

# OURWATER



## ACKNOWLEDGEMENTS

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# 1

## INTRODUCTION

With cities worldwide expected to grow an estimated 2 billion residents by 2050, there is an urgent need for urban water management that ensures consistent, adequate and high-quality water services for all. However, the scale and complexity of this need presents new challenges to decision-makers in government, civil society and the private sector.

OurWater is a digital tool designed to help cities identify local initiatives that build water resilience, understand the impact of shocks and stresses on natural and man-made water infrastructure, and explore the interaction between key stakeholders involved in urban water management. A collaborative effort between Arup and the Stockholm International Water Institute (SIWI), funded by the Resilience Shift, the tool represents a new approach to building resilience through the use of digital, crowd-sourced and openly accessible information.

OurWater addresses the need for improved water governance through coordination and knowledge-sharing between actors working in the water system. By crowd-sourcing these tasks, OurWater creates a growing repository for city-wide information supplied by users across multiple sectors and levels of government.







# 2

## THE NEED

As the world's population grows larger and more urbanized, resilient urban water management is critical to ensuring safe, healthy and prosperous cities. Water is an essential condition for human health, a catalyst of economic development, an ingredient in urban place-making and an element in shared culture, heritage and history. Urban water issues are complex, involving overlapping and interconnected systems and diverse sets of actors. Water services are shaped by financial and political considerations, affected by urban growth, land use planning and environmental management. Given the complex nature of these relationships, planning for water resilience is neither simple nor straightforward.

In particular, cities require tools that can help them understand what drives water resilience and how to navigate the process of building resilience through coordinated action across multiple stakeholders.

Because holistic urban water resilience is often a new consideration, cities confront significant hurdles in building resilience. Information is rarely shared between actors working in narrow silos and coordination is rare across actors and between interdependent urban systems such as energy, transportation and public health.

Clearly, new tools are needed to help cities build water resilience.





## WHAT IS WATER GOVERNANCE

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 articulate their interests and have their concerns considered, and decision-makers are held accountable for water management (OECD Principles on Water Governance).

Table 1: OurWater value proposition

KEY STAKEHOLDERS	COMMON CHALLENGES
<p><b>High-level decision-makers in:</b></p> <ul style="list-style-type: none"> <li>- City Government</li> <li>- Regional/national government</li> <li>- Private sector</li> <li>- Catchment/basin authorities</li> </ul>	<ul style="list-style-type: none"> <li>- Limited time/resources to explore full impact of urban water on the city and its impacts on interdependent systems</li> </ul>
<p><b>Department/organizational heads in:</b></p> <ul style="list-style-type: none"> <li>- City Government</li> <li>- Utilities</li> <li>- Private sector</li> <li>- Multi-national government organizations</li> <li>- Regional/national government</li> <li>- Catchment/basin authorities</li> <li>- NGOs</li> <li>- Community organizations</li> <li>- Development banks</li> </ul>	<ul style="list-style-type: none"> <li>- Agency heads are not fully aware of how their organizations impact others in the system</li> <li>- Duplication of roles (or roles not performed) result from a siloed view of the water system</li> <li>- Small but critical organizations are not visible in water system and therefore not properly utilized</li> </ul>
<p><b>Managerial staff in:</b></p> <ul style="list-style-type: none"> <li>- City Government</li> <li>- Utilities</li> <li>- Private sector</li> </ul>	<ul style="list-style-type: none"> <li>- Difficulty conveying complex information about system interdependencies in a digestible way to high-level decision-makers</li> <li>- Difficulty identifying which related organizations/agencies can be approached for needed information</li> </ul>
<p><b>Researchers / technical staff in:</b></p> <ul style="list-style-type: none"> <li>- City government</li> <li>- NGOs</li> <li>- Academia</li> <li>- Community groups</li> <li>- Private sector</li> </ul>	<ul style="list-style-type: none"> <li>- Confusion or lack of clarity around current policies and programmes</li> <li>- Lack of coordination with government</li> </ul>
<p><b>End users:</b></p> <ul style="list-style-type: none"> <li>- Residential users</li> <li>- Commercial users</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of coordination by water providers impacts quality of water service for end-user</li> </ul>



