How water sensitive is your city? Benchmarking and navigation in planning for climate adaptation of midsize cities in the North Sea region

N. J. Dolman**, G. Özerol**, H. Bormann and S. Lijzenga******

** Royal HaskoningDHV, Amersfoort, the Netherlands (E-mail: nanco.dolman@rhdhv.com)*
*** Twente University of Technology, Enschede, the Netherlands*
**** Jade University of Applied Sciences, Oldenburg, Germany*
***** Water Authority Vechtstromen, Almelo, the Netherlands*

Introduction

Many cities in the North Sea Region (NSR) and around the world face challenges in water extremes, urban densification, climate change and ultimately people's quality of life. In the NSR, 80% of the inhabitants live in urban areas and most cities are midsize cities with approximately 20,000 to 200,000 inhabitants. Even though these midsize cities also feel the urgency to develop climate adaptation strategies, researchers, politicians and planners often focus on large cities and metropolitan areas, leaving this large group of midsize cities unaddressed. Further, midsize cities often do not have the personnel and financial resources to tackle adaptation to climate change themselves.

How can we benchmark and navigate the implementation of adaptation to climate change? Inspired by the 'Water Sensitive City' (WSC) framework (Wong and Brown, 2008), a guiding online decision support tool (DST) has been developed in the Interreg NSR project CATCH (*water sensitive Cities: the Answer To CHallenges of extreme weather events*). The DST supports primarily small and medium-sized cities to become climate resilient and water sensitive – futures cities which combines physical infrastructure, such as blue-green infrastructure, with social systems (e.g. governance and engagement) to create a city where the infrastructure and systems enhance the connections people have with water and improve quality of life.

Methodology

Determining the specific needs of midsize cities

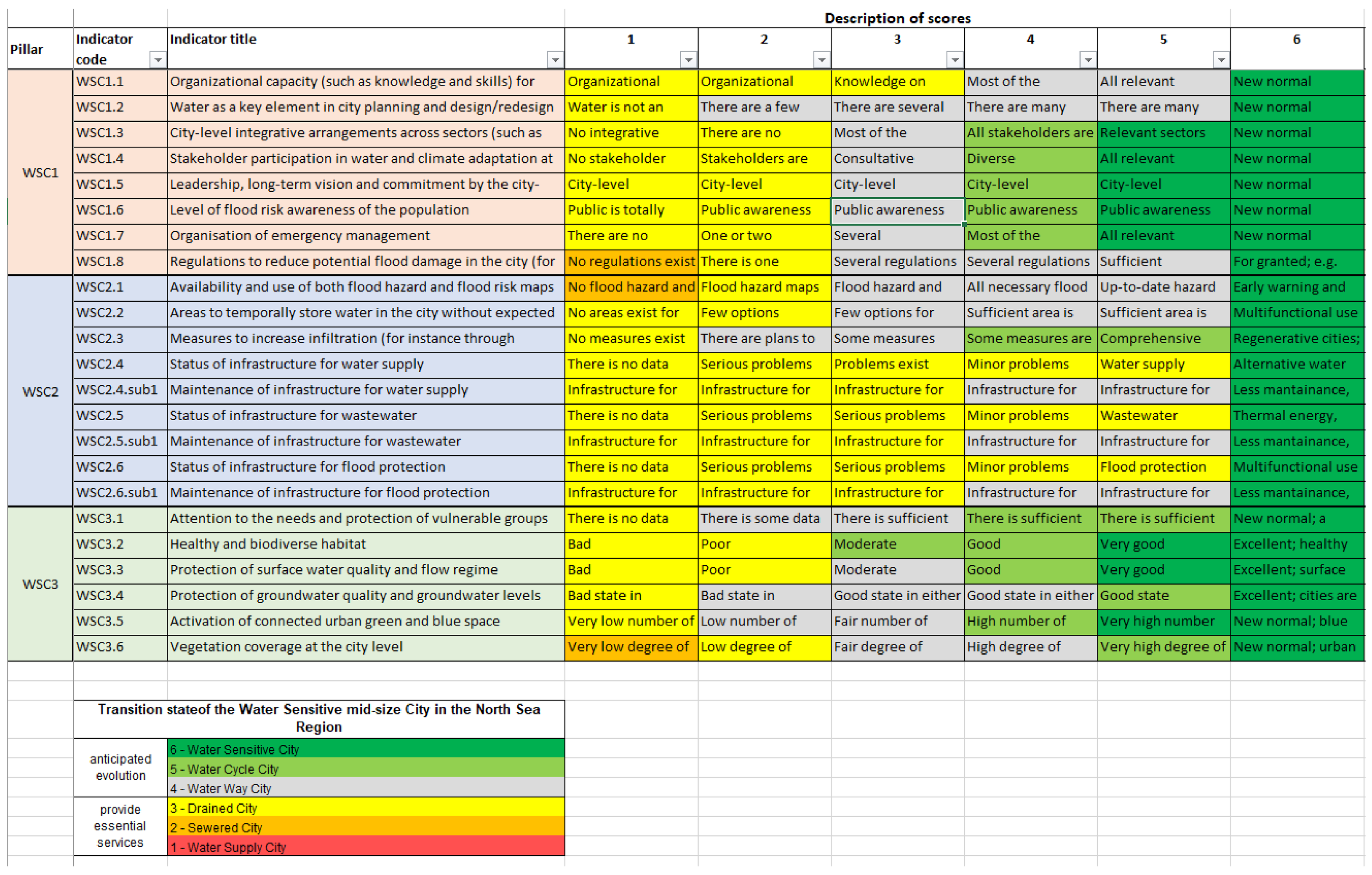
The partners of the CATCH-project identified a list of challenges that midsize cities have to deal with the challenges of climate change adaptation, incl. a lack of expertise in dealing with climate challenges in an integrated manner, insufficient human resources to develop and implement a thorough climate change adaptation strategy (Kunzmann, 2009). But most of all, midsize cities have less autonomy in dealing with climate adaptation. Compared to major cities, midsize cities are highly connected to their water catchments and surroundings. To come to a successful climate adaptation strategy there is a great need for midsize cities to cooperate.

