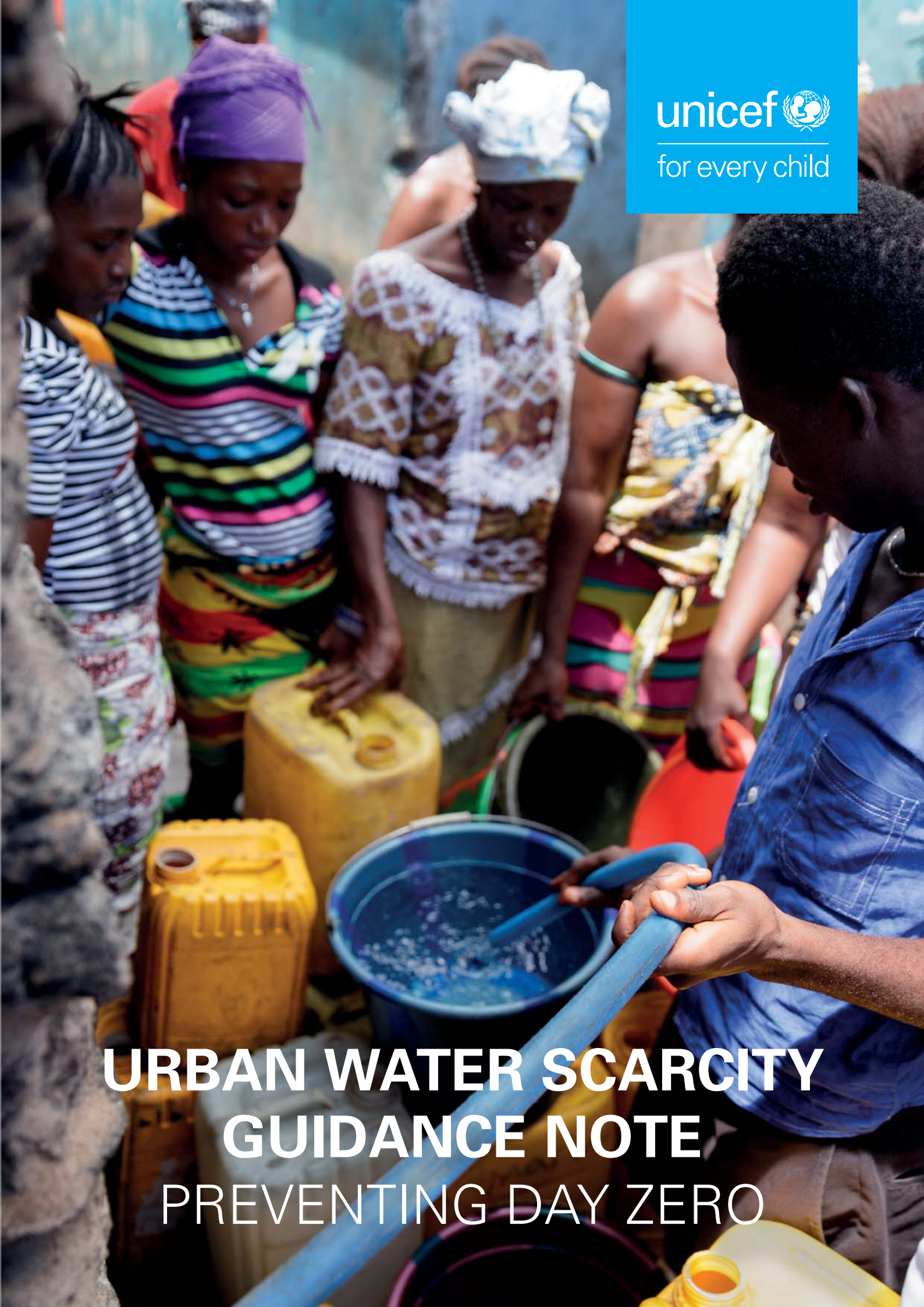


unicef
for every child

URBAN WATER SCARCITY GUIDANCE NOTE

PREVENTING DAY ZERO

Published by
UNICEF
www.unicef.org

March 2021

URBAN WATER SCARCITY GUIDANCE NOTE

PREVENTING DAY ZERO

unicef
for every child

ACRONYMS

C4D	UNICEF's 'Communication for Development' approach
CRWSP	Climate-resilient water safety planning
DPR	Direct potable reuse
IDP	Internally displaced people
JMP	Joint Monitoring Programme
L/capita/day	Litres per capita per day
ML	Megalitre (1 million litres, or 1,000 m3 of water)
MLD	Megalitres (million litres) per day
PBC	Performance-based contracts
PPP	Public-private partnerships
NRW	Non-revenue water
SMQ	Strategic Monitoring Questions (SMQs)
WASH	Water, sanitation and hygiene
WCWDM	Water conservation and water demand management

CONTENTS

SUMMARY

Water shortages are a major risk in urban areas – including secondary towns and cities – around the world. This Guidance Note was created in response to that risk and describes the implications on water, sanitation and hygiene (WASH) programming for UNICEF staff and partners, with suggested programmatic interventions. This Guidance Note highlights the dynamic threat of urban water scarcity and the importance of assessing the resilience of urban WASH services by considering current and future available safe water against projected water demand. The Guidance Note also explores the impact of water scarcity on the affordability, sustainability and quality of urban WASH services. Water scarcity in a variety of different urban contexts is illustrated in this note, with special attention given to Cape Town's 2018 water crisis, including identifying what the most effective initiatives were in practice to reduce water demand and conserve available water resources. This Guidance Note is accompanied by the Water Scarcity Guidance Note: Programmatic Approaches, which contains broader guidance on WASH programming and water scarcity.

Building on its long history of successful rural WASH interventions, UNICEF is increasingly supporting marginalised urban populations towards the achievement of the Sustainable Development Goals.[1] The imperative for engaging on urban WASH is rapidly strengthening; urban water shortages are increasing in both frequency and severity, often due to rapid urbanisation – and these have a disproportionate impact on the most vulnerable children and their families.

In this context, UNICEF has many roles to play. They include advocacy on the value of water, and the impacts of water scarcity on the most vulnerable children. They also include promoting and supporting water- and energy-efficient approaches, behaviour change initiatives, and providing wider support to the enabling environment. This Guidance Note summarises three types of actions grounded in these various roles, which can take place at different times. These are preparedness actions, immediate actions and long-term actions.

1 For example, see UNICEF's Strategy for WASH 2016-2030, available here, and its Global Framework for Urban WASH, published in 2019, available here.

© UNICEF/UN0119005/Nigeria

© UNICEF/UN046894/Syria

BACKGROUND

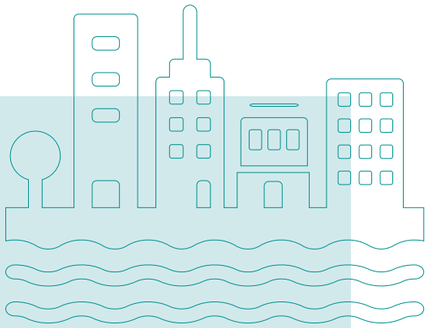
Urban areas[2] around the world are facing extreme water shortages, with one in four cities described as being 'water stressed'.[3] Cape Town's 'Day Zero', or the day the city was predicted to run out of water, alerted the world to the stark threat posed by urban water scarcity. In the future, urban water shortages – seasonal, intermittent or prolonged – are predicted to increasingly become the norm.[4] In fact, the reality is that in many of the urban areas where UNICEF works – from Karachi to Maputo to La Paz – water shortages are already happening. These shortages may not make global headlines, but they all affect children and youth, impacting the services they need to survive and thrive, and their future opportunities.

2 This Guidance Note includes secondary and tertiary cities under the broad framing of 'urban areas'.

3 McDonald, R., et al. (2014) – according to a survey of 500 cities.

4 McDonald, R., et al. (2011) states that seasonable water shortages are expected to affect 1.9 billion people in 2050 from close to 500 million people in 2000.

Physical scarcity of water is not the only factor creating urban water shortages. Poor urban water governance and associated limitations on service delivery are also key factors. Increasingly, urban services are becoming more unreliable, providing water for only a few hours per day, week or even less. Such urban water shortages have a knock-on effect on sanitation and hygiene; sufficient and predictable water volumes are needed for the effective operation of wastewater systems and to ensure basic hygiene practices, including handwashing.



SUMMARY OF KEY TERMS

Water scarcity is defined as the lack of available water resources to meet the demands of a specific population. Water scarcity can be experienced by a community, region or country and may be temporary (for example over several months of the year), or increase and decrease over time. Water scarcity can either be physical or economic. Physical water scarcity occurs where water resources can no longer meet the needs of the population. Such scarcity may be related to the mismanagement or poor governance of water services and/or limited recharge of surface or groundwater resources. Economic water scarcity may occur in countries with adequate water reserves, but where access remains poor. It can be due to poor governance, limited human capacity and limited investments. Whatever the cause, water scarcity is a major barrier towards the achievement of all aspects of SDG 6.

