



How Covid-19 has sharpened focus on water resilience

The Covid-19 pandemic has illustrated the importance of urban resilience, especially the tight interdependence between urban systems and the key role resilient water systems play in our community.

Water is a critical variable in many systems. During this crisis we have been reminded of water's essential role in the prevention and management of health in cities at all scales — from enabling hand washing for 20 seconds at least five times a day to mapping disease spread by testing water samples in sewers for Covid-19 to inform high-level decision-making. In this article we explore how urban areas must be designed with water resilience in mind to help cope with shocks and stresses in our communities.

Asia's troubled waters

Covid-19 is yet another shock our systems have faced. Our communities are exposed to a variety of shocks and stresses every day, from floods and droughts caused by extreme weather conditions to water pollution as a result of overpopulation, rapid economic development and uncontrolled industrial activity. Water systems can complement and strengthen but also cause fragilities in our cities. Urbanisation is occurring at an alarming rate as, in many areas across the region, water and sanitation infrastructure struggles to keep pace. Covid-19 has further highlighted issues of inequality in water and sanitation provision and vulnerabilities in our communities. Statistics, [published in 2019 by UNICEF and the WHO, report that around 15% of Eastern and South-Eastern Asia](#) live without access to basic sanitation and almost half the region lives without safety managed sanitation, making these communities more vulnerable during this pandemic.

Building resilience and expecting the unexpected is essential to ensuring water security and also the safety of connected infrastructure. How can our city systems prepare for more uncertainty and avoid a single point of failure?



Ensuring fresh water for Manila

Consideration of infrastructure resilience early and holistically during design and planning can better prepare us. For example, as part of Arup's work on a water treatment plant in Manila a few years ago, they introduced additional measures to enhance resilience to increasingly likely extreme climate events including typhoons and floods. These measures have also allowed staff to keep the facility operating during the Covid-19 outbreak, by enabling some of the operational staff to self-isolate while keeping the plant up and running.

Those with poor access to basic services like water will be impacted most by Covid-19.

Improving water resilience in Shanghai



Public plazas could store rainwater during flooding in cities to mitigate economic losses and traffic impacts. This temporary stored rainwater will be discharged via the municipal stormwater network when the rainfall is reduced.

At a bigger scale, in 2018, Arup developed an urban drainage masterplan for the city of Shanghai with the Shanghai Urban Construction Design & Research Institute. The masterplan covered 640 square kilometres of urban area serving a population of 15 million. The team recognised the importance of resilience infrastructure design and that resilient water governance is integral to urban decision-making and planning processes.

The plan proposed the use of three layers – ‘blue, green and grey’ – to represent water-related infrastructure in urban areas; strategic use of nature as an infrastructure system; and human-engineered infrastructure, respectively. This visionary approach supports an integrated water cycle within the city and in Greater Shanghai, and champions multi-functional infrastructure design, encompassing aspects including ecology, economy and public health.



Governance

Green infrastructures

strategic use of nature as an infrastructure system

Blue infrastructures

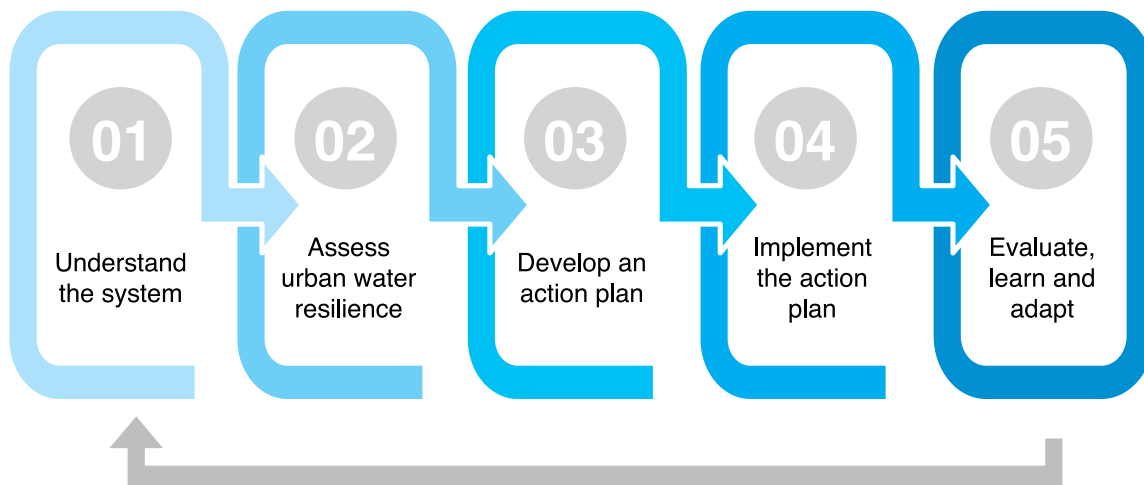
water related infrastructure in urban areas