POTENTIAL GAINS	VALUE
<ul style="list-style-type: none"> <li>- Clear visualization of city water cycle and system interdependencies suggests how water is critical to every aspect of urban health and prosperity</li> </ul>	<p><b>OurWater improves coordination between organizations working in the urban water system by sharing information</b> about stakeholders involved, their respective responsibilities and existing water programmes and policies. The app also identifies the key governance processes involved in managing a city's water system, the roles undertaken by organizations and where critical roles are not being filled. Through its open and crowd-sourced platform, the tool encourages inputs from a wide variety of stakeholders, including the private sector, academic, civil society actors and the diverse government departments and agencies involved in managing cities' water systems.</p> <p><b>OurWater visualizes complex systems for non-specialists</b> so that interdependent and overlapping systems are made more easily understandable to non-technical users, including both high-level decision-makers and urban residents interested in better understanding where their water comes from. Effective communication of city water issues will help illustrate how water management touches on every aspect of a city's health and prosperity, and why water resilience is so important.</p> <p><b>OurWater facilitates assessment of current governance practices</b> by recording how ongoing initiatives contribute to water resilience. This information helps identify the city's current strengths and weaknesses in providing equitable and high-quality water services. Ultimately, the app will coordinate with other tools and frameworks to guide users through an assessment of local water resilience.</p>
<ul style="list-style-type: none"> <li>- New platforms for information sharing</li> <li>- Clear mapping of stakeholder roles shows which roles are duplicated or unmet</li> <li>- Clear visualization of city water cycle and system interdependencies gives a complete and expansive view of the system and how assets and organizations relate</li> </ul>	
<ul style="list-style-type: none"> <li>- Clear and attractive visualization of complex water network and stakeholder relationships</li> <li>- Clarity of roles and responsibilities in the system</li> </ul>	
<ul style="list-style-type: none"> <li>- Searchable listing of current water policies and programmes facilitates research and informs new actions</li> <li>- Clear mapping of responsibilities and information about programmes encourages coordination</li> </ul>	
<ul style="list-style-type: none"> <li>- Better coordination results in improved water service</li> </ul>	

# 3

## DEVELOPING OURWATER

OurWater has been developed to address the growing need for tools that can help cities share information between different stakeholders and visualize complex interactions. This goal of understanding the city's water landscape is one critical element of moving towards the goal of building cities' capacity to endure, adapt and transform in the face of water challenges. The OurWater app may be used independently from the CWRA, but it is also designed to facilitate the **first step in the CWRA process**.

The tool was developed over the course of one year, through a user-centric design approach that first identified cities' most pressing needs through examination of the literature, and city workshops, and then used user testing and stakeholder engagement to refine the tool and make it user-friendly and intuitive.

The city fieldwork engaged 711 participants from five partner cities in a process to co-develop the tool. The five partner cities are Amman, Greater Miami and the Beaches, Mexico City, Cape Town and Hull. Cities were taken through a structured workshop to understand:

1. Who might use the tool?
2. What challenges do they want the tool to address?
3. How will they use the new tool?

The outputs from these workshops are summarised in the OurWater Value Proposition table on pages 8-9.

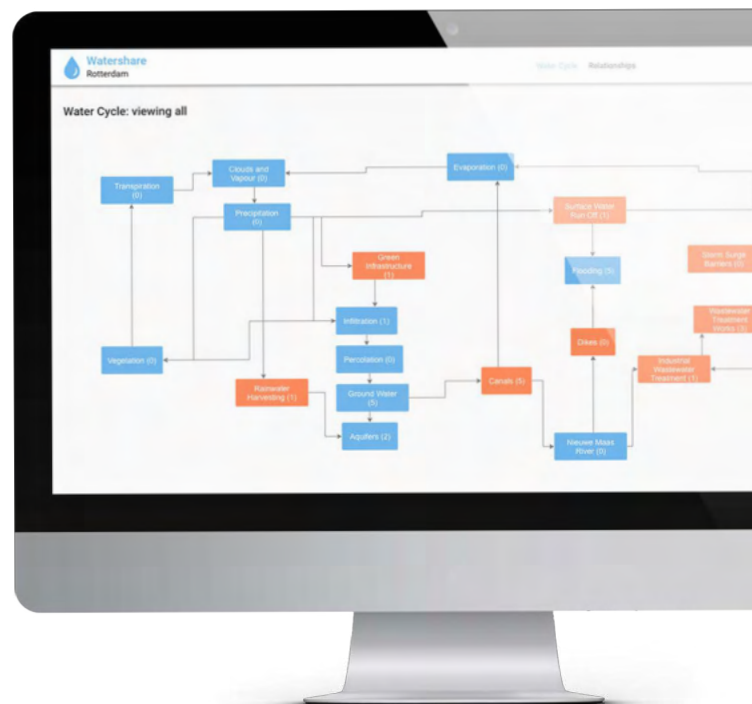
In developing OurWater, the project team first identified guiding qualities for tool development based on field research and inputs from project partners:

**1. Practical** - Any new tool should be easy to use, and low-cost in terms of the time and resources required from potential users. If they are not, users will find more convenient alternatives or will return to the methods they used before.

**2. Flexible** - Cities confront different challenges and have access to different types of resources. Tools should therefore be flexible enough to work in diverse contexts. New tools must be made easily adoptable by multiple users, including government, inter-governmental organizations, development banks, public utilities, academia, NGOs, civil society, the private sector and even community groups. Tools should be designed for inputs from a wide range of actors, and can be deployed by any of the type of actors described above with the interest and resources to do so.

**3. Consistent** - The desire for flexibility should be balanced with a need to maintain a consistent view of resilience. OurWater allows for flexibility in the ways that cities build resilience, including the specific solutions adopted, but advances good governance as a critical factor of resilience, based on extensive collaborative research.

In moving from general principles to specific tools and frameworks, Arup worked closely with project partners to better understand the needs and challenges that cities confront. Each new addition therefore targets a specific challenge or “pain point” identified by cities in their efforts to improve water governance. Initial engagement with city partners, and user testing in the five pilot cities—Amman, Miami, Cape Town, Mexico City and Hull—and validation at the Global Knowledge Exchange 2018 refined these resources and informed decisions around design, functions and user interface.



## LITERATURE REVIEW

The Arup team reviewed literature describing the practices and qualities that help build water resilience; the types of shocks and stresses typically encountered; and commonly used tools, approaches and frameworks. In total, we examined more than 50 academic sources, and 40 sources on shocks and stresses. These included academic literature, government and regulatory reports, and guidance from non-government, non-profit and policy institutions. Based on these investigations, the research team created a database of 750 factors that contribute to the resilience of urban water systems.

The literature review reinforced the need to understand water resilience as a function of interdependent *urban systems*. A systems-based approach to urban resilience differs from an asset-based approach, which focuses on physical assets rather than considering intangible forces that influence human behaviour. Systems-thinking helps account for the important ways governance influences decisions around assets, how socio-cultural systems determine human behaviour, and how these phenomena ultimately impact how physical systems are designed and used in the urban environment. The literature also suggested the need for coordination between interdependent systems operating at different scales.

Based on our review, we concluded that a need exists for a holistic approach and related tools for building water resilience. The approach should address the physical and hydrological elements of the city's water system, as well as aspects related to governance, institutions and human behaviour. It should be relevant in the context of economic, physical and social disruption and apply at the full catchment scale rather than to individual systems within a city







▲ Workshop in Hull

## LEARNING FROM CITIES

The second stage of research involved fieldwork in Cape Town, South Africa; Mexico City, Mexico; Miami and the Beaches, United States of America; Hull, United Kingdom; and Amman, Jordan. We selected these pilot cities because they confront persistent water-related shocks or suffer chronic water-related stresses, and have expressed commitment to co-creating water resilience approaches. The cities represent diverse geographies, a range of shocks and stresses faced, and a variety of political systems.