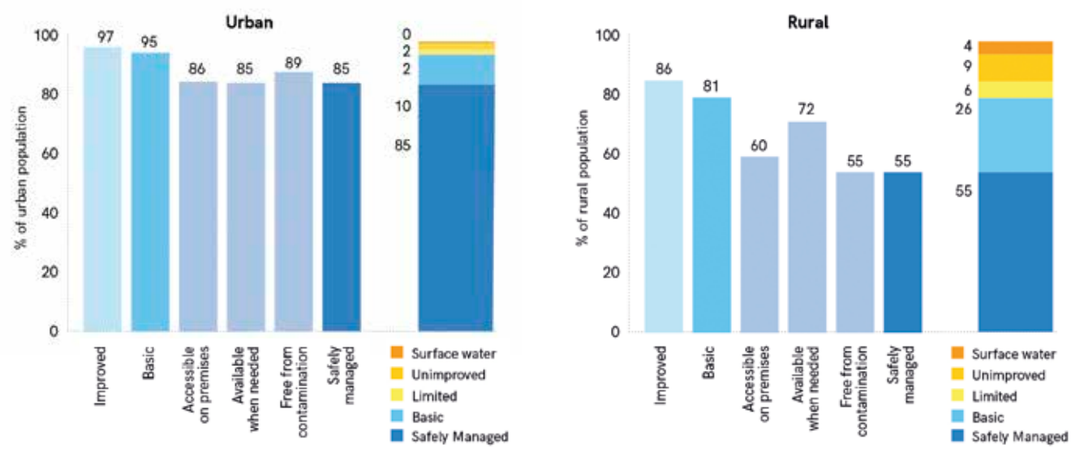
Water stress is an outcome of water scarcity amongst other variables. Water stress occurs where water scarcity leads to poor accessibility and poor water quality. Water stress may manifest as conflict over water resources, over-extraction of aquifers, or poor health and disease.[5]

Water shortages can result from a range of causes, and can be experienced as highly variable or intermittent water supply (i.e. water that is supplied less than 24 hours a day). Water shortages can occur frequently (e.g. every day) or for a prolonged period of time.

Water scarce cities are cities that are facing challenges to supply adequate water to inhabitants.

5 The Institute of Civil Engineers, Oxfam and WaterAid (2011).

FIGURE 1: Proportion of global population using drinking water sources meeting SDG criteria for safely managed services – rural and urban, 2015 (from Progress on Drinking Water, Sanitation and Hygiene. WHO/UNICEF, 2017)

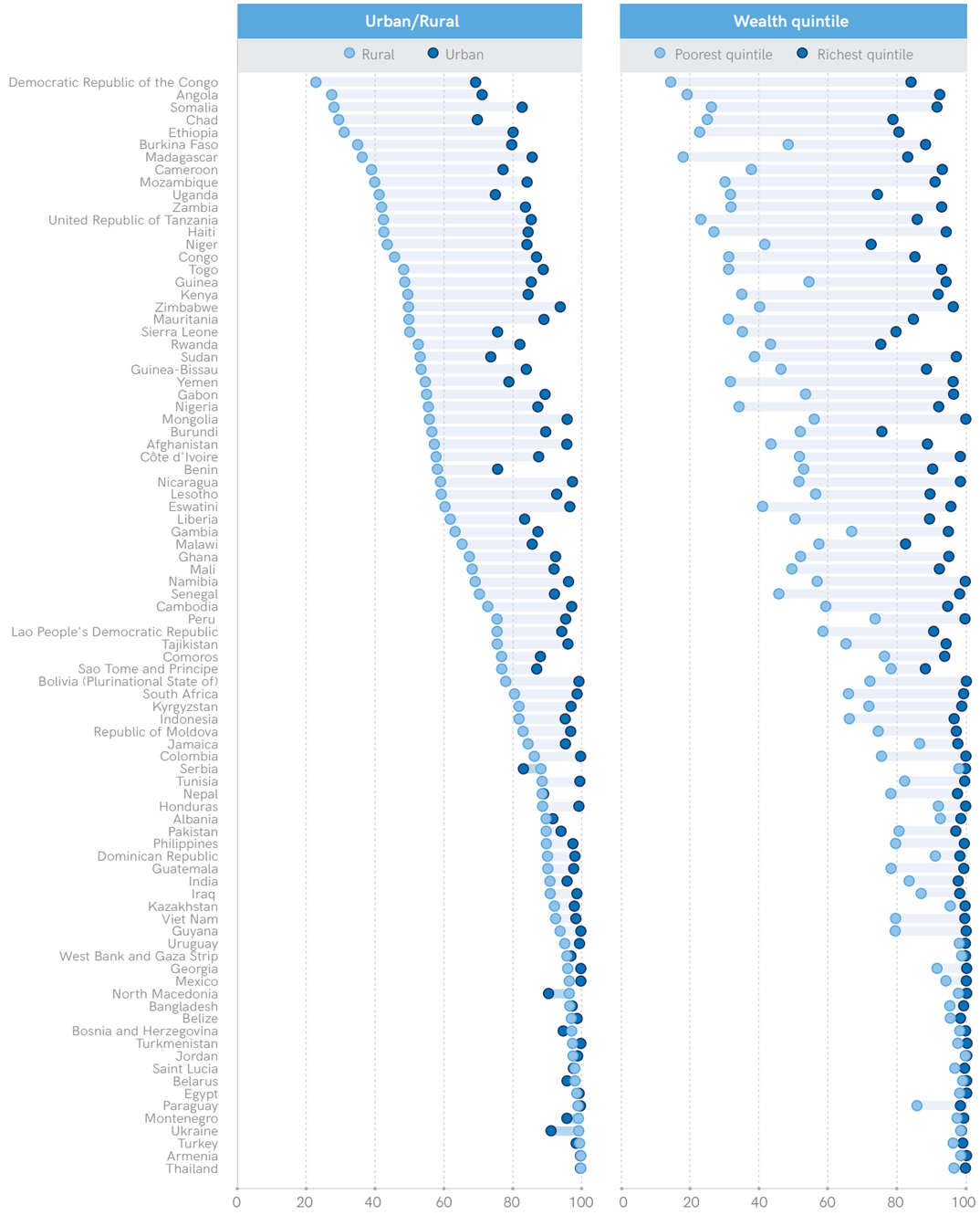


The scale of the challenge, and in particular, the exposure of the most vulnerable children and their families to water scarcity, requires new approaches and a sharpened focus. Even in areas not affected by water scarcity, the poorest households often have the lowest levels of service. This is due to a variety of reasons, including the land tenure status of their home, as well as their limited ability to pay for, and maintain, water network connections.

The focus of UNICEF's urban WASH programming is to ensure equitable access to sustainable, affordable and safe WASH services for the most vulnerable households. In times of water crises, a common solution is the use of water tankers. While tankering does provide a short-term emergency option, it is not a sustainable solution for the most vulnerable. Drawbacks of tankering include the amount of time required to collect the water, the

© UNICEF/UNI325732/Kenya

FIGURE 2: Inequalities in the proportion of population with at least basic water services, between urban and rural areas and richest and poorest wealth quintiles, 2017 (%) (from Progress on Household Drinking Water, Sanitation and Hygiene 2000-2017: Special Focus on Inequalities. WHO/UNICEF, 2019)



limitations in volume and quality, the higher cost, and the challenges faced when trying to phase tankering out, in order to move to a more sustainable solution. A recent report[6] indicated that households which have to purchase water from water tankers to supplement the insufficient amounts delivered through their piped system can pay up to 52 times more than the cost of piped water. In addition, the same report indicated that out of 15 cities analysed, 12 received water 'intermittently'. Clearly, while tankering can help provide emergency water supplies to communities in times of water scarcity crises, it cannot be a long-term solution for urban WASH programming.

In 2017, 151 million people were using unimproved water sources in urban areas.[7]

The reasons for unimproved and unreliable water services in urban areas are numerous, complex and dynamic. What is certain though, is that urban water scarcity is compounding already challenging situations and threatening the progress made in recent years to improve WASH services for households, communities, schools and healthcare facilities. Water scarcity impedes progress up the service ladder in terms of water, sanitation and hygiene, and threatens the progress made towards the SDG targets for 6.1 and 6.2. To ensure the continued progression towards SDG 6.1 and 6.2, and the sustaining of these, progress towards the other SDG6 targets is also required.

The COVID-19 crisis has reminded the world that access to reliable WASH facilities and services are vital to stem transmission of infectious diseases. The current JMP data estimates that only 75 per cent of the world's population (5.7 billion people) use an improved drinking water source[8] located on premises – indicating that a staggering 1.9 billion people do not have such access. The risk of COVID-19 transmission increases when people have to leave the relative safety of their home to collect water, especially as they are often unable to maintain a social distance while queueing and filling – a particular challenge in crowded urban contexts. An effective COVID-19 response for the long-term will fundamentally rely on improving such access for urban populations – including through the optimum and sustainable use of water (and energy) resources, and the efficient operation of utilities and systems.

6 Mitlin, D., et al. (2019).

7 Progress on household drinking water, sanitation and hygiene 2000-2017. Special focus on inequalities. UNICEF/WHO, 2019

8 Ibid.

TRENDS IMPACTING ON URBAN WATER SCARCITY

Urban water shortages can be the result of major intersecting trends, including population growth, unsustainable water management, poor governance, deteriorating infrastructure, inefficient water use, and increasing competition for water between different sectors. A changing climate with increasing temperatures and unpredictable precipitation patterns adds significantly to these trends, contributing

© UNICEF/UN0314269/Madagascar

© UNICEF/UN0314269/Madagascar

to more frequent and severe drought periods, and increased water demand. Climate change is also contributing to the deterioration of urban water quality; more pollutants are flushed into water systems during storm events, and reduced summer precipitation means more concentrated and lower summer flows.[9] Increasing urbanisation, and the associated increase in paved surfaces, results in reduced levels of recharge and increased runoff. For the most vulnerable urban residents, who are often living in informal settlements, water shortages are accentuated by a widespread lack of access to piped water services.[10] Water scarcity in urban areas is often even more pronounced in fragile and conflict-affected situations, due to infrastructure damage and the increased difficulties to maintain functional services. Fragility and conflict also increase urban migration – swelling the numbers already moving to urban settings to escape the impact of water scarcity on water-dependent rural livelihoods adding additional pressure to over-burdened systems.