Grey infrastructures

human-engineered infrastructure

‘Blue-Green-Grey’ infrastructure for Shanghai Urban drainage masterplan

Structuring the approach to city water resilience



A five-stage approach to guide cities through initial stakeholder engagement and baseline assessment, through action planning, implementation and monitoring of new initiatives to build water resilience

As part of the work on the drainage masterplan for the city of Shanghai, urban drainage best practice has been incorporated into long-term urban planning. To support the development of a suitable framework, the City Water Resilience Approach (CWRA)*¹ is applied. The CWRA helps cities understand how water services provide, connect and protect all residents. It then supports tailored water resilience assessments and action planning for the city, which is evaluated to help decision-makers learn and adapt accordingly. The team used part of the CWRA approach to identify existing challenges and opportunities facing Shanghai's drainage system, including researching current stakeholders, their responsibilities enabling the key connections between stakeholders to be mapped against the water cycle.

While there is no 'one-size-fits-all' solution to enhance water resilience in every city, the CWRA provides guiding principles that enable climate change, natural disaster and extreme event management considerations in decisions. On a broader scale, the City Resilience Index has also enabled us to understand our complex urban systems and develop appropriate plans for strengthening resilience.



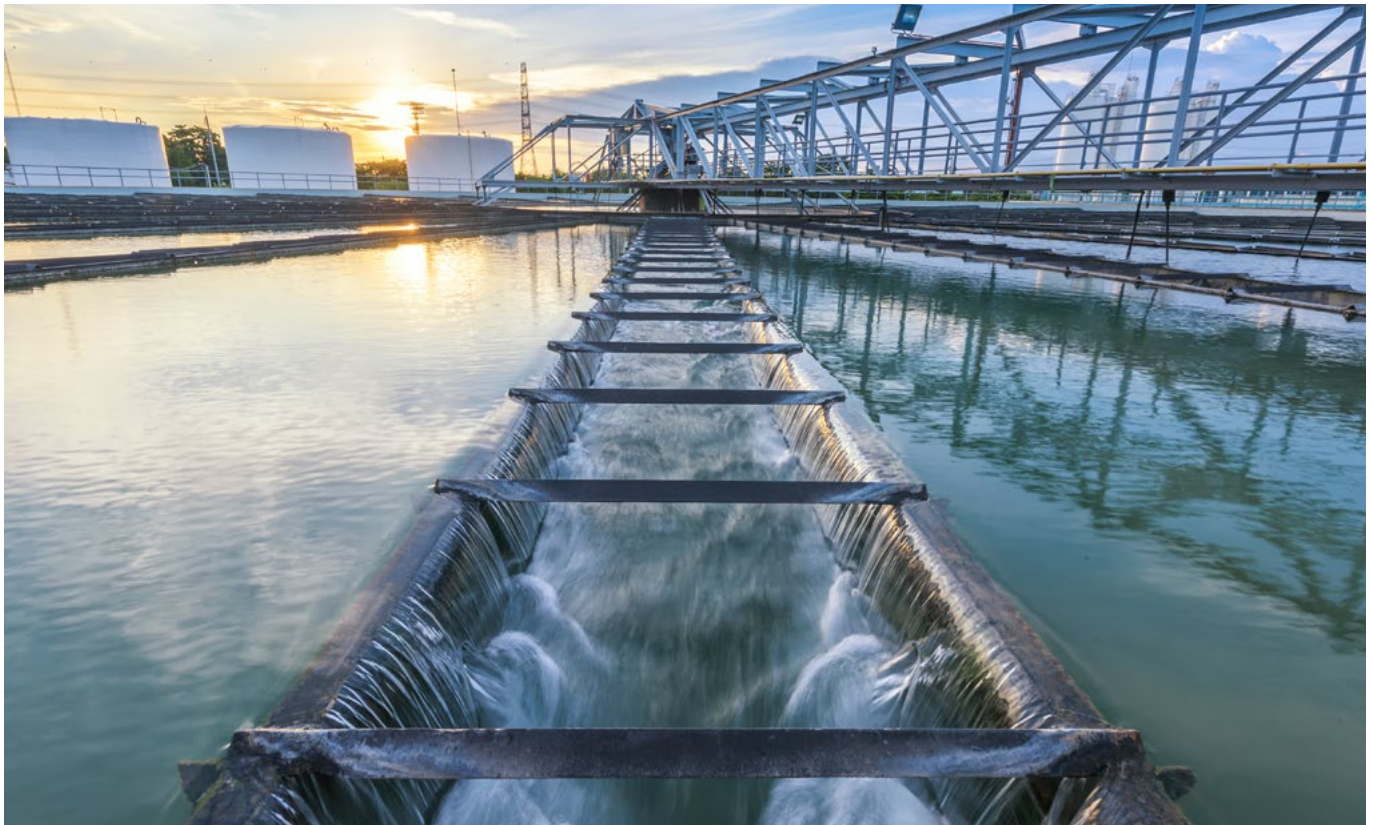
Cape Town , dry reservoirs

Sharing learning after water crisis

To support continuous improvement in city water resilience we have been supporting the dissemination of lessons learned from Cape Town's water crisis alongside a number of partners*². This has helped promote discussion on how these lessons can be useful, not just in drought response, but in wider infrastructure resilience. Some of the key transferable learnings include: expecting unpredictability; the importance of collaboration and clear

communication to citizens. Although a drought is very different from a pandemic, some of our initial learnings from the Covid-19 response are similar. This shows that by developing more resilient urban systems cities may better prepare us for a multitude of shocks or stresses.

Shaping a better and more resilient ‘new normal’



While unprecedented in scale, this pandemic can be seen as an opportunity to reflect and rethink how cities are being planned, constructed, operated and managed while incorporating greater resilience into the agenda. In summary we must:

1. Expect the unexpected and consider resilience in a systematic way rather than solely focussing on individual risks;