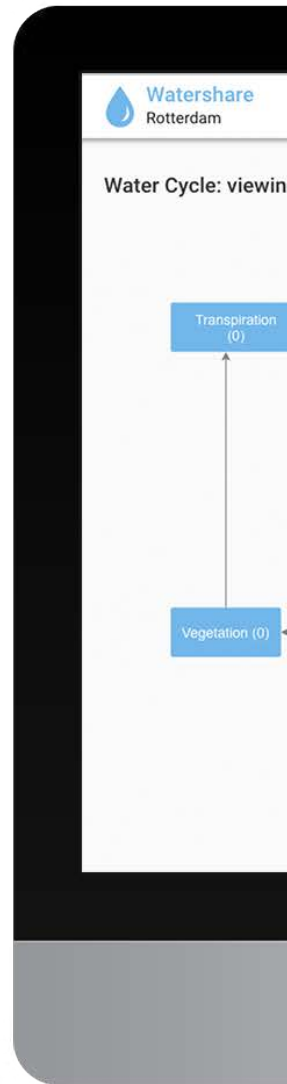
By casting a wide net, we anticipated the need for approaches that work in a range of cities around the world, confronting different challenges in different socio-political contexts.

Fieldwork involved workshops, focus groups and key informant interviews with representatives from municipal government, utility providers, business and civil society. Site visits helped the team better understand the realities of water shocks and stresses in each city, and the tools and approaches currently used to tackle those problems. In an additional three “Wave 2” cities—Rotterdam, Holland; Thessaloniki, Greece; and Greater Manchester, United Kingdom—the team provided remote support to city partners leading on-the-ground engagement.

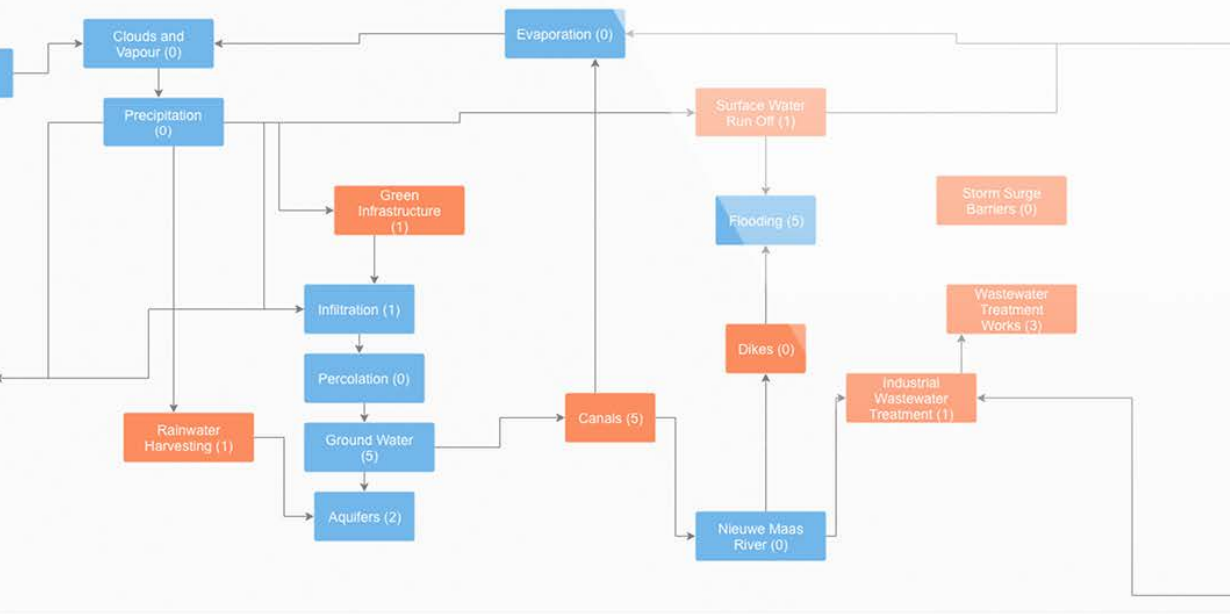
# 4

## OUR WATER

Based on our research, the team identified a set of critical needs to address using this new digital tool. In each city studied, the team identified a need for improved coordination and collaboration between stakeholders, reduced siloing of functions within the urban water system, and new avenues for sharing knowledge.