The World Bank projects that in the next three decades, demand for water in cities will increase by 50 to 70 per cent.[11] The depletion of surface and groundwater resources have led water service providers (typically referred to as 'water utilities') to better understand that previous patterns of water recharge cannot be relied upon in the future, and that storage facility capacities are increasingly insufficient as precipitation patterns change. One of the key lessons from the Cape Town water crisis (explored in Section 2 below) was that the assumption that there would be time to adapt to the impacts of climate change was dangerously unfounded; in reality, the crisis unfolded more suddenly and severely than expected.[12]

Building resilient and sustainable urban water services which can cope with current and future climate change, water scarcity and increased demand, is a critical element of any strategy for addressing urban water scarcity. The sustainability of services relates not just to the infrastructure, but also to the mode of delivery and operation of the systems, as well as the enabling environment for the sector and other, wider considerations such as tariff structures. This will require collaboration and coordination with stakeholders across a range of sectors in order to address water scarcity successfully. Sustainable, resilient services depend not just on physical systems and their reliability, but on broader objectives. This means, for example, initiating policy changes, strengthening WASH strategies so they recognise the impact of climate change and the needs of the most vulnerable, developing service regulations and transparency, and creating a culture of continuous monitoring, data collection, analysis and planning.

Current global trends point to an alarming outlook for urban water resources. However, by acknowledging these trends and assessing the resilience of water and sanitation services in urban areas, opportunities can be identified and positive change can be achieved. Increased water and energy efficiency, replacing carbon-dependent systems with renewable energy, developing longer-term water conservation strategies, and positive behaviour change must all be used to help build the resilience of the world's urban water resources in what will be challenging years ahead.

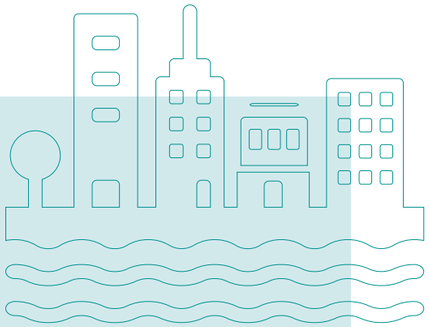
9 Watts & Anderson (2016)

10 Mitlin, D., et al. (2019). Recent research in 15 major cities shows that almost half of urban residents lacked access to piped utility water. Access is lowest in Sub-Saharan Africa, where only 22% of households received piped water

11 World Bank (2018)

12 Winter (2018)

WHAT IS WATER DEMAND MANAGEMENT?



Water demand management is the adoption of a strategy, policy or programme that promotes a more efficient use of water, either within the water supply system or by the end-user. Typical water demand management activities may include: customer/water user efficiency behaviour change campaigns; reducing physical losses, including leakage in networks; reducing illegal connections; improving tariff modalities (while balancing equity with a sense of resource valuation); water reuse; and implementing water use restrictions. Water demand management approaches are more effective when targeted at specific populations and sectors that use large quantities of water that can be reduced. Demand management approaches are likely to be less effective when targeted at marginalised populations with already limited access to water, sanitation and hygiene services.

URBAN WATER SCARCITY - THE SAME CHALLENGE, DIFFERENT CITY RESPONSES

Arguably, some of the most water-scarce cities are the most successful in meeting water needs,[13] especially where they have the financial resources and technical capacity to develop solutions. Research has identified Tokyo as the most water stressed city globally,[14] followed by New Delhi, Mexico City and Shanghai. While all of these are fast-growing cities which are limited in terms of water availability, some of the cities have demonstrated effective solutions to adapt to water stress. Singapore is typically hailed as an example of a city that is physically water scarce, but has overcome its water scarcity through implementing a set of highly effective policies and initiatives (see Section 2 below for more details).

13 World Bank, 2018b.

14 McDonald, R., et al. (2014)

INTRODUCTION

Cities around the world face a growing threat of urban water shortages. The complexities of urban water scarcity mean that the affordability, sustainability, safety and quality of urban WASH services are all likely to be impacted on a large scale if nothing is done to mitigate the risks. The objective of this Guidance Note is to highlight the importance of assessing the current and future resilience of urban WASH systems, and to consider actions which may help mitigate the impacts of water scarcity on these. To avert potential crises in the years ahead, every urban WASH programme will need to ensure it includes a thorough understanding of its own context and associated risks. This means building local and accessible knowledge on the available and projected demand for safe water (from a range of sectors); the different technologies/sources available to meet that demand, and the range of current and future risks urban WASH services will face.

© UNICEF/UN046879/Syria

This Guidance Note complements UNICEF's global Strategy for WASH (2016-2030) and its Global Framework for Urban WASH, which outlines UNICEF's commitment to increase its focus on urban WASH in order to reach the most vulnerable children. The note accompanies a second Guidance Note on water scarcity – Water Scarcity Guidance Note: Programmatic Approaches, which contains broader guidance on WASH programming and water scarcity.

This note illustrates the experiences of different cities and contexts in Sections 1 and 2 below, including the 2018 Cape Town water crisis. It demonstrates some of the steps and initiatives taken to mitigate urban water scarcity crises – and suggests what lessons urban authorities, UNICEF, the broader WASH sector, and other partners may learn from them.

Not all elements of the Cape Town crisis response are applicable to the programming contexts of secondary and tertiary cities where UNICEF's urban programming primarily takes place, or to densely populated camps for refugees or internally displaced people (IDP). However, there are many aspects of the Cape Town experience, such as the communication and behaviour change aspects of the response and the wider strategic approach, which can provide inspiration for UNICEF urban WASH programmes looking to tackle the effects of urban water scarcity.

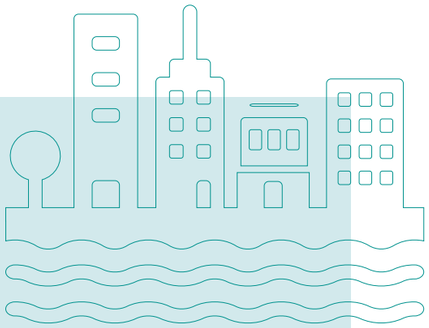
© UNICEF/UNI108283/Sierra Leone

The Guidance Note builds on the experiences of cities that have faced water scarcity crises to outline some specific actions that can be considered to mitigate the effects of urban water scarcity. The note categorises these actions into three types of action: preparedness actions; immediate actions; and long-term actions (which includes mitigation), summarised briefly in Figure 3 below.

FIGURE 3: The three types of action to address water shortages

PREPAREDNESS ACTIONS	IMMEDIATE ACTIONS	LONG-TERM ACTIONS
Risk management actions undertaken to prepare for the risk of water shortages, including protecting the most vulnerable	Simultaneous actions to drastically reduce water usage in the city by, for example, aggressive demand management and restrictions, while protecting access for the most vulnerable	Including mitigation actions, to reduce or eliminate long-term risk. Support to supply augmentation, resilience-based approaches which includes equitable and sustainable water resource management. Strategies to improve access to unserved marginalised communities

< © UNICEF Mongolia



UNICEF'S URBAN WASH RESULTS IN 2020

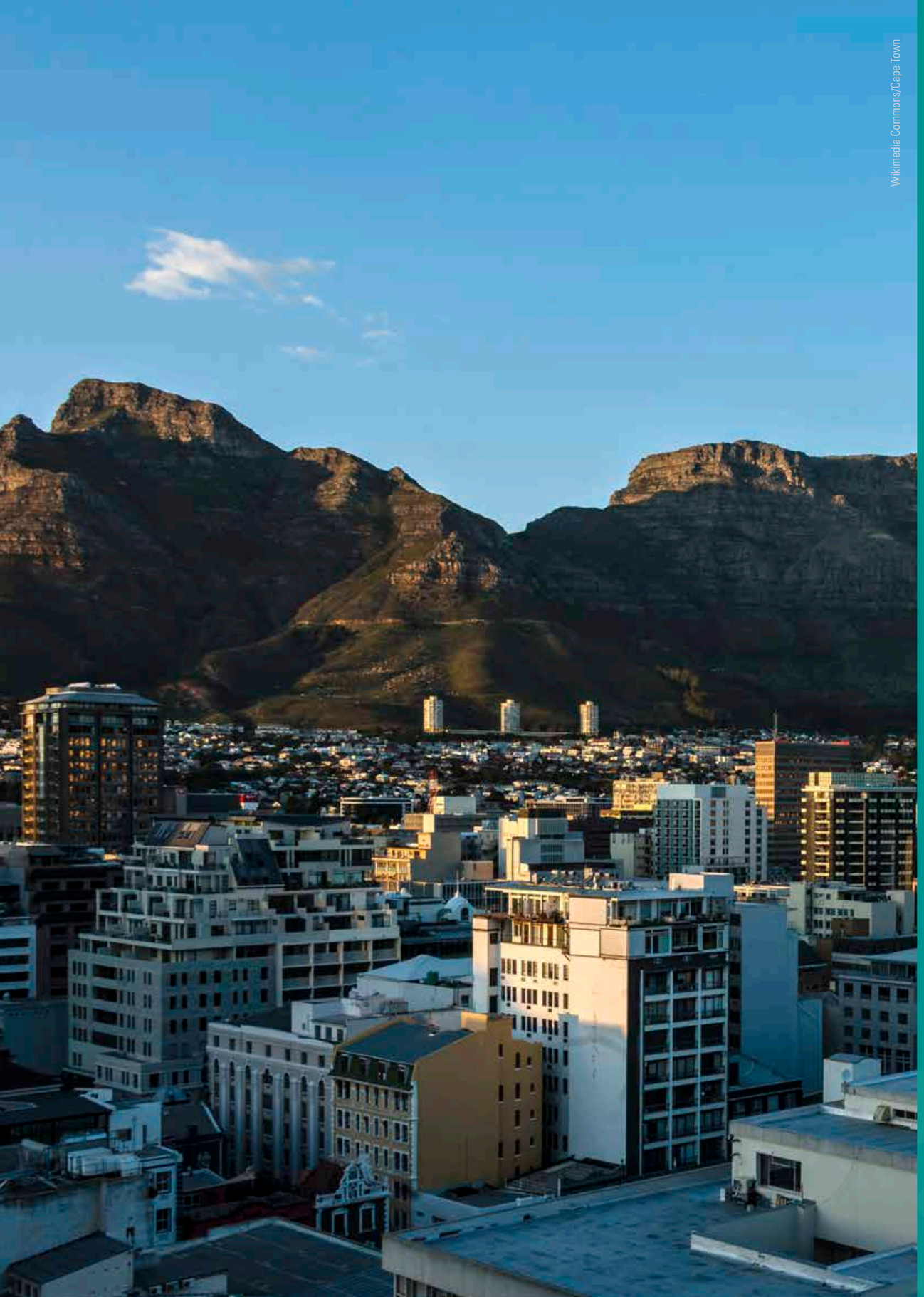
In 2020, UNICEF implemented urban water programmes in 42 countries[15] and reached an estimated 21.9 million people, according to data collected from UNICEF's Strategic Monitoring Questions (SMQs).

