

Bridging Science and Policy

Optimizing and Operationalising the Governance Capacity Framework



KWR WATERCYCLE RESEARCH INSTITUTE
WATERNET
UTRECHT UNIVERSITY

Master thesis

Student: Alisa Doornhof

Student nr.: 4193903

Course code: GEO4 – 2321

Supervisor: Prof. Dr. C.J. van Leeuwen

S.H.A. Koop, MSc.

Ir. Dr. O. Reinstra

Second reader: Dr. Carel Dieperink

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KWR Watercycle Research Institute

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Course code: GEO4 – 2321

Student: Alisa Doornhof

Studentnumber: 4193903

E-mail: a.e.doornhof@students.uu.nl
a.doornhof@live.nl

Supervisor: Prof. Dr. C.J. van Leeuwen (KWR)
S.H.A. Koop, MSc. (KWR)
Ir. Dr. O. Reinstra (Waternet)

Second reader: Dr. Carel Dieperink

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Summary

Considering current and future challenges for water management in cities, adequate water governance to deal with these challenges is crucial. Urban water challenges are typically 'wicked challenges' that are complex and unclear and have fragmented scopes and viewpoints. It is an iterative process that requires governance capacity to find flexible solutions that can anticipate on emerging barriers and changing situations. Implementation of Integrated Water Resources Management appears to be difficult due to governance gaps and barriers. The Governance Capacity Framework (GCF) is a tool to assess the governance capacity of an Urban Water Governance Network (UWGN). It consists of 9 governance conditions, each specified into 3 characteristics. The GCF elucidates where improvements can be made in urban governance. At the start of this study the GCF was purely a theoretical framework that lacked applicability and optimization. First, the GCF was reviewed and theoretically optimized. Secondly, it was operationalized. Thirdly, the GCF was applied and practical discrepancies were resolved. The operationalisation entailed the development of an assessment tool with clear indicators and an application strategy. Therefore, the GCF was moulded into the Water Governance score chart that is used to assess an UWGN's governance capacity, based on 15 in-depth interviews, a desk study and thorough result verification with UWGN representatives. Governance capacity can be assessed to be very limiting (--), limiting (-), indifferent (0), encouraging (+) or very encouraging (++). Interviewees have been selected from the strategic, tactical and operational governance level for the five wicked water-related challenges: (1) flood risk, (2) urban heat islands (UHI), (3) water scarcity, (4) wastewater treatment and (5) solid waste treatment. Subsequently, the GCF was applied to the UWGN of Amsterdam. Practical optimization entailed eliminating overlap, fragmentation, haziness and mismatches between theory and practice. Two products are obtained from this research: (1) an optimized and operationalized GCF and (2) a governance capacity assessment of Amsterdam's UWGN. The GCF, is now a tool that is unambiguous and applicable to assess and improve urban water governance. It also provides a proper and insightful base for comparing cities. The governance capacity of Amsterdam's UWGN for the five wicked challenges is encouraging. Amsterdam has adequate governance capacity for flood risk, water scarcity and wastewater treatment in that it enables good and adaptive water management on these challenges. There is some room for improvement regarding the transparency of information and knowledge co-creation. It was found that data generating systems, processes and approaches of flood risk, water scarcity and wastewater treatment can be better aligned. The governance capacity for solid waste treatment is adequate to facilitate good and adaptive management, but shows room for improvement in terms of information sharing and cooperation. The issue of information sharing is recognized and is being developed between city districts. Adequate governance capacity and management for UHI is lacking attention. This means that Amsterdam has to prepare itself better to face increasingly high temperatures and UHI. The recommendations are the following: (1) data generating systems, methods and approaches need to be better aligned throughout the UWGN; (2) the network of UHI governance needs to expand and UHI needs to be better embedded in policies; (3) a joint strategy for solid waste collection and treatment must be formulated that conforms with the principles of circular economy and prevents lock-in.

CONTENTS

| | |
|--|----|
| List of figures | 7 |
| List of tables | 8 |
| Acronyms..... | 9 |
| 1. Introduction..... | 10 |
| 1.1 Background..... | 10 |
| 1.2 Previous work: The City Blueprint Approach..... | 11 |
| 1.3 Relevance | 15 |
| 1.4 Research questions..... | 16 |
| 2. Theoretical framework..... | 17 |
| 2.1 Literature on water governance gaps, barriers, principles and capacities | 17 |
| 2.2 Conceptual framework..... | 19 |
| 2.3 Research delineation..... | 20 |
| 3. Method..... | 21 |
| 3.1 Sub-question1: Theoretical review | 22 |
| 3.2 Sub-question 2: Operationalisation | 24 |
| 3.2.1 Composing the Water Governance Score Chart | 24 |
| 3.2.2 Application strategy WG score chart on the city of Amsterdam | 25 |
| 3.3 Sub-question 3: Improving the WG Score Chart | 27 |
| 4.Results | 27 |
| 4.1 Theory..... | 27 |
| 4.1.1. Ensuring theoretical inclusiveness | 28 |
| 4.1.2. Resolving theoretical discrepancies | 29 |
| 4.2 Practice..... | 32 |
| 4.2.1 Operationalisation..... | 32 |
| 4.2.2 Application..... | 38 |
| 4.2.3 Resolving practical discrepancies | 51 |
| 5.Discussion | 56 |
| 5.1 Validity & reliability of the research..... | 56 |
| 5.1.1 Theoretical optimization | 56 |
| 5.1.2 Operationalisation..... | 57 |
| 5.1.3 Application..... | 59 |
| 5.1.4 Practical optimisation..... | 60 |
| 5.1.5 Contextual | 60 |
| 5.2 Implications for Amsterdam..... | 61 |
| 6.Conclusion | 65 |

| | |
|--|-----|
| 7.Recommendations | 66 |
| 8.References..... | 67 |
| 9. Appendix..... | 74 |
| Appendix A | 74 |
| GCF Starting document | 75 |
| Literature used for theoretical optimization..... | 96 |
| Literature used for operationalisation | 98 |
| Strategy 1 of identifying and assigning observable indicators..... | 99 |
| Interview outline | 101 |
| Literature used for desk study in application..... | 105 |
| Overview of interviewees per water-related challenge..... | 107 |
| Completed Water Governance Score Chart for Amsterdam | 109 |

LIST OF FIGURES

| | |
|---|----|
| Figure 1. Global risks according to WEF. Source: WEF (2016) | 11 |
| Figure 2. Strategic planning process. Source: Philip et al., (2011) | 11 |
| Figure 3. City Blueprint performances of Amsterdam. The overall score, i.e., the Blue City Index is 8.3 points. Source: Koop and Van Leeuwen (2015a) | 12 |
| Figure 4. OECD principles of good water governance. Source: OECD brochure (2015)..... | 19 |
| Figure 5. Method for constructing the GCF. Source: Koop and Koetsier, (2016, Pers. Comm.) | 22 |
| Figure 6. Research Framework . The yellow boxes represent the literature that is consulted to answer research sub-question 1. The light green box represents the theoretical part of the optimization of the Governance Capacity Framework. The dark green boxes represent the practical part of the study. The first dark green box represents the activities for answering sub-question 2. The second dark green box represents the application of the Water Governance Score Chart in order to answer sub-question 3. The result of this research is twofold: an operationalised GCAF and a set of recommendations to improve Amsterdam's governance capacity to deal with the wicked water-related challenges. | 22 |
| Figure 7. Levels of management and leadership development pyramid on which the stakeholder identification is based. | 26 |
| Figure 8. Interview outline. Given the comprehensiveness and complexity of each characteristic, questions for each of the 2 to 5 elements per characteristic have been formulated. Here an example of characteristic 3.1 (smart monitoring). | 35 |
| Figure 9. Overall scores of the 9 water governance conditions in Amsterdam. Scores range from very limiting (--) to very encouraging (++) the governance capacity needed to address wicked water and climate adaptation challenges. | 38 |
| Figure 10. Overall scores of the 27 characteristics showing the average water governance performance of the 5 wicked water-related challenges in Amsterdam. Scores ranges from very limiting (--) too very encouraging (++) the governance capacity needed to address wicked water and climate adaptation challenges..... | 39 |
| Figure 11. Scores of the 9 conditions determining the governance capacity to address flood risk in Amsterdam. Score ranges from very limiting (--) to very encouraging (++) the governance capacity to resolve challenges regarding flood risk. | 40 |
| Figure 12. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding flood risk. Score ranges from very limiting (--) too very encouraging (++) the governance capacity to resolve challenges regarding flood risk. | 41 |
| Figure 13. Scores of the 9 conditions for governance capacity in Amsterdam regarding urban heat islands. Score ranges from very limiting (--) to very encouraging (++) the governance to resolve challenges regarding urban heat islands..... | 43 |
| Figure 14. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding urban heat islands. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to resolve challenges regarding urban heat islands..... | 43 |
| Figure 15. Scores of the 9 conditions for governance capacity in Amsterdam regarding water scarcity. Score ranges from very limiting (--) to very encouraging (++) the governance capacity, that is needed to resolve water scarcity challenges. | 45 |
| Figure 16. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding water scarcity. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to challenges regarding water scarcity. | 45 |
| Figure 17. Scores of the 9 conditions for governance capacity in Amsterdam regarding wastewater treatment. Score ranges from very limiting (--) to very encouraging (++) the governance capacity, that is needed to resolve challenge regarding wastewater treatment. | 46 |

| | |
|--|----|
| Figure 18. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding wastewater treatment. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to resolve challenges of wastewater treatment. | 47 |
| Figure 19. Scores of the 9 conditions for governance capacity in Amsterdam regarding solid waste treatment. Score ranges from very limiting (--) to very encouraging (++) the governance capacity, that is needed to resolve challenge regarding solid waste treatment. | 49 |
| Figure 20. Scores of the 27 characteristics showing the Water Governance performance of Amsterdam regarding solid waste treatment. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to resolve challenges regarding solid waste treatment. | 49 |

LIST OF TABLES

| | |
|---|----|
| Table 1. City Blueprint trends and pressure assessment of the city of Amsterdam | 12 |
| Table 2. Proposed categorization of different levels of sustainable IWRM in cities based on the results of 45 City Blueprint performance assessments in 27 different countries. Source: Koop and Van Leeuwen (2015b) | 13 |
| Table 3. Overview of the initial theoretical Governance Capacity Framework (GCF). Source: Koop and Koetsier (2016, Pers. Comm.)..... | 14 |
| Table 4. The identified wicked water-related challenges in cities that are considered in the GCF assessment and optimization of the GCF | 21 |
| Table 5. Logic model for monitoring (INECE 2008). | 24 |
| Table 6. GCF outline of conditions and characteristics | 32 |
| Table 7. Logic model applied to characteristic 3.1 (smart monitoring) (Source: INECE, 2008). | 33 |
| Table 8. Triple-loop learning theory (Pahl-Wostl 2009), provide indicators levels for upper three levels of characteristic 2.1 (smart monitoring). | 33 |
| Table 9. Overview of interviewees that participated in the Governance Capacity Assessment of Amsterdam. Assigned for each of the 5 identified wicked water-related challengeand selected by governance level (i.e. strategic, tactical and operational). | 36 |
| Table 10. Overview of the selected interviewees per condition or characteristic. | 36 |
| Table 11. Applicability of levels to preparedness in Amsterdam for the networks of FLO, WSC and WWT | 52 |

ACRONYMS

| | |
|--------|--|
| AEB | Waste-to-Energy Company |
| AGV | Amstel Gooi Vecht |
| AM | Adaptation Management |
| BCI | Blue City Index |
| CB | City Blueprint |
| CBA | City Blueprint Approach |
| CBF | City Blueprint Framework |
| EC | European Commission |
| EBA | Ecosystem Based Approaches |
| EEA | European Environmental Agency |
| EPA | Environmental Protection Agency |
| FLO | Flood Risk |
| GCF | Governance Capacity Framework |
| GGD | Municipal Health Service Department |
| GWF | Global Water Forum |
| GWP | Global Water Partnership |
| INECE | International Network for Environmental Compliance and Enforcement |
| IPCC | Intergovernmental Panel on Climate Change |
| IWRM | Integrated Water Resource Management |
| KING | Quality Institute for Dutch Municipalities |
| OECD | Organisation for Economic Co-operation and Development |
| SDG | Sustainable Development Goals |
| SNA | Social Network Analysis |
| SWT | Solid Waste Treatment |
| TPF | Trends and Pressures Framework |
| UHI | Urban Heat Islands |
| UN | United Nations |
| UNDP | United Nations Development Program |
| UNECE | United Nations Economic Commission for Europe |
| UNEP | United Nations Environment Program |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| UWG | Urban Water Governance |
| UWGN | Urban Water Governance Network |
| UWM | Urban Water Management |
| VNG | Union of Dutch Municipalities |
| WSC | Water Scarcity |
| WWT | Wastewater Treatment |

1. INTRODUCTION

1.1 Background

The global population is expected to grow from 7.3 billion in 2015 to 9.7 billion in 2050 and 11.2 billion in 2100 (UN, 2015). Around 54% of world's population lives in urban areas, this will become 66% in 2050 (UN, 2014), which means approximately 2.5 billion people need to be accommodated in cities by 2050. Urbanization and population growth already put serious pressure on cities. More challenges are to be expected due to climate change. Extreme events increase in frequency and in ferocity. Figure 1 shows the top ten of risks regarding likelihood and impact. Water and climate issues are high on the list. It can even be argued that the societal risks in the figure have an environmental causal fundament. An important environmental issue for cities is the effect climate change has on their water balance. Issues of water surplus, scarcity and pollution in cities have a vast impact on the livelihood of citizens, especially on the public services related to the water cycle.

The UN recognizes the issues addressed above and formulated these into Sustainable Development Goals (SDGs). Actually, the water crisis is a water governance crisis (OECD, 2015; Pahl-Wostl, 2008). Recently, the OECD explained how their principles of good governance are related to the several SDGs concerning water. However, dealing with the dynamics of population growth, urbanization and climate change in cities is a complex challenge for Urban Water Governance Networks (UWGN). A reason for this is the overlap of the water sector with the energy sector, spatial planning, waste, transport, etc. and thus UWG requires some level of cross-sectoral integration. Adding to the complexity of the issues, water governance is characterized by a multi-level network. This results in various governance gaps due to fragmentation of the water sector. A solution to the governance of the integration of water, waste and climate adaptation is sought in an inclusive and sustainable water governance perspective called Integrated Water Resources Management (IWRM). IWRM is defined as “*a systematic process for the sustainable development, allocation and monitoring of water resource use in the context of social, financial and environmental objectives*” (GWP, 2008). IWRM in cities ideally encompasses the inclusion of waste management and climate adaptation into urban water cycle governance as well as acknowledging and discovering the social and economic co-benefits and opportunities. Besides connecting energy and material flows and efficiently utilizing co-benefits towards a circular economy, the sustainable aspect is covered in adaptive management (Pahl-Wostl, 2008). However, it is rather complex to apply IWRM on urban water governance (UWG). Therefore UWG varies globally from lacking basic water services to water-wise cities (table 2).

In light of the setting described above the EC commissioned the research partnership SWITCH (2006-2011) to research the innovation and practical realization of IWRM. Following this path, the European Innovation Partnership initiated the support of City Blueprint actions for IWRM according to the long-term strategic planning process pictured in figure 2.

The Global Risks Report 2016

| Top 10 risks in terms of Likelihood | Top 10 risks in terms of Impact | Categories |
|---|---|--|
| <ol style="list-style-type: none"> 1 Large-scale involuntary migration 2 Extreme weather events 3 Failure of climate-change mitigation and adaptation 4 Interstate conflict 5 Natural catastrophes 6 Failure of national governance 7 Unemployment or underemployment 8 Data fraud or theft 9 Water crises 10 Illicit trade | <ol style="list-style-type: none"> 1 Failure of climate-change mitigation and adaptation 2 Weapons of mass destruction 3 Water crises 4 Large-scale involuntary migration 5 Energy price shock 6 Biodiversity loss and ecosystem collapse 7 Fiscal crises 8 Spread of infectious diseases 9 Asset bubble 10 Profound social instability | <ul style="list-style-type: none"> Economic Environmental Geopolitical Societal Technological |

Figure 1. Global risks according to WEF. Source: WEF (2016)

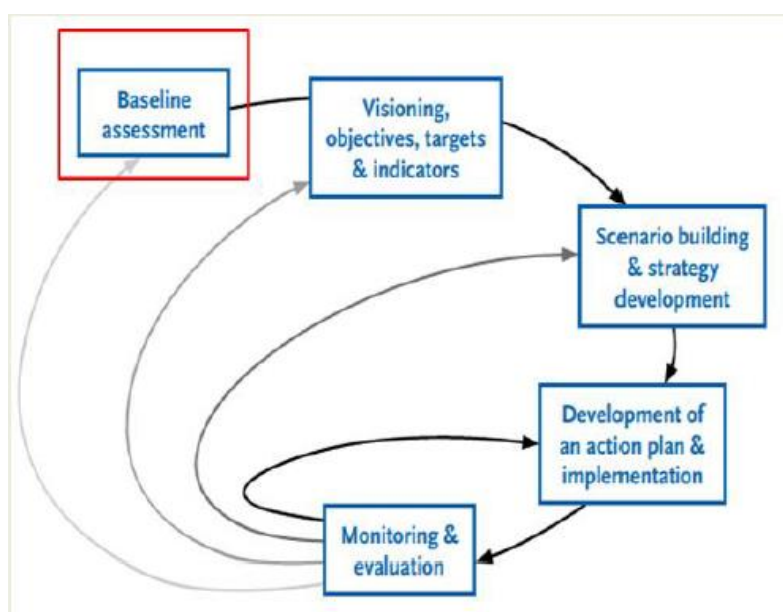


Figure 2. Strategic planning process. Source: Philip et al., (2011)

1.2 Previous work: The City Blueprint Approach

The City Blueprint (CB) project so far includes (a) the Trends and Pressures Framework (TPF) (table 1), (b) the City Blueprint Framework (CBF) (figure 3) and (c) the Governance Capacity Framework (GCF). The TPF describes the most important social, environmental and financial pressures that may hamper or, on the other hand, provide windows of opportunity for local water management. The CBF measures the actual performance of local water management considering 25 performance indicators divided over seven broad categories. The Blue City Index (BCI), is the overall geometric mean of all 25 performance indicators (Koop and Van Leeuwen, 2015a). Cities are assigned to an IWRM category based on a hierarchical clustering analyses that coincided with the BCI scores. The categories are explained in Table 2.

Table 1. City Blueprint trends and pressure assessment of the city of Amsterdam

| | | | 0 | 1 | 2 | 3 | 4 |
|----------------|---------------|--------------------------|---|---|---|---|---|
| City Blueprint | Social | 1. Urbanization rate | | | | | |
| | | 2. Burden of disease | | | | | |
| | | 3. Education rate | | | | | |
| | | 4. Political instability | | | | | |
| | Environmental | 5. Water scarcity | | | | | |
| | | 6. Flood risk | | | | | |
| | | 7. Water quality | | | | | |
| | | 8. Heat risk | | | | | |
| | Financial | 9. Economic pressure | | | | | |
| | | 10. Unemployment rate | | | | | |
| | | 11. Poverty rate | | | | | |
| | | 12. Inflation rate | | | | | |

| | | | | | | | | | |
|---|------------|---|-------------|---|----------------|---|---------|---|---------------|
| 0 | No concern | 1 | Low concern | 2 | Medium concern | 3 | Concern | 4 | Great concern |
|---|------------|---|-------------|---|----------------|---|---------|---|---------------|

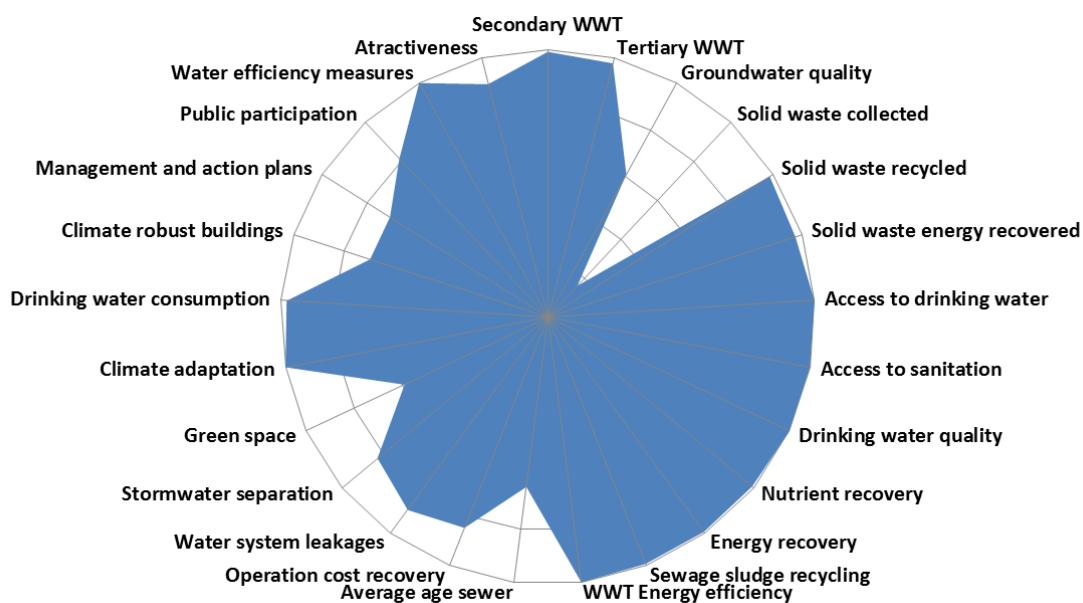


Figure 3. City Blueprint performances of Amsterdam. The overall score, i.e., the Blue City Index is 8.3 points. Source: Koop and Van Leeuwen (2015a)

Table 2. Proposed categorization of different levels of sustainable IWRM in cities based on the results of 45 City Blueprint performance assessments in 27 different countries. Source: Koop and Van Leeuwen (2015b)

| BCI score | Categorization of IWRM in cities |
|-----------|--|
| 0–2 | <p>Cities lacking basic water services</p> <p>Access to potable drinking water of sufficient quality and access to sanitation facilities are insufficient. Typically, water pollution is high due to a lack of WWT. Solid waste production is relatively low but is only partially collected and, if collected, almost exclusively put in landfills. Water consumption is low but water system leakages are high due to serious infrastructure investment deficits. Basic water services cannot be expanded or improved due to rapid urbanization. Improvements are hindered due to governance capacity and funding gaps (Table 2).</p> |
| 2–4 | <p>Wasteful cities</p> <p>Basic water services are largely met but flood risk can be high and WWT is poorly covered. Often, only primary and a small portion of secondary WWT is applied, leading to large scale pollution. Water consumption and infrastructure leakages are high due to the lack of environmental awareness and infrastructure maintenance. Solid waste production is high and waste is almost completely dumped in landfills. Governance is reactive and community involvement is low.</p> |
| 4–6 | <p>Water efficient cities</p> <p>Cities implementing centralized, well-known, technological solutions to increase water efficiency and to control pollution. Secondary WWT coverage is high and the share of tertiary WWT is rising. Water efficient technologies are partially applied, infrastructure leakages are substantially reduced but water consumption is still high. Energy recovery from WWT is relatively high while nutrient recovery is limited. Both solid waste recycling and energy recovery are partially applied. These cities are often vulnerable to climate change, e.g. urban heat islands and drainage flooding, due to poor adaptation strategies, limited stormwater separation and low green surface ratios. Governance and community involvement has improved.</p> |
| 6–8 | <p>Resource efficient and adaptive cities</p> <p>WWT techniques to recover energy and nutrients are often applied. Solid waste recycling and energy recovery are largely covered whereas solid waste production has not yet been reduced. Water efficient techniques are widely applied and water consumption has been reduced. Climate adaptation in urban planning is applied e.g. incorporation of green infrastructures and stormwater separation. Integrative, centralized and decentralized as well as long-term planning, community involvement, and sustainability initiatives are established to cope with limited resources and climate change.</p> |
| 8–10 | <p>Water wise cities</p> <p>There is no BCI* score that is within this category so far. These cities apply full resource and energy recovery in their WWT and solid waste treatment, fully integrate water into urban planning, have multi-functional and adaptive infrastructures, and local communities promote sustainable integrated decision making and behavior. Cities are largely water self-sufficient, attractive, innovative and circular by applying multiple (de)centralized solutions.</p> |

A baseline assessment is the starting point for long-term planning and implementation. In fact, all phases of the strategic planning process (figure 2) are activities of governance. Unfortunately, due to the complexities of water governance, translating empirical governance gaps into an IWRM appears to be a bridge too far (OECD, 2015a). A first attempt for bridging science on good and adaptive water governance and practical application is initiated by S. Koop and L. Koetsier (2016, Pers. Comm.) in the form of the Governance Capacity Framework (GCF) shown in table 3. The GCF focuses on UWG networks and takes into account water-related challenges, contexts, institutions and considers short-, medium- and long-term goals. The method focusses on five most urgent, reoccurring, wicked urban water-related challenges that are strongly susceptible to be amplified by global trends of climate-change and urbanization, i.e., urban heat islands, flood risk, water scarcity, and wastewater and solid waste

collection and treatment (EEA, 2012). These wicked water problems are also assessed in the CB Trends and Pressure Framework.

Table 3. Overview of the initial theoretical Governance Capacity Framework (GCF). Source: Koop and Koetsier (2016, Pers. Comm.)

| | |
|--------------------------------------|---|
| GC1 Awareness | 1.1 Internalization 1.2 Local engagement |
| GC2 Applicable knowledge | 2.1 Data completeness 2.2 Relevancy 2.3 Accessibility |
| GC3 Continuous learning | 3.1 Monitoring 3.2 Evaluation |
| GC4 Network potential | 4.1 Human resources 4.2 Room to manoeuvre 4.3 Political power |
| GC5 Stakeholder participation | 5.1 Inclusiveness 5.2 Influence on results 5.3 Equity |
| GC6 Leadership | 6.1 Visionary 6.2 Collaborative 6.3 Entrepreneurial |
| GC7 Policy ambition | 7.1 Embedding 7.2 Ambitious and realistic goals 7.3 Long-term integrative solutions |
| GC8 Financial viability | 8.1 Financial resources 8.2 Economic robustness 8.3 Affordability |
| GC9 Implementing capacity | 9.1 Enforcement and monitoring 9.2 Legislation 9.3 Action plans |

The application of GCF is predominantly an evaluative research, as the framework elucidates the governance conditions where most improvements can be made. This means that the GCF provides a snap-shot of the current governance capacity and identifies the most beneficial opportunities that can aid cities in a potential acceleration towards water-wise cities. Limiting governance conditions may lead to insufficient governance capacity. It may be the underlying cause of a dysfunctional system, which implies that this framework serves as a diagnostic tool or gap-analysis as well.

The GCF is based on empirical and conceptual literature, with a focus on OECD's and UNDP's good governance principles, and is triangulated with expert knowledge. The governance conditions, that together form the governance capacity, are defined by bundling the most validated concepts in literature. Testing, refining and reviewing ensures that the GCF will be communicative, widely accepted and in accordance with prevailing scientific insights. 9 conditions are identified with each 3 characteristics. For each of the 27 characteristics, performance levels have been formulated as narrative for operationalization according to a Likert type response rating scale of five levels, ranging from: strongly limiting adaptive, good governance building towards a level of strongly encouraging adaptive, good

governance. The scale facilitates the visualization of the results, since the five levels correspond perfectly with the numeric range of 0 to 4 when coding the indicated levels (see chapter four for visual presentation). The performance levels are based on various literature fields such as governance gaps or barriers (OECD, 2011; Ekstrom et al., 2011), multilevel governance (OECD, 2011; Adger et al., 2005), adaptive governance (Pahl-Wostl, 2007; Gupta et al., 2010) and organizational theory (Ballard, 2008). The full extent of the GCF, and starting document for this research, is provided in appendix A-1.

So far the GCF is purely a theoretical framework. At this stage the GCF needs to be optimized and operationalized to make sure that it can actually be applied in comparative and reproducible case studies. The instrument that will be made and applied is called the Water Governance Score Chart. It will contain the same structure as the GCF. The practical application is a pivotal step in the development of the GCF in terms of practical accuracy and internal validity. Furthermore, it is important to analyze if the current GCF covers the most relevant governance gaps, barriers, principles and capacities found in scientific approaches and if the GCF conditions fully represent the pre-conditions for IWRM. IWRM refers to components of the level of integration of sustainability 'elements' as well as completeness of the framework.

1.3 Relevance

Considering the global risks (figure 1) and the performances of cities on water management in some of the most prone areas (Koop and Van Leeuwen, 2016), the results of this research are relevant, both scientifically and socially.

Scientific relevance

Firstly, by the combining scientific literature into the GCF this study contributes to scientific knowledge as it integrates different fields of science such as water governance, governance capacity, institutional qualities, adaptive governance and organization theory. Secondly, the GCF is a first step to aid in the strategic planning process towards sustainable inclusive UWG in the form of an assessment. In other words, the GCF is a first step in bridging academic knowledge and policy application. To achieve this, it is essential that the GCF is clear, concise and understandable for decision makers, non-experts and other stakeholders. As most research is focused on small-n inductive case studies or are theoretically orientated (Biesbroek et al. 2013), the practical oriented GCF contributes to the empirical knowledge regarding governance processes limiting or encouraging the governance capacity challenges of water and climate change adaptation. It allows for comparative case studies that can make a valuable contribution to address the lack of comparative empirical knowledge of governance processes and water governance processes in particular.

Connection to theoretical debate

Which governance components are most determining in the process of adopting climate adaptation measures and resolving wicked water-related challenges? And how can they be incorporated in a balanced assessment framework that allows for comparative studies in various cities? How can these components be assessed quantitatively in order to determine if they are limiting or encouraging the governance capacity to address wicked water-related challenges? These questions are intrinsically answered during the development of this study by translating empirically found governance gaps into governance conditions. The framework therefore contributes to the debate of water management and governance that deal with wicked water-related challenges under changing social, environmental and financial conditions; as will it contribute to debates on how to implement, or more yet, how to indicate the presence of transformation management, IWRM, adaptive governance, adaptive capacity and sustainability.

Societal relevance

The GCF, as part of the City Blueprint Approach, aims at enhancing and sharing of knowledge, experiences and best practices between cities. The GCF provides key insight into the main governance conditions that need to be present in order to efficiently and effectively leapfrog their water management

performance to a higher level (from e.g. a wasteful city to a resource efficient and adaptive city (Table 2)) to overcome the imposing threats. Anticipating on imposing threats is an important element in societal resilience. In this respect the GCF can be used in other European projects as well. Moreover, GCF results can be used in the EC agenda to advise member countries and countries abroad on the role and level of governance required for sustainable IWRM.

Relevance of research in natural context

Considering that this study also practice-oriented, the researcher studies the UWGN of Amsterdam in its natural context in the form of a research internship. The internship is completed at the strategy department at Waternet. Waternet is essentially a public drinking water facility that provides for the urban area of Amsterdam. Currently, it is the only water cycle company in the Netherlands, that takes into account the management and governance of drinking water, surface water, storm water, groundwater and wastewater.

1.4 Research questions

The aim of this research is to contribute to the City Blueprint Approach by focusing on the improvement and operationalization of the GCF (Table 3). This is done by focusing on three key objectives:

1. To further include important components from, amongst others, the baseline assessment in the SWITCH project, the OECD governance gaps and OECD principles of good governance into the theoretical GCF.
2. To transform the theoretical GCF into a tool that can be applied to assess the limiting and encouraging components determining the governance capacity needed to resolve 5 wicked water-related challenges, i.e., 1) flood risk, 2) urban heat island effect, 3) water scarcity, 4) wastewater treatment, and 5) solid waste.
3. To apply the operationalized GCF on the 5 wicked water-related challenges of the city of Amsterdam and further improve the GCF based on the results.

The objective is therefore formulated in the following research question:

How can the GCF be theoretically and practically optimized using conceptual literature and empirical information, and be operationalized to assess urban water governance networks varying in scale, social context, governance structure and water-related challenge, to provide insight into the governance conditions that can make the transformation towards water-wise cities possible?

The sub-questions below support the research question by steering the search for information, which is needed to answer the main research question. The sub-questions provide a pathway for how to procure the required information.

1. 'Which governance aspects are missing in the Governance Capacity Framework and are needed for the assessment and comparison of Integrated Water Resources governance in cities around the world'

This sub-question aims to improve the theoretical inclusiveness for good and adaptive UWG within the scope of the theoretical framework, by re-doing steps three to five from the constructing method as given in figure 2.

2. How to operationalize the Governance Capacity Framework in order to assess the water governance network of Amsterdam and other cities?

This sub-question aims to prepare the Governance Capacity Framework for application using knowledge on how to formulate concrete, expedient and unambiguous questions.

3. How can the practical application of the Governance Capacity Framework in Amsterdam be used to further improve the Governance Capacity Framework and its operationalization?

This sub-question aims to improve the GCF and operationalisation regarding the practical applicability. It will do so by incorporating self-acquired insights, feedback from interviewees and criticism from governance experts and empiricists.

Summarizing this chapter, you have now read the societal and scientific context and relevance of the research including the main research questions. This line of reasoning is continued with the Theoretical framework in chapter 2, in which the scope and level of analysis is described, defined and delineated. After which the methods in chapter 3 provide the strategy and tools that are used for answering the research questions. The results that are presented subsequently are divided into results from Theory and Practice. In the theoretical part the focus is on answering sub-question 1. The practical part the focus is on answering sub-question 2 and 3. The results are discussed in chapter 5. Chapter 6 summarizes the research in the form of a conclusion, where concrete answers to the research questions will be provided as well as a set of recommendations.

2. THEORETICAL FRAMEWORK

This chapter provides the state of the art literature on water governance regarding the dominant paradigm for sustainable water management and governance, governance gaps and principles, existing water governance assessment tools and a review on innovative measures and insights in the water sector conform sustainability principles. Also the theoretical boundaries within which the GCF was constructed and will be optimized. Finally, the delineation and focus of the study is provided.

2.1 Literature on water governance gaps, barriers, principles and capacities

The recognition of the exhaustibility of resources by more and more institutions has lead to sustainable approaches and development in the form of Integrated Water Resources Management (IWRM). Grigg (2008) defines IWRM as *“a framework for planning, organizing and operating water systems to unify and balance the relevant views and goals of stakeholders.”* With that he lists eight types of integration that must occur as to comprehend the complexity of water resources management and governance, i.e., the integration between 1) policy sectors, 2) water sectors, 3) government units, 4) organizational levels, 5) functions of management, 6) geographic units, 7) phases of management and 8) disciplines and professions. Besides the confusion of the use of the IWRM concept that Grigg aims to eliminate, he notices the vastness and variety of institutional barriers. But what confines a barrier? Biesbroek et al. (2013) argue that only seven out of 81 articles that they researched defined what barriers are (p.1123). They researched barriers to climate change adaptation. In their research they wielded the definition provided by the IPCC AR4-WG2: *barriers to adaptation are defined as those factors and conditions that hamper the process of developing and implementing climate change adaptations.* Biesbroek et al. (2013) argue that barriers are part of the governance process that influence the output and later outcome. These barriers range from cognitive and motivational barriers to institutional barriers dependent on contexts. They argue that defining “barriers” is important for comparing studies and for guiding the search for solutions. The institutional barriers mentioned by Grigg (2008) and Biesbroek et al. (2013) show similarities with the multi-level governance gaps that were identified by the OECD (2011).

A variety of governance principles have been published as to overcome the barriers to adaptation and the governance gaps (figure 5) (Graham et al., 2003; UNECE, 2008; Lockwood et al., 2010; Satijn en ten Brinke, 2011; OECD, 2012; UNDP, 2013; OECD, 2015a). To overcome the barriers to adaptation, the water sector is set on using IWRM. IWRM is to be incorporated in water governance globally. One of the focal points of IWRM is water governance and management at the most appropriate level, another

focal point is the sustainability of solutions. Larsen et al. (2016) provide a review of innovative approaches with the potential to provide locally adapted, resource-efficient alternative solutions. They recognize the limitations for global centralized Urban Water Management (UWM). Alternatives for conventional UWM are IWRM, Adaptation Management (AM) and Eco-system Based Approaches (EBA). They elucidated a few of the state of the art approaches in UWM regarding storm water drainage, increased water productivity, source separation of waste, distribution or on-site treatment of waste streams, institutional and organisational reforms. Furthermore, Larsen et al. (2016) argue that UWM is a predominantly social-technical system. Stakeholder involvement is extensively researched in the context of water governance by Akhmouch and Clavreul (2016). They have studied cases of stakeholder engagement for inclusive water governance and shed a light on the potential of stakeholder engagement for water governance in terms of incorporating the OECD governance principles (figure 5). Still, IWRM is not always easily implemented and not all water governance institutions comply. In the attempt to envision the level of IWRM in water governance institutions several water governance assessment tools have been made.

The Water Governance Assessment Tool was made in the context of drought adaptation (DROP governance team, 2013). The tool consists of five dimensions (levels and scales, actors and networks, perceptions of the problem and goal ambition, strategies and instruments, resources and organisation) and four quality criteria (extent, coherence, flexibility and intensity). Together they form a matrix with four questions per dimension. The five dimensions together are called the governance regime as to point out that it is context for action and not the action itself. Contrary to the latter insight, the UNDP (2013) has created the Users Guide on Assessing Water Governance. It entails an eight-step process that includes the assessment of institutions and stakeholders, governance principles (transparency, accountability and participation) and water management performance (effectiveness, efficiency and functions). It is a more government-oriented document that aims to guide the design of effective policy interventions by aiding the identification of implementation problems and by pointing out how to deal with such problems. Furthermore, Van Rijswijk et al. (2014) created an assessment tool to assess approaches to water shortage, water quality and flood risks consisting of ten building blocks for sustainable water governance. It comprises a three-step interdisciplinary method that concerns generating content knowledge, providing the organisational process, and implementing the agreed service level. Interestingly, cultural-historic context is clearly elaborated and incorporated in the building blocks. Furthermore, in the Netherlands the umbrella organisation for water and wastewater organisations have published an article on the challenges for urban water governance and consequently an article on how to deal with urban water governance challenges in the form of a guideline (Stichting Rioned, 2016). First, they reason from a three-layered model comprising the substantial, institutional and relational layers. The layers refer to knowledge of the systems functions, the use of available and accessible instruments, and the change of cultural aspects and working method respectively. Integration of water sectors is fairly recognized in this approach, yet it does not take into account urban heat islands and solid waste. Additionally, they focus on local, tailored water governance. In the second article, the guideline focuses on (1) a sense of urgency and reciprocal dependence, (2) leadership, (3) shared ambitions, (4) clear approach and role division, (5) open and honest communication, (6) justification of each other's interests and (7) the organisation and embedding of the new approach and method. Questions are provided to test the level of compliance to the seven aspect for good governance.

Overview of OECD Principles on Water Governance

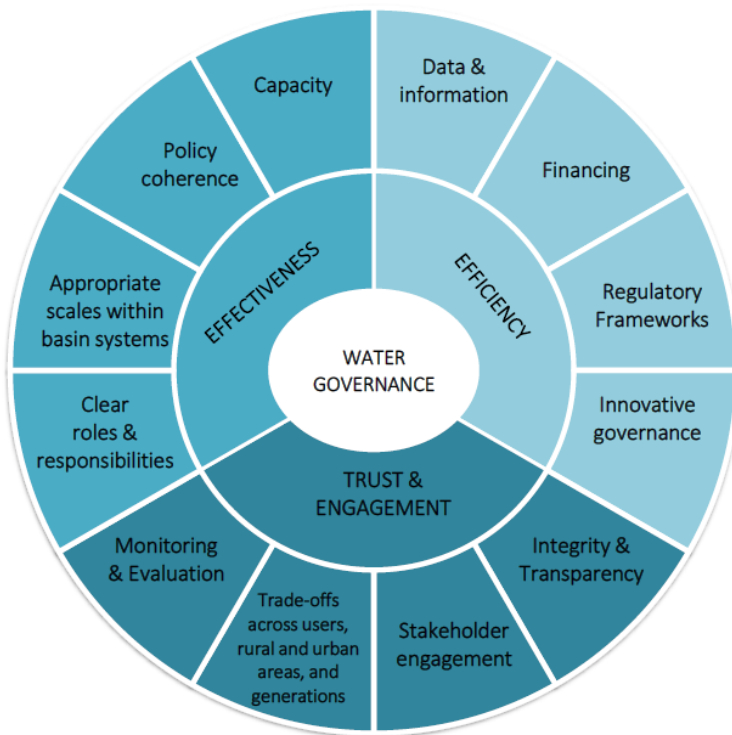


Figure 4. OECD principles of good water governance. Source: OECD brochure (2015)

This research builds on the latest insights that are elucidated above. Hence, it is well embedded in the state of the art water governance literature. Following the frame of SWITCH, regarding the research of innovation and practical realization of IWRM, the GCF and its operationalisation contribute to the literature as well. The GCF provides an assessment tool that focuses on the governance capacity to deal with the wicked water-related challenges on city level. Governance capacity is to facilitate adequate water management, which is focused on dealing with wicked challenges. It takes a network approach, which according to latest insights is a promising way to deal with wicked challenges (Pahl-Wostl, 2009). Furthermore, the insights developed with the former assessment tools have been incorporated into the GCF. The developed, unambiguous, practical application method makes the GCF unique. As such, the tool lends itself perfectly for large-N comparison studies. Dynamic context, adaptiveness and the requirement for comparability are well taken into account. With that the GCF will aid in bridging the literature gap on urban water governance. However, before optimizing and operationalizing the GCF, it is evident to define the main concepts from the research question. This is done in the next paragraph.

