of governmental as well as non-governmental actors involved in the process increases the flexibility of the implementers in terms of resource allocation.

Flexibility. Even though there is no flexibility in the application of the $ 230 million of federal funding (being designated mainly to the implementation of the Resist-component of RBD), the municipal government of Hoboken has a large variety of alternative funding sources at their disposal.

Firstly, the city has multiple opportunities to apply for grants, which is its most common funding strategy for the implementation of the DSD components. A promising state sponsor for green infrastructure projects in Hoboken is the NJDEP Green Acres Program. 'In a lot of cases we would apply actually to the NJDEP or to some other private foundation or federal entity', explains the city of Hoboken. Foundations include the National Fish and Wildlife Foundation, which is involved in a significant part of the funding for Hoboken's Southwest Resiliency Park, or the Rockefeller Foundation.

Secondly, when it comes to loans, the NJ Environmental Infrastructure Trust is an important funding source for the implementation of green infrastructure in Hoboken. 'We use the Environmental Infrastructure Trust as lot, because of its ability to provide low interest loans', explains Interviewee GC2. For both the Southwest and the Northwest Resiliency Park project, the Environmental Infrastructure Trust contributes a significant amount of funding.

Thirdly, Hoboken has an Open Space Trust Fund, which reserves general capital funds for open space acquisition and the development of these spaces for recreation and conservation. The Open Trust Fund increases Hoboken's bonding capacity.

Moreover, the city increasingly engages with innovative and non-traditional actors like the business community in order to set up public-private-partnerships (PPPs) for project funding. In fact, one of the three biggest green infrastructure projects, the 7th and Jackson Resiliency Park, is being funded through a PPP. The private developer has purchased the entire project area, paying for all construction costs, including a stormwater capture- and delay system. After completion, the private party will 'hand the public spaces over to the city, and the city will move forward with operation and maintenance', explains Interviewee CE1. Even though this strategy of financing brings a long a risk of losing public control, is has significantly reduced the costs for the local government and has ensured continued and dedicated funding for a part of the measures planned.

The multiple benefits of green infrastructure beyond stormwater management, including its effect on water quality, air quality, habitat and wildlife protection or the wellbeing of communities, further diversifies possible funding sources. Green infrastructure projects 'fit within the requirements of many different funding opportunities you have allocated' (Interviewee GC2). Even though state and federal grants or low-interest loans are highly competitive due to the fact that repayment is low or not required, Hoboken has performed particularly well in competing for these funds: 'the way they are systematically going about arriving at those

plans, and securing funding, and trying to grapple with all the challenges... it's just mind-boggling‘ (Interviewee CS2). Neither accountability nor transparency is compromised by allocating and pooling resources in such a diversified way.

Intensity. Despite the fact that the amount of possible funding sources for implementation is so expansive, all interviewees, including those representing the municipality of Hoboken, have agreed that funding is by far not sufficient and will pose ‘an enormous challenge’ to those responsible for implementation. Even though Hoboken was able to secure a significant amount of federal funding for its comprehensive RBD strategy that includes a wide array of green infrastructure measures as ‘Delay, Store, Discharge’ (DSD) elements, the state of NJ, as the administrator of the funds, has assigned them exclusively for the Resist-element. ‘So the way the city is actually planning to implement the DSD part of the project is through alternative sources of funding‘ as enlisted above, explains Interviewee A1. Consequently, funding for the DSD green infrastructure elements is highly dependent on individual solutions for each individual measure, individually applied for in each situation. This process is associated with a lot of insecurity. Interviewee A1 gives an account of the current situation: ‚right now the city has funding for the Northwest [Resiliency Park], meaning block 10 [Southwest Resiliency Park], the housing authority [7th and Jackson Park] and the right-of-way sites [bio swales and rain gardens] are not being funded, nor implemented‘. The Dewberry Feasibility Report affirms: ‚It should be noted that the entire DSD solution […] cannot be funded with the available funds‘ (Dewberry, 2017, p. 291). The city has confirmed the problematic funding situation: ‚there is never enough funding to build what you need to build. I would not say there is nearly enough‘.