Water programmes were implemented in 17 countries in development contexts, 37 countries in humanitarian contexts, and 12 countries implementing urban water programmes in both development and humanitarian contexts. Over 88 per cent of the people reached by urban programmes were in humanitarian contexts, with a significant proportion coming from conflict emergency settings.

15 As reported in the 2020 Strategic Monitoring Questions (SMQs)

FIGURE 4: Reported beneficiaries for water servcies in 2020[16]

16 Taken from the 2019 UNICEF Global annual results report 2019: Goal Area 4. Available here.



Wikimedia Commons/Cape Town

1. THE CAPE TOWN ‘DAY ZERO’ CRISIS

In 2018, severe drought conditions over three successive years led to a major water shortage in Cape Town, a city with a population of over four million people. At the start of the 2018 crisis, almost all of the water supplied to Cape Town was from surface water collected from six dams.[17] In 2014, the six dams were full, but after successive years of lower than average rainfall, the water levels in the dams progressively declined, eventually to 20 per cent capacity in 2018. The combined inflow between 2015 and 2017 was lower than any other consecutive three-year period in the 90-year record, resulting in an estimated 1-in-590 year event.[18] In early 2018, it was predicted that if no changes were made, Cape Town would experience 'Day Zero' – the day when the city would run out of water – before the rainy season started. This led to the initiation of Level 6 restrictions (see Box 5 below) to avoid the reservoirs running empty, prompting widespread efforts to reduce water use.

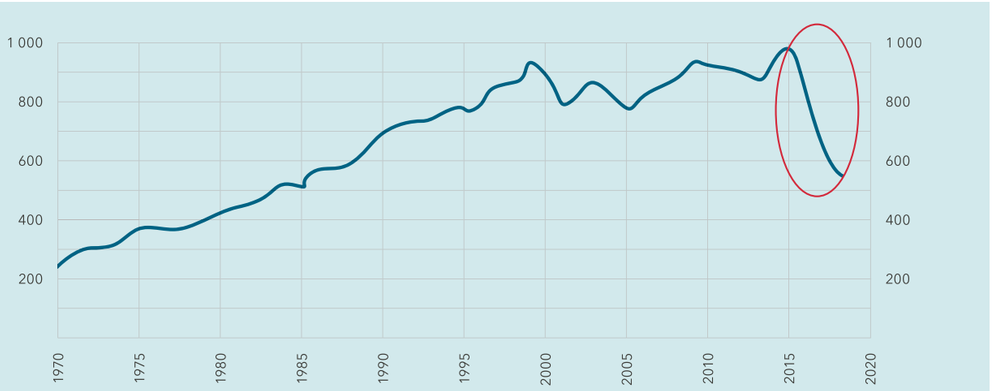
17 A small proportion of the water is also sourced from small dams, groundwater and springs

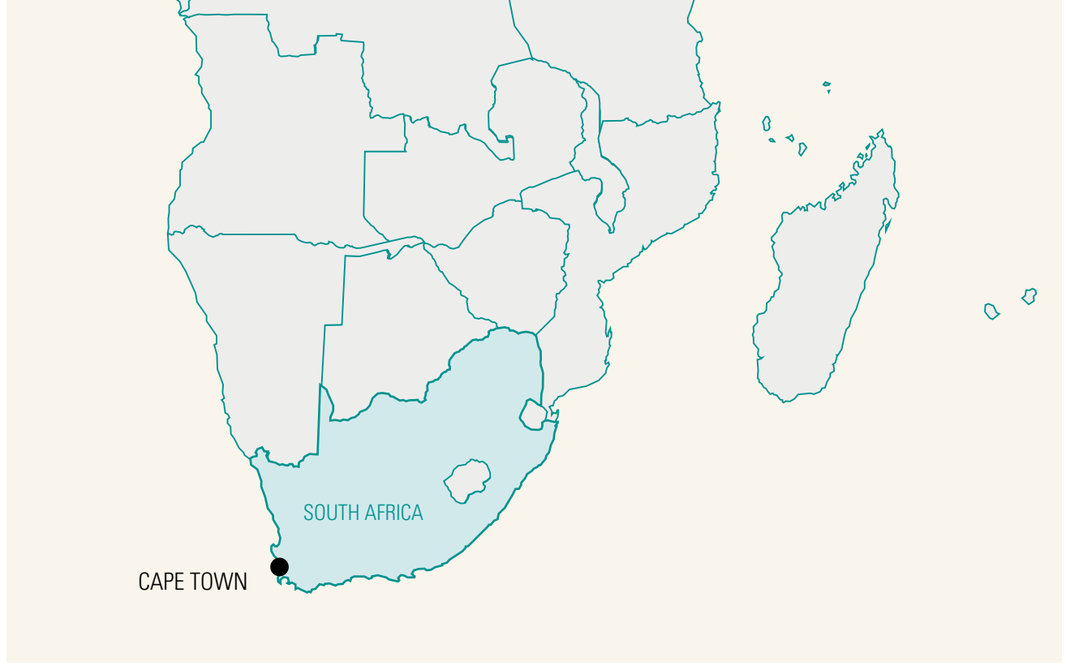
18 Cape Town Water Strategy, 2019.

The scale and speed of the crisis was unexpected, particularly because the City of Cape Town had long recognised the growing threat of water scarcity and, prior to the crisis, had made great progress in reducing water consumption. Beginning in the 1990s, the city progressively introduced a range of measures to reduce the amount of water consumed and to promote water efficiency. These included public awareness campaigns, leakage reduction initiatives, development and enforcement of restriction levels, alternative water source identification, the installation of meters, and the development of a tariff structure requiring large water users to pay more for the larger quantities of water they consume. Despite population growth of three per cent per year, Cape Town's water demand in 2017, for example, was lower than it had been in the year 2000 (see Figure 5 below). The City had won several international water management and conservation awards for its extensive efforts, and it was confidently predicted at the start of the crisis that a well-managed city like Cape Town would never run out of water.

19 Taken from Cape Town's Water Strategy, 2019. Available here.

FIGURE 5: Total water use in Cape Town since 1970. Water use as measured by the treated water supplied, including losses, on average for each year in megalitres per day (MLD)[19]





As early as 1995, the City of Cape Town committed itself to a 10 per cent saving on the historical demand growth of 4 per cent per annum. An integrated water resource planning (IWRP) study carried out in 2001 also indicated that various water conservation and water demand management (WCWDM) initiatives were the most feasible water augmentation options to meet the growing water demand of the city in the medium term.

In 2001, the City developed a WCWDM policy and strategy based on the outcome of the IWRP study. A number of WCWDM projects were implemented and some of the projects, such as the Khayelitsha Pressure Management Project, were very successful and received wide recognition. However, the implementation of the full strategy proved unsustainable; numerous institutional challenges meant that the initial commitment and resources to WCWDM were significantly reduced during 2003, 2004 and again during 2006. In 2007, a revised WCWDM strategy was approved for inclusion in the existing 'Raw water supply agreement' between the City and the national Department of Water and Sanitation, which had also finalised funding arrangements for the construction of the Berg River dam.[20]

WATER CONSUMPTION IN CAPE TOWN

Water consumption in 1998:
330 L/person/day

Water consumption in 2014:
220 L/person/day

Water consumption in 2018:
120 L/person/day (with restrictions)

Water reduction between 2015 and 2018: **50%**

Water use in informal settlements:
5% of total use in entire city

(Source: Cape Town's Water Strategy, 2020)

In the end 'Day Zero' never arrived for Cape Town. But there are many lessons to be learned from policy, engineering, behaviour change and communication perspectives about the factors that led to, and averted, the crisis.

Despite the successes reducing the city's water demand during the crisis (see Box 4), many believed that restrictions were implemented too late in the drought cycle considering the city's complete dependence on surface water (the restrictions were introduced in the third year of drought), and that they should have been applied to all sectors for greater effect.