2.2 Conceptual framework

The research object of this study is the Urban Water Governance Network (UWGN). Water governance is the range of political, institutional and administrative rules, practices and processes (formal and informal) through which decisions are taken and implemented, stakeholders can articulate their interests and have their concerns considered, and decision-makers are held accountable for water management (OECD, 2015). Furthermore, urban refers to the governance at municipal-level and governance networks are defined as: the use of institutions and structures of authority and collaboration through which participants interact to allocate resources and to coordinate and control joint action across the network as a whole (Provan and Kenis, 2008).

We aim to assess the governance capacity of the UWGN that is necessary to deal with 5 identified wicked water and climate adaptation challenges (table 1). A challenge is characterized to be wicked

when it deals with complexity, uncertainty, as well as divergence and fragmentation of viewpoints. Reasons for characterizing a challenge as wicked are: the challenge is (1) poorly identified and scoped, (2) constantly changing, (3) addressed by dealing with the symptoms instead of underlying causes, (4) dependent on solutions that need to achieve major shifts in attitudes and behaviors and (5) insufficiently tackled due to a lack of incentives or points of leverage (Roberts, 2000) Wicked challenges therefore require dynamic and flexible solutions. The process of dealing with wicked challenges is highly iterative and there are multiple solutions depending on the aim of the adaptation and the context. The governance capacity, that is needed to address these wicked water and climate adaptation challenges, can therefore be defined as *“key city-scale governance conditions that should be developed to enable change that will be effective in finding dynamic solutions for wicked water and climate adaptation challenges in cities.”* In paragraph 2.3 the wicked water and climate adaptation challenges are elaborated as part of the research delineation.

2.3 Research delineation

These definitions provide the range for the GCF within which we aim to analyze and assess governance conditions. Further delineation and focus is given by the fact that the GCF builds on the work done for the OECD, SWITCH and the CB. This means that the GCF must fit the following applicability requirements:

- offer coverage of OECD’s multi-level governance gaps
- incorporate the water governance principles by the OECD as pictured in figure 5,
- fit the scope of SWITCH, in that the framework
 - ✓ ...must be applicable in cities around the world and at various stages of development
 - ✓ ...covers the entire urban water cycle
 - ✓ ...is applicable in a wide range of climatic, socio-economic and institutional situations
 - ✓ ...integrates social, economic and environmental perspectives
 - ✓ ...includes water as part of urban planning and the built environment
- the interactive character of the CB Framework, meaning that the assessment framework:
 - ✓ ...is molded into a score chart
 - ✓ ...is bounded to the governance of urban water networks
 - ✓ ...is easily accessible for all organizations, decision-makers and civilians
 - ✓ ...is easily completed through a document study and limited number of in-depth interviews,
- the requirement that the results are easily interpreted by all parties.

Water governance in cities can be divided into networks. These networks consist of all relevant actors incorporated in managing and governing a wicked water challenge. The networks are organized according to the following themes: Flood Risk (FLO), Urban Heat Island effect (UHI), Water Scarcity (WSC), Wastewater Treatment (WWT) and Solid Waste Treatment (SWT).

Table 4. The identified wicked water-related challenges in cities that are considered in the GCF assessment and optimization of the GCF

| | |
|------------|---|
| FLO | Many municipalities or regions will experience flooding within the next 50-100 years. This can be temporary overflow or inundation of a normally dry area (EU directive, 2007). This includes flash floods and mudflows. Causes for flooding are overflow of a body of water, unusual buildup in groundwater, runoff of surface waters, channel obstructions and; all as a result of storms, heavy rainfall, fast melting snow, unawareness or unfit measuring methods. |
| UHI | A municipality or region is subject to this issue when it deals with elevated temperatures in urban areas compared to its surrounding. During heat waves the temperature difference is on average 4 degrees with extremes up to 10 °C , depending the time of day. Communities are affected in terms of heat-related illness and premature mortality, increased costs and peak energy demand due to increased air conditioning, increased air pollution and GHG emissions (EPA, 2014). Mainly elderly, young children and marginalized communities are at risk. |
| WSC | A municipality or region is subject to this issue when it deals with any kind of water stress or scarcity that are defined by the UN ¹ as well as ensuring water quantity and quality matters in any (urban) water body. The network that deals with these issues or prevents water scarcity issues are also very much included in this description. |
| WWT | A municipality or region is subject to this issue when it deals with the occurrence and inputs of waste and the impacts of these waste on human health and water quality. Industrial, chemical, agricultural and sewage discharge (including plastics) without adequate treatment is polluting surface water and groundwater (This description is based on the definition of Marine Pollution from the OECD and UNESCO.) |
| SWT | A municipality or region is subject to this issue when it deals with domestic waste that is being disposed on the streets or in open dumpsites. The waste risks leaking into water bodies such as river, lakes, and oceans. (This description is based on the definition of Marine Pollution from the OECD and UNESCO.) |

The five water and climate adaptation challenges are chosen based on their relevance to cities and on their respective link with climate change, which is relevant for the governance approach and scope that is to be considered in the GCF optimization and operationalization. They are fairly in line with the categories and indicators of the City Blueprint (figure 3). The sharp minds will immediately notice the absence of Drinking Water. It is argued by the researcher that Drinking Water should be assessed as part of the GCF when the score for the City Blueprint indicators 6 *access to drinking water*, 7 *access to sanitation* and 8 *drinking water quality* is below nine out of ten points. It is assumed that if all of these indicators are higher than a score of 9 points, the authorities concerning these services are well organized and do not need a GCF assessment.

3. METHOD

Based on the aim of the research and the connection to the theoretical debate the objective refers to several components that lead to optimizing and operationalizing the GCF. It requires an in-depth study of the (i) body of literature on urban governance and water governance that was used for the construction of the GCF and additional conceptual and empirical literature to test the GCF for theoretical inclusiveness, (ii) information on Amsterdam's governance regarding the five identified wicked problems to test the completeness of the GCF as well as a literature study regarding the construction of questionnaires and surveys for the practical operationalization, and (iii) data and knowledge from actors in the UWG for the applicability of the GCF. Throughout the research, steps three to six from figure 5 (Test – refine – review – operationalize) are repeatedly executed in order to optimize and operationalize the framework. This is depicted in figure 6. The process of optimization is iterative as new insights can

¹ <http://www.un.org/waterforlifedecade/scarcity.shtml>

be obtained at any moment of research. How the optimization and operationalization is executed and how it provides information for answering the main research question is given per sub-question.

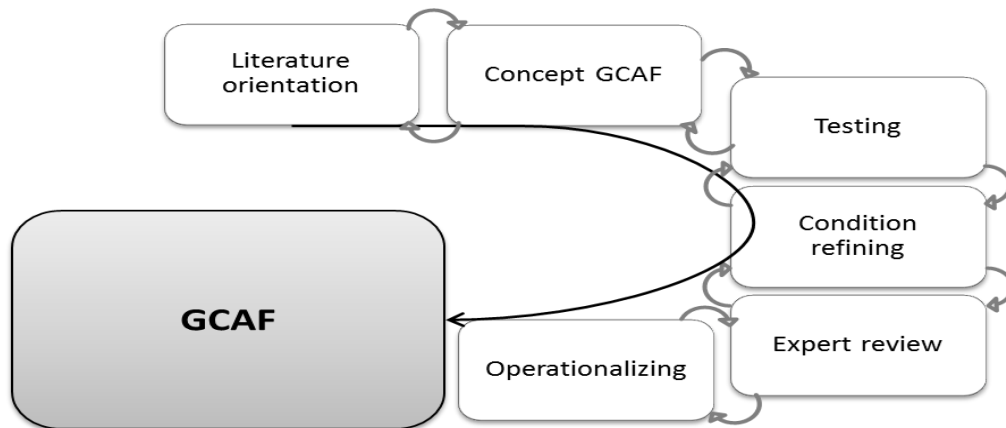


Figure 5. Method for constructing the GCF. Source: Koop and Koetsier, (2016, Pers. Comm.)

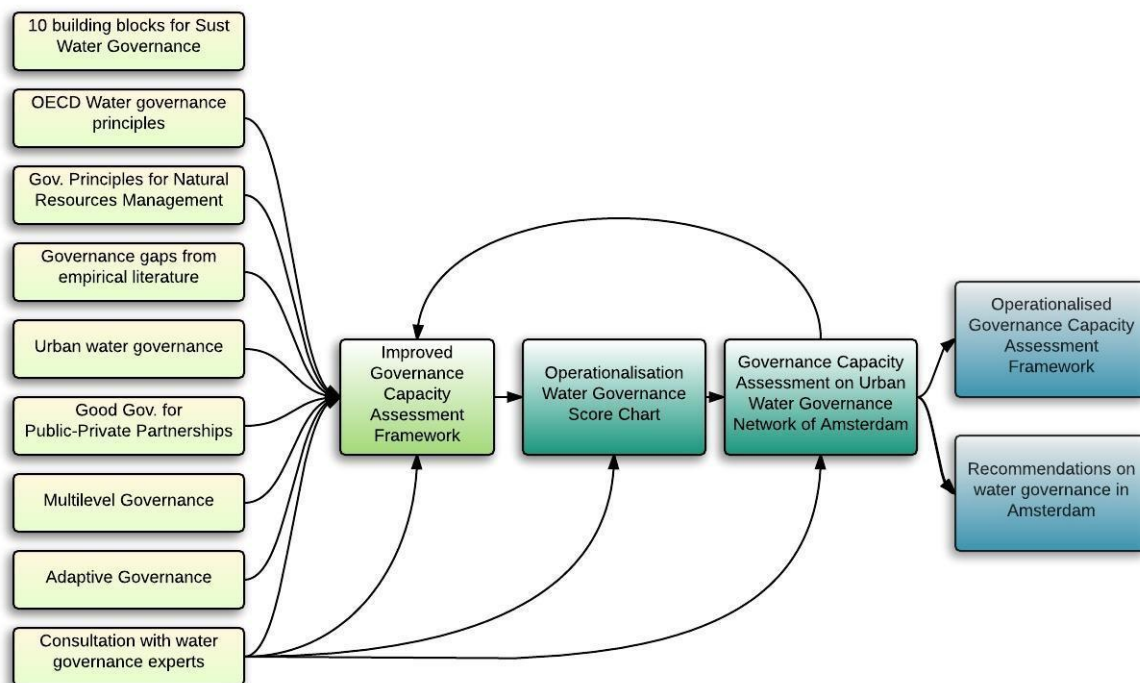


Figure 6. Research Framework . The yellow boxes represent the literature that is consulted to answer research sub-question 1. The light green box represents the theoretical part of the optimization of the Governance Capacity Framework. The dark green boxes represent the practical part of the study. The first dark green box represents the activities for answering sub-question 2. The second dark green box represents the application of the Water Governance Score Chart in order to answer sub-question 3. The result of this research is twofold: an operationalised GCAF and a set of recommendations to improve Amsterdam's governance capacity to deal with the wicked water-related challenges.

3.1 Sub-question1: Theoretical review

The GCF is critically reviewed regarding its theoretical inclusiveness. In order to improve the GCF theoretically, a triangulation of methods is applied using three iterative steps:

1. critical review of the GCF using varying conceptual and empirical literature and researchers core group meetings and discussions;
2. expert judgement by involving various researchers in the review of the GCFs composition, structure and scientific embedding;

3. an interactive workshop with experts to verify improved GCF. The variety in sources (academic literature and experts) and the variety in methods (literature review, face-to-face in depth discussion, workshop feedback session) enhances the comprehensiveness of the GCF and decreases the chance of misinterpretation in the operationalization of the GCF.

Step 1

With regard to the theoretical inclusiveness of the GCF, special attention was given to include:

- good governance principles
- multi-levelled character
- adaptive governance theory
- empirically found governance gaps
- the specification to the city level
- logic build up and consistency of descriptions of characteristic levels

The GCF includes the most important components that encourage or limit the governance capacity to address wicked challenges. The framework's theoretical adjustments are made on the basis of insights derived from the variety of literature (see appendix A-2). In particular the 10 building blocks for sustainable water governance (Van Rijswijk et al., 2010) has been used. To smoothen the structure and facilitate the reader, some characteristics were rearranged or renamed as to provide a logical order in the questions and levels thus smoothening the transition between topics within a governance condition as advised by Sarantakos (2005). The GCF has been improved to be more in accordance with prevailing scientific insights and gain more acceptance from experts. The suggested changes were discussed in three core group meetings. The core group included three of the researchers working on specifically the GCF. Discussions were held on the inclusion of concepts; extent of concepts; the name of conditions, characteristics and characteristic levels.

Step 2

Once the suggested changes were either implemented or rejected, the renewed GCF was reviewed by two Water management practitioners at Waternet. The empirical experts were sent the renewed GCF by email. Their critique was thoroughly discussed in a face-to-face fashion.

Step 3

A review workshop was organized with eight participants of the strategy department of Waternet. The participants were sent the GCF by email, prior to the workshop. The participants were chosen based on their experience with governance on multiple levels and their constructive critical view towards the concept of a GCF that is aimed to compare cities around the world. In the email they were asked to give feedback on the theoretical comprehension and completeness of the framework as well as the consistency with which the GCF aims to compare cities' governance capacity to deal with wicked water-related challenges. The latter concerns the issue of cultural-historic restraint.

The GCF is based on the prevailing scientific literature and international organization such as the UNEP and OECD that studied social and institutional adaptation barriers, governance principles and governance capacity. Hence, the GCF is based on predominantly democratic and liberal-oriented literature and includes principles of stakeholder engagement, social learning and open access data. It is important to address how to deal with the issue of cultural-historic restraint as to ensure that the GCF can purposefully be applied to cities throughout the world. It must be noted that there is no or minimal alternative literature. Besides, the existing articles from countries with a different polity and economic organisation are rarely cited (Web of Science, accessed on August 10th, 2016). Despite the practical limitation, the comparability between cities around the world is essentially relevant given that the GCF must incentivize dialogues between cities regarding their similarities and differences as to learn from each other rather than to discuss the method that was used for assessment.

3.2 Sub-question 2: Operationalisation

The GCF was molded into Water Governance (WG) Score Chart as its operational form. The method and choices made for the composition of the WG Score Chart and its application strategy on the UWGN of the city of Amsterdam are described in this section. The methods that are described below, are based on the series of steps described by Thomas (2004) and Bird (2009). Application strategy choices were made are based on administrative showdown (in Dutch: *Bestuurskrachtmeting*) examples from the Netherlands (B&A groep, Vereniging van Nederlandse Gemeenten (VNG) and Quality Institute for Dutch Municipalities (KING)). First, the purpose of utilizing the WG Score chart is given, followed by the methods for composing the WG Score Chart. Secondly, the application strategy is provided. The literature that was used for the operationalisation is listed in appendix A-3.

3.2.1 Composing the Water Governance Score Chart

The WG Score Chart summarizes the scoring results derived from the in-depth interviews and literature study. The WG Score Chart will be used to consistently report the results of each city that will be assessed. The comparability between cities is essential in the operationalization of the GCF, considering that the method must be comparable over time with identical wording (Enders, 2001). Additionally, the Score Chart is used to validate the assessment through feedback from interviewees. The GCF was operationalized as follows.

Identifying indicators and assigning observable entities

Defining the concepts from the GCF into indicators includes delineation, assigning observable entities to the concepts and a link-up to the research objective as suggested by Verschuren and Doorewaard (2010). Delineation of the governance themes for assessment is already provided in the theoretical framework i.e. the five wicked water-related challenges. Further delineation of the theoretical concepts, the Likert type characteristic levels were elucidated with empirical indicators. The literature used for identifying and assigning indicators is provided in appendix A-4. The empirical indicators were selected an incorporated in the Likert type levels of the 27 characteristics using the following strategy (INECE 2008, p.12-17):

1. Split characteristics into different elements and find empirical indicators for these elements by applying the logic model (table 5)
2. Inventory of indicators in existing governance assessments and articles
3. Look beyond existing data

Strategy 1

The 27 characteristics are aggregates of two to five different elements. The indicators were therefore split into single elements and the logic model was used for assigning measurable empirical indicators to each element. In order to find empirical indicators for the elements the following questions are important (Table 1): What is needed to reach a certain level of governance performance? What are intermediate outcomes? And what attributes indicate the final outcome? Table 5 shows the logic model.

Table 5. Logic model for monitoring (INECE 2008).

| Inputs | Outputs | Intermediate outcome | Final outcome |
|------------------|-------------------|-----------------------------|----------------------|
| <i>Resources</i> | <i>Activities</i> | <i>Behaviour change</i> | <i>Impact</i> |

Strategy 2

Example questionnaires and assessments on good governance and adaptiveness were used to see what indicators, criteria and scales are being utilized for measurement. Also articles were found to be useful in the search for indicators. In many instances indicators from document could readily be used in the WG Score Chart.

Strategy 3

Reports and studies were used that explain how behavioral aspects are measured. Often these studies involved a list of criteria to indicate a certain level of behavior based on research and experience: a proven method. In such a case, preferably indicators are incorporated into the WG Score Chart (*strategy 2*). However, a variety of criteria lists for one subject can exist, as well as a variety of methods and so the “presence of a list of criteria”, “use of a proven monitoring method” or “launch of monthly/yearly reports” was listed as an indicator in the WG Score Chart. Incorporating proven concepts contributes to the maturity of the questionnaire. The incorporation of proven criteria and the presence of such performance assessments (*strategy 2 and 3*) have been applied as much as possible.

The WG Score Chart is structured according to the five wicked water-related challenges that are described in chapter two. Optimization regarding the consistency between conditions and characteristic as well as the consistency and applicability of the Likert type scoring of the characteristics is done based on Thomas (2004), Sarantakos (2005) and Bird (2009). Tips were given on the order of questions in terms of logic and flow etc. Furthermore, a checklist for creating Likert type response scales was used (Thomas, 2004, chapter two):

- Do the response choices match the needs of your target audience?
- Do any of the response choices overlap?
 - If yes, how can the response choices be revised so they don't overlap?
- Do the response choices lead the respondent to a particular answer?
 - If yes, how can you revise the choices so the respondent will not have difficulty selecting a response choice?
- Will the respondent need to interpret any of your response choices because not enough information was provided?
 - If yes, what other information should be provided so that no interpretation is necessary?

The resulting WG Score Chart had practical-oriented feedback from two supervising experts by email and from my supervisors and from four empiricists from the strategy department of Waternet.

3.2.2 Application strategy WG score chart on the city of Amsterdam

3.2.2.1 General overview of application strategy

The preferred approach for the WG score chart, is a large-N survey as it enhances the reliability and validity of the study. However, given the limited time and means, a more researcher-reliant approach is chosen. This implies that the WG score chart was filled out by a limited number of researcher following the example of the B&A group and VNG & KING governance capacity measurement approaches²³.

The B&A approach starts with setting standards, which is followed by a i) thorough desk study; and ii) interviews with relevant actors and; iii) a societal profile is made in which perspectives of different societal groups are analyzed. A similar profile is made per policy theme, as to focus on acting capacity and learning abilities. VNG and KING have made a tool to measure “how your municipality is doing” compared to others or to past performances based on 15 themes. The WG score chart contains the standards and the profiles listed in the B&A approach, as well as the thematic approach from the VNG & KING tool. The application strategy is comprised of interviews with relevant officials and a desk study to fill out the WG score chart. The results of the WG Score Chart were also presented to both the interviewees and the directors of the water sector.

² http://www.bagroep.nl/content.php?var_content=45

³ <http://www.waarstaatjegemeente.nl/dashboard/>

There are two kind of bias in this study that must be obviated: researcher bias and sample bias. Regarding the sample bias; i) the sample of interviewees was selected based on the five wicked water-related challenges and on multiple levels of governance, a strategy that is further explained below, ii) a desk study was performed to verify the answers given in the interviews, iii) the results were verified with representatives of the UWGN. Regarding researcher bias; i) the WG score chart is substantiated with a literature study, ii) the interviews are verified with information found in the desk study, iii) the completed score chart is sent back to the interviewees with the request for endorsement and constructive feedback to improve the data quality. As bias will be more or less the same for every city GCF, the comparability of cities is ensured.

The interviews that were held are semi-structured, following the questions of the interview outline that is based on the WG score chart. It contains predominantly open-ended questions including behavioral aspects, knowledge and perception (appendix A-5). As the researcher studies the UWGN of Amsterdam in its natural context, she facilitates ecological validity. Ecological validity concerns the comfort of interviewees so that they do not feel urged to provide tinted information.

3.2.2.2 Identifying and contacting interviewees

As the UWGN is being researched in its natural context, there are some advantages to the application of the WG score chart. Firstly, one can get an idea of the extent of the UWGN and its stakeholders. The UWGN is very diverse, highly interconnected and includes thousands of individual actors. The level of heterogeneity of actors is proposed as the research object for integrative and adaptive management processes in quantitative studies social network analysis (Sandstrom and Rova, 2010). A network is a set of dyadic ties among a set of actors. A tie represents an (social) relation between the actors, all of the same type (Wasserman & Faust, 1994). As we define the relation to be challenge-related, following the five identified wicked water-related challenges, we are in fact assessing five different governance networks. For each wicked challenge the main organization(s) was identified and three interviewees were selected from each of the three levels of the management and leadership development pyramid: 1) organizational development, 2) organizational management, and 3) operational management figure 7 (MSCC, 2015). The three levels of management and leadership development are further referred to as strategic, tactical and operational level of governance respectively.



Figure 7. Levels of management and leadership development pyramid on which the stakeholder identification is based.

As demonstrated in figure 7, the three levels of management and leadership (further referred to as governance levels) require different skills, activities and experiences. These skills, activities and experience are useful for identifying the interviewees per challenge based on their administrative duties. By interviewing persons of all three levels a more holistic knowledge of the water challenge at hand may be provided. The thematic approach and the three levels of governance, that are chosen in this research provide the stability and comparability of governance capacity studies in other cities. A number of 15 interviews enhance the possibility and likelihood of comparing many UWGN's.

A small stakeholder analysis was performed based on the above strategy. Therefore the method of sampling can be described as non-probability purposive sampling, with a touch of snowballing. An advantage of snowballing is the access to (relevant) actors in the UWGN. Relying on established relationships enhances the chance of response, thus enhancing the quality of the results.

3.2.2.3 Desk Study

The answers from interviewees were substantiated and verified with literature on the UWGN of Amsterdam. During the desk study, the following documents were sought: policy documents, project action plans, project reports, evaluation reports, strategy reports, communication arrangements, compliance agreements, collaboration forms/arrangements, formal notes, company vision statements, and occasionally newspaper articles. The literature that was used is displayed in appendix A-6.

3.3 Sub-question 3: Improving the WG Score Chart

By applying the WG Score Chart and processing the practical discrepancies, this research bridges the gap between theory and practice. A strategy of data collection has been developed based on constructive feedback of the water management practitioners at Waternet and various research experts. The actual application of the WG score chart is the pilot with which the score chart was improved. Practical limitations that occurred were solved in this section as to give answer to the third research question. Another method that was used was consultation with experts and empiricists. Five water governance experts were consulted on the results of the application. They were asked to give feedback on 1) the validity of the results, 2) the clarity of the figures and 3) the clarity of the evaluation.

4.RESULTS

In this section the results are elucidated. First, the theoretical part is provided. The results of the feedback are further elaborated in section 4.1.1. The changes that are made to optimize the GCF are provided in section 4.1.2. In the practical part the results of the operationalisation, application and resolving practical discrepancies is given in sections 4.2.1, 4.2.2 and 4.2.3 respectively.

4.1 Theory

The literature that was used can be found in the appendix A-2. Further optimization occurs based on feedback from Otto Reinstra and Ingrid Heemskerk in a face-to-face setting. It appears to be quite difficult for the reviewers to provide purely feedback on the theoretical content of the GCF. A general point of attention is raised with regard to the rather Western norms, values and principles underlying the GCF.

4.1.1. Ensuring theoretical inclusiveness

4.1.1.1 Face-to-face review

Feedback from Otto Reinstra

In the discussion with Otto Reinstra the issue is raised about the word *principles* in the search for “good governance *principles*”. In the GCF, principles concerning equity, legitimacy, transparency and accountability have been woven into and throughout the GCF. Here Reinstra acknowledges the cultural-restraint of the GCF. He argues that accountability and transparency can be valued differently in a Chinese city than in a western-European city. A solution is found in utilizing the words *values* and *conditions*, rather than principles, as to remove some of the controversial political weight that is associated with *principles*. The acknowledgement of the *values* could first be tested, Reinstra proposes, before assessing the governance conditions. Another suggestion that he makes is to specifically search for cases (cities) that vary in values as to verify the rectitude of values in the GCF. These suggestions are not inconsistent and were considered by the researcher. Due to time limitations it is chosen not to follow up on Reinstra’s suggestions.

The discussion evolves to the word *good*, in “*good* governance principles.” When is a governance principle considered to be “good”? The researcher replies that “good” governance primarily refers to the extent to which the governance is able to sustainably and adaptively deal with the five wicked water-related challenges. It is explained that the focus of the GCF is to assess the governance capacity that is needed to anticipate on unknown future impacts, risks and uncertainties; rather than on assessing the level of governance as an independent goal. Moreover, the governance capacity required to deal with the wicked water-related challenges is also related to the water management performance regarding the challenges. Therefore, clear communication on the interpretation of the results in the evaluation and presentation is a prerequisite.

Another point of issue that Reinstra raised is the fact that in some countries or regions the possession of water resources is a form of power and is institutionalized as such throughout governance structures. The researcher ensures that the framework is able to detect such structures, i.e. by 4 *stakeholder engagement process*, 2.2 *information transparency* and 2.3 *cross-stakeholder capacity building*. It is however not limiting the governance capacity to deal with wicked water-related challenges per se. This is an important consideration underlying the GCF; there is not just one form of governance that performs best in terms of governance capacity to deal with the wicked challenges. It is very much dependent on context and nature of the challenge.

Feedback from Ingrid Heemskerk

In the meeting with Heemskerk she points out that she has issues with the varying contexts per city. She shares her critique with respect to the veracity of the characteristic levels and she warns to be careful with value judgements. Similar to Reinstra, she recommends checking the levels and answers of the GCF with a wider perspective of cities around the world. Furthermore, she recommends to make clear in interviews that there is room for feedback in case the levels are not recognized in practice in Amsterdam. The researcher replied that feedback from the interviewees is definitely part of the operationalisation. Lastly, it is uttered that the researcher should primarily focus on the added value of the instrument and not merely science. The main interest of the tool should be to get cities to discuss their similarities and dissimilarities, rather than to systemically map cities’ governance organisation. With that Heemskerk recognizes the potential of the GCF and its operationalisation as well as the importance of comparability of cities in an international context.

The feedback from Reinstra and Heemskerk contribute to the way in which the results should be interpreted and presented. This feedback is therefore taken into account in the evaluation of the application and the results later on in this research.

4.1.1.2 Theoretical triangulation workshop

The researchers choose to divide the conditions into Knowing, Wanting and Enabling; matching the steps of the Knowledge Portal of Spatial Adaptation⁴ to enhance the appeal of the GCF among water management practitioners. A point of critique is that Knowing, Wanting, Enabling does not connect to the prevailing perspectives of climate adaptation measures and implementation. It is not recognized by the reviewers in their daily practice. A recommendation is made to connect the conditions, for instance, to the Sustainable Development Goals (SDG). It is argued by the researcher that the connection with the SDG is an interesting remark, but that it relates more to the CB performance indicators, rather than the governance capacity to deal with wicked challenges.

Furthermore, concerns are expressed regarding the implicit equal weight of the conditions and characteristics. It is questioned whether the conditions are of equal importance or whether cities should be able to assign their own weighing. It is argued by the reviewers that the 8 *financial viability* is of greater importance than for instance 1 awareness. Therefore, they argue that it should be weighed explicitly heavier in the assessment. Subsequently, the relevance of conditions in the variety of polities other than democracies and liberal economies are discussed. Not all conditions are considered equally relevant in all governance structures and economies. 4 *Stakeholder engagement process*, for instance, is not considered as relevant in bureaucracies and dictatorships as in democracies. Also between democracies the perceived relevancy of stakeholder engagement may differ. These two arguments form a paradox: on the one hand it is argued that some conditions are more relevant in practice than others, on the other it is argued that the relevance of conditions varies per city or polity. It is therefore chosen not to assign weight to conditions.

4.1.2. Resolving theoretical discrepancies

The changes that are presented are based on the process of Ensuring Theoretical Inclusiveness (section 4.1.1). Basically, the elements of the dynamic, adaptive capacities were clarified to a larger extent. Also the composition and readability was optimized. The rephrasing of politically sensitive texts is based on arguments by Van der Eijk (2001). The exact changes made according to figure 2 are specified and elaborated below resulting in the new proposed GCF (table 6).

1. Awareness

The characteristic *community knowledge* is added to *internalization* and *public support*. *Internalization* is put at the bottom. And *public support* is now called *local Support*. It is reasoned that awareness and knowledge at community level of the water-related challenge at hand is the first step towards sustainable actions (Fussel, 2007; Moser and Ekstrom, 2010; Marshall et al., 2013; Ford and King, 2013). A superlative degree of being aware of the wicked challenge is to agree and support with adaptation measures as to express recognition and acceptance of a measure that is proposed. *Local support* precedes taking action, referred to as *internalization* (Fussel, 2007; Moser and Ekstrom, 2010; Marshall et al., 2013). Awareness on community level concerns the knowledge on the cause, impact, scale and sense of urgency of the challenge (Moser and Ekstrom, 2010). These components are therefore woven into the characteristic levels. *Local support* can occur in many ways. It can be expressed as a collection of signatures, to initiatives in a neighbourhood, to the formation of community clubs concerning the challenge, to crowdfunding activities for a specific climate adaptation measure, or to pilots launched by local entrepreneurs. *Internalization* measures the extent to which sustainability principles regarding the water-related challenges are incorporated in daily behaviour, such as choice for material, water use, waste separation etc.

2. Useful Knowledge

⁴ <http://www.ruimtelijkeadaptatie.nl/nl/>

Data completeness is now named *information availability* because data is only one type of information, information covers both data and knowledge. The level of completeness of information is woven into the characteristic levels as is done with quality and reliability of information. *Accessibility* is now named *information transparency*. Transparency of information refers to both the accessibility of information as well as the intelligibility of information for both experts and non-experts. Besides, it brings the governance value from the OECD more to the forefront as to enhance the appeal of the framework. Cohesion is put at the bottom. From a practical point of view, the availability of information is considered a precondition for the assessment of *cohesiveness*.

3. Continuous Learning

In characteristic 3.1, *smart* is added to *monitoring*. Smart refers to the learning loops that monitoring can and sometimes must facilitate. In the ++ level the title “*smart systemic and regular monitoring*” was formulated to stress the comprehensiveness of the optimal *smart monitoring*. *Smart monitoring* is essential for accountability (UNECE, 2008) and adaptability (Lockwood et al., 2010) of the water system and its governance. *Openness to cross-stakeholder learning* is now named *cross-stakeholder capacity building*. Open attitude to stakeholders is only a part of *cross-stakeholder capacity building*. An open attitude does not imply actual interaction, cooperation or learning (Lockwood et al., 2010). Capacity building refers to the learning of specific skills, knowledge, competences, (Lockwood et al., 2010; Satijn and Ten Brinke, 2011) in order to develop and stimulate creativity and flexibility as well as leadership (UNECE, 2008). Some additions have been made in the levels as to how this is evident in practice. Social learning is perceived to be crucial for adaptive governance of socio-ecological systems (Folke et al., 2005; Pahl-Wostl, 2005). Therefore the quality of the communication process in actor networks is an entirely new element of monitoring according to Pahl-Wostl (2007, p.58). The embedding of social learning into sustainable adaptive management is crucial to understand the overall dynamics of a transformation to sustainable adaptive water management and governance.

4. Stakeholder Engagement Process

Stakeholder engagement is complemented by *process*, since the interest is not in just one engagement session. In fact, this condition encompasses several aspects that were earlier referred to as elements (see appendix A-4 for all elements related to *stakeholder engagement process*). *Inclusiveness* is now called *stakeholder inclusiveness*, to give focus to the information that is required. For the theoretical inclusivity of the condition, the elements were once more listed and put back together in three encompassing characteristics: *stakeholder inclusiveness*, *protection of core values* and *progress and choice variety*. *Openness* is now named *Inclusiveness*. It is reasoned that an open attitude is only a part of the stakeholder engagement process (Lockwood et al., 2010). The description of the characteristic is complemented for reasons of comprehensiveness. As characteristics should not overlap, the content regarding “low influence on end-results” in characteristic *stakeholder inclusiveness* level is deleted as it is part of the second characteristic, *protection of core values*. It is reasoned that the optimal solution considers all stakeholder interests and values as best as possible (Engle and Lemos, 2009; Lockwood et al., 2010). With that core values are protected and there is a certain amount of influence on the end-result.

5. Policy Ambition

The description of the condition was adjusted in order to make the characteristics more consistent and distinctive. *Embedding* is now named *discourse embedding* to specify the question to political discourse. It drops one place in the order of the characteristics and *ambitious and realistic goals* is now the first characteristic. Furthermore way policy documents address uncertainty is made explicit in the Likert type description of *ambitious and realistic goals* as dealing with uncertainty is an important component of adaptive policy (Haasnoot et al., 2013; Satijn and Ten Brinke, 2011). Having ambitious and realistic goals is one thing. The next importance is the embedment of the goals in the local policy and political discourse in order to ensure support needed to effective implementation (Van Rijswijk et al., 2014). It can be argued that the political support actors can play an important role in media-discourse as well in proliferating the goals and targets.

6. Agents of Change

Initially this condition was named *leadership*. The association with leadership is that leadership is predominantly executed at a high(er) level of governance with the appurtenant amount of “power”, (Van der Eijk, 2001). It is chosen not to limit the condition to actors in leading positions but include actors that can influence the policy direction from every level of management governance or research. *Agents of change* therefore fits better with regard to what we want to measure.

7. Multilevel Network Potential

This condition initially consisted of: *cooperative power*, *room to manoeuvre* and *political power*. It is now composed of *room to manoeuvre*, *clear division of responsibilities* and *authority*. *Cooperative power* was integrated into *room to manoeuvre*. *Room to manoeuvre* measures the extent to which a variety of alternatives or approaches can be developed depending on the freedom, opportunity and possibility given to actors within the UWGN (Gupta et al, 2010). To have the room to manoeuvre is an important step in finding suitable action perspectives. *Clear division of responsibilities* is the second step once a partnership or other collaboration form has been established. To what extent this partnership has the authority to make decisions is measured in the third characteristic, *authority*. There is now a logical build-up of characteristics following: autonomy, legitimacy and authority. *Political power* is a contested and politically sensitive concept, therefore it is now named *authority*. Moreover the political power must be based on legitimacy (Lockwood et al., 2010). Legitimacy can be obtained in various ways. What is important is that the authority is well supported by the stakeholders (Lockwood et al., 2010). Furthermore, freedom, opportunity and possibility to form (ad-hoc) (fit-for-purpose) partnerships are woven into the levels for consistency with the description.

8. Financial Viability

The order of the characteristics was rearranged: *affordability*, *willingness-to-pay*, *financial continuation*. It is argued that *affordability* precedes *willingness-to-pay* (Pavoola and Adger, 2002). Likewise can it be argued that *affordability* and *willingness-to-pay* precede *financial continuation*. Furthermore, the description and levels of Willingness-to-pay are adjusted. It is true that *willingness-to-pay* measures how expenditures on water and climate adaptations services are perceived. This is based on how costs & benefits and risks & opportunities are perceived, as well as a sense of urgency or worry regarding the subject (Ford and Berrang-Ford, 2011; Ford et al., 2011b; Boykoff et al., 2013). Trust in local authorities, indeed, is a factor as well (Lockwood et al., 2010). It is further woven into the characteristic levels as it can serve as an indicator.

9. Implementing Capacity

This condition was called *implementing power*. The word power can be seen as politically sensitive and contested, therefore capacity is a better option. It is more in line with the scope of the GCF. Furthermore, *action plans* is now called *preparedness*. It is reasoned that the presence of action plans are an indicator of an UWGN's *preparedness*. Besides action plans; scenario-building, risk analysis and management, crisis management in documents or in human activities are also indicators for *preparedness*. In characteristic 9.1 *policy Instruments*, “transitions” is replaced by “approaches” in the ++ level. Otherwise the ++level reads “Effective instruments enhance sustainable transitions”. In other words: a state of sustainable transition is the best a city can do. “Approaches” covers a wider set of activities that is more applicable to the measure. Throughout the levels that describe *preparedness*, it is also described if and how resources and preparations are allocated (Gupta et al., 2010).

The resulting GCF (see table 6) served as input for the operationalisation, for which the results are given in the next section.

Table 6. GCF outline of conditions and characteristics

| | | |
|----------|------------------------------------|---|
| Knowing | GC1 Awareness | 1.1 Community knowledge 1.2 Local support 1.3 Internalization |
| | GC2 Useful knowledge | 2.1 Information availability 2.2 Information transparency 2.3 Knowledge cohesion |
| | GC3 Continuous learning | 3.1 Smart monitoring 3.2 Evaluation 3.3 Cross-stakeholder capacity building |
| Wanting | GC4 Stakeholder engagement process | 4.1 Stakeholder inclusiveness 4.2 Protection of core values 4.3 Progress and choice variety |
| | GC5 Policy ambition | 5.1 Ambitious and realistic goals 5.2 Discourse embedding 5.3 Cohesive policy |
| | GC6 Agents of change | 6.1 Entrepreneurial agents 6.2 Collaborative agents 6.3 Visionary agents |
| Enabling | GC7 Multi-level network potential | 7.1 Room to manoeuvre 7.2 Clear division of responsibilities 7.3 Authority |
| | GC8 Financial viability | 8.1 Affordability 8.2 Willingness to pay 8.3 Financial continuation |
| | GC9 Implementing capacity | 9.1 Policy instruments 9.2 Legal compliance 9.3 Preparedness |

4.2 Practice

In section 4.2.1 the results of the operationalisation are given, starting with the composition of the questionnaire, followed by the results for the application strategy. Section 4.2.2 reveals the results of the application of the WG score chart on Amsterdam. Section 4.2.3 elaborates on the practical discrepancies and how they were dealt with.

4.2.1 Operationalisation.

4.2.1.1 Composing the WG score chart: Identifying and assigning indicators

Indicators were identified based on four strategies as explained in chapter three. The strategies are used interchangeably. An example is given below for 3.1 *smart monitoring*. Subsequently, choices for readability and structure are elaborated. Lastly, the feedback on the WG score chart is provided.

Strategy 1

The identified elements that form 3.1 *smart monitoring* are: presence, completeness, reliability, level of learning and frequency. The logic model applied for characteristic 3.1 (*smart monitoring*) is given in table 7.