The problem becomes intensified through the paradigm shift at the federal level, initiated by the Trump administration. Several stakeholders, both from government and NGOs, have expressed concerns that a downward trend in resource sufficiency will be the consequence. ‚Especially in the future, funding is going to be a huge issue – I don’t think that we can expect federal funding for projects related to climate change adaptation and resilience - we all know what that has to do with‘, says Interviewee CS2. Indeed, President Trump’s fiscal 2018 budget provides for an overall EPA budget reduction of about 30 percent (Davenport, 2017).

5. Summary and Discussion of Results

After a systematic assessment of each governance dimension and quality, predictions can be made about the likelihood of successful implementation of green infrastructure in Hoboken. The dimensions and quality criteria as assessed below impact the likelihood of successful implementation of green infrastructure in Hoboken through altering motivations, cognitions and resources of the actors involved.

Extent was assessed as high, and therefore supportive of green infrastructure implementation. No levels of government are excluded from the process. Moreover, two governmental bodies take the lead within the process, namely the municipality of Hoboken and NJDEP. When it comes to actors and networks beyond government, the process of green infrastructure implementation is generally perceived as very inclusive. The high inclusiveness of the process to non-governmental actors shapes the actors' cognitions of their role within the reality of green infrastructure implementation in a way that encourages successful implementation. Minor drawbacks in extent stem from the fact that the private business community is not yet involved sufficiently. However, the municipality is aware of its potential for supporting implementation and tries to improve outreach to private companies and insurances. The majority of problem perceptions is taken into account during implementation, including problems related to resource allocation, operation and maintenance and privately owned land. However, the city's plans regarding green infrastructure are not always aware of the actual site constraints that developers and architects are facing. The range of instruments of green infrastructure as well as the number of innovative strategies for their implementation is very high. Such strategies include enforcement measures like the use of eminent domain or strategic partnerships. Responsibilities between all stakeholders, including both governmental and non-governmental actors, are clearly assigned and facilitated with resources. This affects the actors' power relations in a way that is supportive for successful implementation of green infrastructure.

Coherence was assessed low to moderate, and therefore only partly supportive of a successful green infrastructure implementation. The lack of integration among local, regional and state entities is cited as a 'major stumbling block to designing and implementing green infrastructure projects' by NGOs (Worstell, 2013). The need for numerous approvals, longer approval times and uncertainty in procedures, among others, discourage implementation. While collaboration among NGOs and research institutes is extraordinarily strong, developers, builders and engineers are not trusted in their approach towards green infrastructure. Moreover, community boards do not feel sufficiently heard by the government. Developers and engineers frequently face numerous site constraints and regulatory barriers that they do not feel sufficiently considered in the plans. This leads to trade-offs in instruments actually considered for implementation. Even though the assigned responsibilities are partly overlapping between different governmental institutions and divisions (especially on the state level), the system is generally perceived as legitimate by all relevant stakeholders. Coherence in responsibilities and resources has therefore been assessed as moderate, thus supportive for implementation.

Flexibility strongly differs among the different dimensions of governance. It was assessed as highly supportive in terms of actors and networks, problem perceptions and goal ambitions as well as responsibilities as resources. There is a high potential to include non-traditional and new actors in the process of green infrastructure implementation. Especially the private business community, including real estate,

insurance industry and small- and medium-sized enterprises, could potentially contribute powerful social capital in order to support the task of green infrastructure implementation. Other actors in the arena are therefore increasingly targeting this stakeholder group. The implementation of green infrastructure can optimize multiple and very diverse goals at the same time, ranging from educating the public or gaining electoral benefits to tackling other climate related issues such as urban heat. As the actors' motivations are determined by their goals and ambitions, the fact that many of the actors' goals can be optimized through green infrastructure simultaneously spurs them into action. When it comes to possibilities to pool resources from different sources, the municipality of Hoboken possesses an impressive leeway. However, flexibility was assessed as low and thus restrictive for successful green infrastructure implementation when it comes to levels and scales as well as strategies and instruments. There is no degree for adaptation for the levels included given the current regulatory framework. The choice of different types of instruments for the few available construction sites in Hoboken is extremely limited. This is due to multiple site constraints as well as the small leeway for the city in terms of time.