20 The Berg River dam, completed in 2007, was the last dam to add capacity to the regional water system.

Outlined below are some of the more effective actions that were implemented in response to the 'Day Zero' water crisis in Cape Town. They are organised into the three types of action for mitigating urban water scarcity: Preparedness (risk management actions undertaken to prepare for the risk of water shortages), Immediate (actions undertaken during the crisis to drastically reduce water usage in the city) and Long-term (actions taken to reduce or eliminate long-term risks of water shortages, including mitigation actions).

PREPAREDNESS ACTIONS

Leading up to the crisis, the City of Cape Town developed a 'Critical Water Shortages Disaster Plan'. The full plan was published in October 2017 and comprised three phases, with supporting sector operational plans and protocols, and served as a guide to City operations in the event of critical water shortages. The disaster plan adopted what it called a 'pessimistic' approach to ensure that the city was prepared for a worst-case scenario, assuming very little additional water would be available from either rainfall or augmentation measures, such as desalination and groundwater abstraction. It detailed the steps to be taken, including partially shutting down the network and restriction levels, and outlined the responsibilities of various stakeholders in managing critical water shortages. The three phases of the plan are summarised as follows:

Phase 1

PRESERVATION RESTRICTIONS - RATIONING: this outlines possible disruption to water supply in some areas where demand remains excessive, while introducing pressure management and limiting supply.

Phase 2

DISASTER RESTRICTIONS: this involves intensive water rationing through closing off the reticulation network in suburban areas at the final (or Level 6) restriction (the different levels of restrictions under Phase 2 are given in Table 1).

Phase 3

FULL-SCALE DISASTER IMPLEMENTATION: this outlines full-scale disaster implementation.

TABLE 1: Cape Town's water restriction levels

Restriction levels refer to the saving required to reduce supplied water volumes to meet the Department of Water and Sanitation (DWS) restrictions in times of drought, targeted at all domestic uses of water throughout the city. The City of Cape Town must meet DWS usage targets. To enable these targets to be met, the city council has to approve tariffs and measures for the different restriction levels. Once approved, the City can move between restriction levels as long as they meet the DWS target, and adhere to the approved restriction tariffs.

LEVEL 1	Requires a saving of 10%
LEVEL 2	Requires a saving of 20%
LEVEL 3	Requires a saving of 30%
LEVEL 4	Allows for an urban demand of 600 MLD (megalitres per day) (aimed at 100 l/p/d, and 87 l/p/d at Level 4B)
LEVEL 5	Allows for an urban demand of 500 MLD
LEVEL 6	Allows for an urban demand of 450 MLD (aimed at 50 l/p/d)

(Source: City of Cape Town Water Outlook 2018)

The plan outlined that the drought effort would entail three overarching actions:

- Keep and manage as much water in the dams as possible
- Ensure that the public is aware of, and follows, the measures (through the city's website)
- Provide public access to information on dam levels, which coincided with implementing restrictions on water usage (detailed in the following section).

The plan identified a critical principle that proved to be critical during the crisis: the importance of having publicly accessible information. This was critical to building trust with communities, and establishing public trust and confidence in the management of water resources is key to achieving widespread cooperation in water-saving behaviour.

IMMEDIATE ACTIONS

Opportunities to reduce the amount of water consumed are significantly larger in inefficient systems, where relatively moderate interventions can often create large impacts. Since Cape Town's water system was already relatively efficient, identifying large-scale improvements over short timeframes was increasingly difficult. This meant that the city's existing, more moderate interventions needed to be supplemented with some immediate and drastic actions, in order to achieve the levels of water savings the city needed to address the crisis.

The actions taken by the City of Cape Town included a number of drastic measures which built on previous efforts to improve water demand management. The City worked with diverse stakeholders and across multiple sectors to implement the measures, enabling a reduction of 50 per cent in net domestic water consumption rate by March 2018 (after 26 months of restrictions), as shown in Figure 5. Several existing demand management initiatives which were scaled-up during the crisis primarily, but not entirely, targeted domestic households. The measures did not impact informal settlements; the City ensured that the half a million people living in informal settlements continued to have access to water services, and the provision of a free minimum volume of water per household per day was not affected. In informal settlements, water is supplied for free through public taps at a ratio of approximately 25 households or fewer per tap, and water use averages about 50 litres per person per day.[21]

(from the City of Cape Town's 'Water Dashboard')

The City of Cape Town frequently released updated public information on dam levels supplying the city on a 'Water Dashboard', which also outlined the water restrictions in effect, in addition to water usage by sector, and actual weekly water usage compared to targeted water use. Information was also freely available to the public on the improvements relating to water augmentation. When improvements in dam levels were evident, the City reduced restrictions incrementally. Some of the immediate actions which were used on demand management are summarised below.

WATER RATIONING AND USE OF COMMUNICATION CAMPAIGNS:

The water rationing measures introduced during the crisis were enforced, with Level 6 restrictions and tariffs aimed at limiting consumption to 50 L per person per day. Households using more than 10,000 L per month were restricted through physical installation of flow-restricting water meters.

21 Cape Town's Water Strategy (2019)

A campaign targeted at the wider population provided water conservation guidance on how to reduce consumption, including how to use 50 L per person per day, and this continues to be publicly available (see 'A social norms approach' section below and 'Water-saving tips').

RESTRICTION TARIFFS:

Prior to the crisis, a stepped tariff model was already based on the 'more you use, the more you pay' principle, with progressively more expensive tariffs at higher blocks to encourage water conservation while providing subsidised tariffs at low levels of consumption. During the crisis, progressively more punitive tariffs (up to 'Level 6' tariffs) were introduced so that higher rates of consumption (e.g. volumes over 50 L per person per day or 10,000 L per household per month) were priced at an even higher rate. The rates were extremely punitive above 35,000 L per household per month, even for wealthier households. The high tariffs were effective at reducing household water consumption, and volumes billed at the higher 'blocks' shrunk considerably.

For a more detailed description of the tariffs implemented in Cape Town, it is recommended to read Section 4 of the city's Water Outlook Report 2018, which contains detailed tariff calculations at different usage levels.

FLOW RESTRICTIONS:

Household flow restrictors had been installed prior to the crisis, and once the crisis hit, households which had been deemed not to have reduced consumption sufficiently, and/or had not conducted leak safeguarding, were subjected to flow restrictions. Importantly, water allowances were applied to households, as well as to schools and business. Larger households could apply for additional allocations per month as the household allowances were based on the number of people (Cape Town has guidance on water use based on the number of occupants[22]). If a household continued to exceed its allocation after a second warning, the City installed a household flow restrictor (which was externally visible). In the first six months of 2018, the number of households consuming more than their allocation, reduced by 61 per cent. By 2019, approximately 220,000 household flow restrictors had been installed by the City.[23]

PRESSURE MANAGEMENT:

While water pressure is used to ensure that all parts of a water network receive water irrespective of the elevation or network diameter, high water pressure can lead to damaged water pipes, and as a result, higher rates of leakage. Although pressure reduction initiatives had been introduced a decade earlier, and water losses, estimated at 15 per cent across the network,[24] were low compared to similar cities, actions were accelerated to further reduce the water pressure. Such actions included using smart pressure controllers, proactive leak detection, pipe and meter replacement. These interventions were informed by a network-wide asset management strategy, reducing the amount of time between leak detection and repair, managing water pressure on a zone-by-zone basis, and retrofitting public buildings with water-efficient fittings.[25] Importantly, leak detection initiatives were implemented at the household and network scale; guidelines (for example, see the City's Find and Fix Leaks leaflet) were made publicly available to inform households of how to identify leaks in their property's pipes. The restricted per capita water allocations encouraged households to identify leaks and fix them. It has been estimated that pressure management and leak detection measures led to savings of 70 MLD in Cape Town.

22 Available here.
23 Cape Town Water Strategy (2019)
24 Ibid.
25 Ibid.

EXTERNAL RESOURCES

Think Water' page
How to fix a leak page
Water Saving checklist (shot on p. 30)
Water saving tips

FIGURE 6: Number of water pipe bursts per month in Cape Town[26]

26 Ibid.

A SOCIAL NORMS APPROACH[27]:

The City of Cape Town frequently published data to promote water saving by residents through a drought awareness campaign. The use of data helped to promote a wide discussion and a social norms approach to water saving, where groups including communities, businesses and peers used the urgent messages of the water crisis to influence others to save water. The media disseminated the weekly water report and the government, organisations and businesses promoted water-saving techniques. Businesses made efforts to communicate such techniques to employees. People also shared tips on water saving, including reuse of water, bucket showers and restricted toilet flushing, on social media. Interestingly, techniques used in the poorer informal settlements gained traction in wealthier areas.[28]

27 Alexander (2019)
28 Ibid.

From the City of Cape Town's website on suggestions

ON WHAT HOUSEHOLDS CAN DO TO SAVE WATER:

- Check and fix all leaks on your property
- Use municipal drinking water to irrigate on Tuesdays, Thursdays and Saturdays before 09:00 or after 18:00 for a maximum of one hour per property and only if using a bucket or watering can
- Use of a dripper, drip line or soaker hose for irrigation on Tuesdays, Thursdays and Saturdays
- Use of sprinklers or a hosepipe fitted with a self-closing spray nozzle on Saturdays
- Use municipal drinking water to fill swimming pools if the pool is covered with a non-permeable solid pool cover when not in use and the pool is topped up with rainwater where practically possible
- Vehicles, trailers, caravans and boats can be washed with municipal drinking water using a bucket
- Convert to water-wise landscaping. Use water-wise plant species, limit lawn areas and mulch flowerbeds to help retain moisture in the soil
- Install water-efficient taps or fit existing taps with aerators – these can reduce water flow from 20-30 litres per minute to 6-10 litres per minute
- Install new water-saving toilets

From the City of Cape Town's website on suggestions

WHAT THE CITY IS DOING TO SAVE WATER:

- Finding and repairing underground water leaks
- Continuing with pressure reduction programmes to reduce the flow of water at one time, as well as water losses through leakage in the pipework of the distribution system
- Making more money available for our first line response teams to attend to reported water faults
- Improving response times for water complaints
- Increasing staff numbers to deal with water management device complaints and faults
- Promoting the use of treated effluent (recycled water) or borehole water instead of drinking water for irrigation purposes
- Offering plumbing repairs for indigent households free of charge
- Reducing water losses from our systems
- Replacing ageing water mains
- Creating awareness for water saving through school visits and communication

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

THINKWATER
CARE A LITTLE. SAVE A LOT.