Table 7. Logic model applied to characteristic 3.1 (*smart monitoring*) (Source: INECE, 2008).

| Inputs | Outputs | Intermediate outcome | Final outcome |
|---|---|---|--|
| <i>Resources</i> | <i>Activities</i> | <i>Behaviour change</i> | <i>Impact</i> |
| Personnel, Instruments, Guidelines/ Regulation | Variety of methods and sources: Automatic measurement, Manual measurements, Crowd sourcing, Quality and quantity measurements | Increased insights in processes Change in strategy Frequency of measurement Improving and implementing learned lessons | Increase of compliance Increase in effectiveness and efficiency Higher standards Completeness of information Reliable data Single-, double- or triple-loop learning |

It is argued that if there are no inputs, there is no monitoring present. Likewise, if some resources are present as well as activities, behavioural changes and impacts, then a monitoring system is present but is limited to measure singular effectiveness of efficiency criteria.

Strategy 2

Based on Pahl-Wostl (2009), the triple-loop learning theory is applied to construct the Likert type classes for characteristic 2.1 (*smart monitoring*). Single-loop learning involves making improvements to increase efficiency and effectiveness as to recognize alarming situations according to a set of norms and values within the dominant paradigm. Second-loop learning involves changing the frame of reference and calling into question the guiding assumptions. It is about reframing the problem, the scope or the goals. Triple-loop learning involves gaining and using critical insights to alter the dominant paradigm and improving the set of norms and values (p.359). Single-loop learning implies a certain path-dependency, which corresponds with the middle-level of governance performance (Indifferent). In this line of reasoning double-loop and triple-loop learning could indicate an encouraging and very encouraging level of governance respectively. In the article a set of indicators per loop is given (see table 8).

Table 8. Triple-loop learning theory (Pahl-Wostl 2009), provide indicators levels for upper three levels of characteristic 2.1 (*smart monitoring*).

| Level | Loop | Indicator |
|--------------|-------------|--|
| 0 | Single | Refinement of actions to improve efficiency and effectiveness |
| + | Double | Change boundaries of system analysis, change in actor network, reflection on goals and problem-framing |
| ++ | Triple | Change in regulatory frameworks, practices in risk management, Change in value structure |

Strategy 3

INECE (2015) provided a report on the state of the art monitoring and evaluation techniques, as well as guidelines for self-governance. The mentioned techniques were not used as indicators; but the availability of performance reports, self-governance aspects such as benchmarks and key performance indicators, monitoring instrument development reports suggest an encouraging level of monitoring. Likewise for 9.2 *legal compliance*. The occurrence of self-governance aspects such as benchmarks and

key performance indicators are found in situations where legal compliance is encouraging to very encouraging. Also the availability of performance reports and the existence of external auditing authorities indicate an encouraging compliancy level. For viewing all indicators, check the complete WG score chart in appendix A-8.

Structure

Besides identifying and assigning indicators, the measurement indications were formulated as actual questions. The combination of indicators were specified per characteristic so that respondents/interviewees can specifically formulate their answers and know what to expect in the performance levels.

Review

The resulting WG score chart was reviewed by the supervising expert and three empiricists. The expert pointed out contradictions; recommended the inclusion of time periods, omissions, rephrasing and specification in some instances; eliminated governance terminology; and gave multiple perspectives on some of the logic that was applied by the researcher.

Feedback from the empiricists concerned mainly the extensiveness and difficulty of the document. Reviewers explained that they receive requests to fill in questionnaires on a daily basis. Therefore, it must be easy to fill out. The WG score chart, on the contrary, is difficult to grasp for people that are not read up on governance literature. It was strongly advised to be more specific on the questions asked regarding delineation of concepts. Clearly, the document is too large and comprehensive making it unsuitable for a survey or for questioning in interviews. This feedback provided valuable insight to improve the application strategy. Additionally a point of consistency was raised. One of the empiricists fairly mentioned that if a characteristic is comprised of four elements, all elements must be accounted for in all five performance levels unless otherwise specified. The practicable feedback regarding the WG score chart has already been incorporated in the complete WG score chart in appendix A-8. Based on this constructive feedback the application strategy is improved which is described in the next section.

4.2.1.2 Application Strategy

Here, the results of the application strategy are provided. This section is divided into two parts: Interview structure and Interviews.

Interview structure

As the feedback from the WG score chart session made clear, the WG score chart is too comprehensive and complex to be used as a survey or an interview outline. Therefore, the initial approach for interviewees was changed. Instead of sending relevant parts of the WG score chart to the respondents or going through these together in the form of an interview, the elements per characteristic and conditions were reformulated into a tangible questions as to create a document for semi-structured interviews. The difficulty of the WG score chart, besides wording, is the level of compression of indicators. An example is given for 3.1 *smart monitoring* (see appendix A-8, p.43). The elements that form *smart monitoring* are: presence, completeness, reliability, level of learning and frequency. In the semi-structured interviews each indicator is addressed in a separate question (figure 8).

GC3.1 Smart monitoring:

The indicators for a certain level of smart monitoring are composed of: presence, completeness of information that is reliable and of quality, level of learning.

- Does monitoring occur?
- Is there monitoring equipment in place? What kind of monitoring types are utilized? How often is monitoring performed?
- Has monitoring led to measures of efficiency improvements and effectiveness enhancement?
- Is monitoring sufficient to recognize alarming situations, underlying trends, processes and relationships?
 - If yes, has that changed the monitoring strategy?
 - If yes, in what way?
- Has monitoring resulted in a change of fundamental beliefs regarding the water system/policy measure, resulting in for instance new regulatory frameworks, change of boundaries and power structure, new actors and new risk management approaches?

Figure 8. Interview outline. Given the comprehensiveness and complexity of each characteristic, questions for each of the 2 to 5 elements per characteristic have been formulated. Here an example of characteristic 3.1 (*smart monitoring*).

Some questions are backed-up by a sequence question to verify the initial answer. The interview outline commences with an introduction of the researcher and her credentials. It was explained what the study implies, what the scope is, why the study is being conducted and how the results will be used as advised by Dunn (2005). The interview outline is provided in appendix A-5.

Based on the interviews and desk study, the GCF has been scored using the WG score chart. It is also used to communicate the results back to the respondents to confirm the results or provide constructive criticism to improve the scores. This reduces possible researcher bias. Furthermore, the WG score chart ensures a consistent application of the GCF in different cities.

Interviews

After contacting the interviewees by mail, approximately sixteen out of twenty actors from the UWGN responded positively to the interview invitation. A total of sixteen interviews were held. The list of interviewees is given in appendix A-7 along with their job description. The interviewees are selected based on their expertise regarding the 5 wicked water-related challenges and by their level of governance (table 9). Thirteen interviews are held that focused on the water-related challenges. Three other relevant stakeholders (table 10) have been interviewed in order to provide a balanced and complete assessment of the entire urban water network involved in addressing the each of the 5 wicked water-related challenges. Most water-related challenges are well represented, however it was difficult to find respondents for the governance network concerning UHI. In Amsterdam UHI is not recognized as a problem, therefore the network is very small.

Representation

The responsibility for dealing with urban heat stress is a municipal responsibility that is assigned to the public health department (GGD). There is one person in particular that deals with the governance of this challenge. This person is temporarily unavailable, however there is no one that took or could take over his tasks. Alternatively Geertje Wijten (from the municipal department of sustainability and active in the Rainproof project) is interviewed on the subject of UHI. Rainproof is actually part of the Flood risk challenge, yet the program takes into account urban heat stress where possible. Maarten Claassen, strategic advisor at Waternet, is contracting Rainproof and he is available to represent the program for

both Flood Risk and UHI. Solid Waste Treatment has only two respondents, due to a rather late identification of the fifth water-related challenge.

Table 9. Overview of interviewees that participated in the Governance Capacity Assessment of Amsterdam. Assigned for each of the 5 identified wicked water-related challenge and selected by governance level (i.e. strategic, tactical and operational).

| | Flood risk | Urban Heat Island | Water Scarcity | Wastewater Treatment | Solid Waste Treatment |
|-------------|--------------------------------|-------------------|------------------|----------------------|-----------------------|
| Strategic | Wiegert Dulfer | | Gerard Korrel | Rolf Steenwinkel | |
| | Rob Koeze/ Maarten Claassen | Maarten Claassen | Ed Cousin | | Peter Simoës |
| Tactical | Geertje Wijten | Geertje Wijten | Martine Lodewijk | Kees van der Drift | Mark Nijman |
| Operational | | | Jeroen Ponten | Lex Lelijveld | |

Table 10. Overview of the selected interviewees per condition or characteristic.

| Condition/characteristic | Name |
|--------------------------|------------------|
| 2 Useful knowledge | Alice Fermont |
| 3 Continuous learning | Ingrid Heemskerk |
| 9.3 Preparedness | Jos Ketelaars |

Quality and quantity of interviews

Most interviewees have been asked about a few conditions in order to find in-depth knowledge regarding these governance aspects. Three interviewees were interviewed on the full extent of the Interview Outline. Due to the variety in levels of governance, the interconnectedness and cooperation between these levels, the interviewees were able to verify information and obviate gaps in one another's interviews. Considering the water cycle approach of water management in Amsterdam and the level of integration of water systems, verification among themes was possible as well.

The interviews were predominantly held in the respondents' familiar working environment and were therefore comfortable to give honest and high quality answers. Many examples from personal experience were given, enabling the researcher to validate the initial answers given.

Performing a desk study

The desk study is an important part of the application strategy as it ensures completeness and confirmation of the knowledge that is gathered during the interviews. Much information could be found on the internet and the researcher was given access to the hard drive of Waternet. The literature that was used for this part of the application is listed in appendix A-6. The sources are numbered and so the numbers in this section refer to the sources in the appendix.

With respect to 5 *policy ambition* and 7.2 *clear division of responsibilities*, the content of policy documents provide a lot of information regarding the responsibilities of involved parties and qualitative and quantitative norms of a subject. Policies from regional and local governance levels are predominantly in support of the national policies. The relevant water policies are integrated to a high extent. The series of policy documents give the impression that the level of cohesion and consistency among policies within and between sectors is high. The policy discourse can be described as a triangular frame of sustainability, applicability/reliability and economic viability. Projects, visions and strategy is embedded in the policy discourse when it is clear on three aspects of the policy discourse (sources: 1, 2, 5, 7, 8, 9, 10, 14, 15, 17, 19, 20, 25, 26, 28, 29, 33, 35, 38, 39, 40, 41, 42, 44, 45).

Also the variety of 9.1 *policy instruments* is derived from these documents. Policy instruments range from awareness campaigns to educational projects, to subsidies, to licensing and amercing, and fiscal instruments (various documents and webpages of Waternet, AGV and the Municipality of Amsterdam). The presence of an enactment of compliance indicates there is a high level of 9.2 *legal compliance* (Keur, 2009).

Compared to other cities, Amsterdam's costs for drinking water are fairly low. This is a particular aim of the UWGN in Amsterdam. The waste collection tax is relatively high in Amsterdam⁵. Based on this information water services are argued to be affordable. To a certain extent climate adaptation is affordable as well. Note that climate adaptation measures can range from acquiring a rain barrel and reducing pavement in gardens to water storing rooftops and the construction of infiltration wells (source 50). Another example is home insulation. Unfortunately, the subsidy for home insulation is canceled per July 1st, 2016 (source: 52).

In the various strategy reports, visions and policies there is recognition of the need to anticipate on near and distant future challenges (sources: 48, 49, 50, 53). This contributes to the assessment of 1.3 *internalization*, 6.1 *visionary agents of change* and 9.3 *preparedness*, since scenarios are built and risk assessments are made as well as a comprehensive set of action plans for calamities⁶. This look-out also strongly enhances the recognition of knowledge creation for well-informed decision-making, which supports the assessment of 2 *useful knowledge*. Regarding 6.3 *visionary agents of change*, vision statements from Waternet and AGV are progressive and concrete with regard to sustainability goals. Its vision statements inform the researcher about a high level of 1.3 *internalization* of sustainable behaviour.

Project action plans provide a similar series of information regarding the responsibilities of involved parties and qualitative and quantitative norms of a subject, but at more operational level. Project plans also give more insight in the range of the involved parties and their role and tasks within that project, which facilitates the assessment of 4.1 *stakeholder inclusiveness* and 7.2 *clear division of responsibilities* (sources: 6, 10, 18, 22, 23, 24, 27, 34, 36, 37, 44, 46-50, 52, 53). In surface water management projects, project development is naturally inclined in a participatory approach consisting of mixed modes of engagement this facilitates the assessment of 4.2 *protection of core values*. Regarding 4.3 *progress and choice variety*, it is found that the moments of stakeholder engagement are clearly described in the communication standard for project development concerning Water Board activities (source: 12). In the case of Rainproof, stakeholders are invited and motivated to participate (source: 50). It is unusual to publicly report on stakeholder meetings, however such a report was found on the internet on a stakeholder meeting about the water vision for Amsterdam in 2040 (source: 3).

In some cases, the availability and accessibility of documents provide parts of an answer. Such is the case for evaluation reports. The presence of evaluation reports as well as evaluation formats, tell the researcher that there is in fact evaluation that is systemic. It is difficult to find such reports or they are

⁵ <https://www.coelo.nl/index.php/wat-betaal-ik-waar/gemeentelijke-belastingen-2016>

⁶ Various unpublished documents from the server of Waternet (T: AW : 0_Calamiteit&crisis)

difficult to understand for non-experts. This information is utilized to assess 2 *useful knowledge* and 3.2 *evaluation*⁷.

1.1 *Community knowledge* is quite low in Amsterdam, with regard to the water-related challenges' impact, risk, frequency and urgency. 1.2 *Local support* is quite well concerning implementations to mitigate or adapt to challenges that people have experienced. Moreover, there are many pilots, demo's and living labs as to advance in innovative adaptation (source: 48, 50, 53).

4.2.2 Application

This section provides the scores of the 9 governance conditions and 27 characteristics. First, the overall scoring is provided, followed by the separate scores for the wicked challenges that are 1) Flood risk, 2) Urban Heat Islands (UHI), 3) Water scarcity, 4) Wastewater treatment, and 5) Solid waste treatment.

Overall scoring

Figure 9 shows the average governance conditions scores of the 5 wicked water-related challenges and figure 10 shows the ranked average scores for characteristics belonging to the governance conditions.

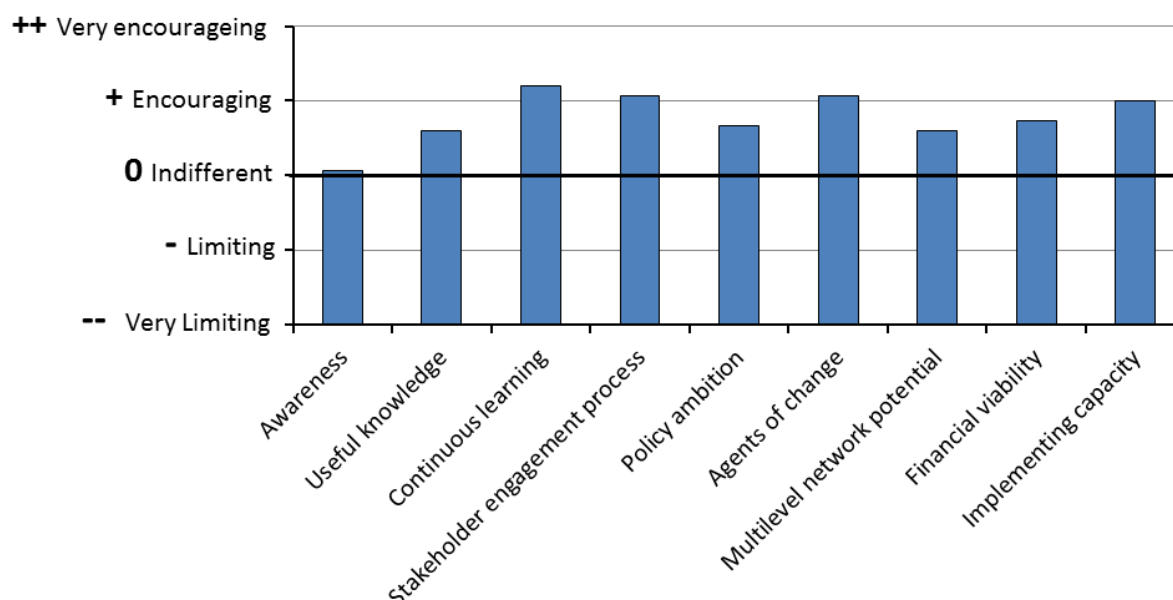


Figure 9. Overall scores of the 9 water governance conditions in Amsterdam. Scores range from very limiting (--) to very encouraging (++) the governance capacity needed to address wicked water and climate adaptation challenges.

⁷ Various unpublished documents from the server of Waternet (T: AW)

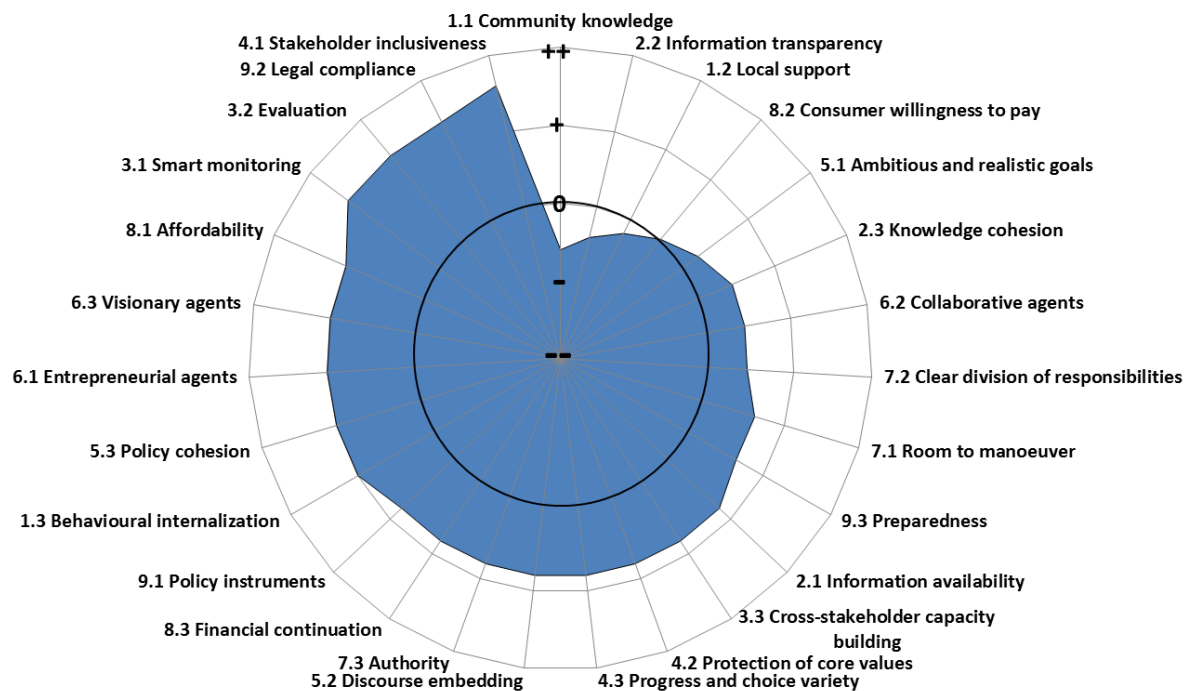


Figure 10. Overall scores of the 27 characteristics showing the average water governance performance of the 5 wicked water-related challenges in Amsterdam. Scores ranges from very limiting (--) too very encouraging (++) the governance capacity needed to address wicked water and climate adaptation challenges.

The overall score of the 5 wicked water-related challenges, that are assessed for Amsterdam, is generally high (figure 9). In fact, none of the 9 governance conditions is actually limiting the development of governance capacity needed to address wicked water-related challenges. However, some characteristics of these conditions are found to be limiting the governance capacity (figure 10). Amsterdam excels in 3 *continuous learning* which is also evident from the high scores of 3.1 *smart monitoring* and 3.2 *evaluation*, which are both found to be very encouraging. Also 4 *stakeholder engagement* and 9 *implementing capacity* are scoring high. This is evident from the high scores for the associated characteristics 4.1 *stakeholder inclusiveness*, 4.2 *progress and choice variety* and 4.3 *protection of core values*, 9.1 *policy instruments* and 9.2 *legal compliance*.

1 *Awareness* and 2 *useful knowledge* are least and second lowest performing conditions. If we take a look at figure 10, we see that their associated characteristics, i.e. 1.1 *community knowledge*, 2.1 *information transparency* and 1.2 *local support* are found to be limiting the governance capacity to address challenges of water and climate adaptation. Therefore, the most effective and efficient improvements can be achieved by addressing the limiting characteristics by raising awareness and heading towards a high level of accessible and co-created knowledge. Given that the characteristics and conditions are reciprocal and reinforcing, condition 1 *awareness* is expected to enhance adaptive capacity (Marshall et al., 2013; Ford and King, 2015) and the willingness to take action and invest in resources (Ballard Ltd, 2008; Raaijmakers et al., 2008). It is thus expected to enhance 1.3 *internalization*, 8.3 *willingness-to-pay* and 9.3 *preparedness* in terms of urgency awareness. This means that when awareness increases (also in media) water and climate change adaptations move up the political agenda (McCombs, 2004) which will result in more vigour to take action.

Likewise, building more 2 *useful knowledge* is expected to further enhance condition 3 *continuous learning*, as well as characteristic 6.2 *collaborative agents*, 3.3 *cross-stakeholder capacity building* and 5.3 *cohesive policy*. Clear documentation that is intelligible for both experts and non-experts is to prevent miscommunication, knowledge gaps and fragmented policy (Rogers and Hall, 2003; Fussel, 2007;

Ballard Ltd, 2008; Corfee-Morlot et al., 2009) as it increases the openness to stakeholders to co-create, collaborate and learn from each other. It also enhances knowledge-based decision-making (Engle and Lemos, 2009). Aligning the inputs and outputs of i) various data-generating systems and methods, ii) processes and iii) policies may result in more efficient implementation, leaving more time and resources for development of knowledge and insights. Furthermore, condition 5 *policy ambition* is not found to be really pulling the cart of governance capacity towards addressing wicked water-related challenges. It is uttered by various interviewees that the policies in general are cohesive and consistent but that ambition is low. They would label the policies realistic rather than ambitious. Increasing the level of ambition in policies can facilitate decision-making and enhance vigour to take action.

Flood risk

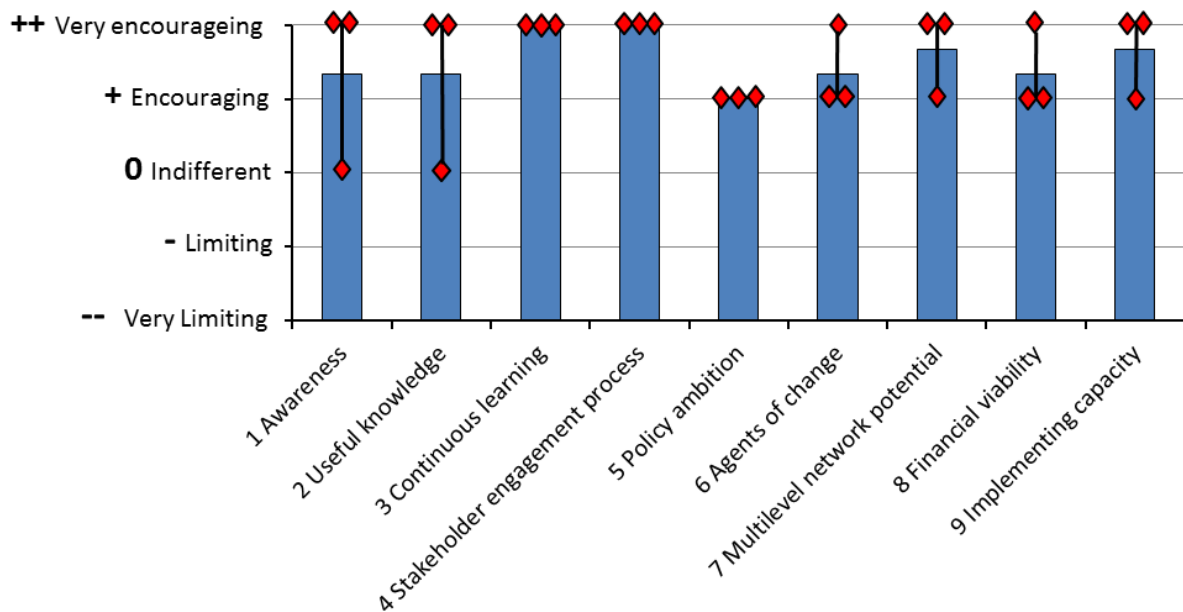


Figure 11. Scores of the 9 conditions determining the governance capacity to address flood risk in Amsterdam. Score ranges from very limiting (--) to very encouraging (++) the governance capacity to resolve challenges regarding flood risk.

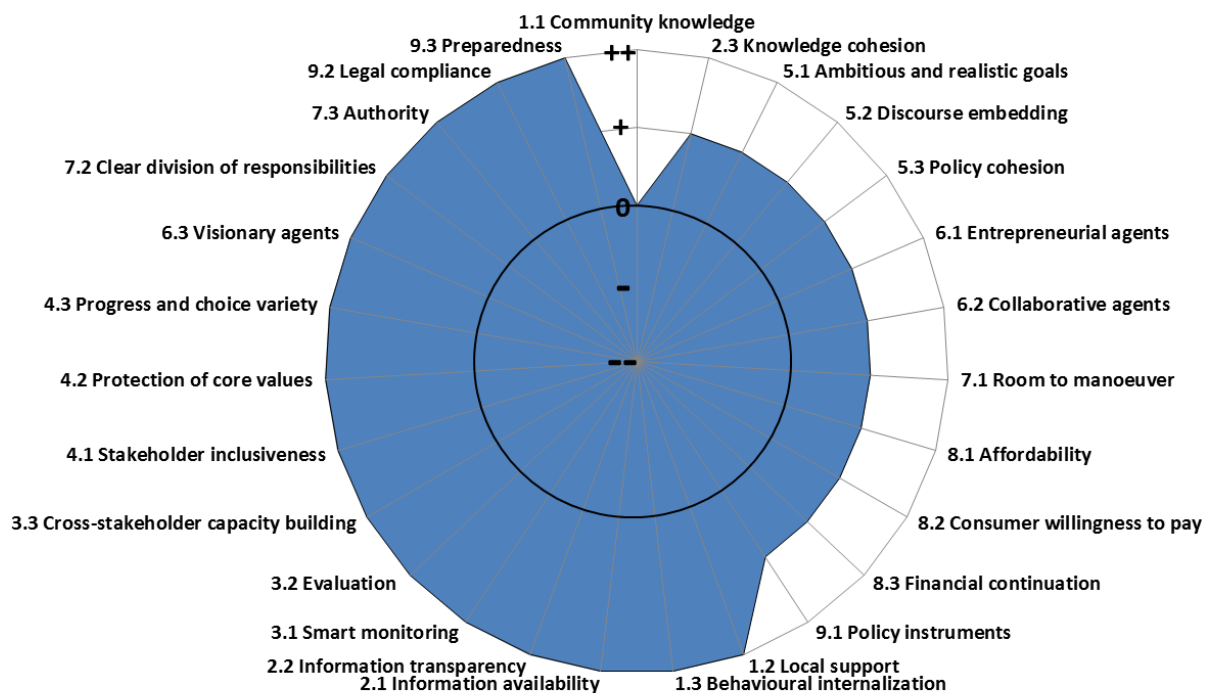


Figure 12. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding flood risk. Score ranges from very limiting (--) too very encouraging (++) the governance capacity to resolve challenges regarding flood risk.

Amsterdam is scoring high on the subject of flood risk as none of the conditions were found to be limiting the governance capacity to address the existing and future flood risks (figure 11). In fact, almost half of the characteristics is very much encouraging (++) the governance capacity required to deal with flood challenges (figure 12). Similar to the overall score (figure 9), condition 3 *continuous learning* and 4 *stakeholder engagement process* are scored best.

Policy and technical measures are smartly monitored, evaluated and co-created. All relevant stakeholders are included or at least represented in decision-making processes, where decisions are made at the end of the process after considering the range of alternatives. The solutions and measures that are implemented are predominantly optimal outcomes of the decision-making process.

Monitoring and evaluation (characteristics 3.1 en 3.2) are important parts of the water sector as it is part of legal compliance agreements. The water governance in Amsterdam is characterized by self-governance following national benchmarks from the ministry of Environment and Infrastructure and regional legal arrangements that are stated by the provincial government. The Keur is a regulation prepared by Waternet, including commands and prohibitions with respect to the establishment, use and maintenance of flood defences, banks and water bodies (Keur AGV, 2011, p.5). Waternet is the executing organisation for legal obligations to the public from Water board Amstel, Gooi and Vecht (AGV) and the municipality. The Keur is approved by the commissioning party Waterboard AGV. Waternet is responsible for operationalising the full water cycle in the municipality of Amsterdam.

The second lowest scoring governance condition, though it is indicated to be encouraging effective governance, is 5 *policy ambition*. Interviewees clearly stated that the policies that apply to flood risk are consistent and congruent, but lack ambitious goals (Wiegert Dulfer, Rob Koeze, Maarten Claassen, appendix B-1,2,3). Furthermore, 2.3 *knowledge cohesion* and 8 *financial viability* show room for improvement. The governance of flood risk can be distinguished between nuisance flooding and actual

flood risk. Nuisance flooding is primarily governed by a bottom-up approach. It involves a cohesive set of policies (GRP, Agenda Groen, Agenda Duurzaamheid, appendix A-4) and policy instruments and actions (subsidies, awareness programs, Rainproof website). The organisation of information is clear to all stakeholders via the website of Rainproof. However, it is still difficult to connect Rainproof to water control systems. For actual flood risk, information is also well organised even in a national database (Landelijke Informatie Water en Overstromingen; LIWO⁸), which enhances cooperation between water boards. However, it can be argued that the new dike standardization could be better aligned with the local systems and approaches in place (Rob Koeze).

8.1 *Affordability* of water and climate change adaptations is considered to be very encouraging. Various taxes ensure that basic water and climate adaptation services are affordable for everyone. Special arrangements are made for those who cannot afford it. Rob Koeze explains that the dike norms are established based on an equal rate of flood risk with two additional criteria based on economic risk and group risk. Many city wide projects for climate adaptation are developing as well (Maarten Claassen). However, since many researches and projects lean heavily on the taxes, the *willingness-to-pay* among the wider stakeholder network can be considered less encouraging. Still, it must be noted that 1 *awareness* of Flood risk is the highest compared to awareness of other water-related challenges and it exceeds the overall score of 1 *awareness* which is generally the lowest scored condition. An explanation for this occurrence can be given by the frequency of nuisance flooding (Rob Koeze) and so people experience this challenge more than other water-related challenges.

⁸

<http://www.helpdeskwater.nl/onderwerpen/applicaties-model/applicaties-per/watermanagement/watermanagement/liwo/>

Urban Heat Island

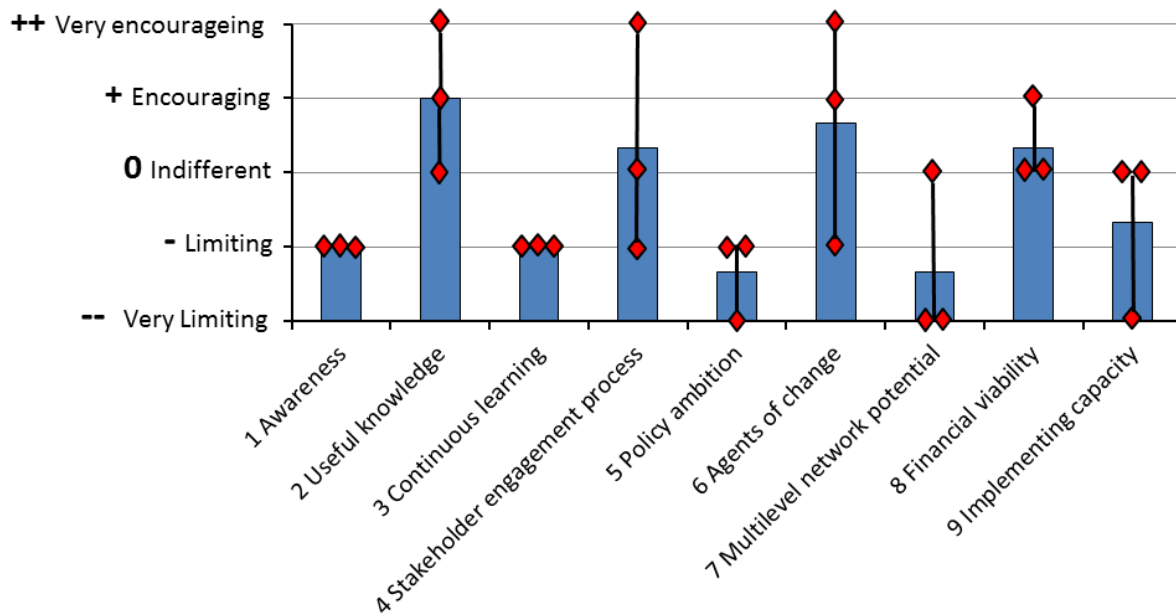


Figure 13. Scores of the 9 conditions for governance capacity in Amsterdam regarding urban heat islands. Score ranges from very limiting (--) to very encouraging (++) the governance to resolve challenges regarding urban heat islands.

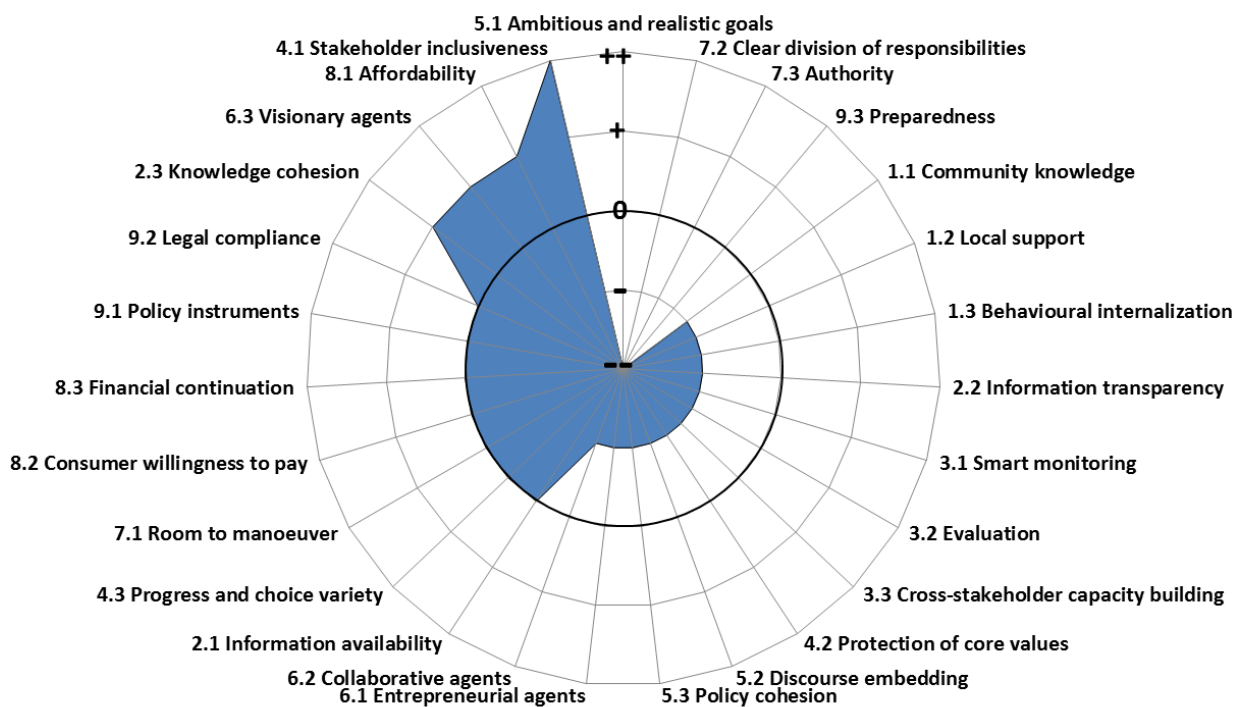


Figure 14. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding urban heat islands. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to resolve challenges regarding urban heat islands.

What is striking about the governance concerning the UHI effect, when looking at figure 13 is that most conditions are limiting the governance capacity to deal with this challenge. Only four characteristics are encouraging (+), some are indifferent (0) and the rest is limiting (-) or very much limiting (--) (figure 14).

4 *Stakeholder engagement process* scores best, whereas conditions 5 *policy ambition* and 7 *multilevel network potential* score least of all.

The reason for this, among others, lies with conditions 1 *awareness* and 5 *policy ambition*, which has the second lowest score. In policies the UHI effect is mentioned only a few times. In the Agenda Groen and Agenda Duurzaamheid actions regarding UHI are mentioned in such a way that the governance of UHI has to hitchhike on the policies for “dry feet” and that climate adaptation measures such as increasing the urban vegetation index contribute to dealing with UHI. There are no concrete targets regarding governance of UHI on any level of governance applicable to the municipality of Amsterdam (Geertje Wijten, appendix B-4). Furthermore, there is a lack of 1.1 *community knowledge* on the subject and thus a lack of 1.2 *Local support* for intensive measures addressing this challenge.

UHI is most prominently accounted for in the city level program called “Rainproof”. Rainproof is initiated by the UWGN, which is not lawfully responsible for addressing UHI. UHI falls under the responsibility of the municipal health services (GGD). Unfortunately, UHI is not well-grounded in policies, therefore rainproof measures predominate decision-making regarding Spatial Adaptation projects. This occasionally leads to inconsistent implementation measures regarding the governance of UHI and rainproof, in which UHI governance is sometimes neglected. If for instance a decision is to be made to construct a small water garden to facilitate the drainage and runoff of storm water the water garden may in fact contribute to the temperature in that area depending on the depth of the water feature (Van der Hoeven en Wandl, 2013). In unfavourable circumstances the water feature increases the temperature, contributing to the UHI effect. In that case a green area would be preferred over a water garden. 4.1 *Stakeholder inclusiveness* is scored to be very much encouraging (++) the governance capacity to resolve UHI effects. As UHI are best accounted for in Rainproof, the stakeholder characteristics 4.1 *stakeholder inclusiveness* and 6.3 *visionary agents* are scored based on the Rainproof program. However, as UHI is of marginal importance in the Rainproof program, the higher scores do not fully represent the actual scores of these characteristics with respect to UHI.

Governance of UHI therefore lacks authority, policy and most importantly: human resources. It has proven difficult to find people that work on this subject. Only one person was assigned to work on this. Unfortunately, this person was not available for several months. Two other GGD employees worked on related matters, but neither felt comfortable to speak on behalf of the municipality regarding UHI due to insufficient knowledge on this subject.

It is clear that the governance of UHI has much room for improvement. In Amsterdam two knowledge institutes have initiated to address UHI. The Technical University of Delft and the Amsterdam University of Applied Sciences have researched the impact of UHI in Amsterdam and which areas and groups of people are most at risk. The TU Delft is member of Climate Proof Cities, a consortium that is initiated in response to the national research program “knowledge for climate” (*Kennis voor klimaat*). Hence, the positive score for 6.1 *entrepreneurial* and 6.2 *collaborative* agents of change. The national research program urges close cooperation on integrated adaptation-research (Van der Hoeven en Wandl, 2013). Since the information produced by the above actors is openly accessible on the internet that is understandable for both experts and non-experts, 2.2 *information transparency* is scored to be very encouraging the governance capacity to deal with UHI challenges. At this moment research institutes are predominantly the network concerning UHI. There is an international level playing field and so there is 7.1 *room to manoeuvre*. Since UHI effects are not explicitly mentioned on the political agenda 6.3 *visionary agent of change* is limiting the governance capacity to deal with UHI. Geertje Wijten suspects that the challenges of UHI will be part of the next municipal elections and that UHI is gaining momentum.