Intensity has been assessed as moderate or high and therefore supportive for green infrastructure implementation, except for responsibilities and resources, which are highly restrictive. The impact for behavioral change highly differs between the two most important levels: the state and the municipality. The weak impulse on the state level is counterbalanced by the municipality's forceful impact for implementation, pushed forward by strong and courageous leadership of Hoboken's Mayor Dawn Zimmer. A high number of actors involved, including NGOs, civil society organizations, research institutes and media houses push very strongly for green infrastructure implementation through convening the different actors in the arena, promoting information-sharing and educating the public. Both the goal of green infrastructure implementation as a measure of flood mitigation as well as the instruments required for such action strongly deviate from former practice and the status quo. Globally, but also on a regional level, the majority of stakeholders has deplored a lack of resilience-based thinking in all levels of society. Rather, a mentality of disaster risk management instead of disaster risk reduction, associated with a 'just-rebuild-it' -mentality has been prevailing. The highly deviating nature of green infrastructure from business as usual potentially affects the actors' motivations in a way that discourages green infrastructure implementation. Despite supportive degrees of intensity for most governance dimensions, responsibilities and resources have been assessed as highly restrictive for successful green infrastructure implementation. The insufficiency of resources for implementation as intended was consistently emphasized as the primary impediment, which is very difficult for the municipality to overcome. The solution to the funding problem requires a lot of individual responses to a lot of individual circumstances, creating planning uncertainty for the implementation of green infrastructure.

Upward trends have become apparent in coherence and intensity of different levels of government. Interviewees from all types of organizations have emphasized the 'emerging' nature of the topic of green infrastructure. In fact, a global tendency towards sustainability practices, of which green infrastructure is an important part, is reflected in Hoboken's local policy-making procedures. Non-profit organizations have indicated: 'if we would be having this interview in two or three years, it would all look a lot different. I think it's promising and I'm very optimistic' (Interviewee RC1). The study took place in a time of paradigm shift on global, national and regional level. Even though awareness of the value and potential of green infrastructure might still be low on state level or among residents, NGOs and research institutes expressed their optimism in the future of green infrastructure. Unsupportive conditions of the regulatory framework might be adapted and disincentives might be wiped out in the coming years. Moreover, non-traditional actors like real estate firms and insurances are becoming increasingly integrated in the process of green infrastructure implementation.

Downward trends are anticipated by numerous stakeholders regarding flexibility and intensity of resources for green infrastructure implementation. This is due to the disruptive potential of government elections and the ideological shift away from resilience-based thinking within the Trump administration on federal level. Table 3 below summarizes these findings per governance dimension and quality criterion.

Table 2. Assessment Results

Governance Dimension	Extent	Coherence	Flexibility	Intensity
Levels & Scales	High	Low ⇧	Low	Moderate ⇧
Actors & Networks	High ⇧	Moderate	High	High
Problem Perceptions & Goal Ambitions	Moderate	Low	High	Moderate
Strategies & Instruments	High	Moderate	Low	Moderate
Responsibilities & Resources	High	Moderate	High ⇩	Low ⇩
Assessed as:	High Supportive	Low/Moderate Partly Supportive	High to Low	Mostly Supportive

6. Conclusion

This thesis assessed the degree to which the governance context in Hoboken is supportive or restrictive for successful implementation of green infrastructure, a measure adopted towards flood resilience.

As Table 2 shows, the majority of dimensions and quality criteria of governance are supportive towards a successful implementation of green infrastructure in Hoboken. In particular, the high degrees to which different governmental levels as well as non-governmental actors are involved in the process as well as the high extent to which different strategies and instruments for implementation are taken into account increase the likelihood of success. Moreover, there is a very high flexibility to achieve multiple stakeholder goals at the same time, to include non-traditional actors in the process and to allocate alternative funding sources, positively impacting the likelihood of implementation success. The clear distribution of resources as well as the strong impact for implementation from civil society organizations and research institutes further increase the likelihood of successful implementation of Hoboken's green infrastructure plans.