Water-saving tips:

The more you save, the less you pay – and more water remains in our dams.
SHARE THIS with others, and visit **www.capetown.gov.za/thinkwater**
for more information and guidelines.

Toilet flushing and sanitation

Only flush the toilet when necessary. Let the 'yellow mellow' at home, work, school, gym, shops, etc. Don't use it as a dustbin.

Place a full glass bottle in your cistern to reduce each flush to a maximum of 6 litres (if you have no choice but to use municipal drinking water).

Flush with greywater only (laundry, bath and shower water) or with rain, borehole or well-point water.

Use less toilet paper to minimise the risk of sewer blockages and do not use your toilet as a dustbin.

Close toilet stopcock (angle valve).
You will save municipal drinking water.

Use bleach or disinfectant to regularly **sanitise toilets and surrounding areas** and keep hands sanitised to prevent health risks.

Please note: The use of water from alternative sources has some health and hygiene risks you must avoid.
Keep hands and surface areas sanitised and disinfected. Don't keep greywater for longer than 24 hours.
Keep water containers in a safe place as children can drown in them.

Body washing and personal hygiene

Take short, stop-start showers.
Wet your body. Turn off the tap. Soap. Rinse quickly.

Don't let taps run for too long or at full flow. Use a cup for shaving, brushing teeth, etc.

No shower? **Take a sponge bath.**
Use minimal water in a basin, bowl or washtub ('waskom').

Use waterless hand sanitiser instead of washing your hands.

Don't let water run while you wait for it to heat. If possible, use cold water or heat your water for a sponge bath, in a kettle or on the stove.

Collect as much washing water as possible and re-use for flushing toilets as a priority. Excess greywater can be used for plants or washing vehicles.

City of Cape Town website: Water saving tips

From the City of Cape Town website:

A NOTE ON THE SUSTAINABILITY AND CHALLENGES OF WATER SAVING:

Following the crisis (i.e. when dam levels were recharged by rains), water restrictions continued, although on a less stringent basis, and focused on particular activities, including watering gardens. Water restrictions and guidelines on the amount of water use per household (depending on the number of occupants) remain in effect as of 2020. The City of Cape Town continues to encourage residents to work together to change the way water is consumed. Despite this, the city's daily water consumption has increased somewhat over the past year with a summer peak of approximately 750 MLD (compared to 600 MLD in 2018) and winter peak around 650 MLD (compared to 550 MLD in 2018).[29] However, water usage is significantly lower than before the crisis, suggesting there may be longer-term effects of demand reduction interventions at household and business levels.

The actions described above were considered to be key initiatives contributing to the reduction in water demand and consumption during the period of the immediate crisis. It is hoped the interventions will also have longer-term impacts and behaviour changes. The Cape Town crisis (as well as other examples, including the Melbourne case study set out later in this document) demonstrates the importance of sustaining intensive engagement and communication to drive a long-term water saving culture, and promoting a sense of individual responsibility and accountability.

While 'Day Zero' was averted and the City of Cape Town earned the trust of many of its residents, many challenges were encountered to achieve overall water savings, including wealthier residents drilling boreholes on their properly to access groundwater to bypass the municipal volume restrictions.

29 Alexander (2019)

LONG-TERM ACTIONS

For longer-term planning, water demand approaches in Cape Town moved from focusing on disaster management to resilience, with the City continuing its efforts to reduce consumption across all sectors. In May 2019, the City Council of Cape Town approved Cape Town's Water Strategy, which outlines five commitments in the context of a 'whole-of-society' approach. The five commitments are set out below.

FIGURE 7: Cape Town's five water commitments, from the City's 2019 Water Strategy.

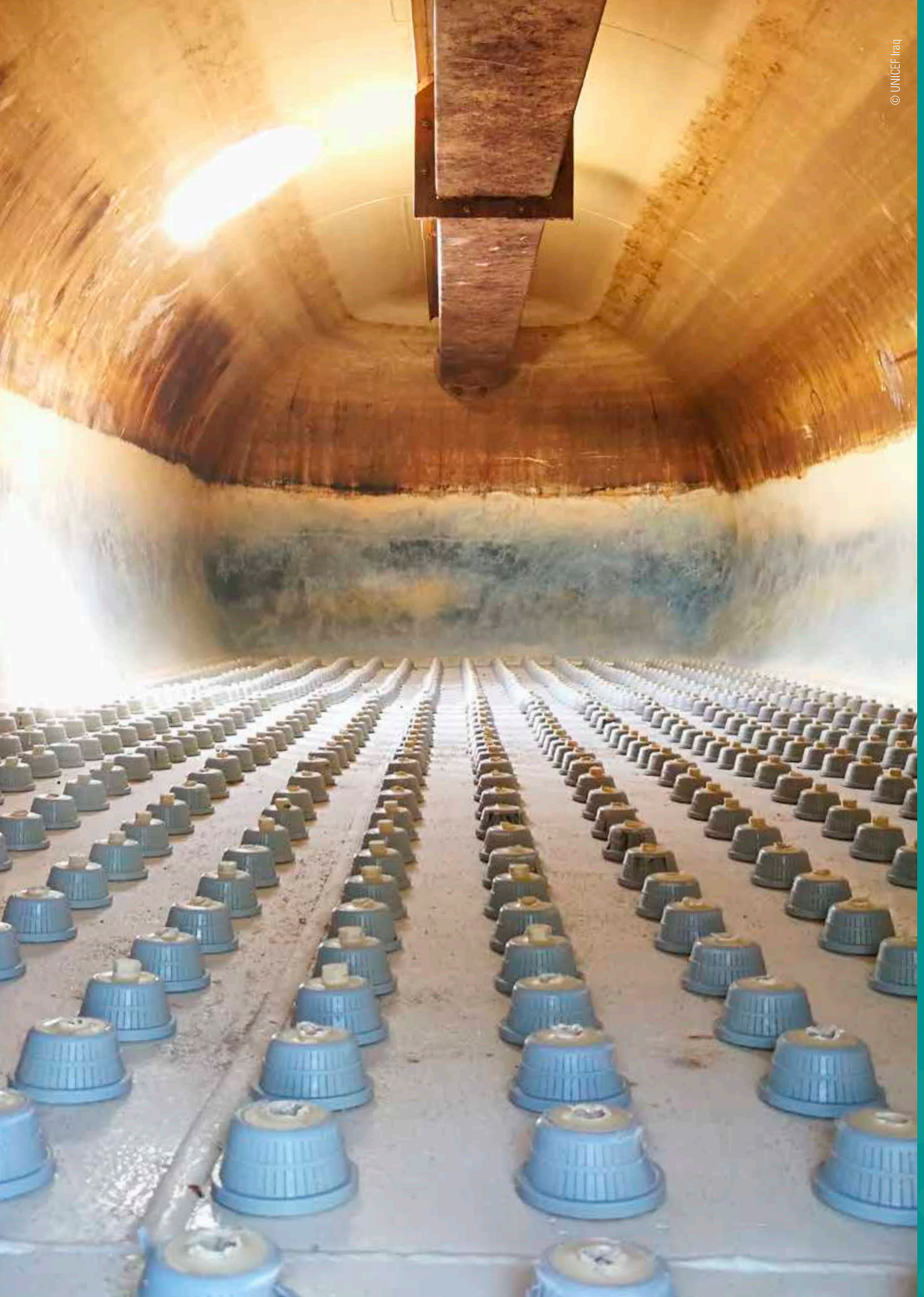
As water resources in the Western Cape are shared with many other sectors, the City of Cape Town is building on multi-stakeholder collaboration with different groups, particularly in the agriculture sector, to ensure that water efficiency continues to improve. This collaborative approach is essential as the city's water catchment area is mostly from outside of the city's boundaries, where agriculture is concentrated. During restrictions, the agriculture sector had to reduce their water consumption by 60 per cent[30] and many farmers are now considering permanent changes to their water use practices to ensure their operations are more efficient in the future. In addition, since 2019, five per cent of the city's water supply has been provided from alternative sources to the rain-fed dams, and the city has committed to increasing its available supply through such alternative sources by 300 MLD by 2029.[31]

THE IMPACT OF THE WATER CRISIS ON INFORMAL SETTLEMENTS:

The impact of the water crisis on informal settlements: The National Water Act (1998) recognised that water resources provide benefits for all people[32], and the Water Services Act (1997) established clear rights of access and the delivery of water as a service[33] under a legal framework. South Africa is one of the few national governments with constitutional protection for the human right to water. Despite this, high levels of inequality persist in Cape Town and there are still many marginalised communities living in informal settlements. This includes newly emerging settlements which are not officially recognised by the City, which have an impact on access to water and the City's obligations to provide a water service[34]. Although the population residing in informal settlements in Cape Town represents an estimated 10 to 15 per cent of the city's overall population, the population uses only five per cent of total city water consumption. Water use in informal settlements is constrained by the volume of water that can be carried;[35] the population residing in informal settlements used 50 litres per person per day on average both before and during the crisis.