Developing and applying the set of water sensitive city indicators

A major element in the transition towards water sensitivity and climate resilience is the assessment of cities in terms of their current status in the three WSC pillars of action by using multiple indicators (Figure 1). These "pillars" address the role of cities as (1) water sensitive communities and networks, (2) water catchments, and (3) providers of ecosystem services.

Assigning the Water Sensitive City-states

The WSC state assignment has been tested to seven city-scale case studies in the NSR. The aim of these case studies was to test the functionality of the WSC framework in delivering reliable, useful and transferable benchmarks in different country contexts. The data were collected through in-depth interviews with stakeholders from the local municipality, the water utility and government departments, as well as a desktop review of key policy documents, organizational materials and diagnostic reports. The results for the seven case studies were also compared to idealized city-states of a Drained City, Waterways City and Water Cycle City in the North Sea Region.



Pillar	Indicator code	Indicator title	Description of scores: 1	2	3	4	5	6
WSC1	WSC1.1	Organizational capacity (such as knowledge and skills) for	Organizational	Organizational	Knowledge on	Most of the	All relevant	New normal
	WSC1.2	Water as a key element in city planning and design/redesign	Water is not an	There are a few	There are several	There are many	There are many	New normal
	WSC1.3	City-level integrative arrangements across sectors (such as	No integrative	There are no	Most of the	All stakeholders are	Relevant sectors	New normal
	WSC1.4	Stakeholder participation in water and climate adaptation at	No stakeholder	Stakeholders are	Consultative	Diverse	All relevant	New normal
	WSC1.5	Leadership, long-term vision and commitment by the city-	City-level	City-level	City-level	City-level	City-level	New normal
	WSC1.6	Level of flood risk awareness of the population	Public is totally	Public awareness	Public awareness	Public awareness	Public awareness	New normal
	WSC1.7	Organisation of emergency management	There are no	One or two	Several	Most of the	All relevant	New normal
	WSC1.8	Regulations to reduce potential flood damage in the city (for	No regulations exist	There is one	Several regulations	Several regulations	Sufficient	For granted; e.g.
WSC2	WSC2.1	Availability and use of both flood hazard and flood risk maps	No flood hazard and	Flood hazard maps	Flood hazard and	All necessary flood	Up-to-date hazard	Early warning and
	WSC2.2	Areas to temporally store water in the city without expected	No areas exist for	Few options	Few options for	Sufficient area is	Sufficient area is	Multifunctional use
	WSC2.3	Measures to increase infiltration (for instance through	No measures exist	There are plans to	Some measures	Some measures are	Comprehensive	Regenerative cities;
	WSC2.4	Status of infrastructure for water supply	There is no data	Serious problems	Problems exist	Minor problems	Water supply	Alternative water
	WSC2.4.sub1	Maintenance of infrastructure for water supply	Infrastructure for	Infrastructure for	Infrastructure for	Infrastructure for	Infrastructure for	Less mantainance,
	WSC2.5	Status of infrastructure for wastewater	There is no data	Serious problems	Serious problems	Minor problems	Wastewater	Thermal energy,
	WSC2.5.sub1	Maintenance of infrastructure for wastewater	Infrastructure for	Infrastructure for	Infrastructure for	Infrastructure for	Infrastructure for	Less mantainance,
	WSC2.6	Status of infrastructure for flood protection	There is no data	Serious problems	Serious problems	Minor problems	Flood protection	Multifunctional use
	WSC2.6.sub1	Maintenance of infrastructure for flood protection	Infrastructure for	Infrastructure for	Infrastructure for	Infrastructure for	Infrastructure for	Less mantainance,
WSC3	WSC3.1	Attention to the needs and protection of vulnerable groups	There is no data	There is some data	There is sufficient	There is sufficient	There is sufficient	New normal; a
	WSC3.2	Healthy and biodiverse habitat	Bad	Poor	Moderate	Good	Very good	Excellent; healthy
	WSC3.3	Protection of surface water quality and flow regime	Bad	Poor	Moderate	Good	Very good	Excellent; surface
	WSC3.4	Protection of groundwater quality and groundwater levels	Bad state in	Bad state in	Good state in either	Good state in either	Good state	Excellent; cities are
	WSC3.5	Activation of connected urban green and blue space	Very low number of	Low number of	Fair number of	High number of	Very high number	New normal; blue
	WSC3.6	Vegetation coverage at the city level	Very low degree of	Low degree of	Fair degree of	High degree of	Very high degree of	New normal; urban

Transition stateof the Water Sensitive mid-size City in the North Sea Region	
anticipated evolution	6 - Water Sensitive City
	5 - Water Cycle City
	4 - Water Way City
provide essential services	3 - Drained City
	2 - Sewered City
	1 - Water Supply City

Figure 1: Assigning indicators to idealized WSC-states in North Sea Region

Results & Discussion

In 2020 a test version of the online CATCH decision support tool was made available, that helps midsize cities in the NSR to (1) benchmark their WSC state and (2) navigate to a climate resilient and water sensitive future. The results are presented in a dashboard (Figure 2).

The benchmark functionality shows how a city compares to the three WSC pillars of action. The scores for each principle are determined based on the relevant indicator scores. This helps to show where the city's strengths and weaknesses lie. The indicators have been designed to allow users to measure their city's progress towards achieving water sensitivity goals. It also helps decision-makers to prioritise their actions, define responsibilities and foster accountability for water-related practices.

The navigating functionality is a 6-step climate adaptation cycle. It is based on the concept of the management cycle as introduced by the EU-Interreg project Climate Proof Areas (Bormann et al., 2015). It is a flexible functionality, which can easily be adapted to scale, scope, timeframe and users. The functionality can be used in the adaptation process and while implementing measures. Two supportive functionalities are included: Governance Assessment (GA) and Ecosystem Assessment (EA), that are directly linked to the respective steps in the adaptation cycle. This tool helps decision makers to identify problems, pinpoint appropriate solutions, and avoid mistakes along the way. Good practices from across the region are the core of this tool.