However, five factors strongly reduce the likelihood of successful implementation of green infrastructure. Firstly, there is a lack of coherence between municipal and state regulations, confusing and discouraging stakeholders to use green infrastructure ambitiously. Secondly, an insufficient coordination of municipal problem perceptions with those of developers and engineers functions as highly restrictive for successful implementation of green infrastructure. Thirdly, the problems faced by developers and engineers during the process are not always taken into account by governmental bodies when drafting the plans. Fourthly, regulatory barriers and site constraints limit the flexibility of instruments so decisively that the restrictive impact on implementation success is strong. Lastly, the insufficiency of financial resources for the municipality strongly restricts the likelihood of implementation of green infrastructure.

Based on these results, the assumption that 'being a city that is considered as best practice for urban resilience, Hoboken has a governance context that is highly supportive of the implementation of green infrastructure' could not be fully confirmed. Even though the majority of dimensions and quality criteria is supportive of green infrastructure implementation, decisive elements of the governance context have the potential to severely impede the process. In order to overcome these impediments, three main recommendations can be made to practitioners, reflecting upon what barriers and hindrances in the governance context they should address.

Firstly, the outreach to developers and engineers needs to be intensified in order to increase awareness about the cost-benefits as well as the potential of green infrastructure as a stormwater management tool. This can be achieved through more case studies, resolving misconceptions and misunderstandings associated to green infrastructure and showing examples of where and how well it has worked before.

Secondly, the overall regulatory framework for green infrastructure implementation needs to be adapted in

order eliminate disincentives for developers and push for an ambitious use of green infrastructure. In the current state, regulatory impediments and the associated permitting processes are agreed upon by all stakeholders as one of the major impediments to green infrastructure implementation. A lack of guidance in state regulations needs to be replaced through a clear and transparent set of rules. In particular, the vague language in the SWM Rules as well as the BMP manual need to be replaced through objective and possibly even mandatory standards for implementation. Green infrastructure needs to be more determinedly credited as an effective tool for stormwater management in laws and regulations.

Thirdly, the social aspect of resilience needs to be addressed much more deliberately. In particular, a stronger engagement of young people and families with children can contribute to the sustainability of green infrastructure measures by addressing the problem of maintenance and operation. Social capacity needs to be increased by including those who are going to be the operators and taxpayers in the future on an early stage of the process. A sustainable approach to green infrastructure requires an alignment of values and priorities. Therefore, resilience-based governance needs to be fostered by comprehensive social inclusion. This way, the community and its institutions, such as research institutes, will function as a safeguard for resilience and the continuity of green infrastructure implementation in the future.

Reflecting on the theory employed, this study has shown that the GAT can be applied in a predictive manner and is useful to provide valuable insights into the likely future of an implementation process. This finding can be generalized to applications of the GAT for other policy-areas beyond water management. However, it was found that construct validity in terms of a strong interconnectivity between the concepts is a serious shortcoming of the theory. As described in Section 3.4, the leading questions of the GAT (Table 1) were employed to assign information to the concepts and thus to the matrix cells. However, several of the dimensions as well as quality criteria of the GAT framework have shown to affect each other in mutual ways. For example, the coherence between the different instruments of green infrastructure increase flexibility of strategies, while at the same time, certain problem perceptions limit flexibility. The number of government levels involved, described under extent, has an effect on the coherence between these different levels of government. Demarcation between the concepts within the theory is thus not completely clear. Moreover, it is not clear for the researcher how to interpret strongly deviating findings within the same dimension or criterion. For example, Hoboken's governance context scores as highly supportive in terms of flexibility of responsibilities and resources, while intensity scores as highly restrictive. Future theory development of the GAT should focus on redefining the concepts and formulating leading questions that separate the different dimensions and criteria more precisely.