Prior to the crisis, households within recognised informal settlement communities were provided with 6,000 litres of free water per household per month (which equates to 50 litres per person per day in a four-person household), delivered largely via public standpipes. Basic allocations continued with no physical restrictions imposed in informal settlements. The free allocation continued throughout the crisis; owing to their already low levels of consumption, the provision of water to informal settlements was not affected by water restrictions, even at Level 6 restrictions.

30 Cape Town Water Outlook (2018)
31 Cape Town Water Strategy (2019)
32 The National Water Act (1998)
33 The Water Services Act (1997)
34 Water connections were not provided to newly occupied (informal) but instead to existing service areas
35 Cape Town Water Strategy (2019)



© UNICEF Iraq

2. EXPERIENCES FROM OTHER WATER-SCARCE CITIES

Some water-scarce cities' experiences, and how they have attempted to safeguard their water supplies, are set out below.

CHENNAI, INDIA

Following successive years of unsustainable groundwater extraction and poor water management, many of India's largest cities are facing continuous water shortages. In June 2019, nearly 65 per cent of the country's reservoirs were almost empty.[36]

In Chennai, a city of nine million, there was no water available in the network during the summer of 2019 as the city faced heatwaves and severe drought. Public toilets were closed and employees were forced to work from home due to insufficient water to ensure functional hygiene facilities at workplaces.

Shortages of water affected the surrounding areas of Chennai, where communities were already dependent on water tankers for their drinking water supply. Tankers collected their water from wells and boreholes in locations outside of the city, but as demand increased, borehole owners were forced to drill deeper to find water. The government provided water through tankers, but residents had to queue for long periods, which greatly affected their time for other livelihood opportunities. Residents who could afford it had to pay exorbitant sums to private water providers for additional water deliveries.

India's long-term planning for water supply augmentation has included investing in desalination plants and transporting water from distant watersheds. Such options are likely to relieve only a small part of the water shortage problem and are unlikely to provide a sustainable water supply for everyone. Alleviating the crisis will require solutions addressing many different factors, such as the enabling environment, technical capacities, water resource monitoring, efficient water use (including improving leakages) and behaviour change. The agriculture sector, currently abstracting enormous quantities of groundwater, will need to be actively included in any such reforms to ensure that water is used efficiently and appropriately.

36 NASA Earth Observatory (2019)

SINGAPORE

The Asian city state has long been hailed as a success in terms of balancing its very limited water availability against its water demand. This is despite the island country having one of the highest population densities in the world, with numbers increasing every year. Due to concerted efforts at a number of levels, the city's per capita household water consumption reduced from 165 litres per day in 2003 to 143 litres per day in 2017.[37] To ensure the optimum management of water resources[38], there have been substantial investments in research and technology to conserve, treat, recycle and supply water (see Figure 8). Singapore's water demand is met through four main sources, outlined in the 'Four National Taps' programme:

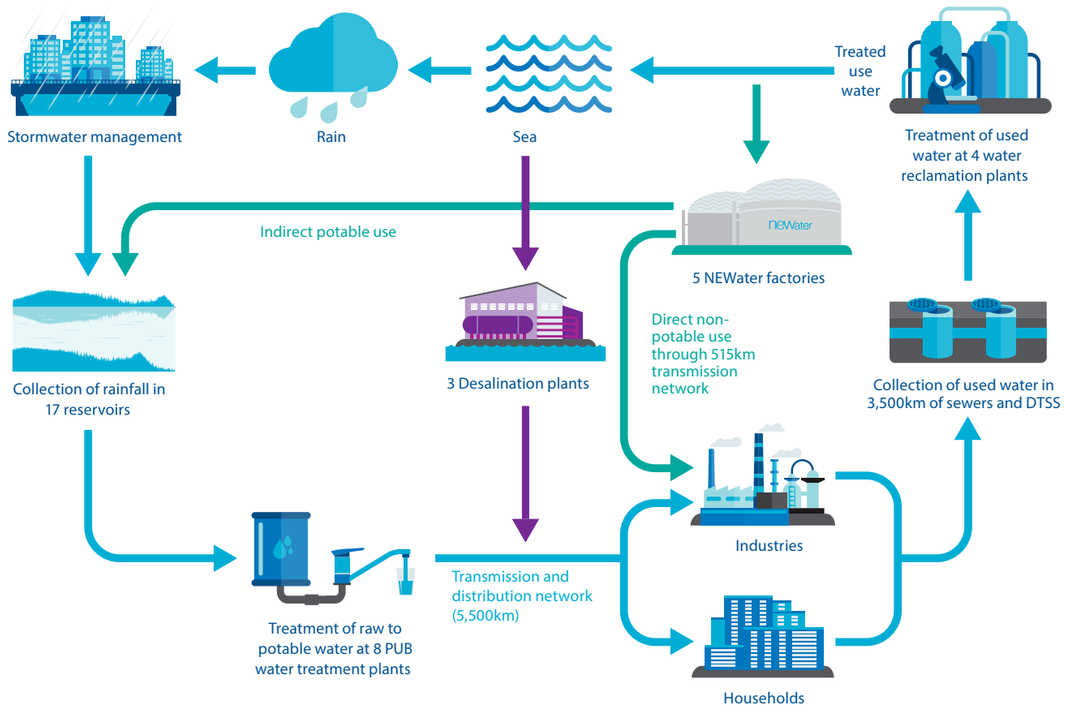
- Collect every drop of water (authorities explore ways to collect every drop of water that falls on Singapore) which includes rainwater harvesting, green infrastructure and storm water management;
- Reuse water endlessly – including for drinking water (reused water provides 40 per cent of demand through the 'NEWater' programme);
- Desalinate seawater (aiming to provide 30 per cent of water demand); and
- Import water from the Johor River in Malaysia through the 1962 Water Agreement which allows withdrawal from the Johor River until 2061.

37 'Singapore Water Story', www.pub.gov.sg/watersupply/singaporewaterstory. [accessed 1 September 2019]

38 Ibid.

FIGURE 8: Singapore's holistic approach to water management[39]

39 Ibid.



LA PAZ, BOLIVIA

In November 2016, the worst drought in 25 years combined with impacts from El-Nino to create water shortages throughout Bolivia. An emergency was declared by the national government and La Paz, the capital, was forced to enact strict water rationing measures in 94 neighbourhoods.[40]

The reasons behind the city's water crisis were multifaceted. The glaciers that once fed the city's reservoirs are disappearing due to higher temperatures over the past 20 years, as a result of climate change. Bolivian cities are highly dependent on glaciers for their water supply, especially during dry months. In addition to this, poor water management was highlighted as a key factor contributing to the crisis. Bolivian water infrastructure has been in decline for many years; leaking pipes and illegal connections have led to high rates of non-revenue water and water losses being reported, of up to 50 per cent.[41] Inadequate investment in new infrastructure or water sources has meant continued dependence on inefficient water and energy infrastructure. Mining operations near La Paz's reservoirs have also been blamed for reducing the city's valuable and limited water resources even further.[42]

The immediate response in La Paz was for the city's water service provider to halt the distribution of water through the network and instead use water trucks and communal water tanks, in addition to the introduction of a strict water rationing system. Community members lined up at the communal water tanks and were limited to collecting two containers of water. In other areas, water was available in the network for three hours every three days. Over the course of the crisis, an estimated 400,000 people in 100 neighbourhoods in La Paz and neighbouring El Alto were affected.[43]

While the city is launching several infrastructure projects to enhance water supply, including a new dam and reservoir to capture more rainwater, a broad range of additional initiatives will be needed to address future water crises that the city will inevitably face.

40 Miranda (2018)
41 Farthing (2016)
42 Martinez (2017)
43 Kaufman (2017)

© UNICEF/UNI189337/Bolivia

AMMAN, JORDAN

Jordan is reported to be the fifth-most water stressed country in the world.[44] Amman continues to struggle with drastic levels of water scarcity, which have seen the Government develop policies which set clearly defined rules to better manage water resources efficiently and sustainably. The 'Water Substitution and Reuse Policy (2016)'[45] recognises wastewater as a potential water source, for example, and sets out specific strategies to increase the amounts of wastewater treated. As a result, Jordan has one of the highest rates of wastewater reuse in the region. In 2014, 125 million cubic metres of treated wastewater were reused after either being blended with fresh water for irrigation or used for other purposes without blending. Despite this progress, water leakage in the network is still a major challenge; non-revenue water is estimated at 52 per cent, largely due to leakage in the distribution system,[46] as well as illegal network connections and boreholes. To address this, a range of projects targeted at promoting water efficiency are being implemented in Jordan, which include the rehabilitation or replacement of leaking sections of the network, alongside support for increased energy efficiency and the use of renewable energy.

UNICEF has supported the Government of Jordan to develop water and wastewater vulnerability maps at a sub-district level, as a planning tool to aid policy and prioritisation. The water vulnerability maps were developed using a number of criteria, including the age of the network, the amount of water consumed (compared to the planned amounts) and poverty, and as flagged areas in most need of additional support, including network extension. The wastewater vulnerability maps were developed using a range of criteria, including the sewage network coverage, data on wastewater treatment plant assessments, the age of the sewage network, and levels of poverty. The maps identified sub-districts most in need of additional treatment infrastructure and capacity.

▲ Wikimedia Commons/Amman

44 https://www.wri.org/applications/aqueduct/country-rankings/
45 Government of Jordan, 'Wastewater substitution and reuse policy (2016), Ministry of Water and Irrigation, 2016.
46 Ibid.