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➤ *Responding directly to these needs, the tool provides the following key functions:*

**OurWater improves coordination between organizations working in the urban water system by sharing information** about stakeholders involved, their respective responsibilities and existing water programmes and policies. The app also identifies the key governance processes involved in managing a city's water system, the roles undertaken by organizations and where critical roles are not being filled. Through its open and crowd-sourced platform, the tool encourages inputs from a wide variety of stakeholders, including the private sector, academic, civil society actors and the diverse government departments and agencies involved in managing cities' water systems.

**OurWater visualizes complex systems for non-specialists** so that interdependent and overlapping systems are made more easily understandable to non-technical users, including both high-level decision-makers and urban residents interested in better understanding where their water comes from. Effective communication of city water issues will help illustrate how water management touches on every aspect of a city's health and prosperity, and why water resilience is so important.

**OurWater facilitates assessment of current governance practices** by recording how ongoing initiatives contribute to water resilience. This information helps identify the city's current strengths and weaknesses in providing equitable and high-quality water services. Ultimately, the app will coordinate with other tools and frameworks to guide users through an assessment of local water resilience.





## WHO CAN USE OURWATER?

OurWater has been developed through extensive user testing with cities of different sizes, in different parts of the world and confronting different shocks and stresses. The tool is developed with the understanding that building resilience requires inputs from diverse voices not limited to government but also including water utilities, academic organizations, private sector actors, NGOs, community organizations and city residents. The app is designed so that a single “champion” is responsible for administering the tool, with other city organizations inputting new information into the platform. All organizations are encouraged to participate in the tool by contributing their own particular knowledge of elements of the water system. The more diverse participating organizations are, the better the tool is at generating new insights and creating new partnerships between important users.

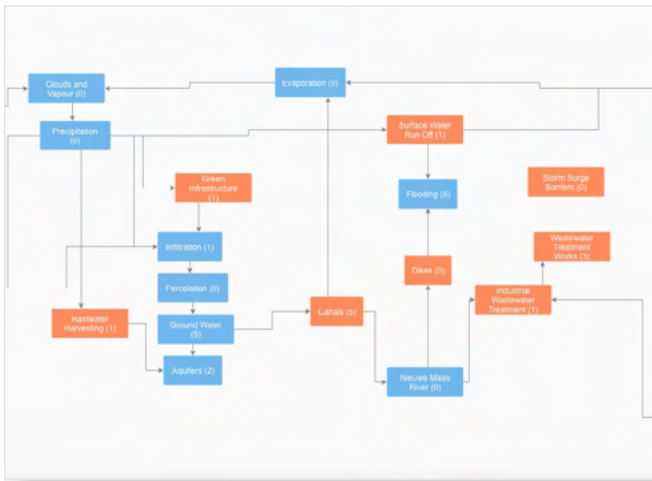
## TOOL FUNCTIONS

*The project team worked closely with city partners to better understand the needs and challenges commonly confronted. The tool targets specific challenges identified by cities in their efforts to better manage water systems and build water resilience. Initial engagement with city partners, and user testing in the five Wave 1 cities – Amman, Miami, Cape Town, Mexico City and Hull – informed decisions around design, functions and user interface.*

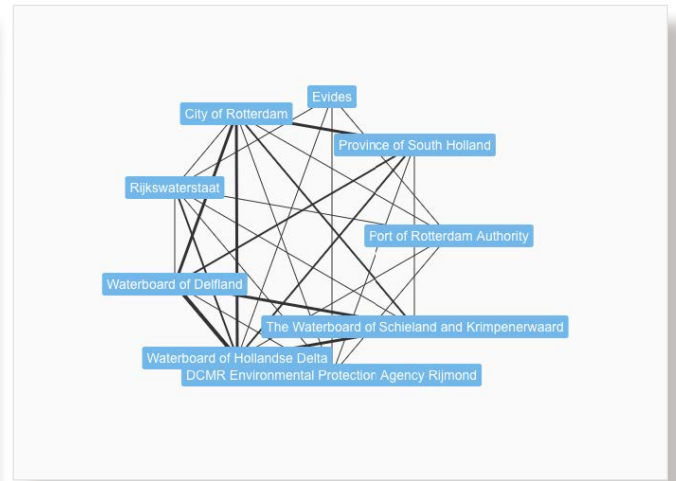
The OurWater tool consists of several related features designed to help users visualize key information about their local water system.