Further limitations to the validity of results may arise from the fact that confounding variables not included in the GAT may also affect the likelihood of successful implementation of green infrastructure in Hoboken. Such a confounding variable might be the wider geographical and socio-economic context of the city, given

the fact that Hoboken is a transit-hub and its resilience economically and infrastructurally crucial for nearby New York City. Future research should explore the effect that wider contextual factors outside of the GAT's operationalization have on motivations, cognitions and resources of actors and thus on the likelihood of successful green infrastructure implementation.

Resilient cities require resilient governance. Through a predictive application of the GAT, this paper has addressed the need for concrete, context-specific knowledge on how to redesign Hoboken's governance structures for more successful implementation of green infrastructure as a measure towards becoming a more resilient city.

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8. Appendices

8.1 Appendix A - Interview Protocol

Before the Interview
– Informed Consent
– (1) all information will be held confidential
– (2) your participation is voluntary and you may stop at any time if you feel uncomfortable
– (3) we do not intend to inflict any harm

Concluding the Interview
– Semi-Structured Interview
– Interview Guide
– 6 Leading Questions
– Open -ended Questions
– Factual before Opinion
– Using Probes as needed

During the Interview
– Notes
– Audio-Tape

After the Interview
– Summarize Key Data immediately
– Check Audiotape for Clarity
– Fill in Notes
– Verify Information given in the Interviews if necessary
– Transcibe and/or review Data
– Analyzation of Data
– Solicit Feedback from Interviewees
– Write Report
– Revise
– Dissemination of Findings to Interviewees

8.2 Appendix B - Interview Guide

Introduction Key Components

- Thank You
- Name
- Purpose
- Confidentiality
- Duration
- How Interview will be conducted
- Opportunity for Questions
- Signature of Consent

I want to thank you for taking the time to meet with me today. My name is Leonie Staas and I would like to talk to you today about your experiences and expectations regarding the implementation of Hoboken's green infrastructure plans. You have been selected to speak with us today because you have been identified as someone who has a great deal to share about the structures that characterize the governance context of Hoboken. Our research project as a whole focuses on Hoboken's green infrastructure plans and their successful implementation. Such green infrastructure measures involve parks, wetlands or vegetated swamps, but also above surface measures like green roofs. Our study does not aim to evaluate your personal contribution or the performance of your organization. Rather, we are trying to learn more about the overall governance structure.

The interview should take approximately an hour. I will be recording the session because I don't want to miss any of your comments. Since we're on tape, please be sure to speak up so that we don't miss your comments. In addition, you are kindly requested to sign a form devised to meet the ethical standards of my university. Essentially, this document states that: (1) all information will be held confidential, (2) your participation is voluntary and you may stop at any time if you feel uncomfortable, and (3) we do not intend to inflict any harm.

All your responses will be kept confidential. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report does not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time. If time begins to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning.

Are there any questions about what I have just explained? Are you willing to participate in this interview?

Interview Questions

- No more than 5 guiding questions
- Predominantly open -ended questions
- Asking factual before opinion
- Using probes as needed

1. Interviewee Background**:** Please tell me about your organization and your position within this organization.
- How long have you been in your present position?
- How long have you been in your present organization?
- Briefly describe your role as it relates to decision-making and implementation of green roofs. How are you involved?

2. Establish Common Meaning
When you hear the term 'flood resilience', what does that mean to you?

3. Stakeholder Relationships
When you think about the implementation of green infrastructure measures in Hoboken, which organizations do you think will play a role and in which way?
- Do you think all relevant actors and levels of governance have been involved when designing the plan? If no, which actors and levels are absent?
- Are you happy with the way your organization collaborates with these other actors and levels of governance? If not, in how far would you like to the collaboration to change?
- Which organizations do you perceive to have the strongest involvement when it comes to green infrastructure projects?
- Please give an account of any pressures from other stakeholders enacted upon your institution, if present.
- Tell me about possibilities to include new actors in the implementation of green infrastructure.