Water scarcity

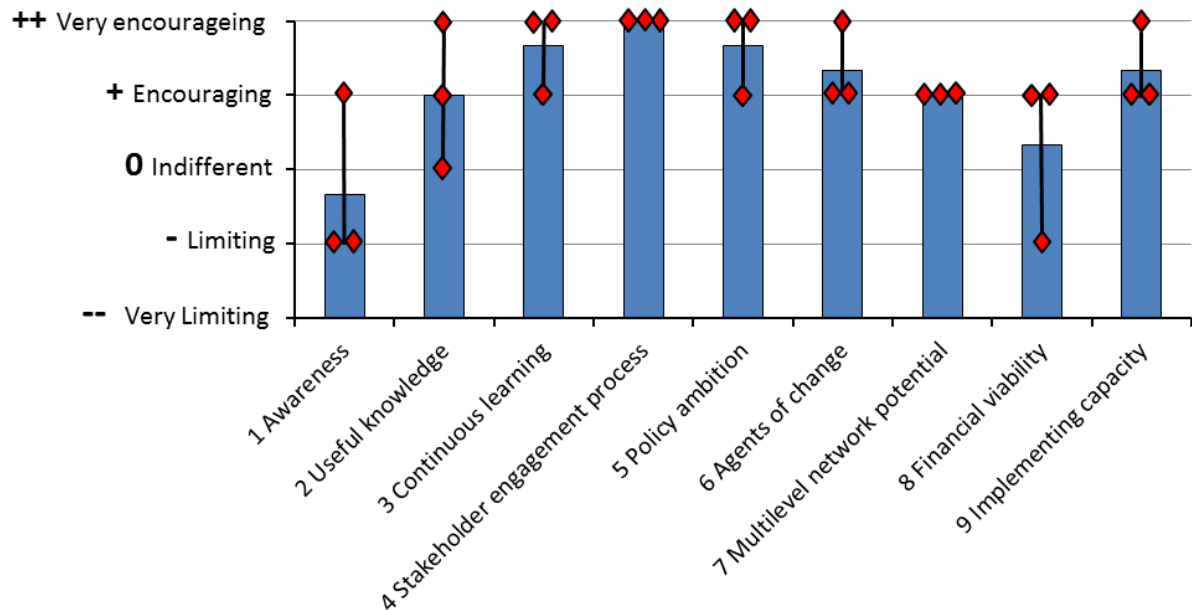


Figure 15. Scores of the 9 conditions for governance capacity in Amsterdam regarding water scarcity. Score ranges from very limiting (--) to very encouraging (++) the governance capacity, that is needed to resolve water scarcity challenges.

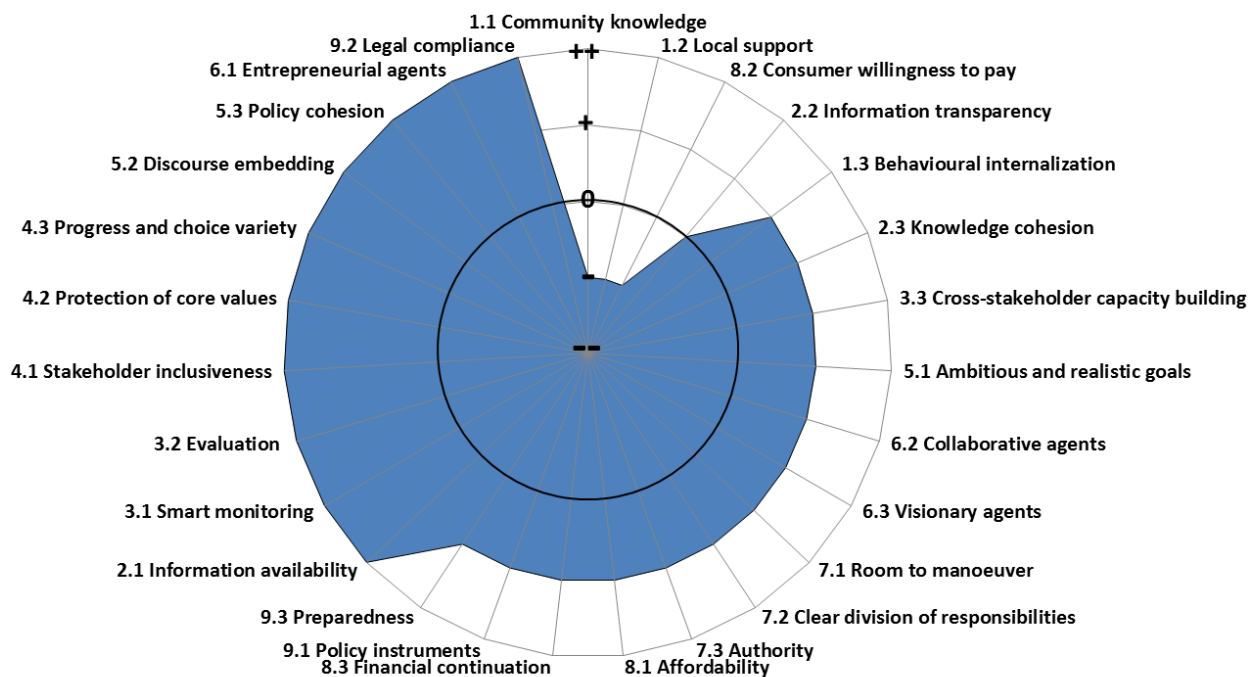


Figure 16. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding water scarcity. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to challenges regarding water scarcity.

Most governance conditions are considered encouraging (+) to very encouraging (++) the governance capacity to resolve challenges of water scarcity (figure 15). Condition 4 *stakeholder engagement process* is, on all characteristics, very much encouraging the governance capacity. 3 *Continuous learning* and 5 *policy ambition* also perform well. 1 *Awareness* on the other hand is limiting the governance capacity to resolve challenges of water scarcity. 8 *Financial viability* has the second lowest score. It is not limiting, yet it does not match the performances of other conditions. More than a quarter

of the characteristics are found to be very much encouraging (++) the governance capacity to resolve the challenges of water scarcity (figure 16).

Here the correlation between condition 1 *awareness* and characteristic 8.2 *willingness-to-pay* is visible. The main factor for this result is the lack of a sense of urgency to address the matter, which can be explained on the basis of Dutch history and the road to welfare. Potable water is a basic human need and potable water has been provided for as long as people can remember. Also, the occasional “wet feet” add to the belief that the Netherlands generally do not have water scarcity challenges, rather challenges of water excess. To a certain extent this is correct, however groundwater scarcity and associated water quality challenges of surface water and groundwater do occur. In fact, salinization of surface water and groundwater is a real challenge. Groundwater governance is however rather unexplored (Martine Lodewijk and Jeroen Ponten, appendix B-7, 8) as it is not yet well invested in the municipal sewerage plan (*GRP 2016-2021*). Furthermore, Kees van der Drift (appendix B-10) and Jeroen Ponten who deal with water systems on a tactical and operational level of management respectively, argue that the systems could be better aligned.

Seeing the high score on condition 4 *stakeholder engagement process*, one might expect a similar result for condition 7 *multilevel network potential*, which is not entirely the case. Regarding water resources management the 7 *multilevel network potential* is fairly well organized, but for groundwater projects it is often not clear how responsibilities are divided. A reason for this is given by the fact that groundwater is not administratively bounded, whereas the responsibility for its management is. Secondly, projects often concern public areas, however stakeholders are mostly private property owners that often do not share the same interests and attention towards governing groundwater (Jeroen Ponten). This is expressed in a limiting *willingness-to-pay* (characteristic 8.2). Therefore, most room for improvement needs to be focused on raising awareness regarding groundwater governance.

Wastewater treatment

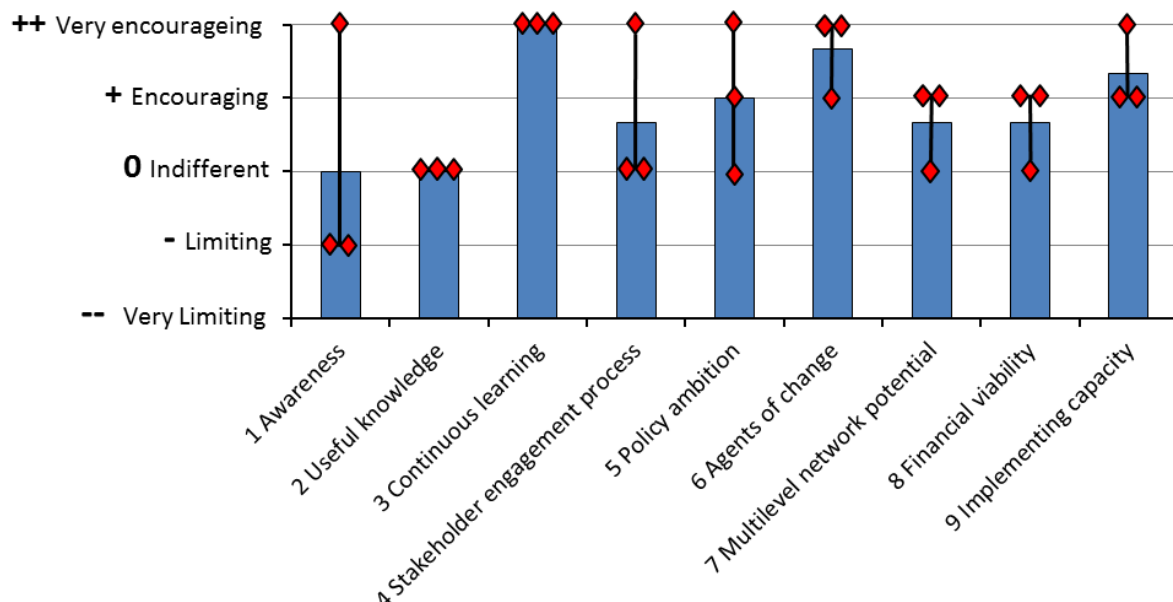


Figure 17. Scores of the 9 conditions for governance capacity in Amsterdam regarding wastewater treatment. Score ranges from very limiting (--) to very encouraging (++) the governance capacity, that is needed to resolve challenge regarding wastewater treatment.

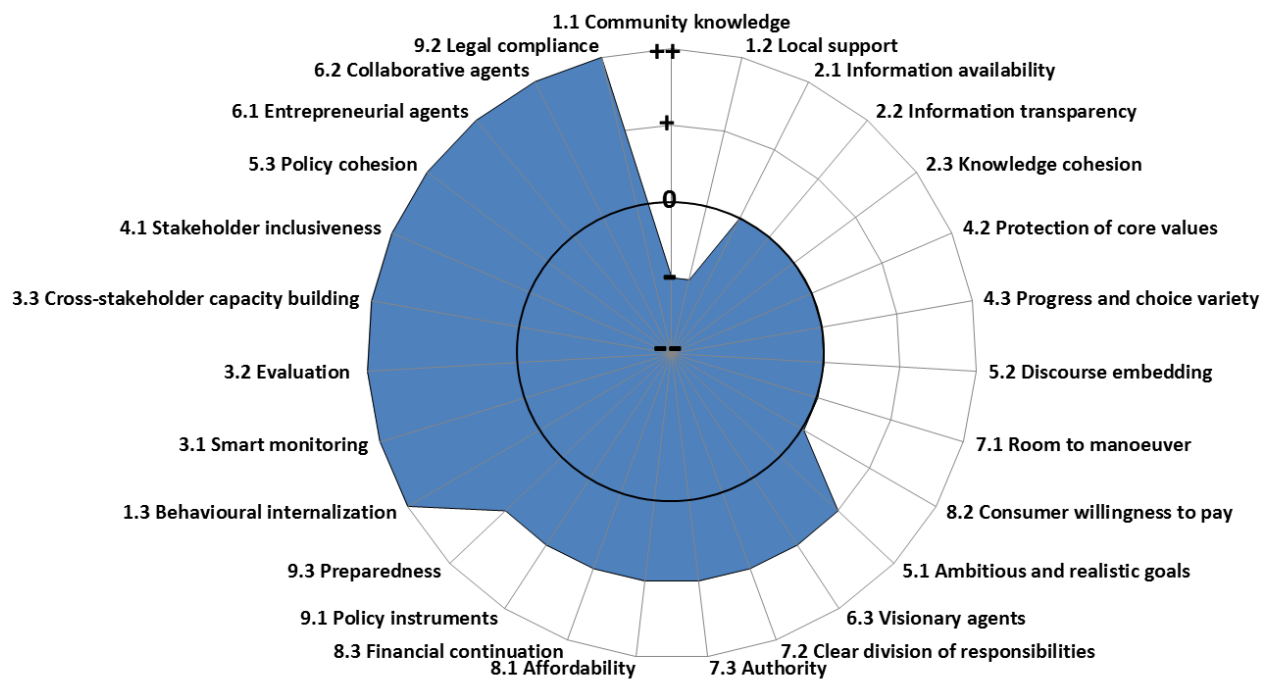


Figure 18. Scores of the 27 characteristics showing the water governance performance of Amsterdam regarding wastewater treatment. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to resolve challenges of wastewater treatment.

Also Wastewater Treatment (WWT) governance has a very positive outcome. None of the conditions are limiting (Figure 17), in fact, half of all characteristics are encouraging towards very much encouraging the governance capacity to resolve challenges of WWT (figure 18). Similar to the overall conditions scores, condition 3 *continuous learning* is very encouraging (++). Conditions 6 *agents of change* and 9 *implementing capacity* are encouraging. However, conditions 1 *awareness* and 2 *useful knowledge* stay somewhat behind. They are neither encouraging nor limiting the governance capacity.

The inputs and outputs of data generating systems are not fully connected, which is the main cause for the result of 2 *useful knowledge*. Additionally, with regard to WWT, there is a clause that prevents the sharing of economically competitive information, which is also taken into account assessing condition 2. 1 *Awareness* has remarkable characteristic scores. Characteristics 1.1 *community knowledge* and 1.2 *local support* are limiting (-), yet sustainable behaviour regarding WWT governance is practically fully internalized (characteristic 1.3). This outcome is merely the result of a distinction in target audience of the three questions in the questionnaire. Regarding 1.3 *internalization*, the researcher chose to solely look at the relevant actors of the UWGN that deal with WWT, for the reason that it was practically unfeasible to perform a survey among the inhabitants of Amsterdam given the time and resources. It was found that sustainability principles such as resource recovery, circular economy and use of sustainable material for assets is best represented in this particular network. Examples are the Energy Factory and the upcoming Calcite Factory. In this line of reasoning the 6.1 *entrepreneurial* and 6.2 *collaborative agents of change* are assessed to be very encouraging. This is also evident from the fact that the WWT network found a market for struvite, a product made from recovered phosphate (Energy and natural resources factory website⁹) and is not to be used on edible agriculture according to Dutch law. Struvite is now used for sports fields and city parks and it is cost-effective (Royal Dutch Water networks¹⁰; Waternet¹¹). Meanwhile, the Dutch law regarding the use of struvite in agriculture is outdated

⁹ <http://www.efgf.nl/projecten/energie-grondstoffenfabriek-amsterdam-west-1>

¹⁰ <http://www.neerslag-magazine.nl/magazine/artikel/1262/>

¹¹ <http://www.innovatie.waternet.nl/struviet-uit-urine-voor-een-groener-nederland/>

(Stowa, 2016), increasing the potential of the Dutch Water Boards' energy factories with regard to circular economy. Furthermore, there are also pilots, studies, projects and demo's regarding more efficient resource recovery and closing loops in new built areas such as "New sanitation" and the "Food waste disposal system". Of all water-related challenges, WWT has the best score for 6 *agents of change*.

The limiting 1.1 *community knowledge* can be assigned to the negative association with faeces. Besides, people simply do not think about where the faeces are going (Rolf Steenwinkel, appendix B-9). Conditions 3 *continuous learning* and 9 *implementing capacity* score high. The self-governance in terms of national benchmarks ensure legal compliance and are a helpful tool to improve expediency of the sector. This is supported by the internal ambition for efficiency and safety (Ingrid Heemskerk, appendix B-15).

For WWT it can be argued that most potential for advancement is found for raising awareness of the potential of wastewater in the current and future sustainable developments. This could enhance the willingness to pay and even spur developments regarding waste separation or closed-loop projects towards self-sufficient urban areas that are climate adaptive. 2 *Useful knowledge* will only further enhance and support informed decision-making in these developments.

Solid waste treatment

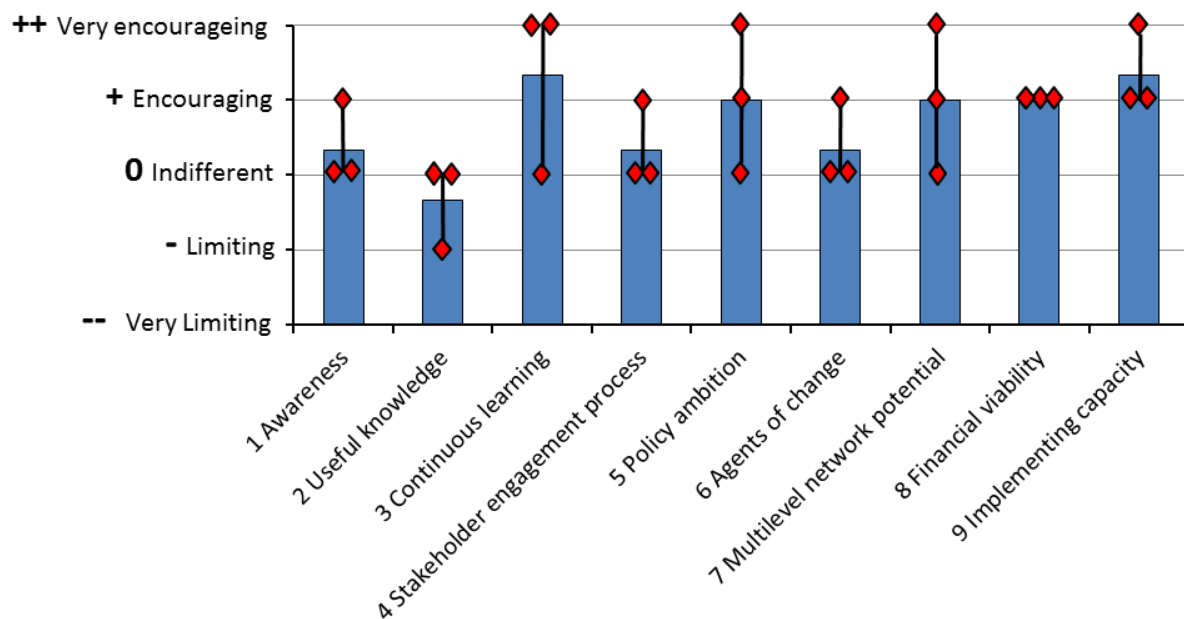


Figure 19. Scores of the 9 conditions for governance capacity in Amsterdam regarding solid waste treatment. Score ranges from very limiting (--) to very encouraging (++) the governance capacity, that is needed to resolve challenge regarding solid waste treatment.

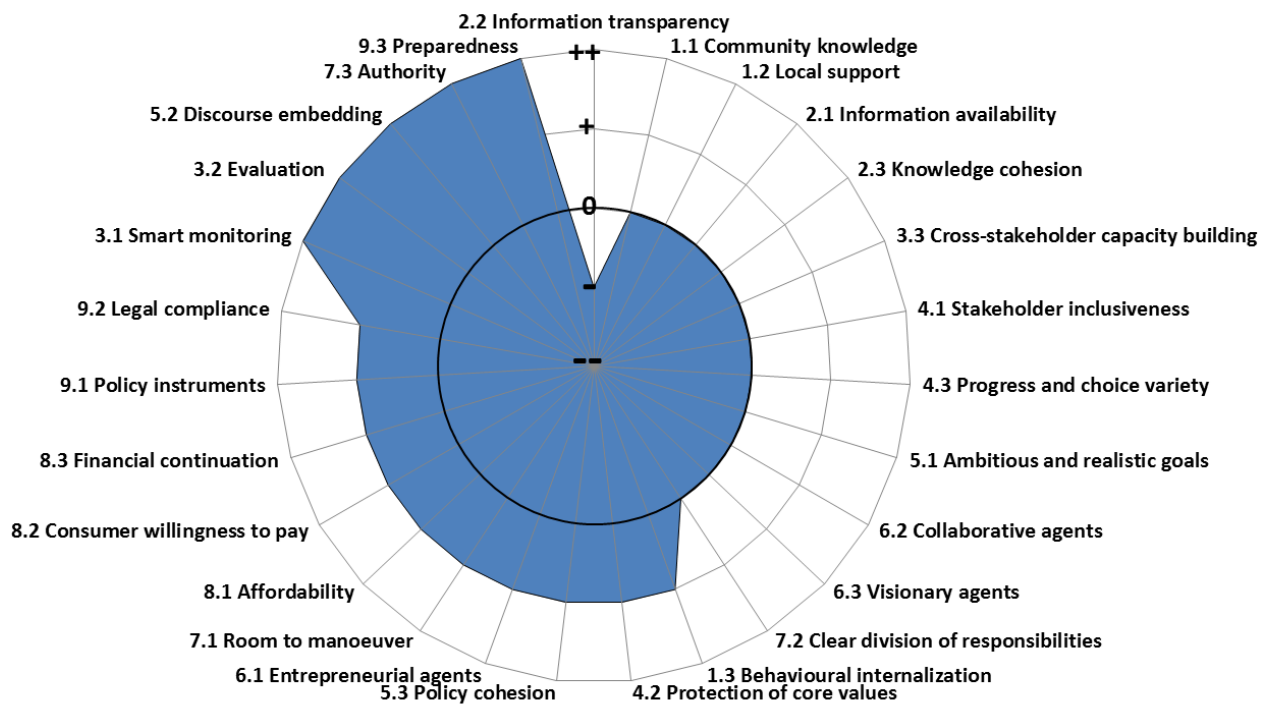


Figure 20. Scores of the 27 characteristics showing the Water Governance performance of Amsterdam regarding solid waste treatment. Score ranges from very limiting (--) too very encouraging (++) the governance capacity needed to resolve challenges regarding solid waste treatment.

In general this theme is well governed, but it may be noted that there is slightly more potential to improve the governance capacity of solid waste compared to FLO, WSC and WWT. There are two main actors

for dealing with waste: the municipality and the Waste-to-Energy Company (Afval en Energie Bedrijf; AEB). The municipal responsibility is to collect and transport solid waste. AEB is responsible for waste treatment. Condition 3 *continuous learning* scores best, condition 7 *multilevel network potential* scores second best (figure 19). Half of the characteristics is found to be encouraging the governance capacity to resolve challenges regarding solid waste treatment (figure 20).

3 *Continuous learning* is the foundation for improvements, and the driver of organizational continuity of the waste treatment company. Furthermore, action plans concerning 9.3 *preparedness* are said to be cohesive and constructed for various scenarios, and resource allocation is consistent (Mark Nijman, appendix B-12). There is a lot of experience with implementing policy instruments. There are many campaigns for waste separation at the source (on community level) such as deposit refund fees for bottles, awareness campaigns, local cleaning campaigns, school programs and projects. There are maxima for domestic waste production, tariffs for the disposal of wastes other than domestic following the polluter-pays principle as well as fines for waste disposal in the environment. The use of policy instruments is dynamic and not yet optimized and efficient, since only 53 percent of domestic waste is separately collected¹². A lot of waste such as plastics still end up in surface waters. The implementation of the polluter-pays principle is furthermore expressed in that private companies are responsible for their own waste disposal regarding chemicals, and also domestic waste above 397 litres per establishment. Below 397 litres of domestic waste, companies are allowed to use the Cleaning Act (Reinigingsrecht). Additionally, waste separation at companies is facilitated by market prices, which means that for some resources (paper, plastic and others) it is financially incentivized to separate (Mark Nijman). For households two tariffs on the Waste Charges (Afvalstoffenheffing) apply. The low tariff applies for a maximum production of 240 litres domestic waste and for the high tariff that maximum production is 360 litres. This information is easily accessible via the municipality website¹³. At the moment 265 Kg of waste is produced in Amsterdam per capita per year (Mark Nijman). The ambition is to reduce the amount of domestic waste production to 125 kg per capita by 2020 and to 100kg per capita in 2025. Therefore, 5 *Policy ambition* is assessed to be encouraging (Ministry of Infrastructure and Environment, 2014). Furthermore, the division of responsibilities may not always be crystal clear and so 7.2 *clear division of responsibilities* is scored indifferent. One would therefore expect a low level of 9.2 *legal compliance*. However, that is not the case. 9.2 *legal compliance* is encouraging.

The condition with the lowest score, which is in fact tending to limiting the governance capacity, is 2 *useful knowledge*. Strikingly, characteristic 1.2 *information transparency* is assessed to be very limiting (--). Additionally, characteristic 2.3 *cohesive knowledge*, 1.3 *cross-stakeholder capacity building* and 6.2 *collaborative agents* are scored indifferent (0). What these characteristics have in common is the assessment of a certain aspect of collaboration and information sharing. The result is based on the duality of visions between the municipality and AEB on the one hand and the individual data generation methods and systems of municipal districts on the other. The municipality urges waste separation at the source, whereas AEB recommends a central organisation of waste separation. These visions do not coincide, however the municipal vision is leading. Also the information gathering and sharing between municipal districts is missing structure and cohesion (Mark Nijman). Furthermore, AEB is a private company and input-output information, efficiency and effectiveness can be considered competitive information for which a clause is drawn on sharing (Peter Simoës, appendix B-13). 2 *Useful knowledge* is critical for the governance of solid waste in the future.

¹² <http://www.clo.nl/indicatoren/nl0143-gescheiden-ingezameld-afval-huishoudens>

¹³ <https://www.amsterdam.nl/veelgevraagd/?caseid=%7BE35FC750-D5F1-4B57-8061-53BE9CF3FA9D%7D>

4.2.3 Resolving practical discrepancies

4.2.3.1 *Resolving practical discrepancies that were found by the researcher*

The practical discrepancies that were encountered can be distinguished into three categories.

- 1) Overlap/fragmentation of conditions and characteristics
- 2) Mismatch between theory and practice
- 3) Haziness of target audience in questions

The discrepancies are resolved using the following methods based on Thomas (2004), Bird (2009) and INECE (2008):

- 1) Elimination
- 2) Alignment
- 3) Specification of target

Elimination

During the application of the GCF, encountered overlap and fragmentation between the characteristics needs to be eliminated. Often definitions, questions and characteristic descriptions need to be refined or adjusted. For example, stakeholders can occur on multiple levels of governance. 7.1 *Room to manoeuvre* assesses to what extent actors are free to cooperate with other (non-conventional) actors in order to develop a variety of alternatives and approaches. 4.1 *Stakeholder inclusiveness* assesses to what extent relevant stakeholders are able to be part of the decision-making process. And 4.3 *progress and choice variety* partly assesses the extent to which a variety of alternative policies are (co-)created. The overlap between 7.1, 4.1 and 4.3 is twofold. Firstly, regarding the extent of cooperation in decision-making (4.3 *progress and choice variety*) and the freedom to cooperate (in any way) and develop a variety of alternatives and approaches (7.1 *room to manoeuvre*). Secondly, regarding the inclusion of conventional and non-conventional actors (4.1 *stakeholder inclusiveness* and 7.1 *room to manoeuvre*). It is argued by the researcher that the emphasis on non-conventional actors is accounted for in 4.1 *stakeholder inclusiveness* and that the demarcation between 4.3 *progress and choice* and 7.1 *room to manoeuvre* is indeed marked by the exclusion of cooperation in decision-making in 7.1 *room to manoeuvre*. The nuance between these two characteristics must emerge more strongly in the interviews as to ensure that the questions measure what they are supposed to measure.

Little overlap is also found in the interview outline for 5 *policy ambition* and 9.1 *policy instruments*. For 5 *policy ambition*, the researcher first requested to name the most relevant policies concerning the water challenge. The number of policies must not be confused with the kind and number of policy instruments. It could help to state some examples for policy instruments in the interview outline.

Alignment

It can be expected that a solely literature based WG score chart might not describe characteristic levels as they truly are in practice. It is therefore evident for the quality of the GCF and WG score chart, that practical situations are incorporated in the characteristic levels as best as possible. An example is given for characteristic 9.3 *preparedness*. The highlighted sentences in table 11 apply to the Preparedness of Amsterdam regarding the challenges FLO, WSC and WWT.

Table 11. Applicability of levels to preparedness in Amsterdam for the networks of FLO, WSC and WWT

| | | |
|----|--|---|
| 0 | Low awareness of preparation strategies | Based on past experiences, there are action plans. Actions required are clear but awareness of existing action plans or the division of tasks is limited. The plans are not sufficient to deal with imminent calamities and gradually increasing pressures. There is recognition of the need for action plans, yet the development of action plans does not cover all water-related threats and challenges. Damage is almost always greater than expected or prepared for |
| + | Abundant preparedness | A wide range of threats is considered in action plans. Maybe over-abundant. Plans are proactive and follow the precautionary principle. Awareness of risks is high, but action plans are scattered and non-cohesive. They may be independent or made independently by various actors. Allocation of resources, staff and training may therefore be ambiguous |
| ++ | Comprehensive preparedness | Long-term plans are flexible by bundling different risks, impacts and worst case scenarios. The action plans for calamities are clearly communicated, co-created and regularly rehearsed by all relevant stakeholders. The required materials and staff are available on short-term notice in order to be able to respond adequately. Evaluations on the rehearsals or reviews on dealing with calamities are available |

Three consecutive characteristic levels were applicable to the UWGN of Amsterdam, but neither fully grasped the situation After a discussion with the crisis manager at Waternet, it was clear that the answer could be found in appending nuance to the + level. The level name is not accurate. In the WG score chart the + level is now named “*Fragmented preparedness*” instead of “*Abundant preparedness*”. In support of this change it can be argued that one is never abundantly prepared when it comes to safety and especially in relation with uncontrollable forces such as climate change.

Specification

The first step in specification is eliminating what needs specification; What is unclear? Specifying the question is a matter of making choices and supporting these choices in relation to the purpose of the GCF and WG score chart. An example is given for characteristic 1.2 *local support*. To whom does local support apply? Whose support is needed to improve the governance capacity to resolve water and climate adaptation challenges? And, consequently, what are the indicators for support? It can be argued that awareness of the broader public is indicated by increasing community initiatives on the one hand, but also more projects on the entrepreneurial level - in the private sector. Awareness is the first step towards acting upon a challenge. Awareness and actions on community level are an important factor (Fussel, 2007; Moser and Ekstrom, 2010; Marshall et al., 2013; Ford and King, 2013), but support from the local stakeholders in the water sector might attribute more to governance capacity in terms of effectiveness. It could therefore be chosen to only address the local stakeholders in the UWGN in the case of 1.2 *local support*, which inherently builds on the awareness on community level (characteristic 1.1). Think of this as ideas being evaporated and sublimated from the community, only to precipitate later in the form of effective projects and systems, in which the community is asked or required to participate. Another reason for this specification of the target audience is the practical limitation of time and resources for a proper survey among citizens. Therefore also 1.3 *internalization* assesses the behaviour of local stakeholders.

Characteristic 9.2 *willingness-to-pay* is about how expenditures on water services and climate adaptation measures are perceived. This is a very broad definition. The interviewees had difficulties answering this. Also the researcher got confused at times. Following the line of reasoning regarding 1.2 *local support*, in that 1.1 *community knowledge* is important for 1.2 *local support*, it is argued that 9.2 *willingness-to-pay* is important for 6.1 *entrepreneurial agents of change*. 9.2 *Willingness-to-pay* must be present at all levels (community level, local stakeholder level and legitimate governance level). This is specified in the WG score chart.

Also 2 *useful knowledge* needs specifying. 2.1 *Information availability* entails information with which actors have to engage in decision-making. 2.2 *Information transparency* involves information accessibility and intelligibility for all interested actors, decision-makers in particular. Thirdly, 2.3 *knowledge cohesion* focuses on the cohesion of information between different policy fields and stakeholders. The build-up of the characteristics is logically ordered, but substantively they do not link-up because of a difference in target audience. In the GCF and WG score chart it is specified that information availability and transparency is focused on a wide audience of both experts and non-experts including policy makers.

Observation

A remarkable observation was made regarding the level of critique among governance levels. It was observed that the interviewees from a strategic governance level were more positive and had less critique than interviewees from a tactical or operational level.

4.2.3.2 Resolving practical discrepancies that were found by experts

Discussing the results with legitimate representatives of the UWGN is an essential part of the strategy. The results for the city of Amsterdam were discussed with:

Gerhard van den Top – Water Board director (AGV) – Legitimate representative

Ingrid Heemskerk – Strategic advisor on corporate control (Waternet)

Otto Reinstra – Strategic advisor on risk management (Waternet)

Rob Koeze – Strategic advisor on flood risk management

Renze Houten – Managing director (Waternet)

Their feedback is given below, as well as the resolution of the discrepancies.

Feedback on presentation of the results

Generally, it was found that it is not clear from the graphs which characteristics belong to which condition. Nor is it clear in the text what the bases are for assessing the characteristics. Regarding the latter, the researcher points out that the completed WG score chart provides the necessary information as to how the results were constituted. Building on that Heemskerk argues, that as a director she could imagine that the information of the figures should be clear instantly or at least clearly explained in a text of maximally two pages. In response, numbers are added to the conditions and characteristics to safeguard the visual link (see figures 9-20). Furthermore, the readability could be enhanced by dividing the long texts into blocks, add images and limit the use of brackets.

The second remark is concentrated on the interpretation of the results. Some of the reviewers wield a more international standard while interpreting the results. Others think in terms of the intensity of governance that is being exerted by actors. The latter inherently interprets a full spider web as a lot of governance being exerted, which is not necessarily the case argues the researcher. For example, Rainproof is quite successful while low governance is being exercised. It might even be argued that the low governmental influence is part of the success of Rainproof as it is primarily a bottom-up approach. This is recognized in the GCF as a phenomenon that increases the governance capacity, as it develops practical knowledge for addressing water and climate adaptations and supports informed decision-making. The correct interpretation of the results is: *Governance capacity is a precondition to address the wicked water-related challenges. The extent to which a governance condition is limiting or encouraging the governance capacity to address wicked water-related challenges is assessed using the WG score chart. The results therefore tell whether a condition or characteristic is limiting or encouraging governance capacity to address wicked water-related challenges. The aim is to map the limiting factors that offer the greatest improvements in terms effective and efficient water management that is needed to address the water-related challenges.* The wording of the results and evaluation are improved by incorporating these nuances of correct interpretation to a higher extent.

Feedback on the results for the UWGN of Amsterdam

Substantively, Van den Top fairly commented on the explanation for the assessment of the cause of 2 *useful knowledge*. The results read that the inaccessibility and fragmentation of useful knowledge is caused by the merger. After explaining the extent and nature of the merger, Van den Top explains that the merger, if anything, is actually accelerating accessibility and cohesion processes. The sentence at issue was deleted from the results.

Heemskerk argues that she does not recognize the averagely low assessment of 8.2 *willingness-to-pay*. Her argument is based on a narrow definition of the concept and the cultural-historic development of drinking water. "A century ago people were willing to pay a *cent per bucket* and they are still very much willing to pay for basic water services. This is measured with price-elasticity rates and polls, also drinking water in Amsterdam is fairly low compared to other cities and regions in the Netherlands." Moreover, she argues that actors in the water sector such as Waternet are very much willing to pay for water services and climate adaptation. Heemskerk's arguments are very much price-related. The cent per bucket argument is invalid according to the researcher, since the costs of potable water expressed in percentages of the disposable income has decreased. The rise of absolute expenditures is due to increased prosperity. In fact, studies on *Willingness-to-pay* show that prices are even an insignificant factor on *willingness-to-pay* (Brouwer et al., 2016). Furthermore, *willingness-to-pay* in the WG score chart measures how expenditures and risks regarding both water services and climate adaptations are perceived in terms of trust, awareness of risk, perceived importance of climate adaptation measures, value of non-economic benefits, financial principles. It is argued by the researcher that *willingness-to-pay* for merely basic services is not in conformity with the intent of assessing governance capacity to deal with wicked water-related challenges. Furthermore, the WG score chart aims to measure the *willingness to pay* of consumers and local stakeholders instead of the water producing stakeholders. The confusion can be eliminated by naming characteristic 8.2 *consumer willingness-to-pay*. Clear elaboration in a two-pager on what elements the assessment is based could also obviate the discord of concepts, Heemskerk says.

Whereas Heemskerk could not agree to the line of reasoning behind 8.2 *consumer willingness-to-pay*, Koeze acknowledges the possible correlation between 1 *awareness* and 8.2 *consumer willingness-to-pay* but doubts the non-spuriousness of the causal relationship. He explains that the degree of urgency is an important factor in *consumer willingness-to-pay*. Awareness could also imply: the risk, frequency and impact of the water-challenge is known – and it is accepted. With that he argues that awareness is not expected to necessarily enhance *consumer willingness-to-pay*, nor is it the only factor that defines *consumer willingness-to-pay*. An example is found for the project Vital and Vulnerable (Vitaal en Kwetsbaar) that deals with vital infrastructure that is vulnerable when water levels rise. In this particular network, he argues, there is awareness but *consumer willingness-to-pay* is delayed by the complexity of the challenge. The researcher acknowledges his arguments and replies that this can be observed using the WG score chart, simply when 8.2 *consumer willingness-to-pay* has a low score and 1 *awareness* does not. The cause for a low *consumer willingness-to-pay* score will in that case have to be clarified in interviews. Furthermore, Koeze states that the challenges of nuisance flooding and flood risk are fundamentally different and so is their governance. Since they are in fact assessed together as one water-challenge, Koeze argues he does not recognize some of the results. He does not recognize the high level of 1 *awareness*. This discrepancy is thoroughly discussed in the next section.

Furthermore, initially the results read that the low sustainability and adaptability policy ambition of the UWGN was caused by strict self-regulation by means of benchmarks. Reinstra argues that he does not think that that is the case. He explains that Waternet is primarily a risk-averting company. The services must be a 100% correct and 100% safe. If ambition is explained as progressiveness to deal with current and future water-related challenges, than it can be argued that ambition carries more risks with it. The risk factor rises when less proven techniques or policy measures are being implemented. Ambition must therefore be spurred by administrators of AGV and the municipality. However, these governmental

institutions are administrated by political coalitions. The largest party of AGV is VVD (People's Party for Freedom and Democracy), which is a very liberal party. The largest party in the municipal administration is D66 (Political Party Democrats 66), which is a social-liberal. One of the core values is to rule with a party that is as small as possible. Naturally, an administration will not take on more tasks than "necessary". The latter can be disputed, but the core thought remains "let's not make a circus, just govern the business as usual as well as we can." Therefore the water management and governance is not high on the political agenda. The lack of sustainability and adaptability ambitions is low due to political tincture. Considering the given definition of ambition, it is understandable that the interviewees responded that goals are predominantly realistic rather than ambitious, says Houten. Building on the Reinstra's view, Houten explains that there have been budget cuts in the last couple of years. In that respect, budget for the governance and management of water systems decreased as well. It can be argued that some innovations arise from the changing settings and can therefore be labelled as ambitious. This, however does not fit the definition of ambition that was wielded in this research. Ambition in policies revolves around the capacity to govern the water systems in such a way that it can deal with current and future wicked water-related challenges. Reinstra and Houten's arguments are compatible and well supported by factual information. Their line of reasoning is therefore obtained in the results of the application.

Building on the risk-averting behaviour of the water network which withholds ambition in policies, Reinstra argues there are more mechanisms at play. The installed base mechanism – also known as sunk investments – is an important factor in decision-making. There is billions worth of infrastructure invested and implemented. Various systems are connected to the water-related infrastructure. Additionally, upscaling of innovations requires a high investment at the beginning of the implementation. This makes it an economically difficult decision to switch and implement a new system. Sunk investments is therefore a form of path dependency. Policies are not ambitious enough to support such major innovations.

Another risk-averting mechanism is hidden in the situation that the dominant liberal democratic aspect in the UWGN hinders decisive decision-making. For example, the municipality of Amsterdam aims to provide 5000 new residences on three islands. For Centre-Island the municipality opts for an energy-neutral system based on thermal storage that is self-sufficient and is not connected to the main energy grid. A tender is released for the realisation of the energy system in which a restriction reads that the system must be as sustainable as possible. Waternet's role is to collect and purify wastewater on behalf of the municipality and AGV respectively. It is known that the thermal storage system needs more heat than cold for the reason of heating houses. Employers at Waternet argue that they can deliver the extra heat from grey wastewater when grey and black water are separately collected (New Sanitation). Waternet argues on the basis of studies and pilots that this is the most sustainable option: heat storage and warmth from wastewater. The problem arises when the municipality does not require the new builders to utilize this energy system for the reason that they should be free to choose. This inherently implies more risk for the entrepreneur that constructs the energy system. Another problem is that the entrepreneur is not required to utilize the heat from wastewater offered by Waternet. In that respect the municipality decreases the probability of implementing the most sustainable energy system and thus the probability of realising an energy-neutral island. The problem increases due to the natural aspects of a tender that the entrepreneur delivers the system and is allowed to determine the rates. Leaving the choice with the entrepreneur for either profit maximisation or building the most sustainable energy system. Consequently, rates are influential for the participation of the new home builders. Since the municipality of Amsterdam is the contractor, Reinstra argues, it should prescribe a "separate pipeline construction in houses", which the municipality can accomplish utilizing the "crisis and restoration act" (crisis- en herstelwet). The other option for Centre-Island is to connect its energy system to the main grid for extra heat from district heating, which actually contributes to the lock-in of fossil energy and waste incineration. Regarding New Sanitation on Centre-Island the local government and spatial planning policies are simply not supportive enough.