2. Develop a structured approach using frameworks like the CWRA;
3. Identify stakeholders and their connection to the water cycle and integrate this into water resilience planning;
4. Seek opportunities to develop multi-functional blue-green infrastructure; and finally
5. Learn from crisis.

City stakeholders globally, including policymakers and planning authorities are already starting to formulate preparedness, protection and response policies to mitigate water security risks from shocks and stresses including natural disasters and health epidemics, this is a great opportunity to direct investment towards resilience - enabling cities to withstand, respond, adapt and transform in the face of an array of shocks and stresses.

Further resources can be found at
▶ www.cityresilienceindex.org and
▶ www.resilienceshift.org when incorporating urban resilience into their infrastructure agenda*³.

*1 The CWRA is a joint effort developed in collaboration with the Resilience Shift, Stockholm International Water Institute (SIWI), Arup, The Rockefeller Foundation, 100 Resilient Cities and the Organisation for Economic Co-operation and Development).

*2 The Cape Town Drought Response Learning Initiative (CTDRLI) is a collaboration between the UCT African Climate & Development Initiative (ACDI), Conversations that Count, and CineSouth Studios and enjoys active support from the City of Cape Town's Director of Resilience. Initial sponsors of the project are Arup, Nedbank, Woolworths, Old Mutual, Aurecon, PwC and 100 Resilient Cities – pioneered by the Rockefeller Foundation (100RC).

*3 The Resilience Shift provides knowledge and tools for those responsible for planning, financing, designing, delivering, operating and maintaining critical infrastructure systems.

Adopting water resilience will allow us to be better prepared in case of future pandemics whilst also helping us prepare for other future shocks and stresses from climate change to resource consumption.

ABOUT ARUP

Arup is the creative force at the heart of many of the world's most prominent projects in the built environment and across industry. Working in more than 140 countries, the firm's designers, engineers, architects, planners, consultants and technical specialists work with our clients on innovative projects of the highest quality and impact.

Since its founding in 1946, Arup has pioneered ground-breaking strategies and technical excellence with social purposes. Today, by combining innate knowledge of the built environment with new technologies, we apply our expertise, diversity of thinking and independence in the quest for a safe, sustainable and resilient future – for all.

We shape a better world

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ABOUT THE AUTHORS



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