4. Identify Prioritization and Goals
Taking improved flood resilience as a goal, what do you think would be the best way to go for Hoboken?
- When it comes to flood management in Hoboken, what do you see as the main problem? What are the causes of that problem?
- Please describe the main goal of your institution regarding Hoboken's flood resilience.
- How would you describe the importance of green infrastructure implementation in relation to other projects and goals of your institution? Does it have a high or low priority for your organization?

5. Instruments for Green Infrastructure Implementation
Please describe the strategy of your institution regarding a realization of more green infrastructure in Hoboken.
- What kinds of instruments (e.g. changes in laws and regulations, subsidies, etc.) would your organization include in that policy -strategy?
- What kinds of instruments would you definitely exclude? Why?
- Which instruments for green infrastructure implementation do you consider combinable? Which ones would run counter each other?
- Do you think the instruments you propose would somehow deviate from the current practice of your

institution? Would they create new ways of working or thinking, or are they similar to what you have been doing so far?

6. Discover Resources and Responsibilities of the Institutions
Which resources and responsibilities are allocated to your organization for the implementation of green infrastructure in Hoboken?
- Please describe the responsibilities of your institution in the context of green infrastructure implementation.
- Are you happy with the way responsibilities are distributed between your institution and other actors involved in the green infrastructure projects?
- Which resources, such as funds and personnel, does your organization have for the implementation of green infrastructure?
- Do you consider the amount of those resources sufficient for the implementation of green infrastructure? Do you see any barriers or constraints?

Closing Key Components

- Additional Comments
- Next Steps
- Thank You

Is there anything more you would like to add? I'll be analyzing the information you and other respondents gave me and submit a draft report to your organization in one month. I'll be happy to send you a copy to review at that time, if you are interested. Thank you for your time.

8.5 Appendix C: Atlas Ti Coding Scheme

Codes Report – Grouped by: Code Groups
Selected codes (23)

Groupless
3 Codes:
○ **Conclusions**
Created by Leonie on 22.06.2017
○ **Downward Trend**
Created by Leonie on 22.06.2017
○ **Upward Trend**
Created by Leonie on 22.06.2017

Actors & Networks
4 Codes:
● **Actors & Networks - Coherence**
Created by Leonie on 22.06.2017
● **Actors & Networks - Extent**
Created by Leonie on 22.06.2017
● **Actors & Networks - Flexibility**
Created by Leonie on 22.06.2017
● **Actors & Networks - Intensity**
Created by Leonie on 22.06.2017

Levels & Scales
4 Codes:
● **Levels & Scales - Coherence**
Created by Leonie on 22.06.2017
● **Levels & Scales - Extent**
Created by Leonie on 22.06.2017
● **Levels & Scales - Flexibility**
Created by Leonie on 22.06.2017
● **Levels & Scales - Intensity**
Created by Leonie on 22.06.2017

Problem Perceptions & Goal Ambitions
4 Codes:
● **Problem Perceptions & Goal Ambitions - Coherence**
Created by Leonie on 22.06.2017
● **Problem Perceptions & Goal Ambitions - Extent**
Created by Leonie on 22.06.2017
● **Problem Perceptions & Goal Ambitions - Flexibility**
Created by Leonie on 22.06.2017
● **Problem Perceptions & Goal Ambitions - Intensity**
Created by Leonie on 22.06.2017

Responsibilites & Resources
4 Codes:
● **Responsibilites & Resources - Coherence**
Created by Leonie on 22.06.2017
● **Responsibilites & Resources - Extent**
Created by Leonie on 22.06.2017

• **Responsibilites & Resources - Flexibility**
Created by Leonie on 22.06.2017
• **Responsibilites & Resources - Intensity**
Created by Leonie on 22.06.2017

Strategies & Instruments
4 Codes:
• **Strategies & Instruments - Coherence**
Created by Leonie on 22.06.2017
• **Strategies & Instruments - Extent**
Created by Leonie on 22.06.2017
• **Strategies & Instruments - Flexibility**
Created by Leonie on 22.06.2017
• **Strategies & Instruments - Intensity**
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