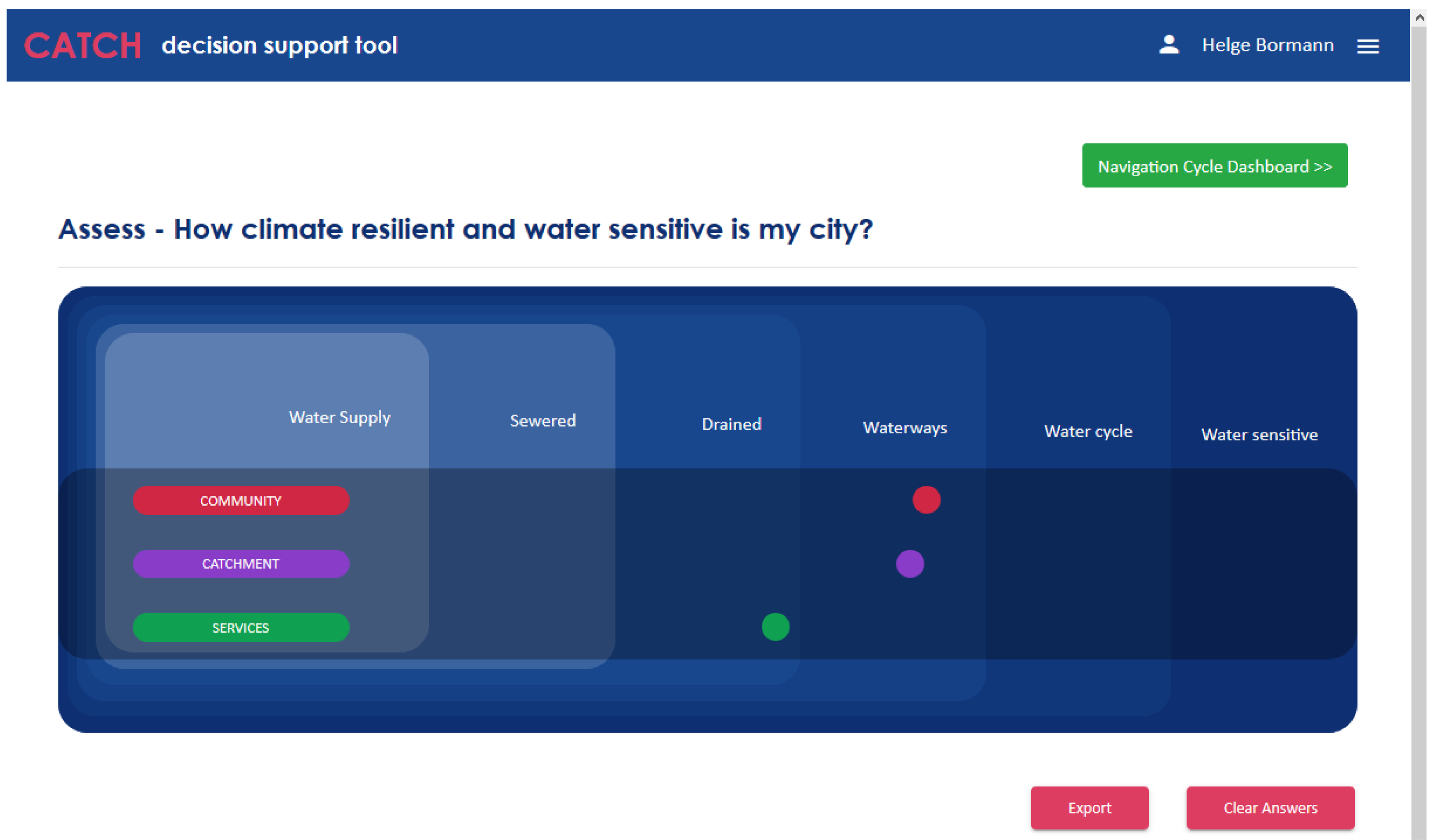


Figure 2: Benchmark dashboard of the CATCH decision support tool

Conclusions

The design of the online DST or CATCH-tool is based on the specific needs and characteristics of midsize cities in the North Sea Region, to assist in taking the right strategic decisions and to help formulating long term climate adaptation strategies and achieve the desired future of a water sensitive city. It's designed to be used by city leaders, programme managers, strategy & policy advisors and urban (master) planners. It can also be adapted to a range of (spatial) scales, scopes of challenges and time frames.

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