Furthermore, a switch in energy systems in existing residential areas would involve a lot of nuisance from construction. Social turmoil may be fuelled by the sentiment of “never change a well operating system.” Regarding risk averting behaviour, it can be argued that the system of infrastructure in place is robust and efficient in terms of hygiene and public health and are always operational. It can be reasoned that the sustainability aspect is simply not urgent enough to develop and act beyond incremental changes.

5.DISCUSSION

Within this research the GCF is optimized and enjoys more local support in the UWGN of Amsterdam. Following the reasoning of varying social contexts, it must be made clear that the Governance Capacity Assessment is in all cases an assessment of the governance capacity i) of an UWGN ii) to deal with wicked water challenges. The WG score chart and application strategy have resulted to be an easy but effective tool for mapping an UWGN's governance capacity to deal with wicked water-related challenges. Optimizing the GCF and WG score chart by applying it to the city of Amsterdam has also greatly benefitted the content. Moreover, it provided more and better insight regarding the use and potential of the tool. It can be argued that the GCF is able to catch all governance forms and structures. It is observed that governance, even within a city, can vary per network, per sector, per water challenge and per project. A certain guiding principle for governance of the water-related challenges was found as well. Especially historical challenges in Amsterdam are generally governed by a central top-down approach, such as for flood risk, water scarcity, wastewater treatment and solid waste treatment to a certain extent. The mavericks in this category of centrally governed challenges are the new projects: Rainproof, Vital and Vulnerable, New Sanitation, Waste separation at the source. These projects all encompass a bottom-up approach to governance. The central and local governments tend to share more and more of their responsibilities with the private sector and civil society¹⁴, resulting in various governance structures. In this section further meaning is given to the results and points of attention are elucidated, after which the validity and reliability of the results are discussed.

5.1 Validity & reliability of the research

This paragraph of the discussion follows the structure as provided by the three sub-questions. All three parts have delivered useful and tangible results.

5.1.1 Theoretical optimization

The theoretical triangulation method is completed, which strengthens the content of the GCF. It is now more in accordance with prevailing scientific insights, it is more structured and it has gained more acceptance from the experts. However, a more substantive feedback from the two empirical expert discussions and the review workshop was expected. It can be argued that no response on the content means that the GCF is theoretically inclusive, but the researcher suspects that not all participants read all of the GCF document. Some participants also stated that the framework is too technical in terms of governance and organisational concepts and jargon. Therefore the discussion was focused on the weighing of conditions and the issue of cultural-historic restraint in the GCF.

Weighing of conditions

Regarding the issue of weighing conditions in section 4.1.1.2, it was chosen not to assign weight to conditions. Firstly, the relevance of conditions varies per local context, secondly weight per condition will therefore vary per city. Hence assigning weight to conditions would limit the comparability of cities in an international context, thirdly. Lastly, universal weighing factors of the governance conditions could not be validated by scientific research or policy documents. Cities can however independently assign weight to conditions in order to better match their local context. Moreover, remember that the

¹⁴ <https://www.riool.net/-/hemelwater-in-de-woning-zaak-van-gemeente-of-burger->

characteristics and conditions are interconnected and reciprocal. It can thus be argued that the importance and relevance of a characteristic or condition is intrinsically taken into account in the GCF. Note that 1 *awareness* is a vital element of 8.2 *consumer willingness-to-pay*. Furthermore, in a way, the matter of weighing conditions is addressed by dividing the conditions according to the level of action: Knowing, wanting and enabling. It enhances effective communication and it implies a logical sequence of actions. Despite the logical order, in reality it is an iterative process without chronology. The division of knowing, wanting and enabling indicates a clear heuristics. It is also utilized on the knowledge portal of Spatial Adaptation, enjoying a wider recognizance as suitable format.

Cultural-historic constraint

Cultural-historic constraint has been subject for discussion throughout this research. It is argued that the issue of cultural-historic restraint is important to discuss regarding the comparability of cities in international context. The cultural historic bias of the GCF is a challenge that can not be readily overcome, since there is no alternative set of literature on adaptive water governance. This practical limitation is obviated in the GCF as follows: various governance structures can be recognized by the GCF as was argued in section 4.1.1. As such, there is not one best governance structure for UWG. However, it is argued that an UWGN should strive for a full blue spider web in order to be able to deal with wicked water-related challenges. Note that a full blue spider web is not always practically feasible. Also note that governance capacity of UWGN's is not a goal by itself. It is merely a precondition to facilitate water management. Moreover, to strengthen the comparability of cities in international context it is recommended to verify the universal validity of GCF by applying it to the four most diverse UWG structures.

5.1.2 Operationalisation

Composing the WG Score Chart

Identifying indicators and assigning observable entities to characteristics and performance levels was based on proven methods from an experienced organisation(s). The method comprised three strategies: 1 split characteristics into elements and apply logic model to find indicators, 2 inventory of indicators and 3 look beyond existing data. However, in accordance with other strategies from literature that is used for the operationalisation, the WG score chart needs to be optimized and refined based on a few more case studies with respect to the empirical indicators of behaviour-oriented aspects.

Application Strategy

The application strategy enhances the study's reliability and comparability of UWGN's governance capacity assessment to better deal with the wicked urban water-related challenges.

Identifying interviewees

Another method for identifying networks is by using Social Network Analysis (SNA). A network is a set of dyadic ties, all of the same type, among a set of actors, concerning a certain (social or professional) relation (Wasserman and Faust, 1994, chapter 2). The networks together also represent the full extent of the UWGN on multiple levels of governance and therefore it could also provide the base for a balanced governance assessment. An example software for performing such a SNA is Pajek. However, a SNA is a time-consuming endeavor. Additionally, when performing a SNA, the comparability of cities would be limited. The set of dyadic ties is based on a single relation. In this case it would be either a SNA per theme or per level of governance. So either the depth of the UWGN would be limitedly addressed or the coverage of the water-related challenges. Therefore, due to comparability issues and time-limitations, SNA was not applied. The thematic approach and the three levels of governance is a time-efficient strategy that provides the stability and comparability of governance capacity studies in cities. The strategy has a positive influence on the results. The unambiguous practical application enhanced the response and the quality of the results. The strategy provides a low threshold for cooperation, since it does not require lots of time, efforts or money to participate. The latter ensures a wide applicability and

possibility to compare cities. This finding is supported by the overall positive feedback on the results by UWGN representatives.

Selection of interviewees

In relation to the above argumentation, it must be noted that the whole network was not covered according to the selection method. Firstly, only two stakeholders instead of three were interviewed for the wicked challenges of UHI and solid waste treatment. Secondly, the operational level of governance is underrepresented. Despite the fact that stakeholders could substantiate each other within and partly among water-related challenges, the omission of interviewees has implications for the results. The validity of the results is influenced as the lack of reciprocal verification leaves more sensitivity to “outliers”. Outliers are not representative for the UWGN.

Timing of challenge demarcation

Furthermore, the final demarcation of the wicked water-related challenges occurred rather late in the study. This is partly the cause for the lack of stakeholders for UHI and Solid Waste and the underrepresentation of the operational level in at least Solid waste treatment. A more operational emphasis could have improved the results as the results are skewed towards the strategic level of governance. As it was found that actors on the strategic level generally view things more positively, the results may be positively biased. Moreover, the final validation is done by UWGN representatives that are mainly positioned in the strategic level of governance.

Extent of UWGN

The definitions of the water-related challenges are dominant in demarcating the extent of the UWGN in that it narrates what constitutes water governance in cities. It can be questioned to what extent the definitions have shaped the results. For instance, what if water scarcity was limited to the water scarcity definition of the UN, reading: An area is experiencing water stress, water scarcity or absolute water scarcity when the annual water supply per person drops below 1.700m³, 1.000m³ or 500m³ respectively?¹⁵ It would vastly limit the UWGN in Amsterdam. What is more important, however, is that the extent of the network is not yet clarified. What qualifies an actor to be a stakeholder in the UWGN? Geographical boundaries, of the municipality are not fit to determine the extent of the network. This entails complications for the comparability between GCA's in cities and thus for comparison studies. Therefore, it is recommended to provide or map to what extent a stakeholder is relevant to the governance of a water challenge (primary influential or dependent stakeholders, secondary and even tertiary). This can be done by means of a stakeholder analysis, in terms of influence, dependence, interests and attributes (Grimble and Wellard, 1997). Stakeholder mapping should be performed for every city that is being assessed.

Limitations of desk study

The content of policy documents provide a lot of information regarding the responsibilities of involved parties and guidelines for the level of quantity and quality in which the subject is addressed. A preliminary thought on the 5 *policy ambition* can also be established already. A series of policy documents can elucidate the level of cohesion and consistency among policies within and between sectors. 5.2 *discourse embedding* may be difficult to find, since it may for instance depend on the ruling party which may change at a frequency of every 4 to 5 years, or there might not be a dominant discourse at all. However, organization vision statements can be a very good source for researching the current and local discourse. Furthermore, for such a momentary reconnaissance, it could be advised to spur through newspaper articles and to consult your group of interviewees. Additionally, policies can indicate the policy instruments that are being deployed.

Project action plans provide a similar series of information regarding the responsibilities of involved parties and the level of quantity and quality of a subject, but at a lower level of governance. Project plans

¹⁵ <http://www.un.org/waterforlifedecade/scarcity.shtml>

also give more insight in the range of the involved parties and their role and tasks within that project. The presence of a timeline can be notified and quantity and quality requirements are more concrete. In some cities, project development is naturally inclined in a participatory approach. The moments of stakeholder engagement will then also be described. Project reports may elucidate on the stakeholder meetings, for instance on the character and the progress of engagement. Whether stakeholder engagement is inclusive is sometimes hard to tell. A best practice example could aid in this assessment, otherwise the researcher is dependent on the responses of individual actors. 4.2 *protection of core values*, for that matter, is primarily answered based on interviewee responses. It is simply not common to report on the stakeholder engagement, the progress and the influence on result in a lot of cities.

In some cases, the availability and accessibility of documents provide parts of an answer. Such is the case for evaluation reports. The presence of evaluation reports tell the researcher that there is in fact evaluation. Secondly, studying such a report often discusses the quality of work and if targets are met, but also what went wrong and how this could be prevented in following projects. This would indicate a level of learning. What level of learning can be researched with a more in depth study of documents that go back ten to twenty years. Here, the level of learning is to be indicated by the interviewees.

Strategy reports provide insight into the ambition of organizations and their prospects. Prospect is part of 2.1 *information availability*, which takes into account that there is a need for outlook to the near and distant future, based on status quo extrapolations and more importantly on scenarios that elucidate new aspects such as the TPF, as to enhance well-informed decision-making. Prospect is also an important indicator in assessing a networks' entrepreneurial and visionary drivers in terms of what opportunities are recognized and how they were dealt with. Prospect is also an indicator for the development of financial viability, i.e. sewage charges gradually rise in Amsterdam as to make sure that in five years the largest project of sewer replacement can be realized. Furthermore strategy reports could enclose the anchoring of stakeholder collaboration agreements or even the institutionalization of co-created knowledge, policy and action plans.

Communication arrangements can be informative for assessing the open attitude to stakeholders. The presence of compliance agreements are indicators for characteristic 9.2 *legal compliance*. The extent of compliance will become clear from the content of such an agreement. Company vision statements can inform the researcher about internalization of sustainable behavior (characteristic 1.3). Newspapers can indicate the level of community awareness and sometimes even local support as well as discourse embedding.

Of course the limit of information that can be found in documents has implications for the results. It was therefore opted for two kinds of sources: a variety of interviewees and a variety of documents. Information from interviewees was mutually verified and substantiated by documents. Also the final validation of the results is an important part of the research to obviate the information limit from documents.

5.1.3 Application

For 1.3 *internalization* the researcher focused on the local stakeholders. Nevertheless, citizens are relevant actors, i.e. what is flushed down the toilet has a direct effect on the effectiveness and efficiency of wastewater treatment. Furthermore, researching 1.1 *community knowledge* and 1.2 *local support* provides insight into the extent to which knowledge and opinion have an influence on behaviour. In the Netherlands, for example, illegal discharges of drugs in sewers occurred. The anxiety that wastewater treatment is insufficient and that drugs indirectly end up in drinking water is strongly felt at the community level, whereas the actual risk is almost non-existent (Van der Aa et al., 2013). Public opinion and community knowledge about wastewater treatment strongly influenced the measures to counteract the illegal discharges and the measures that ought to be taken in the wastewater treatments. Therefore, citizens are relevant in assessing 1.3 *internalization*, but they are not taken into account in 1.3 *internalization* in this research since it was practically not possible to do a survey among citizens.

5.1.4 Practical optimisation

Three out of sixteen interviewees responded positively to the results that were accompanied by the WG score chart as reference work. Five representative actors from the UWGN of Amsterdam have reviewed the results. Despite the knowledgeable reviewers, the legitimate representatives and the positive replies by interviewees; the researcher envisioned a larger audience for the final result validation. Firstly, to gain more acceptance of the GCF results throughout the UWGN of Amsterdam. Secondly, more and more variety of reviewers would increase the alignment of theory and practice in the GCF and its operationalisation, as well as it would strengthen and smoothen the bridge between science and policy.

One of the interviewees urges the researchers to make a distinction in the flood risk theme between water safety challenges and mere nuisance flooding. He argued that besides the large difference in impact, the management differs to a large extent as well. Nuisance flooding is a local phenomenon caused by the lack of discharge capacity, whereas floods are generally caused elsewhere, e.g. dike bursts in rivers or at the seaside. Flooding in the latter category is also unpredictable and catastrophic. Nuisance flooding is not taken into account in water models for risk assessments either. Flooding is managed by storm surges such as dikes, embankment and sluice-gates. Nuisance flooding is managed by increasing the discharge capacity of sewers, ditches and pumps as well as taking rainproof measures. The researchers recognized the distinction in the case of Amsterdam, however the distinction between floods and nuisance flooding might not be widely recognized and clarified in governance systems and regulation in cities around the world. This has consequences for the comparability among cities. Simultaneously, a maximum of five challenges to be assessed guarantees the attractiveness of the WG score chart. A possible solution is that Nuisance Flooding and Flood Risk are separated in the report to the UWGN of Amsterdam (and possibly other cities), but that the two are combined here in the study and in international comparison studies.

5.1.5 Contextual

This research provides the operationalisation of the GCF with which urban water governance around the world can be empirically compared. It also provides a GCA of the UWGN of Amsterdam. The aim of the tool is to gain insight into an UWGN's governance practices as a baseline for further strategy building and implementation to aid in enabling a leapfrog to a more water-wise city. It is a tool that forms a reaction to the request for IWRM implementation tools. The CBF and GCF are a first step in the implementation cycle, therefore they form a bridge between science and policy.

The emphasis is on identifying the most beneficial opportunities to improve. It should be noted that it is practically hardly possible that all twenty-seven characteristics are very encouraging (++). This was also revealed in the pilot study on Amsterdam's UWGN. In the case of flood risk, governance is quite strict; it is a very clear top-down governance structure. Regulations and standards are clear, as well as stakeholders' involvement and their respective responsibilities. In the case of nuisance flooding and the UHI effect governance is less strict; the governance structure comprises a bottom-up approach. Regulations are not strict at all, there are many stakeholders and it enjoys a rather participatory approach that is based on awareness and willingness. Quoting the Water Board Director: *"the loose top-down governance of Rainproof is an important part of its success."*

Building on the experience with Rainproof and on other, more ethical reasons, it is argued that predominantly water management performance (CBF) indicates whether a network should strive for improvement of governance conditions. Notwithstanding, the lack of governance or path dependency can be a cause for underperforming water management and its adaptive capacity to withstand future pressures such as climate change.

The operationalised GCF does not favour a governance structure. Its principle task is to assess which conditions are most limiting governance capacity to find dynamic solutions for wicked challenges. The governance structures, however, can be expressed in modes of governance. Modes of governance vary in the composition of State, Market, Civil Society. Seeing that the WG score chart and its application

strategy are a basis for comparison studies on governance to find dynamic solutions for wicked water challenge, it could be interesting to perform an analysis (statistical) on the variety of modes of governance in cities. Which mode of governance is best fit for city level water management and governance? Which mode of governance suits the governance of a specific water challenge best? Which mode of governance fits a state polity best? In that respect the comparison studies on the basis of the WG score chart could contribute to the implementation and performance of IWRM at the most direct and appropriate level of governance.

5.2 Implications for Amsterdam

Flood risk

Most room for improvement is found for 6.1 *ambitious and realistic goals*. It is argued that for nuisance flooding the goals should be more ambitious. However, in discussion with Rob Koeze it was agreed that not all governance forms thrive on policy goals and targets. He argues that there is a feeling of regulation aversion among national water governance administrators and managers at the moment. When a lack of policy occurs, the entrepreneurial, collaborative and visionary agents of change are essential for pulling the cart of innovation. Rainproof and Vital & Vulnerable are examples of governance methods that are not based on policy targets and regulation, which may be the strength of the method he argues. This proves that not all characteristics in the assessment need to be very encouraging (++) per se. Enhancing policy goals and targets may therefore have adverse effects on the governance capacity to install rainproof and multi-level safety measures. Nevertheless, if we take a look at the big clean-up of the canals of Amsterdam in the 1970's and 1980's, it can be argued that the smell and increasing welfare had stimulated the creation of momentum and national policy goals (Wet Verontreiniging Oppervlaktewater). Thus empirically speaking, visualization and momentum in combination with ambitious policy targets can result in effective governance. Given that nuisance flooding enjoys an encouraging level of awareness, it is argued that in this phase of decision-making it is recommended to enhance the policy ambitions regarding nuisance flooding measures in such a way that a certain level of 7.1 *room to manoeuvre* is maintained. In a later phase goals and targets will be essential to improve implementations. The recommendation is point of discussion in current meetings of the Dutch Water Authorities (Unie van Waterschappen; the umbrella organisation of Dutch Water Boards). The Delta Commissioner (government official in charge of the Delta programme) aims to have devised an approach to tackle the challenge of water nuisance by September 2017 through the Steering Committee of Spatial Adaptation of the Delta Programme. For this he focuses on the strategy and policy ambition formulation of Water Boards (Agendapunt 3: Wateroverlast. Dutch Water Authorities, pers.comm.). It must be noted that the dynamics of decision-making are not included in the GCF, since it is merely a snapshot that the GCF is able to take. The visual results, therefore, are not able to fully display the governance assessment. Hence, complementary interpretation, evaluation and recommendations are essential.

Furthermore, 2.3 *knowledge cohesion* shows room for improvement. Rob Koeze and Maarten Claassen (strategic advisors at Waternet) support the results. It is argued that the local systems and approaches that deal with the flood risk challenges could be better aligned. Specifically, Rainproof and the new dike standardization could be better aligned with water control systems and local approaches. It would be insightful to know the amount of water retention per city district for the design and maintenance of sewer systems for instance. Furthermore, the new dike standardization used to be based on assigned flood reoccurrence intervals. Now it is based on risk. The risk is calculated by multiplying the probability with the impact of a flooding event. Koeze adds that the internal process arrangements and the responsibilities for communication have not yet been clearly established in local and regional governance networks. He says it is unclear who to refer to (Rijksoverheid, Province, Waterboard or Water company) for specific questions.

Urban heat islands

Strikingly, there are hardly any governance arrangements for addressing this challenge. The governance network is small and exists mainly of research institutes. UHI governance is not well grounded in policies. Administrators are simply not aware of the challenge, nor is the local community. Except for a minority group of elderly. As governance capacity to deal with wicked water-related challenges has a long-term perspective, it is evident that the water governance network of Amsterdam should take the risks and impacts of the UHI effect more seriously into account. Compared to the global warming, the Netherlands warms up twice as fast (Oldenborgh et al., 2003, 2009¹⁶) and summers generally warm up more than winters. UHIs sometimes have serious health impacts as was demonstrated in the summer of 2003, where in the Netherlands approximately 1400 died as a result of an heat wave that lasted two weeks¹⁷. The same heat wave also caused an estimated 70.000 excess deaths in Western and Central Europe (EEA, 2012). Climate change is characterized by extreme weather events that are increasingly unpredictable and frequent. It is assumed that heat waves will occur more often. Heat maps of Amsterdam show that the temperatures can already be up to ten degrees Celsius higher than surrounding rural areas (Van der Hoeven and Wandl, 2013). Besides creating awareness the measures to deal this challenge must be properly stated in policies. It can be implemented in environmental policy (determine a level of vegetation in urban areas) and in health policy (determine criteria for a qualitative living environment for elderly and for working environments), construction policy (determine the allowed level of warmth absorption or determine the criteria for the use of cooling coatings of buildings and parking lots). Also the use of more policy instruments is desired to increase the governance capacity to deal with this challenge, i.e. a required percentage of blue-green area in new spatial projects or financial favouring when using cooling coating on street tiles in the garden or limiting street tiles in the garden. In fact, there used to be a subsidy for housing insulation. Regretfully, this instrument was terminated last July. Hopefully UHI will appear more prominently on the political agenda next election (Geertje Wijten, government official on sustainability issues).

Water scarcity

1 *Awareness* of water scarcity challenges is below the average awareness of water-related challenges in Amsterdam. It is in fact limiting the governance capacity to deal with the wicked water challenge, as is 2.1 *local support*. Beyond water conservation measures such as campaigns and water-saving taps there is generally low support for measures to manage groundwater levels and ground- and surface water quality. Generally, the supply and quality of potable water in Amsterdam is well governed. Only in an extreme scenario will the current drinking water process and distribution fail to provide all citizens with potable water. Still, water scarcity is a substantive challenge for Amsterdam's UWGN due to salinization of ground- and surface water. 25 Million cubic meters of fresh water is extracted from the Bethune polder for drinking water provision in Amsterdam (Watergebiedsplan Bethune polder – AGV), which comprises 60% of the total drinking water provision in Amsterdam. When such large amounts of freshwater are extracted and storm water is insufficient to replenish, more saline water wells up. In light of a rising sea level and simultaneously subsidence, salinization is a real threat. In reaction, a dune filtration process was developed that takes (fresh) water from the river Rhine to replenish groundwater levels. Additionally, the location of water offtake is well chosen, since salinization at the Bethune polder is geographically improbable.

Furthermore, Waternet researches the desalination technique and the potential of brackish sources. So there is some 7.1 *room to manoeuvre*. However, the local community is not aware of such a scenario and its probability of occurring. Seeing that the local community cannot sense the challenges of water scarcity and potable water is centrally organized and provided, the *consumer willingness-to-pay* is a little below average.

¹⁶ <http://www.clo.nl/indicatoren/nl0226-temperatuur-mondiaal-en-in-nederland>

¹⁷ Nederland niet voorbereid op hittegolf - Algemeen Dagblad, 9 juni 2006

Interestingly, a result of the governance capacity assessment is the insufficient grounding of groundwater in policies. Besides in salinization challenges, groundwater is an important aspect in storm water retention and drainage. Also, the rotting of foundation in housing due to low groundwater levels is a water scarcity issue. Groundwater quality scores a 6.1 out of 10 in the City Blueprint Framework, which shows room for improvement. It is recommended to explore the role of groundwater mechanisms and systems in flood risk and water scarcity approaches and to embed the knowledge into an integral system and policy in which groundwater bridges flood risk and water scarcity challenges.

Wastewater treatment

The 1.1 *community knowledge* of and 1.2 *local support* for wastewater treatment is fairly low. Similar to the governance of flood risk, the low awareness results in a limited 8.2 *consumer willingness-to-pay* for adaptation measures. When the local community is not aware of the purposes and importance of the expenditures from taxes, the support for measures diminishes and people will vote for parties that promise tax reduction, resulting in a smaller budget for the execution of tasks that a municipality or water board is legally responsible for which reduces the governance capacity.

Condition 2 *useful knowledge* is scored indifferent, which is the second lowest score for wastewater treatment. The main reason for this, as mentioned earlier, is that fact that inputs and outputs of data generating systems are not fully connected. The data generating systems are mainly used at the operational level. In a discussion with Kees van der Drift (head of asset management department at Waternet) two main points of attention were raised for improving the indifference of useful knowledge. It can be argued that there is a lack of awareness of the requisite interconnectedness of data generating systems at the operational level. Better alignment of these systems will result in better analyses and improved facilitation of continuous functionality of the wastewater system. Additionally, actors on the operational level will be able to look ahead and be better informed on critical points in the system on which they can anticipate. This in turn increases actors' satisfaction and vigour to be engaged. Moreover, improving this useful knowledge is expected to increase informed decision-making in terms of integrated insights and policy implementation alternatives, contributing to the governance capacity to deal with wastewater-related challenges. Internally, awareness of the essential interconnectedness of data generating systems is being addressed. Facilitation from the administrative level of governance could aid in the progress of awareness. The other point of attention has a more general focus. Similar issues are recognized throughout the operational level of Waternet. It is recommended for the actors that deal with this issue to visit other departments within the company and to engage in cooperative problem-solving to as to align inputs and outputs of systems within a department and between departments.

Solid waste treatment

Awareness of the solid waste challenge is a little above the average awareness of water-related challenges. The continuation of the awareness programs and campaigns on waste separation at the source and on the impact of wastes in the environment are vital.

Condition 2 *useful knowledge* is actually limiting the governance capacity to deal with solid waste challenges. Of all challenges useful knowledge is scored the lowest for solid waste treatment. The cause for this is twofold: firstly, because information gathering and sharing between municipal districts is missing structure and cohesion and secondly due to a duality in waste management. The former issue is recognized by the municipality of Amsterdam and initiative is taken to align the information gathering and sharing methods (Mark Nijman, government official of city district Amsterdam Zuid). It is opted for a centrally governed approach throughout the city with a single service desk for information distribution.

Secondly, the duality in waste management approach obstructs the governance capacity to effectively and efficiently deal with the solid waste challenge. This is for instance clear from the limited collaboration and the limiting 2.2 *information transparency* which in turn limits collaboration. The municipality reasons from waste separation at the source, which reduces the waste provision that AEB needs to keep their

Waste-to-Energy plant running. It is essential that the visions of the municipality and AEB are in conformity and that a joint strategy is formulated. However, the Waste-to-Energy plant is a classic example of a lock-in. The Waste-to-Energy plant was very cost-intensive in the investment stage and it needs at least ten more years for it to be a cost-effective investment. The waste that is incinerated is turned into energy (biogas and heat) that can be used for warming houses through district heating for instance. The plant requires a minimum amount of waste in order to stay operable. Therefore, approximately two tonnes of waste is being already imported yearly from the UK¹⁸.

The low performance on 2 *useful knowledge* has implications for partnerships. Low 2.2 *information transparency* limits the opportunities for 3.3 *cross-stakeholder capacity building*. It can be argued that if stakeholders were to be included in the problem definition in terms of cross-stakeholder capacity building, 4.1 *stakeholder inclusiveness* and 7.1 *room to manoeuvre* would be consequently enhanced. 4.1 *stakeholder inclusiveness* and 7.1 *room to manoeuvre* are currently scored indifferent (0).

A joint long-term vision and method needs to be created in which domestic waste reductions are stimulated and a higher percentage of waste is separately collected. As a result less waste is generated due to the re-use, repair, refurbishment and recycling of products. This is in conformity with sustainability and Circular Economy (CE) principles and with the current policy statements. At the same time, a strategy needs to be developed to cope with the expected reduced waste production in Amsterdam. A continuous waste input needs to be ensured in order to operate the Waste to Energy plant for at least 10 years to return the investments. It means that more responsibility will be situated at individual actors and actor groups, contributing to the development of awareness among the local community.

Generally

Generally the governance capacity to deal with wicked water-related challenges in Amsterdam is well. Given the results of the CBF, this was to be expected. Still, there are two main points of attention: 1.1 *community knowledge* and 2 *useful knowledge*. Awareness is needed for all water-related challenges. It is needed for the create more support for taxation and measures that are implemented to deal with the challenges. Additionally, awareness is a prerequisite to anticipate on the wicked water-related challenges in terms of governance. 1 *awareness* is thus of high importance for city's preparedness for water-related events.

As for condition 2 *useful knowledge*, especially wastewater treatment and solid waste treatment are to benefit from improvement of this condition. Data generating systems within and between departments must be better aligned to facilitate analyses and develop the level of analysis. Building on the arguments of Koeze and Van der Drift, it is argued that information transparency within the water network is also constrained when individuals are not aware of existing information or do not know where to find the relevant information (Alice Fermont, 2016). The physical merger of AGV and Waternet may accelerate the process of alignment in both formal and informal ways due to respectable inter-sectoral relationships at various levels of the governance network. The informal way is initiated, says Van der Drift. In accordance it can be argued that a slightly formal push could greatly benefit the development of information transparency and cohesion.

¹⁸ http://www.aebamsterdam.nl/media/1621/aeb160623_jaarverslag-2015.pdf

6.CONCLUSION

This research is centred around the following research question:

How can the GCF be theoretically and practically optimized using conceptual literature and empirical information, and be operationalized to assess urban water governance networks varying in scale, social context, governance structure and water-related challenge, to provide insight into the governance conditions that can make the transformation towards water-wise cities possible?

At the start of this study the GCF was purely a theoretical framework that could benefit from a new perspective and required an application method. In order to answer the research question, (1) the framework theory has been reviewed, (2) the operationalization has been developed, and (3) the improved framework has been applied to the city of Amsterdam in the Netherlands. The experiences and results have been used to further optimize the framework.

(1) The theoretical optimization following the literature study and three feedback rounds resulted in enhancing the adaptive capacities and structure of the GCF. Additionally, cultural-historic restraint from literature that is used for the framework can be partly overcome by the decision not to weigh conditions in the governance capacity assessment for reasons of worldwide comparability. Conditions are not weighed the same for every governance structure, i.e. *stakeholder engagement process* is not valued the same in Wuhan as in Amsterdam.

(2) The GCF was operationalised, firstly, by identifying indicators and assigning observable entities and by moulding the GCF into an operational '*Water Governance (WG) score chart*'. Secondly, an application strategy was assigned that entailed (i) three interviews per water-related challenge i.e. one interview per strategic, tactical and operational level of governance; (ii) a desk study and (iii) a review of the results by representatives of the UWGN. The application strategy was subsequently executed in the city of Amsterdam, after which the practical discrepancies were resolved to optimize the GCF and WG score chart. Sixteen interviews were held, the desk study was performed and the results were reviewed by five representatives of the UWGN of Amsterdam. The latter is a pivotal step in terms of validation and support of the results in the UWGN.

(3) Regarding the optimization, the GCF and WG score chart were cleared from overlap, fragmentation, haziness and theory-practice mismatch. Additionally, it was found that the GCF is applicable to the variety of governance structures based on the governance structures found in the case study of Amsterdam. The results of the research are twofold: (1) an optimized and operationalized GCF and (2) a governance capacity assessment of Amsterdam's UWGN. Based on the case study of Amsterdam's water governance, overlap of 4 *stakeholder engagement process* and 7.1 *room to manoeuvre* was eliminated. The fragmentation and haziness regarding 1 *awareness* and 2 *useful knowledge* were eliminated by specifying the target audiences per characteristic. Lastly, the theory-practice mismatch was eliminated for 9.3 *preparedness* of which the fourth level read "abundant preparedness", whereas "fragmented preparedness" is practically more accurate. As for the governance capacity assessment of Amsterdam's water governance network, the results declare that the governance capacity to deal with wicked water-related challenges is generally encouraging. The network performs best in 3 *continuous learning*, which includes smart monitoring of technical measures, evaluation of policy measures and cross-stakeholder capacity building. Additionally, Amsterdam's UWGN does particularly well in 4 *stakeholder engagement*, 6 *agents of change* and 9 *implementing capacity*. Most potential for improvement regarding the governance capacity to deal with wicked water-related challenges is found for 1 *awareness* and 2 *useful knowledge*. A remarkable result has been the low governance capacity to deal with UHI effects and the fragmented strategy of solid waste collection and treatment. Additionally, more attention should be paid to groundwater governance in Amsterdam. Furthermore, ambition in

policies and guidelines were found to be realistic rather than ambitious, which occasionally limits the governance capacity to deal with wicked water-related challenges.

7.RECOMMENDATIONS

The aspects that showed room for improvement of Amsterdam's governance capacity to deal with wicked water-related challenges are formulated into recommendations in this section. It is recommended to the UWGN of Amsterdam that:

1. The network continues to raise awareness
 - a. ...of the water-related challenges on local community level
 - b. ...of the need for interconnected systems for continuous functionality of the company's systems at the operational level at Waternet.
2. Data generating systems, processes and approaches are aligned
 - a. ...specifically for the new dike standardisation measures regarding flood risk
 - b. ...specifically for Rainproof and water control systems
 - c. ...at the operational level for wastewater treatment and resources management (including groundwater) at Waternet
 - d. ...and between city districts of Amsterdam for the governance of solid waste.
also in order to enhance cross-stakeholder capacity building.
3. The governance capacity to deal with UHI effects is enhanced by increasing the human resources that are assigned to this challenge, by improving the challenge's embeddedness in policy and by supporting the implementation of policies with adequate policy instruments.
4. Groundwater should be better embedded in policy with regard to groundwater quality, both in the GRP and in the local "Water management plan" (Waterbeheerplan); and the responsibilities regarding groundwater should be clarified and clearly communicated.
5. The city districts of the municipality of Amsterdam and AEB formulate a joint strategy regarding waste collection and treatment that conforms with the principles of circular economy and prevents lock-in.

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9. APPENDIX

Appendix A

The first appendix is the GCF starting document of the research. The GCF is theoretically optimized using the literature from appendix two, in order to answer research sub-question 1. Appendices three and four are used for the operationalisation as to answer sub-question 2. The literature in appendix three is used to mould the GCF into the Water Governance score chart. Appendix four demonstrates the first step in identifying and assigning indicators to the characteristic levels in the WG score chart. Appendices five to seven are used for the application of the GCF on the city of Amsterdam in order to answer sub-question 3. Appendix five encloses the literature that was used for the desk study as part of the application. Appendix six shows the interview outline with which the interviews are taken. In appendix seven an overview of the interviewees for the application on Amsterdam is given. Based on the desk study and the interviews, appendix eight provides the completed WG score chart. The results from the WG score chart were used to visualize and evaluate the results in order to give recommendations.

CONTENTS

| | |
|---|-----|
| 1. GCF Starting document | 75 |
| 2. Literature used for theoretical optimization | 96 |
| 3. Literature used for operationalisation..... | 98 |
| 4. Strategy 1 of identifying and assigning observable indicators..... | 99 |
| 5. Literature used for desk study in application | 105 |
| 6. Interview outline | 101 |
| 7. Overview of interviewees per water-related challenge | 105 |
| 8. Completed Water Governance Score Chart for Amsterdam | 109 |

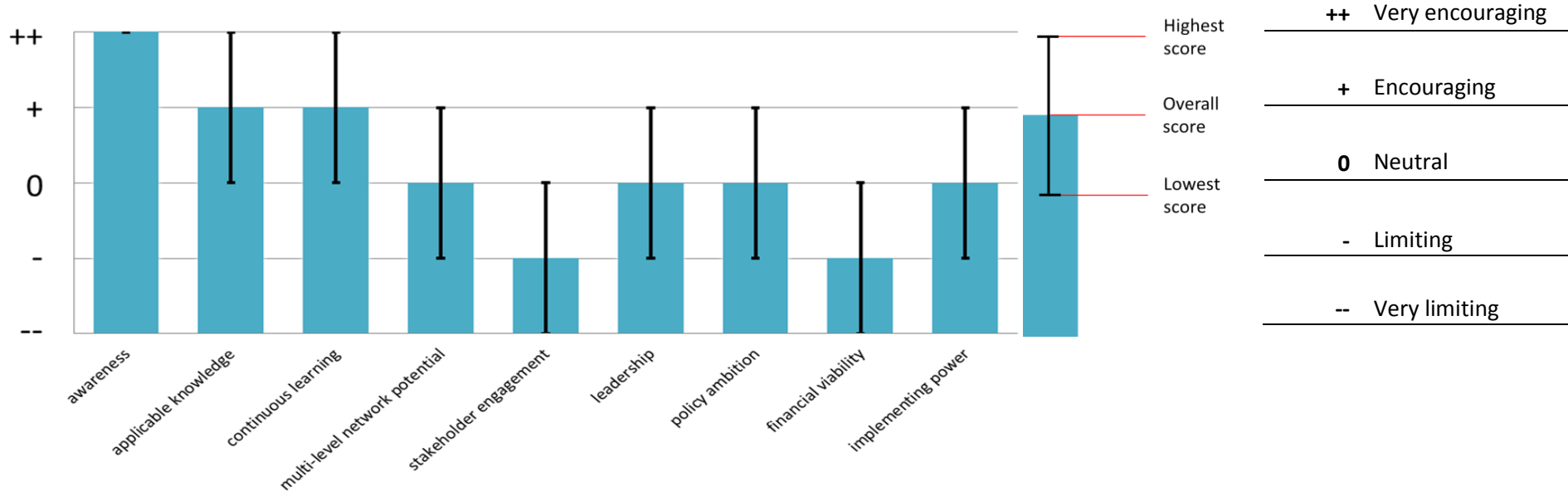
Constructing the capacity levels

This appendix provides the capacity levels specified for each characteristic into (--) very limiting, (-) limiting, (0) neutral, (+) encouraging and (++) very encouraging the transition towards water-wise and climate adaptive cities.

All nine governance capacities consist of 3 characteristics (except capacity 1 *awareness*). For each characteristics, a level is assigned and the average of all 3 characteristics belonging to the capacity determines the overall score. It is chosen to show the lowest and highest characteristic in the capacity score as shown in the bar chart on the next page.

The defined capacity levels of each characteristic form the basis for the questionnaire and the scoring of the Governance Capacities.

Governance capacities



Objective: A Governance Capacity (GC) Assessment Framework for cities and urban areas that is comprehensive, consistent and comparable.

| Capacity | | Characteristics | | Capacity | | Characteristics | |
|----------|-------------------------------|-----------------|--|----------|---------------------|-----------------|-------------------------------|
| GC1 | Awareness | GC1.1 | Stakeholder internalization | GC6 | Leadership | GC6.1 | Visionary leadership |
| | | GC1.2 | Public support | | | GC6.2 | Entrepreneurial leadership |
| GC2 | Useful Knowledge | GC2.1 | Data completeness | | | GC6.3 | Collaborative leadership |
| | | GC2.2 | Cohesion | GC7 | Policy Ambition | GC7.1 | Embedding |
| | | GC2.3 | Accessibility | | | GC7.2 | Ambitious and realistic goals |
| GC3 | Continuous Learning | GC3.1 | Smart monitoring | | | GC7.3 | Cohesive policy |
| | | GC3.2 | Evaluation | GC8 | Financial Viability | GC8.1 | Financial continuation |
| | | GC3.3 | Openness to cross-stakeholder learning | | | GC8.2 | Willingness to pay |
| GC4 | Multi-level network Potential | GC4.1 | Cooperative capacity | | | GC8.3 | Affordability |
| | | GC4.2 | Room to maneuver | GC9 | Implementing power | GC9.1 | Policy instruments |
| | | GC4.3 | Political power | | | GC9.2 | Legal compliance |
| | | | | | | GC9.3 | Action plans |

| | | | |
|-----|------------------------|-------|-----------------------------|
| GC5 | Stakeholder Engagement | GC5.1 | Openness |
| | | GC5.2 | Protection of core values |
| | | GC5.3 | Progress and choice variety |

GC1: Awareness

Description: Awareness is a prerequisite that can be fostered and developed to enable more action. It refers to a more profound understanding of the causes, impact, scale and urgency of wicked problems on daily operations. It forms the base for which understanding, communication, learning and action can be developed to deal with wicked problems. Awareness is something that is cognitively and emotionally felt within individuals, the organizations and society, resulting in different degrees of adaptive capacity. Hence, the limit of adaptation is endogenous in society. This determines the formulation of goals, values, risk perception and social choice.