- The interactive **water cycle diagram** helps users understand their local water system by showing links between key infrastructure. In this feature, users locate and describe the natural and man-made infrastructures that make up their local water system. Users can ‘connect’ these infrastructures to illustrate how collections of assets – which may include green, grey and blue infrastructures – link to one another within the water system. The function also shows how likely any given hazard is to impact each asset.
- OurWater also allows users to explore **stakeholder relationships** throughout the water system to better understand how actors relate to one another within the city’s water system. In answering key questions about the number, type and interaction between assets and actors that make up the water system, the tool addresses one fundamental challenge related to water systems, where organizations are often unaware of what other stakeholders are doing. For each asset in the system, key stakeholders and their respective roles – as asset manager, financier, regulator, etc. – are displayed.
- A related feature of the OurWater tool allows users to create **actor-connection diagrams** that show relationships between stakeholders based on common infrastructure assets in the water cycle. This feature shows where two or more actors are responsible for managing an important piece of infrastructure. It also shows the strength of relationships – how closely connected one actor is to the next based on shared assets – allowing users to identify which other organizations they should be coordinating with, and helping break down silos within management of the system.
- Through the **governance roles and responsibilities table**, OurWater shows the roles that various actors assume in designing, financing, regulating and maintaining the city’s water system. By illustrating this information in a clear and easily understandable way the app helps

OurWater feature 1: Water cycle mapping



OurWater feature 2: Stakeholder network



users identify governance gaps where no organization is fulfilling needed roles, and find areas where efforts are redundant or overlapping.

- Each project and infrastructure asset included in the tool can be associated with **resilience outcomes** to show how it contributes to building specific elements of resilience within the city. This feature allows better integration between OurWater and the City Water Resilience Framework (CWRF) and helps make data collection for resilience assessment easier.

The OurWater web app is envisioned as a platform for sharing knowledge between cities engaged in the shared mission of improving water resilience. It will help cities facing similar challenges to learn from one another, and from other cities at varying stages in the process. Ultimately, this approach can help diverse stakeholders share their experiences and create an active community of practitioners committed to water resilience in their cities.



## USER TESTING

In each city, a workshop was dedicated to identifying governance challenges that can be addressed through the OurWater tool. The tool was presented to audiences for initial feedback related to its usability and interface, and whether it helped address the right problems.

Additionally a series of internal working sessions with Arup, We are Telescopic and SIWI challenged the purpose of the tool and refined its use. Workshops in July 2018, August 2018, October 2018, and January 2019 helped the team refine the tool based on each organization's expertise and experiences in the Wave 1 cities.

## PRESENTING OURWATER

An early version of the app was first introduced to a broad audience as part of the Global Knowledge Exchange (GKE), hosted by Arup and the Resilience Shift and held at the Lloyd's Register Foundation in London from 21-23 August, 2018. The event provided an opportunity to gauge general interest in the tool, test assumptions behind its value, and explore additional uses.

The app was later presented at the Global Engineering Congress (GEC) hosted by the Institution of Civil Engineers and the World Federation of Engineering Organizations and held on 22-26 October, 2018 in London. Arup's collaboration with the Resilience Shift was highlighted in a short presentation on tool-development and lessons learned from developing the app. From 5-9 November Arup, the Resilience Shift and Rockefeller Foundation hosted the Improving City Water Resilience Forum at the Rockefeller Foundation's Bellagio Centre. A beta version of the app was presented to all participants to introduce the project and solicit feedback on this early version of the tool. In all three events, presenting the value of the tool for general participant feedback and comments to improve the functionality of the app and inform future uses.



# FUTURE DEVELOPMENT

Next steps in developing OurWater include rolling out the tool for use in multiple cities, as well as testing and refining to include additional features that help facilitate stakeholder collaboration and improve governance for urban water resilience.

In future iterations, the tool may be expanded to address other sectors such as energy and transport, to help leaders in those sectors better understand local networks of assets and systems that make up the local city landscape. The app can be adapted by a broader range of users, including the private sector, which can extend resilience risk mapping to private assets and systems.

For more information, or to adopt the OurWater app for your city please visit [www.resilienceshift.org](http://www.resilienceshift.org).