In this framework two dimensions of awareness will be assessed; *internalization* and *public support*. Internalization encompasses the extent in which awareness of the urban water issue is 'dissolved' within the relevant stakeholders. This ultimately will affect their goals, values and perceptions, thus their limit of adaptation. Public support reflects the public awareness of the water issue. In any functioning democracy the public opinion will influence governance, therefore this dimension will be taken into account. These two characteristics are prerequisites for sufficient awareness to be able to tackle urban water issues.

| GC1.1: Stakeholder internalization | | Extent to which sustainable behavior regarding the issue is part of the organizational and institutional urban network by learning or (unconscious) assimilation and action |
|------------------------------------|--|---|
| -- | Unaware | The decision-makers and their organizations are unaware of the existence of future impacts of the issue. Even when problems occur there is no understanding of causes and actual effects or how current practices impact the issue. Also those who contribute to the problem (e.g. polluters, project developers, etc.) are often not fully aware of their contribution or ignore it. "Invisible" effects such as groundwater depletion, declining biodiversity, etc. go often unnoticed by most stakeholders |
| - | Recognition mainly by external pressure | Actors are starting to recognize the issues, although it is not because of intrinsic motivation. They are urged to do so by superiors, clients or external pressures. Some actors will concede that there are (looming) issues, but there is often no support to proceed to action or change current (unsustainable) practices. Actors do not want to change their own actions, rather they feel like others are responsible for solving the issue |
| 0 | Exploration | There is a growing awareness that the issue is and/or will affect the business-as-usual. Actors are starting to investigate if and to what extent they can contribute to solving the issue and try to understand what the implications are for the long term. This often starts with informal actors |
| + | Partly internalized | There are incentives for actors to start internalizing the issue with regards to IWRM, climate adaptation and sustainable behavior into their core business and policy. However, a full long-term strategy embedded in everyday practice, policies or in joint strategies with other actors is not yet fully developed |
| ++ | Fully internalized | Full awareness of the causes, impacts, scale and urgency of the issue. Most actors have internalized sustainable behavior and, as a result, the urban network as a whole strongly internalizes a shared long-term strategy to tackle water wicked problems of urban water and climate change |

| GC1.2: Public support | | As urban water issues involves a network of stakeholders, public awareness is a requirement for enabling action. Moreover, public opinion, (media) attention and risk perception, play a key role in the effectiveness and scope of decision and implementation processes |
|-----------------------|--|---|
| -- | Public resistance | There is generally no public support and sometimes resistance to spend resources on the issues. The water issue is not on the political agenda, as is evident in the lack of (media-) attention |
| - | Public unaware, support by small groups | A marginalized group of the public (e.g. the most vulnerable, environmentalists, NGOs) express their concerns, but these are not adopted by the general public. There is no notable (media-)attention to raise public awareness |
| 0 | Moderate support for small changes | There is growing public awareness of the issue. However, the causes, impact, scale and urgency are not widely known or acknowledged. There is support for incremental changes. There is growing (local) media attention for the issue |

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| + | General support for long-term policy | There is increasing public understanding of the causes, impacts, scale and urgency of the issue. There is moderate support for long-term policy, although awareness is raised mainly in parties that are directly involved in decision-making. Furthermore, measures requiring considerable efforts or substantial change are not supported |
| ++ | Active support and demand for more action | There is a general sense of importance regarding the issue. There is active public support and demand to undertake action and invest in innovative, ground breaking solutions. This is also evident, since the issue receives much media attention |

GC2: Useful knowledge

Description: This capacity consists of three characteristics, i.e., *data completeness*, *cohesion* and *accessibility*. *Data completeness* refers more to the quantity of knowledge, both tacit and tangible. *Cohesion* refers to the conformity of knowledge across actors, sectors and administrative layers. Finally, *accessibility* refers to the sharing of knowledge to all interested stakeholders.

| | | |
|---------------------------------|---|--|
| GC2.1: Data completeness | | Information provision needs to meet the requirements of current and future data demands. A complete body of reliable data enhances well-informed decision making and reveals if there are information gaps. Scientific knowledge is complemented with local, tacit knowledge |
| -- | Lack of data | Data incompleteness and poor quality limits everyday operations. The knowledge limitations may contribute to misperception of the issue at hand |
| - | Data scarcity and limited quality | Reliable knowledge does not cover all relevant requirements to address the wicked issue. Often, not all data is of sufficient quality to generate a comprehensive approach. The data may be sufficient for basic operations |
| 0 | Data meets short-term requirements, limited exploratory research | Existing knowledge gaps are hardly identified. Effects of long-term processes are often not considered and exploration of new approaches is seldom researched. Data is often produced in a structured way |
| + | Data enhancing integrated long-term thinking | Relevant information from a wide range of sources. Knowledge gaps are identified and efforts are initiated to bridge these gaps. Local wisdom is also included as citizens co-produce knowledge, for example through citizen science |
| ++ | Comprehensive data enabling long-term integrated policy | Data provision regarding the issue is complete and reliable. Tacit knowledge is a vital part, enhancing data completeness, effective implementation and continuous improvements. Abundant data assimilation results in unforeseen extra benefits |

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| GC2.2: Cohesion | | Dealing with water issues in the urban environment requires different kinds of knowledge, which is produced and shared by different policy fields and stakeholders. Therefore, information needs to be cohesive |
| -- | Non-cohesive and contradicting knowledge | Lack of data strongly limits the cohesion between (policy) sectors, leading to low usefulness for policy making |
| - | Low-cohesive knowledge within sectors | Data within sectors is non-cohesive and therefore hampers non-complex decision making. The data is inconsistent within and between sectors |
| 0 | Insufficient cohesion between sectors | Data collection is consistent and the knowledge base is growing to meet sectorial policy needs. However, knowledge is fragmented leading to limited knowledge exchange. Hence, policy sectors have sometimes conflicting goals, inefficient and overlapping management regarding the issue |
| + | Substantial cohesive knowledge | Risks, insights and predictions of different trends are specified in the local context by bundling sectorial knowledge. Different alternatives, cost-benefit analysis, including cost of inaction, are often calculated to support informed, integrated and long-term decision making. However, knowledge about effective implementation together with relevant stakeholders is still rather limited |
| ++ | Implementation of cohesive knowledge | There is useful knowledge and experience for the implementation of cohesive, long-term and integrated strategies. This may include knowledge co-creation with all relevant stakeholders |

| | | |
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| GC2.3: Accessibility | | Degree to which knowledge is accessible and understandable for all interested actors including decision makers. Co-creation of practical knowledge e.g. pilots |
| -- | Not transparent and inaccessible knowledge | There is little data available and sharing of information is limited or discouraged. Furthermore, information that is available, is often difficult to understand for non-experts |
| - | Low sharing of fragmented knowledge | Data is sometimes shared with other stakeholders. Most of the data is inaccessible for most stakeholders. Furthermore, knowledge is often technical and difficult to understand for non-experts |
| 0 | Sharing of non-communicative | There are protocols for accessing information, however, it is not readily available. Although data is openly available, it is difficult to access due to the specialized character |

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| | specialized knowledge | |
| + | Sharing of partly cohesive knowledge | All interested stakeholders can access data. Although knowledge is increasingly understandable, it requires a time-consuming search through a maze of organizations, protocols and databases to abstract cohesive knowledge and insights |
| ++ | Sharing of cohesive knowledge enabling active citizen engagement | Data is easily available on open source information platforms. There are multiple ways of accessing and sharing information. This will enhance active stakeholder involvement and co-creation of knowledge |

GC3: Continuous Learning

Description: Continuous learning is strongly based on the multiple-loop learning theory. Single-loop learning refers to assessing and improving current practices; double-loop learning refers to questioning and changing basic assumptions on which actions are based; triple-loop learning refers to changing fundamental beliefs and world views. Continuous learning consists of three characteristics, i.e., smart monitoring, evaluation and cross-actor learning. Smart monitoring is needed to be able to monitor process, progress and policy outcome. Evaluation is a prerequisite for learning and openness to cross-stakeholder learning will assist in problem framing and gaining insight in other perspectives.

| GC3.1: Monitoring | | The extent and detail to which technical and policy measures are (smartly) monitored in order to adequately measure effectiveness of policy and implementation. Smart monitoring results serve as tool to recognize trends, predict future developments, recognize or clarify underlying processes and quickly recognize alarming situations |
|--------------------------|---|---|
| -- | Irregular, poor quality or absent | Monitoring is rarely done. As a result ineffective and inefficient policies are repeated. Hence, alarming situations may not be recognized adequately and evaluation is hardly possible |
| - | Reliable data but limited coverage | Monitoring is improved as progress, processes and policy outcomes are regularly registered. However, only a few aspects are monitored and this leads to an incomplete or even wrong understanding of current affairs. As a result, policy-makers are often incompletely informed, which can hinder learning |
| 0 | Quick recognition of alarming situations | Monitoring covers most relevant aspects to assess the business as usual and enables identification of alarming situations. This improves current practices, i.e. single-loop learning, which may lead to a lock-in effect of insufficient strategies. For example, flood defense monitoring often only measures water levels, disregarding (long-term) aspects, such as ecological, esthetical and societal aspects |
| + | Useful to recognize underlying processes | Abundant monitoring allows for adequate evaluation. This abundance uncovers underlying trends, processes and relationships that, in turn, urges for revision of existing assumptions and approaches, i.e. double-loop learning |
| ++ | Useful to predict future developments | Monitoring system is adequate in recognizing alarming situations, identifying underlying processes and provides useful information for identifying future developments. Monitoring of transition progress is done as well as the process itself |

| GC3.2: Evaluation | | The extent to which current policy and implementation are continuously assessed and improved |
|--------------------------|-----------------------------------|---|
| -- | Insufficient evaluation | Evaluation of policy results and decision making process is lacking. As a result ineffective and inefficient policies are repeated |
| - | Non-directional evaluation | There is limited evaluation with inconsistent and random criteria. The evaluation is poorly performed, without taking into account all relevant aspects. The evaluation has low legitimacy and results may be biased |
| 0 | Improving routines | The identified problems and solutions are evaluated based on conventional (technical) criteria. Current practices are improved, leading to a lock-in on dominant paradigms. This corresponds to single-loop learning; the last action is assessed based on existing criteria, leading to small changes and a short-term perspective |
| + | Double-loop evaluation | Evaluation is based on a range of innovative criteria. Hence, a better understanding results in continuous improvements of policy and implementation, including adoption of innovative approaches |
| ++ | Changing assumptions | Double loop evaluation questions the basis of all actions and explicitly communicates uncertainties. Policy assumptions have changed by the full recognition of long-term processes such as climate change |

| GC3.3: Openness to cross-stakeholder learning | | Extent to which stakeholders are open to interaction and deliberately chose to learn from each other, i.e., level of social learning |
|--|--|--|
| -- | Closed attitude towards cross-stakeholder learning | Contact with other parties is non-existent or even discouraged. There is no trust in each other and therefore very limited sharing of experience, knowledge and skills occurs. This results in repetition of similar mistakes and stakeholders acting out of self-interest |
| - | Small coalitions of stakeholders with shared interest | Cross-stakeholder learning occurs only in small groups that strongly dependent on each other or share common interests. These small |

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| | | coalitions may be more resistant to other opinions as they encourage each other to put forward their shared point of view |
| 0 | Open attitude towards stakeholder interaction | Stakeholders and institutions are willing to interact. Learning from these interactions is rather limited due to its informative character or because stakeholders are not always incorporated early on in the decision-making process |
| + | Open for cross-stakeholder learning | Stakeholders and institutions experience the interactions as valuable and useful for improving policy and implementation. However, it appears difficult to put this learning experience into practice |
| ++ | Putting cross-stakeholder learning into practice | Based on cross-stakeholder learning results policy and implementation is improved and this is broadly supported. There is recognition that the issue is complex and that cross-stakeholder learning is a precondition for adequate solutions and successful implementation |

GC4: Multi-level network potential

Description: Urban governance involves a plethora of actors and interests. For sustainable governance, working in networks is inevitable. Multi-level network potential consists of three characteristics, i.e., cooperative power, referring to the ability for stakeholders to create collaborations; room to maneuver, which indicates the level of autonomy of actors; and political power, which refers to the political will to implement sustainable policy.

| | | |
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| GC4.1: Cooperative power | | Cooperative power assesses the extent to which wicked water challenges are or can be addressed by more fit-for-purpose cooperative partnerships |
| -- | Lacking opportunities for cooperation | There is no opportunity for cooperation between civil society, market and government. This could be due to barriers such as lack of cultural embedding, rigid procedures or over-hierarchical relationships. As a result trust relationships can hardly be established |
| - | Considerable barriers for cooperation | The high barriers also result in low trust, miscommunication and often leads to ineffective results Actors only cooperate if there are no other options |
| 0 | Inflexible cooperation | Possibilities to cooperate often only involve a limited set of conventional actors. These cooperations result in fragmented policy which mostly reinforce current strategies and approaches. Hence, most opportunities for fruitful cooperations are not discovered |
| + | Innovative cooperative strategies | Actors recognize that knowledge and experience are scattered within the local network. Therefore, effective overall solutions require bundling of knowledge. Due to the inadequate extent of cooperative networks that address complex issues, extra effort is required to bundle the scattered expertise and to reach fit-for-purpose solutions |
| ++ | Dynamic, fit-for-purpose cooperation | There are many synergetic cooperations within the urban water network that can provide solutions for the issue. These cooperations are dynamic and result in fit-for-purpose problem solving necessary to solve complex, multi-level and unknown challenges |

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| GC4.2: Room to maneuver | | Room to maneuver assesses the extent to which actors in the urban water network have the freedom and opportunity to develop a variety of alternatives and approaches necessary to effectively address complex problems regarding urban IWRM and climate adaptation |
| -- | Strictly imposed obligations | The actions of stakeholders are strictly controlled. The objectives and actions are stringent to meet rigid short-term targets. Actors have insufficient freedom to effectively achieve targets and goals |
| - | Limited autonomy | Only a few actors receive some degree of autonomy. There are limited opportunities for actors to develop alternative approaches. The unilateral approach increases vulnerability, as back-up systems or plans are not established |
| 0 | Limited room for innovation | Actors are given the means to perform predefined tasks for dealing with the present issue. The targets are well-defined, but the possibility to deviate from the prescribed tasks is limited. Therefore, room to innovate is hampered |
| + | Redundancy to address uncertainty | Actors recognize that current approaches are insufficient to deal with complex situations. Therefore, a high degree of freedom is provided to experiment and create a redundant set of solutions. In other words, applying the precautionary principle |
| ++ | Freedom to develop innovative solutions | There is a common and accepted vision for dealing sustainably with the issue. Within the boundaries of this vision, actors are given the freedom to develop novel and diverse approaches. This leads to continuous improvements and the search for alternatives necessary to deal with a complex future |

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| GC4.3: Political power | | Presence of legitimate forms of power (e.g. embedded in policy or law) that put forward the necessity to address water issues |
| -- | Powerless | By far most attempts to put forward water and climate aspects regarding the issues fail due to contradicting and competing interests that overrule them. The issue is hardly included in policy, regulation or any administrative principles |
| - | Unpromising attempts | Attempt to put forward the issue is fragile and has low chances of being accepted or acted upon. This could be due to poor embedding of sustainability principles in current policy, opposing interests, financial constraints, etc. |

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| 0 | Restricted power | The issue is not on the top of the political agenda. There is not a strong opposition against the adoption of regulation, policy and sustainable arguments in general as long as it does not considerably change the status quo. Hence, long-term policy is limited and new policy mainly needs to build upon existing fragmented policy |
| + | Stirring power | Political and public support lead to declarations of intent, sustainability principles and recognition of the need for long-term and integrated approaches. As a consequence, new policies, regulation and projects are introduced that promote long-term integrated policy regarding the issue |
| ++ | Strong well-embedded power | Long-term and integrated approaches regarding the issue are well embedded in policy, regulations and receive much support both politically and societal |

GC5: Stakeholder engagement

Description: Stakeholder engagement is required for common problem framing, gaining access to a wide variety of resources and improving implementation of policy. Stakeholder engagement consists of three characteristics, i.e., openness, referring to the transparency of the engagement process and the opportunity to get involved; protection of core values, referring to respecting stakeholders and allowing them to commit to the process rather than a predetermined outcome; and progress and choice variety; which refers more to the process, where progress is important to encourage stakeholders and where they can co-create and co-decide on a variety of choices.

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| GC5.1: Openness | | The level to which relevant stakeholders are able to be part of the decision-making process, decide or speak on behalf of the group they represent and the stakeholder engagement process should be clear and transparent |
| -- | Limited information supply | There is hardly any stakeholder engagement with insufficient information supply. Stakeholder engagement is sometimes actively discouraged |
| - | Non-inclusive information supply | Stakeholders are informed or sometimes consultation takes place but there is a lack of transparent procedures for stakeholder participation. However, not all relevant stakeholders are recognized or approached and stakeholders hardly have influence on the results of decision-making |
| 0 | Untimely consultation and low influence | Stakeholders are mostly consulted, but not actively involved. Consultation is often not timely, as plans and decisions are already made prior to engaging stakeholders. Therefore stakeholders have low influence on the outcome of decision-making |
| + | Timely, over-inclusive and active involvement | Stakeholders are actively involved in the decision-making process. It may be unclear how decisions are made and who should be involved at what stage. Moreover, some stakeholders are not able to decide on behalf of their group or organization |
| ++ | Transparent involvement of committed partners | Active involvement of all relevant stakeholders where all participants have the power to engage, represent or advise during the process. It is fully clear how decisions will be reached and who will be involved at which stage |

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| GC5.2: Protection of core values | | Extend to which stakeholders feel confident that their core values will not be harmed. Extend to which commitment is focused on the process instead of the results. Possibilities for stakeholders to exit at given moments |
| -- | Insufficient protection of core values | Stakeholders are hardly engaged, leading to stakeholders core values seriously being harmed |
| - | Non-inclusive and low influence on results | Stakeholders are informed or sometimes consulted at a late stage of the decision-making process. Not all relevant stakeholders are approached and influence on result is limited. This leads to core values being harmed, especially for affected groups that have limited means |
| 0 | Suboptimal protection of core values | Stakeholders are often engaged via consultation or short periods of active involvement. This limits the influence on results as well as time and opportunities to find the most optimal solutions in which the core values of all stakeholders are maximally protected |
| + | Requisite early commitment to output | Stakeholders are actively involved, but are expected to commit themselves to the outcomes early in the process. Stakeholders are reluctant to commit themselves as they are concerned that their core values will be harmed. There are limited possibilities to exit the process. This discourages some stakeholders to get involved, leading to suboptimal solutions |
| ++ | Core values are maximally protected | Stakeholders are asked to commit to the process instead of the outcome. There are clear exit possibilities at certain stages in the process and stakeholders do not have to commit themselves to sub-decisions |

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| GC5.3: Progress and choice variety | | Speed and choice variety needs to be ensured by clear and realistic procedures. Stakeholders should produce and then select from a variety of alternatives to ensure learning and get authoritative decisions. The selection should be at the end of the process to secure continued prospect of gain and thereby cooperative behavior |
| -- | Lack of procedures limit engagement and progress | There is a lack of clear procedures to engage stakeholders. There is very limited choice variety hampering widely supported decision-making. As decisions lack support they may result in conflicting situations. This |

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| | | significantly limits progress and effectiveness of decision-making and implementation |
| - | Rigid procedures limit the scope | Informative and consultative approaches have a limited predetermined scope with rigid procedures and low flexibility. This may lead to quick decision making but slow an ineffective implementation that lack support |
| 0 | Consultation or short active involvement | Consultation or short active involvement of stakeholders results in limited choice variety. This can lead to unresolved conflicting interests and suboptimal solutions which often leads to unilateral decisions |
| + | Active involvement with abundant choice variety | Stakeholders are actively involved and extensive choice variety is created. However, the procedures, deadlines and agreements are unclear, leading to inertia and indecisiveness. This limits continued cooperative behavior, learning, optimization of interests or not fully supported end results |
| ++ | Active engagement with choice selection at the end of the cooperation | Clear procedures and realistic deadlines enable active engagement. The process of increasing choice variety is fully explored and selection of the best alternatives is done at the end of the process. This encourages stakeholders to engage throughout the whole process |

GC6: Leadership

Description: In order to drive change, good leadership is required to show direction, motivate others to follow and mobilize the resources required. Leadership consists of visionary leadership, to promote a sustainable vision and convince others of the need to act; collaborative leadership, to build bridges and coalitions between actors, and; entrepreneurial leadership, to gain access to resources, seek opportunities and manage risks.

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| GC6.1: Visionary leadership | | Visionary leaders drive change by promoting a comprehensive and integrated vision and strategy on water and climate change issues as well as enhancing organizational skills and knowledge. They have the capacity to manage change and communicate effectively |
| -- | Deficient sustainability vision and short-term thinking | There is a lack of visionary leadership that promotes a long-term, sustainable vision regarding the issue at hand. This contributes to fragmented expectations and objectives by different stakeholders and sectors regarding the issues, resulting in conflict and indecisiveness. It may even be that there is strong visionary leadership blocking long-term and integrative initiatives regarding water and climate related aspects of the issues |
| - | Unilateral and short-term vision | Visionary leaders successfully promote a unilateral vision, which benefits only a limited group of stakeholders which often has a short-term focus. This inhibits long-term and sustainable development |
| 0 | Visionary leaders defend status quo | At this level, most visionary leaders adjust their vision in order to promote the business as usual. They do not oppose but also not promote long-term and integrated visions addressing water and climate related aspects of the issue |
| + | Long-term vision with flawed dissemination | Leaders develop a clear long-term vision that considers the interests of most sectors and stakeholders. There is still some dissension between short-term targets and implementation strategies on the one hands and the long-term vision from leaders on the other hand |
| ++ | Long-term vision supported by short-term implementation receiving much approval | Visionary leaders in different positions and from different backgrounds actively and successfully promote a sustainable and long-term vision regarding the issue and make sure that it comes up in important meetings, political debates or important events. They have the ability to overcome contradicting objectives and formulate an integrative vision. Their communicative skills are well-developed and they are well-informed by a wide range of knowledge sources. This enables the development of short-term objectives, which contribute to the vision |

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| GC6.2: Collaborative leadership | | Leaders that understand and have the network to access and abstract valuable resources. Because of their 'soft skills' they are able to engage, collaborate with and connect the business, government and social sectors. Moreover they often initiate coalition forming |
| -- | Lack of collaborative leadership | The leaders discourage collaboration, as they take a one-sided perspective of the issue due to personal interest or nepotism. It may lead to distrust between stakeholders and reduces the willingness to cooperate. Talented cooperative leaders do not have the opportunity to use their skills |
| - | Low collaborative leadership leads to incomplete stakeholder inclusion | There is limited collaboration whereas existing visions mainly aims to deal with current and common issues, including only a small group of actors. Leaders do not recognize that the existing collaborations are insufficient and that other actors need to be included |
| 0 | Leaders enhance conventional collaboration to preserve status quo | The leaders promote current coalitions which aim to maintain the business as usual. There is limited effort to create innovative collaborations with conventional actors. There is trust within the existing collaborations, but the leaders do not build trust with other important stakeholders that is necessary for long-term integrated solutions |
| + | Leaders push for exploratory collaboration with new stakeholders | Most leaders understand that the (wicked) problems require more wide-spread collaborations between different sectors and stakeholders. Leaders are starting to investigate collaborations with new unconventional actors. Although this is not always successful, it does result in valuable new insights, trust relationships and improvements towards more adaptive and sustainable collaborations |
| ++ | Strong leadership enhances wide-spread synergetic collaboration | Most leaders have the network and skills to connect different sectors and stakeholders in order to build productive and synergetic collaborations. They successfully mediate where there are conflicting interests and have the authority to provide satisfying compromises. Furthermore, they are aware of who should be included in the collaboration at what time |

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| GC6.3: Entrepreneurial leadership | | Entrepreneurial leaders have the authority, persuasiveness and ability to identify opportunities and subsequently act by initiating new projects. Entrepreneurial leaders are skilled in accessing the necessary resources and networks |
| -- | Insufficient entrepreneurship | The leadership fails to manage risks and squanders resources for ineffective measures. This results in distrust by other actors and potential investors, leading to diminishing access to resources |
| - | Static and short-sighted entrepreneurship | Leaders struggle to gain sufficient resources for dealing with common and immediate aspects regarding the issues. Entrepreneurial leaders fail to make use of windows of opportunity such as increased awareness after a calamity. At these moments opportunities to address stakeholders with potential access to resources are rarely seized |
| 0 | Conventional and risk-averse entrepreneurship | Entrepreneurial leaders are better able seize low-risk opportunities. Therefore, opportunities for innovative approaches and synergies, that by definition include risk, are not pursued |
| + | Tentative experimental entrepreneurship | As there is growing understanding that the (wicked) problems entail uncertainty and complexity, leaders understand that innovative approaches are needed. Entrepreneurial leaders are enabled to do tentative experimental projects often within the existing pool of resources. Novel (financial) resources are increasingly recognized and leaders are stimulated to pursue new opportunities |
| ++ | Measured and enabling entrepreneurship | Entrepreneurial leaders are enabled to experiment, as it is widely recognized that opportunities for improvement need to be explored. Leaders promote measured risk taking, which, besides increased benefits, also provides new insights and encourages creativity of actors. They are able to recognize and access a variety of resources through, e.g., public-private partnerships |

GC7: Policy ambition

Description: The extent of shared problem framing, cohesive goal setting in multi-level governance regulation, across sectors and with stakeholders. Rules and agreements that are based on shared values and principles which make them easier to enforce because parties have the strong conviction that they should behave in conformity with the rules. Goals are feasible regarding the executive authorities' available means and capacity. Goals are set that exploit the potential to tackle water-related issues at hand as well as sustainability objectives such as long-term climate adaptation, reducing resource scarcity and maintaining ecosystem services. Long-term goals are achieved through short- to mid-term goals that are at the appropriate scale.

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| GC7.1: Embedding | | The extent to which sustainable policy is interwoven with historical, cultural, normative and political context. This can be measured by assessing the sustainability ambitions within the institutional setting and implemented policy |
| -- | Unsuitable policy and implementation | The cultural, historical and political context is largely ignored, leading to arduous implementation. A possible reason is the improvident replication of policies from cities that strongly differ |
| - | Persistent reluctance and poor embedding | There is a persistent degree of reluctance, as the local context is not entirely considered. This may lead to ineffective implementation, inefficient use of resources and distrust between actors. There is friction between societal demand and the political values, ambitions and objectives |
| 0 | Problem framing and embedding | Conventional policies fit the local context, but do not improve the city's adaptability to the issue. It assists lock-in onto current practices, but does not embrace uncertainty or the necessity to adapt. The issue is increasingly interwoven and framed into the cultural, historical and political context |
| + | Consensus for sustainable actions | There is a consensus that adaptation may be required, but substantial effort is necessary to overcome opposing interests. Changes that fit the local context are proposed and mostly accepted, however an overall strategy is not established |
| ++ | Embedding of sustainable implementations | Cultural, historical and political values are considered in policy-making and are used smartly to accelerate policy implementation. Innovations are subdivided into suitable phases which are more acceptable and effectively enables sustainable practices |

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| GC7.2: Ambitious and realistic goals | | Sustainable development is developed with a long-term vision with short-term intermittent targets. Important is the level to which concepts such as cost recovery and ecosystem services are operationalized and used to continuously assess existing and new techniques, projects and regulation |
| -- | Short-term, conflicting goals | There is a lack of sustainability objectives, leading to arbitrary and sometimes conflicting actions. These actions may cause negative side-effects and inhibit adaptation |
| - | Short-term goals | Short-term actions and goals are coordinated, but a comprehensive long-term vision is lacking. Policy is reactive and is focused on 'quick fixes'. This results in ineffectiveness and inefficiency |
| 0 | Confined realistic goals | There is a confined vision regarding the issue. Its ambition is predominantly focused on improving the current situation, where predictability and certainties are assumed |
| + | Long-term ambitious goals | There is a long-term vision that incorporates uncertainty. There is a clear long-term vision, but it is not supported by a comprehensive set of short-term targets. It is therefore unclear if and how the long-term vision is realistically achievable |
| ++ | Realistic, ambitious strategy | Ambitious policy objectives are set for the long term. The objectives are specified with a comprehensive set of intermittent targets, which provide a clear and flexible pathway. Scenarios are used to provide valuable insights to maintain adaptability of strategies |

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| GC7.3: Cohesive policy | | Extent to which existing regulation block sustainable innovations. Take into account administrative boundaries, alignment across government levels and technical possibilities. Integration of different sectoral policies and strategies to create co-benefits |
| -- | Incompatible policy | There is high fragmentation between policies from different sectors, resulting in conflicting and incompatible objectives. This makes most policies difficult to implement. Different sectors compete for resources and hamper the ability of other policy fields to reach their objectives |
| - | Opposing sectoral policy | There are some dominant policy fields that are prioritized. For example, urban development objectives are achieved, while decreasing the ecological value |

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| | | and limiting the city's ability to drain stormwater. This practice leads to imbalanced policy |
| 0 | Fragmented policy | Policy is fragmented but not yet conflicting. The policy objectives are based on the sector's specific scope and opportunities for co-benefits are not explored |
| + | Overlapping comprehensive policy | There is cross-boundary coordination between policy fields to address wicked problems. Although the policies are comprehensive, they overlap because integration is not fully established and efforts to harmonize different sectors, policies and overall implementation are required |
| ++ | Cohesive synergetic policy | The urban water policy is coherent with policies in other sectors. There is an overarching vision which ensures effective coordination of policy fields. Goals are continuously evaluated and revised to adapt to new challenges |

GC8: Financial viability

Description: Financial resources and management are crucial for good water governance. This capacity includes financial continuation, which refers to the financial arrangements for the long term; willingness to pay, which is important to create collaborative investments, and; affordability, which allows the whole population to gain access to water services and enable climate adaptation.

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| GC8.1: Financial continuation | | Financial resources are a necessity for developing and implementing sustainable solutions in the urban water cycle. Policy focused on solving long-term problems requires long-term thinking but, more importantly, long-term financial support and security. Policy is most effective if this long-term financial support is guaranteed on forehand |
| -- | Lack of financial resources | There are insufficient financial resources available to perform even the most basic tasks regarding the issue. Financing is irregular and unpredictable leading to poor policy continuation |
| - | Inequitable financial resources | There are potential resources available to perform basic management tasks regarding the issue, but they are difficult to access, fairly randomly distributed and lack continuation |
| 0 | Financial continuation for basic services | Financial resources are available to perform fragmented and singular functions in managing the issue. The allocation of financial resources is based on past trends, current costs of maintenance and incremental path-dependent development. Costs for short-term action to deal with long-term future challenges are not incorporated into baseline funding |
| + | Abundant financial support with limited continuation | Financial resources are made available for project based endeavors. Due to limited prospect of financial continuation, the transition from development to long-term implementation is uncertain |
| ++ | Long-term financial continuation | There is secured continuous financial support for long-term adaptation policy, measures and research regarding the issue. Funding of adaptation includes capital costs of interventions throughout their life-cycle and the costs of research projects and programs. These costs are included into baseline funding for management of the issue, while both economic and non-economic benefits are considered |

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| GC8.2: Willingness to pay | | Willingness to pay assesses how expenditures on water and climate adaptation are perceived. Often, trust in local authorities is important to secure willingness to pay |
| -- | Mistrust and resistance to financial decisions | There is a high level of mistrust in decision making regarding resource allocation. At this level financial decisions are based on prestige projects, projects that benefit a small group of actors or assist limited interests. They often do not address the actual urban water issues. Hence, there is a high degree of resistance regarding resource allocation |
| - | Fragmented willingness to pay | The willingness to pay for measures addressing water related issues is fragmented. There is a gap between the perceived importance of the issues between stakeholders. Furthermore, the perceived required investments to address the issues is substantially lower than the actual cost needed to address these issues |
| 0 | Willingness to pay for business as usual | There is support for the allocation of resources for conventional tasks. Most people are unwilling to financially support novel policies regarding climate change or a transition towards more adaptive governance regarding the issue. There is limited awareness on the actual issues or most important future threats |
| + | Willingness to pay for provisional adaptation | Due to growing concern for challenges, there are windows of opportunity to increase funding for certain aspects regarding the issues. However, the perception of risk is not entirely in accordance with actual risk. Civil society and decision makers do not fully comprehend the magnitude of the issues |
| ++ | Willingness to pay for present and future risk implementation | The actual issues are perceived as relevant and there is political and public support to allocate substantial financial resources to address it. Furthermore, expenditure for non-economic benefits (e.g. ecology, esthetic value, knowledge creation, etc.) are perceived as important. There is clear agreement on- and support for financial principles, such as the polluter-pays-, user-pays- or the solidarity principle |

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| GC8.3: Affordability | | Water services and climate adaptation measures should be available and affordable for all citizens including the poorest |
| -- | Unaffordable basic water services | Water services are not affordable for a substantial part of the population. This may be due to inefficient or obsolete infrastructure, mismanagement, extreme poverty or unsuitable financial principles |
| - | Limited affordability of basic water services | A share of the population has serious difficulty to pay for basic water services, e.g. low-income or marginalized groups |
| 0 | Unaffordable climate adaptation | Basic water services are affordable for the vast majority of the population. However, extreme heat, flooding and water scarcity mainly affect poor people and marginalized communities as they cannot afford adaptation. For example, they cannot afford house insulation or often live in flood prone areas where house prices are lowest |
| + | Limited affordable climate adaptation | There is recognition that poor and marginalized communities are disproportionately affected by the effects of climate change. Serious efforts are made to support climate adaptation for everyone, including vulnerable groups |
| ++ | Climate adaptation affordable for all | Strong solidarity has resulted in programs and policy that ensures climate adaptation for everyone. This includes both public infrastructure as well as protecting private property |

GC 9: Implementing power

Description: Policy instruments are the means to achieve behavioral change. This includes the so called sticks and carrots, or compliance and incentives. This characteristic consists of policy instruments, referring to incentives for sustainable behavior; legal compliance, which refers to the ability to ensure compliance to agreements, laws, targets, etc.; and action plans, which allows actors to know how to reach objectives and how to respond to calamities.

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| GC9.1: Policy instruments | | Effective use of policy instruments to stimulate desired behavior and discourage undesired activities and choices. Continuous monitoring, evaluation and adjustments are needed to check and improve the effectiveness of applied policy instruments |
| -- | Instruments enhance unsustainable behavior | Policy instruments at place enhance unwanted or even behavior that is opposite to envisioned sustainability goals. For example, discount for higher water use stimulate spilling and inefficiency. There is hardly any monitoring that can be used to evaluate or reveal the counterproductive effects of the used policy instruments. Moreover, it is also possible that instruments have the intention to enhance unsustainable behavior |
| - | Unknown impacts of policy instruments | There is little understanding and awareness of unwanted effects of the used policy instruments. Instruments are being used without knowing or properly investigating their impact on forehand. The set of instruments actually leads to imbalanced development and inefficiencies. During the implementation, a persistent believe in the effectiveness of the instruments blocks learning or the recognition that the instruments does not has the intended results. . Furthermore, the instruments, especially subsidies, are prone to misuse, due to unclear preconditions and unverifiable implementation |
| 0 | Fragmented instrumental use | Often, instruments are not coherently used for different policy fields or sectors whereas the goals are very similar. The result is a poor overall instrumental effectiveness and sometimes contradicting stimuli. The scattered instruments, each with a limited sphere of influence, only achieve temporary behavioral changes. Sufficient monitoring results in much knowledge and insight in how current instruments work and perform. Therefore, actors are open to look for improvements in the use of policy instruments |
| + | Profound exploration of sustainability instruments | There is strong realization that the use of instruments may be a powerful tool to effectuate sustainable transitions. It is argued that instruments, such as full cost recovery and polluters pays principles, make actors aware of how their behavior affects the issue and serve as an incentive to internalize sustainable behavior. The use of various instruments are mainly being explored and therefore not yet optimized and efficient. Extensive monitoring and evaluation ensures quick learning to deal with uncertainty |
| ++ | Effective instruments enhance sustainable transitions | There is much experience with the use of instruments to promote long-term, comprehensive and substantial change in actors behavior. Monitoring results show that the current use of instruments prove to be effective in achieving sustainable behavior amongst almost all actors. Still continuous evaluations ensures flexibility, adaptive capacity and fit-for-purpose use of policy instruments |

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| GC9.2: Legal compliance | | Legal compliance ensures that stakeholders respect agreements, objectives, legislation, etc. |
| -- | Poor compliance due to unclear legislation | Legislation and responsibilities are unclear, incomplete or inaccessible leading to poor legal compliance by most actors. Actors are often unable to comply to legislation irrespective of their willingness to comply. If there is powerful enforcement of the unclear legislation, it often leads to poor legitimacy and the loss of credibility. Furthermore, unclear legislation is susceptible for misuse and misinterpretation |
| - | Moderate compliance to incomplete legislation | Legislation is incomplete meaning that certain gaps can be (mis)used to ensure legal compliance. In practice, enforcement of unbalanced policy may lead to discontent and the loss of trust in local authorities. There is no clear division of responsibilities of executive and controlling tasks. Inspections, legal enforcement and sanctions may be inconsistent |
| 0 | Strict compliance to fragmentized legislation | There is strict compliance to well-defined, fragmentized policies, regulations and agreements. However, the prescription of precise targets and means limit flexibility, innovations and realization of ambitious goals. Furthermore, an activity may be penalized multiple times in different direct and indirect ways due to poor coordination |
| + | Flexible compliance to ambitious explorations | New ambitious policy, agreements and legislation is being explored. Most actors are willing to comply and there are also voluntary compliance to more ambitious goals and agreements. The ambitious and explorative character sometimes lead |

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| | | to unrealistic targets that demand for some flexibility. Hence, not all targets have to be strictly accomplished since a 'learning-by-doing' approach is used to realize ambitious goals |
| ++ | Good compliance to effective sustainable legislation | Legislation is ambitious and effective. There is much experience with developing and implementing sustainable policy. Short-term and long-term targets are well integrated leading to realistic implementation. Moreover, compliance is high |

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| GC9.3: Action plans | | Implementation capacity is strongly increased due to existence of procedures, scripts for action that support policy in case of disaster or unforeseen event |
| -- | Poor action plans | There are hardly any action plans for dealing with calamities, uncertainties and existing risks. Therefore, the division of executive tasks is unclear leading to low disaster preparedness and high vulnerability |
| - | Limited unknown action plans | Development of action plans is ad hoc and responds to recently experienced calamities. The actual probabilities and impacts are not well understood, whereas future risks are unknown. Furthermore, the division of roles, tasks and responsibilities are unclear |
| 0 | Low awareness of action plans | As a result of past experiences, there is a more complete set of action plans. However, they are ineffective as tasks are not clearly assigned and affected people do not know what to do. The set of action plans are not sufficient to deal with increasing pressures, such as climate change |
| + | Over-abundant set of action plans | There are abundant action plans for dealing with a wide range of short- and long-term threats. Policymakers follow the precautionary principle and create a set of proactive action plans. However, they are scattered and non-cohesive. There is high awareness of possible threats, however, an overall action plan combining all threats and their interactions is missing |
| ++ | Comprehensive set of action plans | Long-term plans that are flexible by bundling different risks, impacts and worst case scenarios. The action plans for calamities are clearly communicated, co-created and regularly rehearsed by all relevant stakeholders |

LITERATURE USED FOR THEORETICAL OPTIMIZATION

Table 12. Literature used for theoretical inclusiveness

| Governance principles | |
|------------------------------------|--|
| Author & year | Title |
| (Van Rijswick et al., 2014) | Ten building blocks for sustainable water governance: An integrated method to assess the governance of water |
| (OECD, 2015a) | OECD principles on water governance |
| (Lockwood et al., 2010) | Governance principles for Natural Resources Management |
| (UNECE, 2008) | Guidebook on promoting good governance for Public-Private Partnerships |
| (OECD, 2012) | Recommendation of the Council on principles for public governance of public-private partnerships |
| (UNDP, 2011) | Chapter 8: Governance principles, Institutional Capacity and Quality |
| (UNDP, 2013) | Users guide on Assessing Water Governance |
| (Graham et al., 2003) | Principles for good governance in the 21 st century |
| (Satijn & ten Brinke, 2011) | Governance Capacities for Adaptive Water Management |
| Multilevel governance | |
| Author & year | Title |
| (OECD, 2011a) | Water governance in OECD countries: A multilevel approach |
| (Adger et al., 2005) | Successful adaptations to climate change across scales |
| Adaptive capacity qualities | |
| Author & year | Title |
| (Boykoff et al., 2013) | Media discourse on adaptation: competing vision of “success” in the Indian context |
| (Folke et al., 2005) | Adaptive governance of socio-ecological systems |
| (Ford & Berrang-Ford, 2011) | Climate change adaptation in developed nations: From theory to practice |
| (Ford et al., 2011b) | Canadian Federal Support for Climate Change and Health Research Compared With the Risks Posed |
| (Fussel, 2007) | Adaptation planning for climate change: Concepts, assessments, approaches and key lessons |
| (Halbe et al., 2013) | Towards adaptive and integrated management paradigms to meet the challenges of water governance |
| (Huitema, et al., 2009) | Adaptive water governance: Assessing the institutional prescriptions of adaptive (co-) management from a governance perspective and defining a research agenda |
| (Marshall et al., 2013) | Climate change awareness is associated with enhanced adaptive capacity |
| (Moser & Ekstrom, 2010) | A framework to diagnose barriers for climate adaptation |
| (Pahl-Wostl, 2007a) | Transition towards adaptive management for water facing climate and global change |
| (Pahl-Wostl, 2007b) | The implications of complexity for integrated resources management |
| (Pahl-Wostl, 2009) | A conceptual framework for analysing adaptive capacity and multilevel learning processes in resource governance regimes |
| (Haasnoot et al., 2013) | Dynamic Adaptive Policy Pathways: A method for crafting robust decisions for a deeply uncertain world |
| Governance Gaps | |
| Author & year | Title |
| (OECD, 2016a) | Chapter 4: Multilevel governance gaps in urban water management |
| (Pahl-Wostl et al., 2013) | Missing links in global water governance: A process-oriented analysis |
| (Waterschap Rivierenland, 2007) | Obstacles to the delivery of adaptation to climate change (water storage) in municipal spatial planning |
| Urban governance | |
| Author & year | Title |
| (Seboka, 2003) | City/Municipal Management Strategy |

LITERATURE USED FOR OPERATIONALISATION

Table 13. Literature used for operationalisation

| Composing WG Scoring Chart and Application Strategy | | |
|---|--|---|
| Name & year | Title | Composition challenge |
| (BA groep, n.d.) | Bestuurskrachtmeting: Hoe functioneert uw gemeente, provincie of waterschap? | Mixed methods application strategy |
| (Bird D. K., 2009) | The use of questionnaires for acquiring information on public perception of natural hazards and risk mitigation - a review of current knowledge and practice | Logical order and presentation |
| (Creswell, 2003) | Research design: Qualitative, quantitative and mixed methods approaches | Use of mixed methods |
| (Giesen et al., 2012) | Questionnaire development | Checklist, p.64 |
| (INECE, 2008) | Performance measurement guidance for compliance and enforcement practitioners | Purpose of WG Scoring Chart Role and use of performance indicators |
| (Sarantakos, 2005) | Social research | Logical order |
| (Thomas, 2004) | Using web and paper questionnaires for data-based decision making : From design to interpretation of the results | Method for creating the WG Scoring Chart |

STRATEGY 1 OF IDENTIFYING AND ASSIGNING OBSERVABLE INDICATORS

Table 14. Elements per characteristic

| CONDITION | CHARACTERISTIC | ELEMENTS |
|--|-------------------------------------|--|
| 1.AWARENESS | Community knowledge | Awareness of Issue, risk & uncertainty, impacts, frequency |
| | Local Support | Group size supporting worries Forms of support |
| | Internalization | Recognition >sustainable behaviour |
| 2.USEFUL KNOWLEDGE | Information availability | Availability Quality Reliability Completeness |
| | Accessibility | Availability Accessibility Transparent/clear Sharing |
| | Cohesion | Information availability Integration |
| | Smart monitoring | Present/absent Completeness / reliability Learning (single-double-triple) Frequency (as often as changes occur) |
| | Evaluation | Present/absent Quality/method used Learning |
| 3.CONTINUOUS LEARNING | Cross-stakeholder capacity building | Openness (to other parties) / trust Opportunity to interact / access to process Learning: individual / cross-stakeholder, institutionalized? |
| | Room to manoeuvre | Opportunity / level of freedom? Redundancy Autonomy |
| | Clear division of responsibilities | Clarity Effectiveness (trust/interest/flexibility) Legitimacy?? |
| 4. MULTI-LEVEL NETWORK POTENTIAL | Authority | Legitimacy Authority |
| | Inclusiveness | Abundance of stakeholders participating Abundance of represented interests Level of engagement Time & frequency of engagement Clarity of procedure + communication |
| | Protection of core values | Abundance of stakeholders / own values Level of engagement Level of influence Commitment to process |
| 5. STAKEHOLDER ENGAGEMENT PROCESS | Progress and choice variety | Abundance & representation of alternatives End selection Clarity of procedure Progress Effectiveness |

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| 6. AGENTS OF CHANGE | Entrepreneurial | <ul style="list-style-type: none"> Opportunity identification Access to resources and networks Level of entrepreneurial activity (static/short sighted vs. creative, measured risk taking) |
| | Collaborative | <ul style="list-style-type: none"> Cooperation/collaboration (trust/interest-based) Conventional vs. new partners Type of collaboration (synergetic vs. single issue) |
| | Visionary | <ul style="list-style-type: none"> Term of targets Level of vision/interests integration Unilateral/multilateral Communicativeness |
| 7. POLICY AMBITION | Ambitious and realistic goals | <ul style="list-style-type: none"> Term of targets Practicality Reactive / adaptive (anticipatory?) |
| | Discourse embedding | <ul style="list-style-type: none"> Friction between political ambition, discourse and societal demand Interwoven-ness Willingness of actors Level of adaptiveness |
| | Cohesive policy | <ul style="list-style-type: none"> Scope and Overlap Fragmentation vs. Integration |
| 8. FINANCIAL VIABILITY | Affordability | Unaffordable > climate adapt. affordable for all |
| | Willingness to pay | <ul style="list-style-type: none"> Trust Awareness of risk & opportunities Perceived importance of adaptation measures Importance/value of non-economic benefits Financial principles |
| | Financial continuation | <ul style="list-style-type: none"> (ir)regular (un)predictable Continuation ? Financial allocation... |
| 9. IMPLEMENTING CAPACITY | Policy Instruments | <ul style="list-style-type: none"> Impact Effectiveness & Consistency Monitoring and learning |
| | Legal Compliance | <ul style="list-style-type: none"> Clarity of policies Completeness of policies Voluntary/supportive compliance |
| | Preparedness | <ul style="list-style-type: none"> Clarity Action plans + assigned + material Knowledge of probability and Vulnerability Scenarios |

INTERVIEW OUTLINE

Introduction

My name is Alisa Doornhof. I am finalizing my master programme Sustainable Development in the direction of Environmental Governance at the Utrecht University. My research is about governance capacity to deal with wicked water and climate adaptation challenges in cities. The governance capacity is assessed for five wicked water challenges: Flood risk, Urban Heat Island, Water Scarcity, Wastewater treatment and Solid waste treatment. The Governance Capacity Assessment Framework encompasses nine conditions for governance capacity and each condition is divided into three characteristic that together constitute the performance level of the condition. Each characteristic is going to be assessed based on questions the answers given in interviews such as this one.

A little more background: the Governance Capacity Assessment Framework is a sequel to the City Blueprint framework and is part of the City Blueprint Approach. City Blueprint is a project that is supported by the European Innovation Partnership on Water. It consists of i) a Trends & Pressures framework to assess the trends and pressures of a city for the next 50 to 100 years, ii) a water management performance assessment that measures how well a city manages i.e. surface water quality, potable water provision, sanitary facilities, resource recovery etc. and iii) soon a GCAF.

Can you introduce yourself?

Please provide information that is widely recognized in your network as best as possible. Ok let's start!

1 Awareness

1.1 Community Knowledge

Is there awareness of [water challenge]? About the risks, probability, frequency, impact?

1.2 Local Support

How large is the group of people that is aware of [water challenge] in % ?

Is there support for countermeasures? How is that visible? What is that support?

1.3 Internalization

Can you recognize sustainable behaviour within [Waternet/organisation]? In Water Sector? Within partnerships/collaborations?

2 Useful Knowledge

2.1 Information availability

Is information available, considering [water challenge] – for local network?

What is the quality of information? Is the quantity sufficient? Is it recent?

What is the contextual time period that is taken into account?

2.2 Information accessibility

Is information accessible? ranging from very limited --> very well accessible

Is information clearly formulated?

Is information shared with all relevant actors in UWGN? Is knowledge co-created based on this?

2.3 Cohesion

Are multiple sources of information used?

Are multiple methods for information sharing used?

Are multiple methods used for strategy co-creation?

Is accessible information integrated among sectors?

Is accessible information integrated among actors in the UWGN regarding [water challenge]?

3 Continuous Learning

3.1 Smart monitoring

Is monitoring being performed? for both water systems and policy measures

What types of monitoring is applied? (automatic – continuous, manual –regular, other...)

Is monitoring method and equipment reliable? (prone to external faults – electricity)

How often is monitoring performed?

Is qualitative monitoring performed? (bird or fish count?)

What is the level of learning:

Is monitoring sufficient to improve efficiency and effectiveness?

Is monitoring sufficient to discover alarming situations, underlying trends, processes, (causal) relations...

Is monitoring sufficient bring about fundamental changes, such as: new regulatory framework, new boundaries, change in power structure/mandates, new actors, new risk management approaches?

3.2 Smart Evaluation

How often does evaluation take place?

Is there a proven method used for evaluation?

Do you feel that the evaluation takes all important aspects into account? (nothing surpassed?)

Is the evaluation method sufficient to improve efficiency and effectiveness?

Is the evaluation method sufficient to discover alarming situations, underlying trends, processes, (causal) relations...

Is the evaluation method sufficient to bring about fundamental changes, such as: new regulatory framework, new boundaries, change in power structure/mandates, new actors, new risk management approaches?

3.3 Cross-stakeholder capacity building

Is there openness to other stakeholders?

Is there opportunity to interact with other stakeholders?

How would you describe the character of interaction? (informative, consultative, active involvement)

4 Stakeholder Engagement

Specifically regarding decision-making processes

4.1 Inclusiveness

In your network of [water challenge] – are there stakeholders missing? Stakeholders that would facilitate tackling the [water challenge] (Even more)?

Would you say that all relevant stakeholders are participating?

What's the character of the engagements? (informative, consultative, active involvement)

Is the procedure of stakeholder engagement in the decision-making process clear?

4.2 Protection of Core Values

Do you think that all interests are represented? Equally?

Are stakeholders committed to the process or only end-result/influence? Are all stakeholders evenly committed?

Are all interests accounted for in end-result?

Is there a possibility to exit the process?

4.3 Progress and Choice Variety

Are alternatives considered?

Are alternatives co-created? And selected?

What's the progress of a decision-making process? And how do you view progress?

Is the decision-making process clear for all stakeholders in the network concerning [water challenge]?

During a decision-making process are all alternatives considered? When does decision-making take place?

5 Policy Ambition

5.1 Ambitious and Realistic goals

What are the relevant policy, strategy and visionary documents regarding the water challenge?
What period of action is considered in each of the documents?

Would you say that goals and targets are cohesive? Do they support one another? Do you think they are Ambitious and realistic?

How is uncertainty and predictability of water challenge occurrence taken into account in the document?

5.2 Discourse embedding

What is the current political discourse in policy?

Does policy fit the local context? How can you tell? How would you express it? (similarity of words in policies)

Does policy relate to recent and local occurrences

To what extent is the UWGN concerning [water challenge] able to create momentum for radical adaptability measures.

5.3 Cohesive policy

Are policies consistent? (inter-sectoral/horizontal + vertical)(the level of integration without fragmentation or overlap)

Are policies compatible? (inter-sectoral/horizontal + vertical) (the level of balance without conflicting or opposing aspects).

6 Agents of change

6.1 Entrepreneurial

Can you give examples of people/organisations that were able to bring forth, explore, execute new ideas regarding the [water challenge]?

To what extent are UWGN-actors able to identify windows of opportunity?

To what extent are measures invasive?

To what extent are risks taken into account?

To what extent are entrepreneurial actors in the UWGN regarding [water challenge] able to get resources? (financial, means, human effort)

6.2 Collaborative

To what extent are actors enabled to engage, trust and collaborate with business government and social sectors?

What is the scope of collaboration? (project-base, divided tasks, co-creation, integral ...)

What is the term for collaboration? (project-based, short-term, mid-term (5yrs), long-term (10yrs and on...)

6.3 Visionary

To what extent is the vision (that is interwoven in policy/strategy/plan of actions) integrated?

Long-term?

To what extent is the vision supported by short-term targets?

What is your vision regarding [water challenge]? What step must be taken for a more radical/invasive measure?

7 Multi-level network potential

Specifically regarding the implementation of projects and exploring new ideas

7.1 Room to manoeuvre

To what extent do you feel free to explore new ideas/perspectives?

To what extent are actors in the UWGN concerning [water challenge] free to explore and actively supported to engage in new partnerships and cooperation?

7.2 Clear division of responsibilities:

Is the role/task division clear in the network concerning [water challenge]?

Is there trust among actors in this network? Can you describe this trust, if present?

If present, do actors trust each other to complete their task?

To what extent is the network organization regarding [water challenge] effective? Are there improvements to be made? Do you think the network organisation needs improvement?

7.3 Authority

To what extent is the network regarding [water challenge] self-contained and authorized to make decisions? What is the mandate? Who has the mandate/who has provided the mandate?

8 Financial Viability

8.1 Affordability

Are basic water facilities affordable for all people in your city?

Are climate adaptation services affordable for all people in your city?

[NOTE: What climate adaptations are considered? When is a city climate adaptive? Climate adaptations can range from district-gardens, water barrels and moss roofs to blue-green infrastructure measures, climate proof housing foundation, etc.

8.2 Willingness-to-Pay

Is there WTP in the UWGN concerning [water challenge]?

Based on what?

- trust

- awareness of risk

- perceived importance of climate adaptation measures

- value of non-economic benefits

- financial principles.

- Sense of ownership: Individual awareness, responsibility and accountability

8.3 Financial Continuation

How is availability of financial resources arranged?

Is financing continuous or regular?

What time-period of financing is taken into account? (project-based – continuous – long-term certainty)

9 Implementing Capacity

9.1 Policy Instruments

What policy instruments are being deployed currently regarding [water challenge]?

How would you rate the effectiveness? (scale 1-10)

Are policy instruments tuned? Are they cohesive? (are target-groups unaddressed or affected twice)

Are policy instruments adapted or replaced on the bases of monitoring and learning?

Legal Compliance

Is the policy related to [water challenge] clear? Is regulation regarding surveillance and enforcement clear?

Are the regulations comprehensive? Do you think some issues are not addressed?-clarity of regulations

Is there (wide) support for the regulatory framework?

Preparedness

In case of calamities, are there action plans? Multiple?

Who are involved in these plans/calamities?

Are they aware of the action plan(s)

Are the action plan(s) clear for all involved parties?

Is the division of tasks clear to every involved party?

Are involved parties aware of the probability of the risks regarding [water challenge] and vulnerability of the city?

LITERATURE USED FOR DESK STUDY IN APPLICATION

Table 15. Literature used for desk study in application of WG Score Chart on Amsterdam

| Theme(s) | Title | Source | Governance scale |
|-------------------------|--|--|------------------|
| All | 1. Agenda Duurzaamheid 2015-2018 | Municipality of Amsterdam | Local |
| FLO, UHI, WSC, WWT | 2. Agenda Groen 2015-2018 | Municipality of Amsterdam | Local |
| FLO, UHI, WSC, WWT | 3. Verslag stadsgesprek watervisie Amsterdam (Juni 2015) | Municipality of Amsterdam | Local |
| FLO, WSC, WWT | 4. Waternet beheergebied (jpg.) | Waternet | Local |
| FLO, WSC, WWT | 5. “Breed water” Plan gemeentelijke watertaken 2010-2015 | Waternet | Local |
| FLO | 6. Regionaal Crisisplan 2012-2016 (2011) | Veiligheidsregio Amsterdam – Amstelland | Local/regional |
| All | 7. Watervisie Amsterdam 2040 | Municipality of Amsterdam | Local |
| FLO, WSC, WWT | 8. Waterbeheerplan 2016-2021 | AGV | regional |
| FLO, WSC, WWT | 9. Visie van het Hoogheemraadschap Amstel, Gooi en Vecht (2006). “Sterk voor water” | AGV | regional |
| FLO, WSC, WWT | 10. Keur (2011) | AGV | Regional |
| FLO, WSC | 11. Handreiking stedelijk grondwater (dec. 2009) | AGV | Regional |
| FLO, WSC, WWT | 12. Inspraak waterschapsactiviteiten | AGV | Regional |
| FLO, WSC, WWT | 13. Keur 2009 aanwijzing besluit toezichthouders | AGV | Regional |
| FLO, WSC, WWT | 14. Nota natuurvriendelijk onderhoud (2001) | AGV | Regional |
| FLO, WSC, UHI | 15. Nota recreatief medegebruik landschap en cultuurhistorie (2011) | AGV | Regional |
| FLO, WSC, WWT | 16. Ontwerp Waterplan 2010-2015 Noord-Holland | Province of Noord-Holland | Regional |
| FLO, WSC, WWT | 17. Bestuursakkoord water (2011) | Ministry of Infrastructure and Environment | National |
| FLO, WSC, WWT | 18. Landelijke handhavingsstrategie (apr.2014) | Rijkswaterstaat | National |
| FLO, UHI, WSC, WWT, SWT | 19. Wet Milieubeheer | Rijkswaterstaat | National |
| FLO, WSC, WWT | 20. Kaderrichtlijn Water | EU | International |
| FLO specific | | | |
| | 21. Amsterdam Waterbestendig | Municipality of Amsterdam | Local |
| | 22. Waterbestendige Westpoort. Pilotstudie vitaal en kwetsbare functies in de haven van Amsterdam | Must Witteveen + Bos | Private sector |
| | 23. Programmaplan Rainproof | Rainproof team | |
| | 24. Notitie stand van zaken Amsterdam Rainproof - stafversie | Rainproof team | |
| | 25. Deltaprogramma Ruimtelijke Adaptatie: Vitale en kwetsbare functies – Naar een waterrobuuste inrichting in 2050 | Ministry of Infrastructure and Environment | National |
| (WWT) | 26. Handboek Hemelwater (2009) | AGV | Regional |

| | | | |
|-------------------------|--|---|----------------|
| | 27. Netwerk Rainproof (poster) | Rainproof team | Local |
| | 28. Watervisie 2021 “Buiten de oevers” | Province of Noord-Holland | Regional |
| | 29. Nota peilbeheer (2010) | AGV | Regional |
| | 30. Overzichtskaart peilbesluiten Amsterdam | AGV | Regional |
| | 31. Plan van aanpak: Vervolg Amsterdam Rainproof (2015) | Rainproof team | Local |
| | 32. Plan van aanpak: Amsterdam Rainproof. Regen – water van waarde | Maarten Claassen, Waternet | Local |
| | 33. Richtlijn ter voorkoming grondwateroverlast (2007) | Waternet | Local |
| | 34. 100 kilometer dijken verbeteren – terugblik actieprogramma 2010-2015 | AGV | Regional |
| | 35. Regionaal Beleidsplan (2015) | VrAA | Local |
| UHI specific | | | |
| | 36. Amsterwarm – Gebiedstypologie warmte-eiland Amsterdam | TU Delft | Local |
| | 37. De hitte de baas. Koeling in zorginstellingen | Bouwcollege (now) Ministry of health, welfare and sports) | National |
| WSC specific | | | |
| | 38. Nationaal Waterplan 2016-2021 | Rijkswaterstaat | National |
| WWT specific | | | |
| | 39. Afvalwaterplan 2010-2015 | Waternet | Local/regional |
| (FLO) | 40. Gemeentelijk Rioleringsplan Amsterdam 2010-2015 | Municipality of Amsterdam | Local |
| (FLO) | 41. Gemeentelijk Rioleringsplan Amsterdam 2016-2021 | Municipality of Amsterdam | Local |
| | 42. Handboek stedelijk afvalwater | BOWA (2013) AGV | Regional |
| 43. SWT specific | | | |
| | 44. Uitvoeringsplan afval (jun.2016) | Municipality of Amsterdam | Local |
| | 45. Landelijk afvalbeheerplan 2009-2021 | Ministry of VROM | National |
| (WWT) | 46. De metropoolregio Amsterdam als circulaire grondstoffen hub | Amsterdam economic board | local |
| | 47. Waste2Energy – presentation | Peter Simoës | Private sector |
| Websites | | | |
| | 48. www.waternet.nl | | |
| | 49. www.agv.nl | | |
| | 50. www.rainproof.nl | | |
| | 51. www.hitte-eilanden.nl | | |
| | 52. www.amsterdam.nl | | |
| | 53. www.amsterdamsmartcity.com | | |
| | 54. www.waternet.nl | | |

OVERVIEW OF INTERVIEWEES PER WATER-RELATED CHALLENGE

FLO

Wiegert Dulfer – *Strategic administrator at Water board Amstel, Gooi and Vecht*

Portfolio manager of flood defences, spatial planning, ecology and freshwater.

Rob Koeze – *Strategic advisor at Waternet*

Advisor on the implementation of the national Deltaprogram. Project initiator of Vital and Vulnerable and Water-resistant Westpoort as part of multi-level safety measure.

Maarten Claassen – *Strategic advisor at Waternet*

Advisor on organisation wide change and acceleration. Deals with strategy and process management, agents of change, transition and future exploration. Also project owner of Rainproof.

UHI

Geertje Wijten – *Tactical employee at the Municipality of Amsterdam*

Deals with Spatial planning and Sustainability, including Rainproof policy and continuation.

WSC

Gerard Korrel – *Strategic administrator at Water board Amstel, Gooi and Vecht*

Portfolio manager of freshwater resources management (among other things).

Ed Cousin – *Tactical advisor at Waternet*

Head of the department of Resource and Nature Conservation and Management.

Martine Lodewijk – *Tactical/operational employee at Waternet*

Program manager of EU's "Kaderrichtlijn Water". Also team leader of the Water Control System.

Jeroen Ponten – *Tactical/operational employee at Waternet*

Team leader water plans and projects as well as groundwater planning. Also government official at the Ministry of Environment and Infrastructure dealing with groundwater and the national Deltaprogram.

WWT

Rolf Steenwinkel – *Strategic administrator at Water board Amstel, Gooi and Vecht*

Portfolio manager of wastewater treatment, Spatial planning and the "Water management plan" (Waterbeheerplan).

Kees van der Drift – *Tactical employee at Waternet*

Head of the department Asset Management of the Water Cycle: wastewater collection, purification and sludge treatment.

Lex Lelijveld – *Tactical/Operational employee at Waternet*

Head of the department logistics and natural resources in the wastewater sector. Deals with the transport of sludge and the marketing channels and manages contracts for chemicals with purchasers.

SWT

Mark Nijman – *Strategic/Tactical employee at the Municipality of Amsterdam, South district*

Manager of the business office of (solid) waste collection, previously employed in other districts as well and used to own a company called “Communiverse”.

Peter Simoës – *Strategic advisor at the Waste-to-Energy company (AEB)*

General

Alice Fermont – *Tactical/Operational (senior) advisor at Waternet*

Employed at the department of Research and Advice on the topics of hydrology and ecology as well as ground- and surface water. Is responsible for networking with knowledge institutes. And participates in the Stowa’s committee of urban water.

Ingrid Heemskerk – *Strategic advisor at Waternet*

Deals with business economic issues, strategy development, benchmarking and the learning cycle within the Water sector

Jos Ketelaars – *Tactical employee at Waternet*

Crisis manager and co-ordinator. Deals with crisis management, security and net central working.

COMPLETED WATER GOVERNANCE SCORE CHART FOR AMSTERDAM

Water Governance Capacity in Amsterdam

This questionnaire was completed by:

| | |
|------------------------------------|--|
| Respondents' name(s) | Alisa Doornhof |
| Municipality | Amsterdam |
| Organisation & Position | KWR Watercycle research institute Waternet - Intern |
| E-mail | Alisa.doornhof@waternet.nl a.doornhof@live.nl |
| Telephone | 06 46 11 37 43 |

Municipalities and regions are increasingly subject to Flood Risk, Urban Heat Islands, Water Scarcity and Pollution as a result of too little, too much or too polluted water. Climate change and urbanization will only amplify the frequency and intensity of these challenges. This questionnaire is an instrument to convey insight into current conditions that determine urban water governance capacity. It is a tool that helps to identify the most important opportunities for effective and efficient transformations towards sustainable and climate adaptive water governance. The questionnaire focusses on Urban Water Governance Networks (UWGN).

Instructions

The governance capacity of an UWGN is divided into nine conditions that each include three characteristics that are appurtenant to the condition. An overview is given on the following page. For each characteristic we provided a question. An answer is given by crossing one of the boxes in the questions per theme. The answer should make a statement about the condition in relation to the theme.

Wicked water-related challenges:

- Flood Risk (FLO),
- Urban Heat Islands (UHI),
- Water Scarcity (WSC),
- Waste Water Treatment (WWT),
- Solid Waste Treatment (SWT).

Overview of Governance Capacity Assessment Framework

| Action level | Condition | Characteristic |
|-----------------|---|---|
| Knowing | GC1 Awareness | GC1.1 Community knowledge GC1.2 Local support GC1.3 Behavioural internalization |
| | GC2 Useful knowledge | GC2.1 Information availability GC2.2 Information transparency GC2.3 Knowledge cohesion |
| | GC3 Continuous learning | GC3.1 Smart monitoring GC3.2 Evaluation GC3.3 Cross-stakeholder capacity building |
| Wanting | GC4 Stakeholder engagement process | GC4.1 Stakeholder inclusiveness GC4.2 Protection of core values GC4.3 Progress and choice variety |
| | GC5 Policy ambition | GC5.1 Ambitious and realistic goals GC5.2 Discourse embedding GC5.3 Policy cohesion |
| | GC6 Agents of change | GC6.1 Entrepreneurial GC6.2 Collaborative GC6.3 Visionary |
| Enabling | GC7 Multi-level network potential | GC7.1 Room to manoeuvre GC7.2 Clear division of responsibilities GC7.3 Authority |
| | GC8 Financial viability | GC8.1 Affordability GC8.2 Consumer willingness-to-pay GC8.3 Financial continuation |
| | GC9 Implementing capacity | GC9.1 Policy instruments GC9.2 Legal compliance GC9.3 Preparedness |

1 Awareness

Awareness refers to the understanding of causes, impact, scale and urgency of wicked water problems. It consists of three dimensions: *community knowledge*, *local support* and *behavioural internalization*.

GC1.1: Community knowledge

To what extent is knowledge per theme dispersed throughout the community as to be able to come to the right decision and to receive support for policy decisions? The public's knowledge regarding the water challenge is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|-----------------------------|--|
| | | | | | Ignorance | The community and decision-makers are unaware of the water challenge. This is demonstrated by the absence of articles on the issue in newspapers, on websites or action groups addressing the issue |
| | X | X | X | | Fragmented knowledge | Only a small part of the community recognizes the risks related to the water challenge. The most relevant stakeholders, have limited understanding of the water challenge. As a result, the issue is hardly or not addressed at the local governmental level |
| X | | | | X | Underestimation | Most of the community understand the water challenge, However the risks, impacts and frequencies are often not fully known. Future risks, impacts and frequencies are often unknown. Some awareness has been raised at the local level |
| | | | | | Overestimation | The community is knowledgeable and recognizes the existing uncertainties. Consequently, they often overestimate the impact and probability of occurrence of incidents or calamities. The water challenge has been raised at the local political level and policy plans are developed, partly as a result of this community knowledge |
| | | | | | Balanced awareness | Nearly all members of the community are aware of and understand the actual risks. The community has addressed the water challenge at the local level. It is familiar with or is involved in the implementation of adaptation measures |

Sources

FLO: Rob Koeze, Maarten Claassen, Rainproof Notitie stand van zaken 2015

UHI: Geertje Wijten

WSC: Ed Cousin, Jeroen Ponten, Gerard Korrel

WWT: Rolf Steenwinkel

SWT: Peter Simoës, Mark Nijman

GC1.2:**Local****support**

To what extent are actions and policies per theme supported by local public? Group size and form of support are characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|--|
| | | | | | Public resistance | There is generally no public support and sometimes resistance to spend resources to address the water challenge. It is not an item on the political agenda during elections, as is evident from the lack of (media-) attention |
| | X | X | X | | Raising awareness, support by small groups | A marginalized group of the public (e.g. the most vulnerable, environmentalists, NGOs) express their concerns, but these are not widely recognized by the general public. Adaptation measures are not an item on the political agenda during elections |
| | | | | X | Moderate support for small changes | There is growing public awareness and increasing worries regarding the water challenge. However, the causes, impact, scale and urgency are not widely known or acknowledged leading to the support for only incremental changes. It is a side topic in local elections |
| X | | | | | General support for long-term sustainability goals | There is increasing public understanding of the causes, impacts, scale and urgency of the water challenge. There is general support for long-term sustainable approaches. However, measures requiring considerable efforts, budget, or substantial change with sometimes uncertain results are often receiving only temporal support. The water challenge is a main theme in local elections |
| | | | | | Strong support and demand for action | There is a general sense of importance regarding the water challenge. There is continuous, active, public support and demand to undertake action and invest in innovative, ground-breaking solutions. This is evident, since the issue receives much media attention and action plans are implemented |

Sources

FLO: Rob Koeze, Maarten Claassen, Wiegert Dulfer

UHI: Geertje Wijten

WSC: Ed Cousin, Jeroen Ponten

WWT: Rolf Steenwinkel

SWT: Peter Simoës, Mark Nijman

GC1.3:**Behavioural****internalization**

To what extent is sustainable behaviour per theme part of the community, organizations and institutions within the urban network, by learning assimilation and action? The level of action taken to understand, react and anticipate on the water challenge is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Unawareness | There is unawareness of the water challenge with hardly any understanding of causes and effects or how current practices impact the water challenge, the city or future generations |
| | X | | | | Recognition mainly by external pressure | The water challenge is partly recognized, mainly due to external pressure instead of intrinsic motivations. There is no support to investigate its origin or to proceed to action or change current practices |
| | | | | | Exploration | There is a growing awareness, often as a result of local, exploratory research regarding the causes and solutions of the water challenge and the implications of current practices for longer time periods |
| | | X | | X | Moderate internalisation | Awareness has evolved to mobilization. There are various incentives for actors to change current practices and approaches regarding the water challenge. The water challenge, however, is not yet fully integrated into strategy, practices and policies |
| X | | | X | | Full internalisation | Actors are fully aware of the water challenge, their causes, impacts, scale and urgency. The water challenge is integrated into long-term and joint strategy, practices and policies. Other actors are encouraged to participate. At this point, the water challenge is integrated into everyday practices and policies |

Sources

FLO: Rob Koeze, Maarten Claassen, Wiegert Dulfer

UHI: Geertje Wijten

WSC: Ed Cousin, Jeroen Ponten

WWT: Rolf Steenwinkel

SWT: Peter Simoës, Mark Nijman

2 Useful knowledge

This condition describes the qualities of information with which actors have to engage in decision-making. This condition consists of three characteristics, i.e., *information availability*, *transparency* and *knowledge cohesion*.

GC2.1:

Information

availability

To what extent is information per theme available, reliable and composed from multiple sources and methods to experts and non-experts including decision-makers? And to what extent does information meet current and future information demands as to reveal information gaps and enhance well-informed decision-making? Indicators are availability, quality and contextual time period that is taken into account. The level of information availability is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Lack of information | No information on the water challenge can be found. Or the scarce available information is of poor quality |
| | | | | | Information scarcity and limited quality | Limited information availability that does not grasp the full extent of the water challenge. In some cases not all information is of sufficient quality to generate a comprehensive overview |
| | X | | X | X | Information meets short-term requirements, limited exploratory research | Information on the water challenge is available. Knowledge on understanding or tackling the water challenge is progressing and is produced in a structural way, whereas gaps are hardly identified. This is apparent from the quantity of factual information, but the theories on causes and impacts and long-term processes are lacking |
| | | | | | Information enhancing integrated long-term thinking | Information on the water challenge is made available from various sources. Information gaps are identified and attempted to bridge. This is clear from extensive documentation on the long-term process. Strong effort is put in integrating fragmented information that is relevant for the water challenge. Not all sustainability pillars may be accounted for. Knowledge from citizens is increasingly taken into account |
| X | | X | | | Comprehensive information enabling long-term integrated policy | A comprehensive and integrated documentation of the issue can be found on local websites and policy papers. It is characterized with adequate information, an integrated description of social, ecological and economic processes regarding the water challenge, and goals and policies. Furthermore, progress reports on effective implementation can be found |

Sources

FLO: Rob Koeze (pers.comm.), Maarten Claassen (pers. comm.)

UHI: Geertje Wijten, Amsterwarm, De Hitte de Baas

WSC: Alice Fermont, Jeroen Ponten, Martine Lodewijk

WWT: Alice Fermont, Kees van der Drift

SWT: Mark Nijman

GC2.2:**Information****transparency**

To what extent is information per theme accessible and understandable for experts and non-experts, including decision-makers and does co-creation of practical knowledge such as pilots occur? Indicators are accessibility, clarity of formulation and the level of co-creation in terms of information sharing. The level of accessibility is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|--|
| | | | | | Not transparent and inaccessible knowledge | Information is limitedly available and shared. Sometimes sharing is discouraged. Available and accessible information is difficult to understand. The water challenge is not addressed on local websites or mentioned by the local authorities |
| | | | | X | Low sharing of fragmented knowledge | Information is sometimes shared with other stakeholders. However, information is inaccessible for most stakeholders. Furthermore, knowledge is often technical and difficult to understand for non-experts. The water challenge may be addressed on local websites or mentioned by local authorities |
| | | X | X | | Sharing of non-communicative specialized knowledge | There are protocols for accessing information; however, it is not readily available. Although information is openly available, it is difficult to access and comprehend because it is very technical. The water challenge is reported on local websites and reports |
| X | | | | | Sharing of partly cohesive knowledge | All interested stakeholders can access information. Action has been taken to make knowledge increasingly understandable. Still, it is a time-consuming search through a maze of organizations, protocols and databases to abstract cohesive knowledge and insights |
| | X | | | | Sharing of cohesive knowledge enables active citizen engagement | Information is easily accessible on open source information platforms. There are multiple ways of accessing and sharing information. Information is often provided by multiple sources and is understandable for non-experts |

Sources

FLO: Rob Koeze (pers.comm.), Maarten Claassen (pers. comm.), Alice Fermont

UHI: Geertje Wijten, Amsterwarm, De Hitte de Baas

WSC: Alice Fermont, Jeroen Ponten, Martine Lodewijk

WWT: Alice Fermont, Kees van der Drift

SWT: Mark Nijman

GC2.3:**Knowledge****cohesion**

To what extent is information between themes cohesive in terms of using, producing and sharing different kinds of information among different policy fields and stakeholders, as to deal with the water challenges in the urban environment? Indicators are the use of multiple information sources, multiple methods to support knowledge sharing and strategy co-creation, and the level of integration. The level of information cohesion is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|---|
| | | | | | Non-cohesive and contradicting knowledge | A lack of data strongly limits the cohesion between sectors. Information that is found can even be contradictory |
| | | | | | Low-cohesive knowledge within sectors | Information that is found is sectoral. Overall, the information is inconsistent within and between sectors |
| | | | X | X | Insufficient cohesion between sectors | Data collection within sectors is consistent and is sustained in multiple projects for about two to three election periods. Knowledge on the water challenge, however, is still fragmented. This becomes clear from different foci of the stakeholders as stated in their organisation's strategies and goal setting |
| X | X | X | | | Substantial cohesive knowledge | Sectors cooperate in a multidisciplinary way, resulting in complete information regarding the water challenge. Besides multiple actors, multiple methods are involved to support information. Too many stakeholders are involved, sometimes in an unbalanced way. Knowledge about effective implementation is often limited |
| | | | | | Implementation of cohesive knowledge | Stakeholders are engaged in long-term and integrated strategies. Information can be found that is co-created knowledge and will contain multiple sources of information, multiple and mixed methods taking into account the socio-, ecological and economic aspects of the water challenge |

Sources

FLO: Rob Koeze (pers.comm.), Maarten Claassen (pers. Comm.)

UHI: Geertje Wijten, Amsterwarm, De Hitte de Baas

WSC: Alice Fermont, Jeroen Ponten, Martine Lodewijk

WWT: Alice Fermont, Kees van der Drift

SWT: Mark Nijman

3 Continuous learning

Continuous learning is essential as it provides stability and guidance in a transition towards adaptive, multi-level governance with respect to the required changes in practice, basic assumptions and fundamental beliefs, world views. Continuous learning is strongly based on the multiple-loop learning theory. This condition consists of the following characteristics: *smart monitoring*, *evaluation*, and *cross-stakeholder capacity building*.

GC3.1: Smart monitoring

Smart monitoring is needed to be able to monitor process, progress and policy outcomes. To what extent is monitoring able to quickly recognize alarming situations, recognize or clarify underlying trends & processes and can it aid in the prediction of future developments? Indicators are presence, completeness of reliable and qualitative information and level of learning. Monitoring is assessed to be:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|---|
| | | | | | Irregular, poor quality or absent | There is no system to monitor the water challenge or monitoring is irregular |
| | X | | | | Reliable data but limited coverage | Monitoring occurs, however the monitoring system does not cover all facets of the water challenge, with sometimes incomplete description of the progress and processes of technical and policy measures. Monitoring is limited to singular effectiveness or efficiency criteria and cannot identify alarming situations |
| | | | | | Quick recognition of alarming situations | Monitoring system covers most relevant aspects. Alarming situations are identified and reported. This leads to improvement of current practices regarding the technical measures. There is only minor notification of societal and ecological effects |
| | | | | | Useful to recognize underlying processes | The abundant monitoring provides sufficient base for recognizing underlying trends, processes and relationships. Reports of monitoring will display discrepancies between assumptions and practices. Acting upon these findings by altering the underlying assumptions characterizes the level of smart monitoring. Indicators are a reflection of goals and problem framing, a new set of guiding assumptions, change of boundaries, new system analysis approach, (other) priorities, new aspects (insights) |
| X | | X | X | X | Useful to predict future developments | Monitoring system is adequate in recognizing alarming situations, identifying underlying processes and provides useful information for identifying future developments. Reports of monitoring will display discrepancies between fundamental beliefs and practices. Acting upon these findings by altering the fundamental beliefs indicates the highest level of learning. Indicators are a transformation of structural context and factors, resulting in: new regulatory frameworks, change of boundary and power structure, new actors in the action arena, new risk management approach etc. |

Sources

FLO: Ingrid Heemskerk, Alice Fermont

UHI: Amsterwarm, Geertje Wijten

WSC: Ingrid Heemskerk, Alice Fermont, Martine Lodewijk, Jeroen Ponten

WWT: Ingrid Heemskerk, Alice Fermont

SWT: Mark Nijman

GC3.2:**Evaluation**

Evaluation is a prerequisite for learning. To what extent are current policy and implementation continuously assessed and improved? Indicators are frequency, quality of evaluation method and level of learning. Evaluation is assessed to be:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|--|
| | | | | | Insufficient evaluation | There is no evaluation of technical or policy measures regarding the water challenge. Otherwise it is not documented |
| | X | | | | Non-directional evaluation | Evaluation is limited regarding both frequency and quality. Evaluation occurs sometimes, using inconsistent and even ad-hoc criteria. Also the evaluation is performed poorly in that it is not systematic. There is no policy on the performance of evaluations, yet there are sometimes reports of evaluation(s) |
| | | | | | Improving routines | The identified problems and solutions are evaluated based on conventional (technical) criteria. Current practices are improved. This becomes clear from information of the used and existing criteria, the small changes recommended in reports and its appurtenant short-term character |
| | | | | | Changing assumptions | There is continuous evaluation, hence continuous improvements of technical and policy measures and implementation. Innovative evaluation criteria are used as well as innovative approaches. This is evidenced by reports containing recommendations to review assumptions or explicitly indicating the innovative character of the approach |
| X | | X | X | X | Exploring the fitness of the paradigm | Frequent and high quality evolution processes fully recognize long-term processes. Assumptions are continuously tested by research and monitoring. Evidence for this is found in sources (primarily online documents) that report on the learning process and the progress. Uncertainties are explicitly communicated. Also, the current dominant perspective on governance and its guiding principles are questioned and criticized |

Sources

FLO: Ingrid Heemskerk, Alice Fermont

UHI: Amsterwarm

WSC: Ingrid Heemskerk, Alice Fermont, Martine Lodewijk, Jeroen Ponten

WWT: Ingrid Heemskerk, Alice Fermont

SWT: Mark Nijman

GC3.3: Cross-stakeholder capacity building

Cross-stakeholder capacity building will assist in problem framing and gaining insight in other perspectives. To what extent are stakeholders open to and do stakeholders have the opportunity to interact with other stakeholders and deliberately choose to learn from each other? The level of openness to stakeholders, opportunity and interaction is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|--|
| | | | | | Closed attitude towards cross-stakeholder learning | There is no contact with other parties, contact may even be discouraged. This is apparent from limited sharing of experience, knowledge and skills. No information is shared outside organisation and sector, nor is external information used |
| | X | | | | Small coalitions of stakeholders with shared interest | Interaction occurs in small coalitions based on common interests. Opinions of those outside the coalition are generally withheld. Only information for the shared point of view is sought. This is evidenced by the finding of only one perspective regarding the water challenge or few perspectives that are supported by means of circle-referencing |
| | | | | X | Open attitude towards stakeholder interaction | Stakeholders are open to interaction, though not much learning is going on due to the informative character of the interaction. Often, a number of stakeholders, that do not necessarily share interests or opinions, are involved in the decision-making process |
| | | X | | | Open for cross-stakeholder learning | Stakeholder interaction is considered valuable and useful for improving policy and implementation. Various initiatives for cross-stakeholder capacity building (programs) have been deployed, yet the translation into practice appears difficult. The programs may not be structural and the learning experience may not be registered and shared |
| X | | | X | | Putting cross-stakeholder learning into practice | There is recognition that the water challenge is complex and that cross-stakeholder learning is a precondition for adequate solutions and smooth implementation. This is evidenced by broad support for policy measures and implementation. Moreover, continuous cross-stakeholder capacity building programs are in place and may be even institutionalized |

Sources

FLO: Ingrid Heemskerk, Alice Fermont

UHI: Amsterwarm

WSC: Ingrid Heemskerk, Alice Fermont, Martine Lodewijk, Jeroen Ponten

WWT: Ingrid Heemskerk, Alice Fermont

SWT: Mark Nijman, Peter Simoës

4 Stakeholder engagement process

Stakeholder engagement is required for common problem framing, gaining access to a wide variety of resources and creating general support that is essential for effective policy implementation. Stakeholder engagement consists of three characteristics, i.e., *stakeholder inclusiveness*, *protection of core values*, and *progress and choice variety*.

GC4.1

Stakeholder

inclusiveness

Inclusiveness refers to the transparency of the engagement process and the opportunity to get involved for all stakeholders. To what extent are stakeholders able to be part of the decision-making process, are stakeholder engagement processes clear and transparent, and are stakeholders able to speak and decide on behalf of a group? Indicators are variety of stakeholders; character of stakeholder interaction (i.e. information supply, consultation or active involvement); clarity of engagement procedure derived from written reports. The level of inclusiveness is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Limited information supply | No stakeholders are included, or few. Information cannot be found on the extant decision-making process. Stakeholder engagement may even be discouraged |
| | | | | | Non-inclusive information supply | Not all relevant stakeholders are informed and sometimes consulted. Procedure for stakeholder participation is unclear. If involved, stakeholders have but little influence |
| | | | | X | Untimely consultation and low influence | Stakeholders are mostly consulted or informed. Decisions are largely made before engaging stakeholders. Frequency and time-period of stakeholder engagement is limited. Stakeholder engagement is characterised by ad hoc meetings, expert panels, focus groups, shareholding, consultations in regulatory process |
| | | | | | Timely, over-inclusive and active involvement | Stakeholders are actively involved. It is still unclear how decisions are made and who should be involved. Often too many stakeholders are involved. Some attendants do not have the mandate to make arrangements. Stakeholder engagement is characterised by broad and specific themed conferences, workshops, surveys, and online-platforms, resulting in abundant and overlapping information regarding the water challenge. This is evidenced by new perspectives on the water challenge, broad knowledge spectrum attending the meetings |
| X | X | X | X | | Transparent involvement of committed partners | All relevant stakeholders are actively involved. The decision-making process as well as opportunities for stakeholder engagement are clear. Stakeholder engagement is characterised by local initiatives specifically focussing on water such as local water associations, contractual arrangements, regular meetings, assemblies, workshops, focus groups, citizen committees, surveys and hotlines |

Sources

FLO: Rob Koeze, Maarten Claassen

UHI: Geertje Wijten

WSC: Jeroen Ponten, Ed Cousin, Martine Lodewijk

WWT: Kees van der Drift, Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

GC4.2 Protection of core values

Protection of core values is ensured if commitment is focused on the process instead of the results and stakeholders have the possibilities to exit at given moments. To what extent do stakeholders feel confident that their core values will not be harmed? Indicators are the extent to which stakeholders represent all interest groups, the level of stakeholder engagement (i.e. information supply, consultation or active involvement), commitment to the process; the possibility to exit at pre-determined moments and the influence on end-results. The level of protection of core values is assessed to be:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|--|
| | | | | | Insufficient protection of core values | Because stakeholders are hardly engaged or even informed, core values are being harmed. Implementation and actions may be contested in the form of boycotts, legal implementation obstructions and the invoking of anti-decision support. Other indications of this level are distrust, absence of participation or exits during the decision-making process |
| | X | | | | Non-inclusive and low influence on results | The majority of stakeholders is engaged, but the level of engagement is low (informative or consultative at best). There is very low influence on the result. Resistance may be invoked, for example on internet platforms and newspapers |
| | | | X | | Suboptimal protection of core values | Because stakeholders are consulted or actively engaged for short periods, alternatives are insufficiently considered. Influence on end-result is still limited. Decisions comply with the interests of the initiating party primarily. There often is no clear exit strategy at this level in the stakeholder participation process |
| | | | | X | Requisite for early commitment to output | Stakeholders are actively involved and expected to commit themselves to the outcome early in the process. Hence relevant stakeholders may be missing in contractual arrangements as they do not want to commit themselves to decisions to which they have not yet contributed. At this point involved stakeholders have influence on the end-result and therefore the output serves multiple interests |
| X | | X | | | Maximal protection of core values | Stakeholders are actively involved and have large influence on the end result. There are clear exit possibilities and so stakeholders are more committed to the process. The participation opportunities and procedure of implementation are clear. All relevant stakeholders are part of the decision-making process |

Sources

FLO: Rob Koeze, Maarten Claassen

UHI: Geertje Wijten

WSC: Jeroen Ponten, Ed Cousin, Martine Lodewijk

WWT: Kees van der Drift, Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

GC4.3 Progress and choice variety

To what extent are procedures clear and realistic, are the variety of alternatives co-created and selected, and are decisions made at the end of the process; as to address progress and the importance of co-creation and joint decision making, ensure learning and get authoritative decisions, and secure continued prospect of gain and thereby cooperative behaviour? The level of progress and choice variety is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Lack of procedures limit engagement and progress | The lack of clear procedures hinder stakeholder engagement. This unilateral decision-making limits progress and effectiveness of both decision-making and implementation. It might result in conflicting situations. Often, much resistance can be found online and implementation may be obstruct |
| | | | | | Rigid procedures limit the scope | Informative and consultative approaches, according rigid procedures with low flexibility. The period of decision-making is short with a low level of stakeholder engagement. These unilateral decision-making processes may lead to slow and ineffective implementation. The latter can be observed from critique via public channels |
| | X | | X | X | Consultation short involvement or active | There is a clear procedure for consultation or short active involvement of stakeholders, but the opportunities to consider all relevant alternatives is insufficient. Decisions are therefore still largely unilateral and solutions suboptimal. Unilateralism serves one interest specifically. The suboptimal character of a solution can become apparent from evaluations or comparisons with similar situations |
| | | | | | Active involvement with abundant choice variety | Stakeholders are actively involved and there is sufficient room for elaborating alternatives. Procedures, deadlines and agreements are unclear. There is no or few specification on deadlines in terms of dates. Due to inexperience decisions are taken too early in the process leading to the exclusion of argument and solutions. Decisions may therefore not enjoy full support |
| X | | X | | | Active engagement with choice selection at the end of the cooperation | There is active engagement of all relevant stakeholders and clarity of participation procedure and realistic deadlines. The range of alternatives is fully explored and selection of the best alternatives occurs at the end of the process. Reviews of stakeholder meetings provide the alternatives addressed. Stakeholders are engaged throughout the whole process as specified in contractual agreements |

Sources

FLO: Rob Koeze, Maarten Claassen
 UHI: Geertje Wijten
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 WWT: Kees van der Drift, Lex Lelijveld
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Policy ambitions assesses if current policy is ambitious, feasible, well-embedded in local context and it forms a cohesive set of long-term and short-term goals within and across sectors. Rules and agreements that are based on shared values and principles are easier to enforce because parties have the strong conviction that they should behave in conformity with the rules. The feasibility of goals depends on the available capacity and resources. Ambitious goals are set that exploit the full potential to tackle the water-related challenge at hand by means of a set of cohesive long-term, mid-term and short-term goals. Policy ambitions consists of three characteristics, i.e., *ambitious and realistic goals*, *discourse embedding*, and *policy cohesion*.

GC5.1 Ambitious and realistic goals

Sustainable development involves a long-term vision with short-term intermittent targets. Important is the level to which concepts such as cost recovery and ecosystem services are operationalized and used to continuously assess existing and new techniques, projects and regulation. To what extent are goals ambitious and yet realistic? Indicators are the period of action considered, the cohesion of goals and targets, the role of (un)certainty and predictability. The appropriate level is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|-----|-----|-----|-----|-----|--------------------------------------|---|
| | X | | | | Short-term, conflicting goals | Goals consider only contemporary water challenges and are short-sighted. Goals lack sustainability objectives. Goals are arbitrary and sometimes conflicting, causing reoccurring issues. Character of policy is predominantly reactive |
| | | | | | Short-term goals | Actions and goals are better coordinated. Actions and goals are "quick fixes" mainly, not adhering to a long-term vision or sustainable solutions. Uncertainties and risks are largely unknown |
| | | | | X | Confined realistic goals | There is a confined vision regarding the water challenge. Its ambition is predominantly focused on improving the current situation where predictability, unchanging conditions, is assumed. Evidence is the lack of risk assessments and scenarios |
| X | | X | X | | Long-term ambitious goals | There is a long-term vision that incorporates uncertainty. However, it is not supported by a comprehensive set of short-term targets. Hence, achievements and realistic targets are difficult to measure or estimate. Visions are often found online as an organisation's strategy. These visions often entail a description of the water challenge or outlook as motivation for the approach of the organisation |
| | | | | | Realistic, ambitious strategy | Policy is based on modern and innovative assessment tools and policy objectives are ambitious. Support is provided by a comprehensive set of intermittent targets, which provide a clear and flexible pathway. Hence, assessment tools, scenarios and tipping points must be specified in documents |

Sources

FLO: Wiegert Dulfer, Rob Koeze, Rainproof documents and website, Deltaprogramma, Waterbeheerplan, GRP, Breed Water

UHI: Geertje Wijten

WSC: Gerard Korrel, Jeroen Ponten, Ed Cousin, Martine Lodewijk

WWT: Rolf Steenwinkel

SWT: Mark Nijman, Peter Simoës

GC5.2**Discourse****embedding**

The new policy discourse must coincide with policy in place for effective implementation. To what extent is sustainable policy interwoven in historical, cultural, normative and political context? Indicators are similarity of words in policies, relation to recent and local occurrences, the extent of creating momentum for radical adaptability measures. The level of discourse embedding is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|---|
| | | | | | Unsuitable policy and implementation | Cultural, historical and political context and history is largely ignored, leading to arduous policy implementation. Actors may not understand the scope or moral of the policy or may not understand to whom it applies or where to start the implementation (confusion) |
| | X | | | | Persistent reluctance and poor embedding | Actors feel reluctant to execute current policy as it conflicts with their norms and values. Policy hardly takes the local context and existing discourses into account. And the policy does not correspond with societal demands. This may lead to distrust between actors, inefficient use of resources and ineffective overall implementation |
| | | | X | | Problem framing and embedding | Current policy fits the local context, but hardly improve the city's adaptability to the water challenge. The water challenge is increasingly identified, framed and interwoven into local discourse, but the disregard of uncertainty prevents a sense of urgency that is necessary to adopt adequate adaptation measures. Decision making often results in very compromised small changes that fit into the current short-term policy focus |
| X | | | | | Consensus for sustainable actions | There is a consensus that adaptation is required, but substantial effort is necessary as there is little experience in addressing the water challenge in a long-term integrated approach. Furthermore, opposing interests and problem framing need to be solved. This is evidenced by long decision-making periods, often trust relations with new unconventional partners need to be built |
| | | X | | X | Embedding of sustainable implementations | Local context is used smartly to accelerate policy implementation. Innovations are subdivided into suitable phases which are more acceptable and effectively enables sustainable practices. Effective policy implementation is enabled by a general consensus that long-term integrated policy is needed to address the water challenge and deal with uncertainty |

Sources

FLO: Wiegert Dulfer, Rob Koeze, Rainproof documents and website, Deltaprogramma, Waterbeheerplan, GRP, Breed Water

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GC5.3**Policy****cohesion**

Cohesive policy is necessary for sustainable innovations that require disciplines, sectors and governance levels to be increasingly integrated. The focus is on the alignment of enabling factors such as financial, human and material resources. To what extent is policy coherent regarding geographic and administrative boundaries, alignment across sectors, government levels and technical possibilities. Indicators are consistency of policies (the level of integration without fragmentation or overlap) and compatibility of policies (the level of balance without conflicting or opposing aspects). The level of cohesiveness is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|--|
| | | | | | Incompatible policies | Policies between and within sectors are strongly fragmented and conflicting. This is evidenced by contradicting objectives and the squandering use of resources |
| | X | | | | Opposing sectoral policies | Overall water and climate adaptation policy is characterised by fragmentation and imbalance between sectors. The majority of resources is spent on the dominant policy field and overlap between sectors lead to inefficient use of resources |
| | | | | | Fragmented policies | Policy is fragmented and based on sector's specific scope and opportunities for co-benefits are not explored. However, effort is made to balance the resource allocation between sectors |
| X | | | | X | Overlapping comprehensive policies | There is cross-boundary coordination between policy fields to address water challenges. Policies are comprehensive, but have not yet resulted in a broad thematic multi-sectoral approach. Efforts to harmonize different sectors are evident from employee – functions or assignments and protocols |
| | | X | X | | Cohesive synergetic policies | Policies are coherent and comprehensive within and between sectors. There is an overarching vision resulting in smooth cooperation. Goals are unitedly formulated, evaluated and revised to adapt to new challenges. This is evidenced by thematic approaches instead of sectoral, many inter-sectoral meetings, interdisciplinary reports and cohesiveness in goals and strategies formulated |

Sources

FLO: Wiegert Dulfer, Rob Koeze, Maarten Claassen, Rainproof documents and website, Deltaprogramma, Waterbeheerplan, GRP, Breed Water

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SWT: Mark Nijman, Peter Simoës

6 Agents of change

In order to drive change, agents of change are required to show direction, motivate others to follow and mobilize the resources required. Agents of change consists of *entrepreneurial*, *collaborative* and *visionary agents*.

GC6.1

Entrepreneurial

To what extent are the entrepreneurial agents-of-change in the network of the theme enabled to gain access to resources, seek and seize opportunities and reduce risks? Indicators are opportunity identification, invasiveness of measures, perspective on risks. The level of entrepreneurship is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Insufficient entrepreneurship | Ignorance for risk and threats leads to ineffective rigid governance and lack of opportunity for entrepreneurial agents to enable improvements. Moreover, distrust by other actors and potential investors, further decrease access to resources |
| | | | | | Room for short-sighted entrepreneurship | Agents of change struggle to gain access to sufficient resources to address imminent or short-term water challenges. Risks are often not acknowledged. Windows of opportunity to identify and to act upon perceived risks are limited. Opportunities to address stakeholders with potential access to resources are rarely seized |
| | | | | | Conventional and risk-averse entrepreneurship | Entrepreneurial agents of change are better able to seize low-risk opportunities. Therefore opportunities for innovative approaches and synergies are not pursued. Small changes can be recognized |
| X | X | | | X | Tentative experimental entrepreneurship | There is a growing understanding of the water challenge's uncertainty, complexity and need for innovative approaches that entail a certain level of risk. Tentative experimental projects set in but are paid by conventional resources. Projects are small-scale pilots |
| | | X | X | | Long-term support for entrepreneurship | There is recognition of the need for continuous innovation, hence applied research is enabled that explores future risk management and supports strategy formulation. The experiments yield increased benefits and new insights. This is recognized by other actors, thereby providing access to new resources. Continuous experimentation is supported by long-term and reliable resource allocation |

Sources

FLO: Rob Koeze, Maarten Claassen (pers.comm.), Rainproof website

UHI: Rainproof documents

WSC: Jeroen Ponten, Ed Cousin

WWT: Kees van der Drift, Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

GC6.2

Collaborative

Collaborative agents tend to build bridges and coalitions between actors. To what extent are actors enabled to engage, collaborate with and connect business, government and social sectors? Indicators are trust, scope of collaboration, term for collaboration. The level of collaboration is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|--|
| | | | | | Lack of collaborative agents | Collaboration is discouraged, because there is a very strong hierarchical structure or even personal interest. There is distrust between stakeholders and the willingness and opportunity to initiate collaboration are limited |
| | | | | | Insufficient opportunity for collaborative agents to set up collaboration | There is insufficient opportunity for agents of change to go beyond conventional collaboration. The current collaborations are deemed sufficient to deal with the water challenge whereas the vision limited |
| | | | | X | Agent are enabled to enhance conventional collaboration | Traditional coalitions are preserved to maintain status quo. There is trust within these coalitions. There is limited space to create new collaborations (including new composition of actors). If new collaboration occurs solutions are still mostly sectoral and short- to mid-term |
| X | | X | | | Agents of change push collaboration for new stakeholders | There is an understanding that wicked water challenges require long-term, integrated solutions. Hence, wide-spread collaborations between a variety of stakeholders and sectors are being established. New collaborations with unconventional actors, result, more and more, in valuable new insights and effective networks |
| | X | | X | | Agents of change strongly enhances wide-spread synergetic collaboration | There is ongoing build-up of productive and synergetic collaborations. Facilitators may even be administered to coordinate this through mediation and authority. There is a conception of the ideal collaboration composition |

Sources

FLO: Rob Koeze, Maarten Claassen (pers.comm.), Rainproof website

UHI: Rainproof documents

WSC: Jeroen Ponten, Ed Cousin

WWT: Kees van der Drift, Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

GC6.3

Visionary

Visionary agents of change promote a sustainable vision and convince others of the need to act. They drive change by promoting a comprehensive and integrated vision sq. strategy regarding the theme and by enhancing organizational skills and knowledge. To what extent are actors in the network of the theme able to manage change and communicate this effectively? Indicators are period of time taken into account and level of integration in the vision and the extent to which the vision is supported by short-term targets. The visionary agents of changes are characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|--|
| | | | | | Deficient sustainability vision and short-term thinking | There is a lack of visionary agents that promote change towards a long-term, sustainable vision regarding the water challenge. Diverging expectations and objectives of stakeholders are the result. This may be evidenced by indecisiveness or even conflicts. Long-term and integrative initiatives may also be blocked |
| | X | | | | Unilateral and short-term vision | There is a unilateral vision regarding the water challenge, which benefits only a small groups of actors. The vision often has a short-term focus, with a maximum of 3 to 4 years |
| | | | | X | Defense of status quo | The visions of the existing agents of change are limited to promoting the business as usual. They do not oppose nor promote long-term, integrative thinking. There is probably no attention to or employment in trend analysis |
| | | X | X | | Long-term vision with flawed communication | There is a clear long-term vision that considers the interests of most sectors and stakeholders. There is still some discrepancy between short-term targets and implementation strategies on the one hand and the long-term vision from visionary agents of change on the other hand. This means that agents are not always clear in their formulation regarding the effect and impact of envisioned strategy |
| X | | | | | Long-term vision supported by short-term targets receiving much approval | Visionary agents of change in different positions and with different backgrounds actively and successfully promote a sustainable and long-term vision regarding the water challenge, that is communicated clearly throughout the entire multi-level network. Short-term targets seamlessly fit the long-term vision. There is employment in trend analysis and these actors are consulted. There are sectoral and inter-sectoral meetings to formulate short-term targets to support long-term goals |

Sources

FLO: Rob Koeze, Maarten Claassen (pers.comm.), Rainproof website

UHI: Rainproof documents

WSC: Jeroen Ponten, Ed Cousin

WWT: Kees van der Drift, Lex Lelijveld, Rolf Steenwinkel

SWT: Mark Nijman, Peter Simoës

7 Multi-level network potential

Urban governance involves a plethora of actors and interests from all levels of government, organizations and (private) stakeholders. For sustainable solutions, working in networks is inevitable. To exploit the full potential of progression networks need a certain level of autonomy, legitimacy and authority. Multi-level network potential consists of three characteristics, i.e., *room to manoeuvre*, *clear division of responsibilities*, and *authority*.

GC7.1 Room to manoeuvre

To what extent do actors have the freedom and opportunity to develop a variety of alternatives and approaches; includes the possibility to form ad hoc, fit-for-purpose partnerships that can adequately address existing or emerging water challenges? Indicators are the level of freedom, opportunity and empowerment for actors to form new collaborations. The room to manoeuvre is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|--|
| | | | | | Strictly imposed obligations | The actions of stakeholders are strictly controlled and there are rigid short-term targets. Freedom to form ad hoc fit-for-purpose partnerships is strongly limited. Actor network composition is fixed and small. There are no resources made available for exploring alternatives that might be more effective or efficient whereas many actors that are affected by the water challenge do not have a voice |
| | | | | | Limited autonomy | Only a few actors receive some degree of freedom, there are limited opportunities to develop alternatives, and there is hardly any opportunity to form partnerships with unconventional actors |
| | X | | X | | Limited room for innovation and collaboration | Actors are given the means to perform predefined tasks for dealing with problems that are framed with a narrow, short-term and technical-oriented scope. There is limited room to deviate. Solutions are sought in own sectoral field and expertise |
| X | | X | | X | Redundancy to address uncertainty | There is recognition that a high degree of freedom is necessary to deal with complex situations in the form of experiments and looking for new unconventional collaborations. There is a dynamic mix of cooperative partnerships and a redundant set of diverging alternative solutions. A clear overall vision to steer research is however lacking |
| | | | | | Freedom to develop innovative solutions | There is a common and accepted long-term vision for dealing sustainable with the water challenge. Within the boundaries of this vision, actors are given the freedom to develop novel and diverse approaches and partnerships, resulting in continuous improvements and exploration. These partnerships are most likely institutionalized |

Sources

FLO: Rob Koeze, Maarten Claassen (pers.comm.), Rainproof documents and website

UHI: Geertje Wijten

WSC: Jeroen Ponten, Ed Cousin

WWT: Rolf Steenwinkel, Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

GC7.2 Clear division of responsibilities

A clear division of responsibilities in new and changing situations and actor compositions is essential for dealing effectively with wicked water challenges. To what extent are responsibilities clear and clearly divided, also in new fit-for-purpose partnerships? Indicators are clarity of role division, trust and effectiveness of organized structures. The level of clarity of responsibilities and division is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|-----|-----|-----|-----|-----|--|--|
| | X | | | | Unclear division of responsibilities | There is an unclear division of responsibilities and often the relationships are over-hierarchical. Everybody expects someone else to make required effort and trust is hardly found |
| | | | | | Barriers for effective cooperation | Authorities are fragmentized or they lack interest. Moreover, miscommunication and lack of trust are causes that block effective water governance |
| | | | | X | Inflexible division of responsibilities | Responsibilities are divided over a limited set of conventional actors and are based on dealing with past practices. Opportunities for new cooperation and more effective division of responsibilities are not seized or even recognized. Conventional actors are given more tasks to deal with new water challenges |
| | | X | X | | Innovative cooperative strategies | Actors recognize that knowledge and experience are scattered within the local network. Therefore extra effort is made to bundle the scattered expertise and to reach fit-for-purpose division of clear roles and responsibilities. New cooperation compositions are abundantly explored |
| X | | | | | Dynamic, fit-for-purpose cooperations | There are many synergetic cooperations within the urban water network that can provide solutions for the water challenge. The roles and responsibilities are clearly divided amongst actors. These cooperations are dynamic and result in fit-for-purpose problem solving necessary to solve complex, multi-level and unknown challenges |

Sources

FLO: Rob Koeze, Maarten Claassen (pers.comm.), Rainproof documents and website

UHI: Geertje Wijten

WSC: Jeroen Ponten, Ed Cousin, Martine Lodewijk

WWT: Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

GC7.3**Authority**

Presence of legitimate forms of authority are essential to put forward the necessity of addressing the water challenges. To what extent are legitimate forms of power and authority present? The level of authority is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|---|
| | X | | | | Powerlessness | The addressing of water challenges is regularly overruled with contradicting and competing interests and so it is hardly included in policy, regulation or administrative principles |
| | | | | | Unfruitful attempts | The water challenge is put forward by individuals or a groups of actors, but there is only little interest that is also fragile due to poor embedding of sustainability principles in current policy mechanisms, interests, and budget allocation. The challenge may have been mentioned in reviews or reports but left unaddressed due to earlier mentioned restrictions |
| | | | | | Restricted authority | The water challenge is addressed as long as the status quo is not changed. Long-term vision in policy is limited and new policy mainly needs to fit into existing fragmented policy. This means small (technical) changes are occurring and efforts are primarily made by individuals or small groups |
| | | X | X | | Stirring authority | There is recognition of the need for long-term and integrated approaches by both the public and the political arena. Sustainability approaches regarding the water challenge are now implemented as declarations of intent and sustainability principles in policy and regulation. Legitimate authorities are assigned to coordinate long-term integrated policy and implementation |
| X | | | | X | Strong embedded authority well- | Long-term, integrated approaches regarding the water challenge are well embedded in policy and regulatory authority. Authoritative figures receive much support both politically and societal. Their opinions and statements concerning the water challenge also receive much media attention |

Sources

FLO: Rob Koeze, Maarten Claassen (pers.comm.), Deltaprogramma, Waterbeheerplan, Rainproof documents and website

UHI: Geertje Wijten

WSC: Jeroen Ponten, Ed Cousin

WWT: Lex Lelijveld

SWT: Mark Nijman, Peter Simoës

8 Financial viability

Sufficient financial resources are crucial for good water governance. Willingness to pay for water challenge adaptation services is important to gain access to reliable funding for long-term programs. At the same time, water and climate adaptation services need to be affordable for everyone including poor people or people being disproportionally affected. This condition consists of three characteristics, i.e., *affordability*, *consumer willingness-to-pay* and *financial continuation*.

GC8.1

Affordability

To what extent are water services and climate adaptation measures available and affordable for all citizens, including the poorest? Affordability is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|--|
| | | | | | Unaffordable basic water services | Basic water services are not affordable or even available for a substantial part of the population. This may be due to inefficient or obsolete infrastructure, mismanagement or extreme poverty |
| | | | | | Limited affordability of basic water services | A share of the population has serious difficulty to pay for basic water services including neighbourhoods with low-income or marginalized groups. There is hardly any social safety net regarding water services, let alone for climate adaptation measures |
| | | | | | Unaffordable climate adaptation | Basic water services are affordable for the vast majority of the populations, however poor people and marginalized communities have much difficulty to afford climate adaptation measures to protect themselves against impacts of extreme heat, flooding or water scarcity. Sometimes, priority is given to the economic relevance of climate adaptation measures instead of access to climate adaptation services for everyone |
| X | X | X | X | X | Limited affordable climate adaptation | Serious efforts are made to support climate adaptation for everyone, including vulnerable groups. There is recognition that poor and marginalized communities are disproportionately affected by effects of climate change. Human rights and equity principles are embraced and fully recognized. This is increasingly reflected in policy and regulation |
| | | | | | Climate adaptation affordable for all | There are programs and policies that ensure climate adaptation for everyone. This includes both public infrastructure and private property protection. The solidarity principle clearly percolates in policy and regulation |

Sources

FLO: Wiegert Dulfer, Rob Koeze, Maarten Claassen

UHI: Geertje Wijten, www.amsterdam.nl – wonen en leefomgeving – duurzaam Amsterdam

WSC: Jeroen Ponten, Ed Cousin

WWT: Rolf Steenwinkel, Kees van der Drift

SWT: Mark Nijman, Peter Simoës, Landelijk afvalbeheerplan, Uitvoeringsplan afval (jun.2016), www.coelo.nl – kaart met belangrijkste gemeente belastingen

GC8.2 Consumer willingness to pay

How are expenditures and risks regarding water and climate adaptation perceived by all local stakeholders including the community? Indicators are trust, awareness of risk, perceived importance of climate adaptation measures, value of non-economic benefits, financial principles. The willingness to pay is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Mistrust and resistance to financial decisions | There is a high level of mistrust in decision making regarding resource allocation. At this level financial decisions are based on prestige projects, projects that benefit a small group of actors or assist limited interests. As expenditures often do not address the actual urban water challenges, there is a high degree of resistance regarding resource allocation |
| | | X | | | Fragmented willingness to pay | Willingness to pay for measures addressing water challenges is fragmented and insufficient. The importance and risk of the water challenge is perceived differently by the stakeholders. This may be clear from media attention given to the water challenge. Generally, the perceived required investments to address the water challenge in substantially lower than the actual costs |
| | X | | X | X | Willingness to pay for business as usual | There is support for the allocation of resources for conventional tasks. There is limited awareness or worries on the water challenge and imposed future threats. Most people (both public or stakeholders are unwilling to financially support novel policies regarding the water challenge. There is sufficient trust in local authorities |
| | | | | | Willingness to pay for provisional adaptation | Due to growing worries about challenges, there are windows of opportunity to increase funding for certain aspects regarding the water challenge. However, the perception of risk does not necessarily coincide with actual risk. Financial principles, such as polluter-pays principle, may be introduced. However due to inexperience, implementation is often flawed. Focus groups decide on priority aspects regarding the water challenge, but there is confusion regarding the extent and magnitude of the water challenge |
| X | | | | | Willingness to pay for present and future risk implementation | The water challenges are fully comprehended by decision-makers. There is political and public support to allocate substantial financial resources to address the challenges. Also expenditure for non-economic benefits is perceived as important. There is clear agreement on the use of financial principles, such as polluter-pays-, user-pays- or solidarity principle in policy implementation |

Sources

FLO: Wiegert Dulfer, Rob Koeze

UHI: Geertje Wijten

WSC: Gerard Korrel, Jeroen Ponten, Ed Cousin

WWT: Rolf Steenwinkel, Kees van der Drift

SWT: Landelijk afvalbeheerplan, Uitvoeringsplan afval (jun.2016), www.coelo.nl – kaart met belangrijkste gemeente belastingen, Mark Nijman, Peter Simoës

GC8.3**Financial****continuation**

To what extent do financial arrangements support long-term, climate adaptive [theme] policy? Indicators are availability of financial resources, regularity and predictability of financing, and time-period of financing. The level of financial continuation is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|--|
| | | | | | Lack of financial resources | There are insufficient financial resources available to perform basic tasks regarding the water challenge. Financing is irregular and unpredictable leading to poor policy continuation |
| | | | | | Inequitable financial resources allocation | There are potential resources available to perform basic management tasks regarding the water challenge, but they are difficult to access, are distributed rather randomly and lack continuity. No clear criteria can be found on the resource allocation. Resources allocation is ad hoc and considers only short-time horizons |
| | X | | | | Financial continuation for basic services | Financial resources are available for singular projects of basic services, that do not necessarily adjoin. The allocation of financial resources is based on past trends, current costs of maintenance and incremental path-dependent development. A tool for this is a cost-benefit-analysis. Costs to deal with future water challenges are not incorporated. Limited resources are assigned for unforeseen situations or calculated risks |
| X | | X | X | X | Abundant financial support with limited continuation | Abundant financial resources are made available for project based endeavours that often lack long-term resource allocation or institutionalized financial continuation. Hence, long-term implementation is uncertain |
| | | | | | Long-term financial continuation | There is secured continuous financial support for long-term climate adaptation policy, measures and research regarding the water challenge. These costs are included into baseline funding. Both economic and non-economic benefits are considered and explicitly mentioned using comparison tools |

Sources

FLO: Wiegert Dulfer, Rob Koeze

UHI: Geertje Wijten

WSC: Jeroen Ponten, Ed Cousin

WWT: Rolf Steenwinkel, Kees van der Drift

SWT: Landelijk afvalbeheerplan, Uitvoeringsplan afval (jun.2016), www.coelo.nl – kaart met belangrijkste gemeente belastingen

9 Implementing capacity

Implementing capacity is about the effectiveness of policy instruments with respect to the water challenge. Part of the effectiveness is also due to the level of compliance to policy and regulation and the familiarity with (calamity) action plans. This condition consists of the characteristics *policy instruments*, *legal compliance* and *preparedness*.

GC9.1

Policy

instruments

Policy instruments are used to achieve behavioural change. To what extent are policy instruments concerning the theme effectively used to stimulate desired behaviour and discourage undesired activities and choices? Indicators are the effectiveness and cohesive deployment of instruments as well as optimization in the use of instruments based on monitoring and learning. The appropriate level is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | | | | | Instruments enhance unsustainable behavior | Policy instruments may enhance unwanted or even damaging behaviour that opposes sustainability principles, e.g., discount for higher water use stimulates spilling and inefficiency. There is hardly any monitoring that can be used to evaluate or reveal the counterproductive effects of these policy instruments. Unsustainable behaviour can be intentional |
| | | | | | Unknown impacts of policy instruments | Instruments are being used without knowing or properly investigating their impacts on beforehand. The set of instruments actually leads to imbalanced development and inefficiencies. During the implementation, a persistent belief in the effectiveness of the instruments blocks learning or the recognition that the instruments do not have the intended results |
| | X | | | | Fragmented instrumental use | Policy fields or sectors often have similar goals, but instruments are not coherent and may even contradict. Overall instrumental effectiveness is low and temporary. There is sufficient monitoring and evaluation leading to knowledge and insights in how instruments work. Actors are open to look for improvements in the use of policy instruments |
| X | | X | X | X | Profound exploration of sustainability instruments | Instruments to implement principles such as full cost-recovery and polluter-pays principle, serve as an incentive to internalize sustainable behaviour. The use of various instruments is explorative and therefore not yet optimized and efficient. The use of instruments is dynamic. There are a lot of simultaneous or successive changes and insights |
| | | | | | Effective instruments enhance sustainable transformations | There is much experience with the use of policy instruments. Monitoring results show that the current use of instruments proves to be effective in achieving sustainable behaviour amongst almost all actors. Continuous evaluation ensures flexibility, adaptive capacity and fit-for-purpose use of policy instruments |

Sources

FLO: Wiegert Dulfer

UHI: Geertje Wijten

WSC: Gerard Korrel, Ed Cousin

WWT: Rolf Steenwinkel

SWT: Mark Nijman

GC9.2

Legal

compliance

To what extent do stakeholders respect agreements, objectives, legislation etc.? Indicators are clarity of regulations, comprehensiveness and support of policies. Legal compliance regarding the theme is characterized by:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|---|--|
| | | | | | Poor compliance due to unclear legislation | Legislation and responsibilities are unclear, incomplete or inaccessible leading to poor legal compliance by most actors. If legislation is present it enjoys poor legitimacy. Actors operate independently in small groups. Fraudulent activities take place |
| | | | | | Moderate compliance to incomplete legislation | The division of responsibilities of executive and controlling tasks is still unclear. Legislation is incomplete meaning that certain gaps can be misused. This stimulates autocratic behaviour. There is loss of trust in local authorities due to inconsistent enforcement typically signalled by unions or NGO's |
| | X | | | | Strict compliance to fragmented legislation | The water sector is still fragmented, but complies strictly to well-defined fragmented policies, regulations and agreements. Flexibility, innovations and realization of ambitious goals are limited. An activity may be penalized multiple times in different direct and indirect ways due to poor coordination and unclear divisions of roles and responsibilities |
| | | | | X | Flexible compliance to ambitious explorations | New ambitious policies, agreements and legislations are being explored in a "learning-by-doing" fashion. Most actors are willing to comply. Some targets may be unrealistic and requires flexibility. At this level frontrunners of the long-term climate adaptive water policies can be recognized |
| X | | X | X | | Good compliance to effective sustainable legislation | Legislation is ambitious and effective. There is much experience with developing and implementing sustainable policy. Short-term targets and long-term goals are well integrated leading to realistic implementation. There is a good relationship among local authorities and stakeholders based on dialogues. Implementation of policies and technical innovations succeed quite rapidly |

Sources

FLO: Ingrid Heemskerk, Wiegert Dulfer

UHI: Geertje Wijten

WSC: Ingrid Heemskerk, Gerard Korrel, Ed Cousin

WWT: Ingrid Heemskerk

SWT: Mark Nijman

GC9.3

Preparedness

Preparedness in terms of procedures and scripts for action to support policy strongly increases implementation capacity. In this respect, To what extent is the UWGN prepared for both gradual and sudden uncertain changes and events? Indicators are clarity of action plan, clear division of roles; knowledge of probability and vulnerability of risks; awareness of action plans, and scenario-building. Regarding the theme there is:

| FLO | UHI | WSC | WWT | SWT | | |
|----------|----------|----------|----------|----------|--|---|
| | X | | | | Poor preparedness | There are hardly any action plans for dealing with (future) calamities, uncertainties and existing risks. The city is highly vulnerable. No disaster plans or resilience plans can be found |
| | | | | | Limited preparedness | Action plans are responsive to recent calamities and ad hoc. Actual probabilities and impacts of risks are not well understood. Action plans are still unclear. Reports should be found on how the water sector dealt with recent calamities, as well as evaluation reviews |
| | | | | | Low awareness of preparation strategies | Based on past experiences, there are action plans. Actions required are clear but awareness of existing action plans or the division of tasks is limited. The plans are not sufficient to deal with imminent calamities and gradually increasing pressures. There is recognition of the need for action plans, yet the development of action plans does not cover all water-related threats and challenges. Damage is almost always greater than expected or prepared for |
| | | X | X | X | Fragmented preparedness | A wide range of threats is considered in action plans. Maybe over-abundant. Plans are proactive and follow the precautionary principle. Awareness of risks is high, but action plans are scattered and non-cohesive. They may be independent or made independently by various actors. Allocation of resources, staff and training may therefore be ambiguous |
| X | | | | | Comprehensive preparedness | Long-term plans are flexible by bundling different risks, impacts and worst case scenarios. The action plans for calamities are clearly communicated, co-created and regularly rehearsed by all relevant stakeholders. The required materials and staff are available on short-term notice in order to be able to respond adequately. Evaluations on the rehearsals or reviews on dealing with calamities are available |

Sources

FLO: Wiegert Dulfer, Jos Ketelaars, Rob Koeze

UHI: Geertje Wijten refers to GGD website – found nothing. There is one person at the GGD that provides a program for elderly regarding health and heat stress

WSC: Jos Ketelaars, Gerard Korrel, Ed Cousin

WWT: Jos Ketelaars

SWT: Mark Nijman

Appendix B

Appendix B provides the transcriptions of the interviews that were held as part of the application of the GCF. They are listed according to water-related challenge. *Appendix B is only digitally available.*

FLO

1. Wiegert Dulfer
2. Rob Koeze
3. Maarten Claassen

UHI

4. Geertje Wijten

WSC

5. Gerard Korrel
6. Ed Cousin
7. Martine Lodewijk
8. Jeroen Ponten

WWT

9. Rolf Steenwinkel
10. Kees van der Drift
11. Lex Lelijveld

SWT

12. Mark Nijman
13. Peter Simoës

General

14. Alice Fermont on condition 2 *Useful knowledge*
15. Ingrid Heemskerk on condition 3 *Continuous learning*
16. Jos Ketelaars on characteristic 9.3 *Preparedness*