MELBOURNE, AUSTRALIA

The 'Millennium Drought' occurred in south-east Australia over the period 1997 to 2009, after below average precipitation for almost a decade, with predictions emerging that the city would run out of water by June 2009. The drought led the City of Melbourne to find alternative ways to address and meet water demand.[47] Their water saving measures were introduced during the period of the drought, including a very effective behaviour change campaign, which used a variety of public social marketing methods and led to a reduction in per capita domestic water use of more than 40 per cent.[48] Some of the measures Melbourne used included publishing information on the level of water in dams, and the water authorities informing people about how much water they were using in comparison to neighbours. The social marketing methods at the time were seen to be effective not only for increasing water use awareness, but also for gaining the commitment of whole families towards water saving. Other activities which took place during the drought included rebates on water saving products, water restrictions, pricing to reward water saving, and requirements for industrial water audits. Melbourne now has permanent water saving rules in place since the last set of water saving restrictions were introduced in 2012. 'Target 155' encourages everyone to make best use of water and limit their use to a maximum of 155 litres per person per day (in 2018-19 the average person was using 162 litres per day).[49]

47 Low, et al. (2015)

48 Thwaites (2014)

49 'Permanent water-saving rules and Target 155', <www.melbournewater.com.au/water-data-and-education/environmental-issues/why-we-need-save-water/permanent-water-saving-rules>. Accessed 23 December 2020.

DETECTING LEAKS SAVES MORE WATER THAN RATIONING

The World Bank supported the Lebanon Water Supply Augmentation Project, which supported a workstream that identified the sources of water leakage, which were duly repaired. As a result of the initiative, the total volume of water needed following the project was less than when supplies had been rationed to an average of eight hours a day.

From '24/7 Water Supply in Beirut: Fantasy or reality?', World Bank Feature Story, 6 February 2017. Available here.

WINDHOEK, NAMIBIA

The city is increasing water security through multiple approaches, including managed aquifer recharge to stabilise and replenish groundwater levels, and reuse of wastewater for direct potable reuse (DPR). In addition, Windhoek is working with Angola and Botswana on transboundary water from the Cubango-Okavango river basin.[50]

© UNICEF/UNI146573/Namibia

50 'Transforming Water-Scarce Cities into Water-Secure Cities through Collaboration', <www.worldbank.org/en/news/feature/2017/05/15/water-scarce-cities-initiative>. Accessed 23 December 2020.

CALIFORNIA, US

A very effective strategy[51] has been developed in California's water-scarce Orange County to efficiently manage water, focusing on groundwater basin governance and wastewater reuse for various purposes. Orange County has employed a community education campaign to educate the community and create acceptance of the concept of recycled water. The reuse system is the largest in the world; the Orange County Water District captures and treats domestic wastewater to recharge aquifers and manage seawater intrusion, thus improving groundwater quality,[52] and the municipal water service successfully provides water to 2.5 million inhabitants.[53] It uses innovative techniques (for example, deploying inflatable rubber dams to maximise water infiltration), as well as working to increase the recharge capacity of the basin over time.

51 Ibid.

52 'GWRS: New water you can count on', <https://www.ocwd.com/gwrs/>. Accessed 23 December 2020, and 'Groundwater management', <www.ocwd.com/what-we-do/groundwater-management/>. Accessed 23 December 2020.

53 'Created to safeguard Orange County's groundwater supply', <www.ocwd.com/about/>. Accessed 23 December 2020.

54 Text summarised from the chapter on Promoting water conservation in Colombia in the World Development Report, World Bank, 2015.

BOGOTÁ, COLOMBIA[54]

In 1997, a tunnel conveying water to the city of Bogotá partially collapsed, reducing the volume of water available for the city, and an emergency was declared. The city management implemented a communication campaign to outline the importance of conserving water, and the city assumed that people would change their behaviour accordingly. However, instead of conserving water, the opposite happened; people stockpiled water and demand for water increased. This necessitated a change in strategy, and the city government instituted a new communications approach. This included:

- A more personal engagement strategy targeting the practices which used most water (including stickers of San Rafael – the name of the reservoir which the city was now depending on – placed prominently in places which used most water), and daily updates in newspapers on water conservation to provoke discussions.
- Education campaigns, which were positive and light-hearted and included catchy slogans, using 4,000 youth volunteers to disseminate messages, alongside TV adverts (featuring the mayor), and the engagement and active participation of religious leaders.
- A system of awards and deterrents, rewarding those who saved water and penalising excessive use, with the deterrent system introduced after a second tunnel collapsed. The awards (a poster of San Rafael) were given out at public media events. Sanctions for consumers with excessive water use included service interruptions (additional water cuts) and the participation in water conservation workshops.

Together, these approaches led to a change in behaviour, and the creation of an accepted social norm for conserving water. A significant reduction in the city's water consumption was evident within eight weeks of the revised campaign, and continued long after the repairs to the city's tunnel infrastructure were completed.

3. WHAT CAN UNICEF DO?

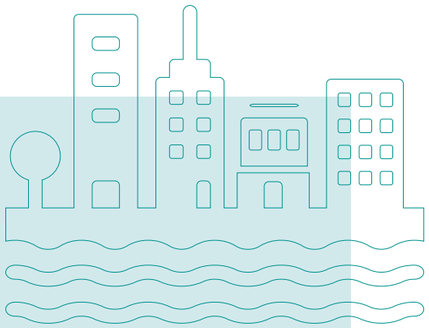
SUGGESTED INTERVENTIONS THROUGH WASH PROGRAMMES

As children are particularly vulnerable to water scarcity in urban areas, UNICEF has an obligation to explore current and predicted future gaps in the provision of urban WASH services – as well as the short-, medium- and long-term impacts of such gaps on children's health and development. UNICEF is uniquely placed to highlight the effects of inequity, affordability and disparities, as well as to demonstrate potential technical and behavioural solutions, and identify opportunities for the sector. UNICEF can also collaborate with other UN agencies to advocate on minimum requirements for domestic water use, as well as working with international financial institutions to highlight the longer-term economic benefits of investing in water and energy-efficient interventions – and the impacts of not doing so.

© UNICEF State of Palestine

The sustainability and effectiveness of interventions designed to achieve SDG 6.1 and 6.2 depend on ensuring that water resources are available and properly managed. Ensuring that all WASH interventions are climate-resilient is a critical step towards this.[55] However, water security for basic human needs also depends on well-managed water services. This requires that systemic barriers to access urban WASH services are addressed – and that actions which invest in innovative interventions are supported.

55 See the Guidance for UNICEF Regional and Country Offices, How to Shift to Climate Resilient WASH Programming. UNICEF, 2020. Available here.



MEETING THE CRITERIA OF A CLIMATE-RESILIENT WATER SERVICE

UNICEF is now shifting its programmes to ensure that all WASH interventions are climate resilient and that water services meet the following criteria:

a. Risk analysis is considered to identify potential impacts of extreme weather events and the cumulative impacts of climate change, and preventive measures are included into the design, siting and technology choice (i.e. elevated infrastructure in flood-prone areas, additional storage capacities, climate resilient-water safety plans (CR-WSP), etc.).

b. Water sources are reliable at all times, both during the year (i.e. during dry season) and during extreme weather events (i.e. during droughts/floods).

c. Management/service delivery models are sufficiently robust to cope with crisis and ensure longer-term sustainability of the infrastructures.

d. Have considered the impact of the system in terms of greenhouse emissions (GHE) and (when feasible) use renewable energy sources such as solar to mitigate that. The use of diesel-powered generators is accepted if is to be used as back up or in circumstances where other alternatives are not possible.

Below are some suggested actions which can be supported to mitigate the risk of water scarcity in urban areas. These suggestions are designed to help prepare for, and respond to, the threat of urban water shortages (for more general suggestions on water scarcity in WASH programming, please see the accompanying Water Scarcity Guidance Note: Programmatic Approaches).

UNICEF's Procedures on Environmental and Social Safeguards, due to be published in 2021, will help identify specific procedures and risks relating to both environmental and social impacts of WASH programming.[56] In any case, the core principles of UNICEF programming are still applicable at all stages of responding to water shortage risks. That is: any actions taken should do no harm, and programmes and partners must consider how interventions impact on the most marginalised (with particular focus given to impacts on women and children), ensuring no-one is left behind. In addition, great care must be taken to ensure that interventions do not lead to water scarcity in other parts of the system or areas.

Table 2 below provides a summary of some options that can be undertaken in the three types of action (preparedness, immediate and long-term) as part of a WASH programme. Many of the suggested actions could take place at more than one stage. For example, actions relating to technical approaches to reduce leakage, augment supply and behaviour change campaigns can also be included as preparedness actions, but are included here under long-term actions. The options are categorised by the action type below, and according to the structure of UNICEF's Global Framework for Urban Water, Sanitation and Hygiene. That is, actions that could be taken at sector level, service level and user level. More detail on the options for activities, as well as some broader programming principles behind interventions intended to mitigate the effects of water scarcity, are set out below.

56 Regional WASH Advisors can also be contacted to discuss other social and environmental frameworks, impact assessments and management plans currently in use in your region and beyond.

TABLE 2: Alignment of the suggested intervention options and types of action to the three areas of support of the UNICEF Global Framework for Urban, Water, Sanitation and Hygiene (colours highlight where the same intervention appears at multiple levels)

	PREPAREDNESS	IMMEDIATE	LONG-TERM
SECTOR LEVEL	Water demand and supply forecasting	Communication and Social Norms	Promoting wastewater recovery and reuse
	Water shortages disaster planning		Advocacy on sectoral allocations
	Vulnerability mapping		Supporting policy changes
	Advocacy		Tariffs
	Communication strategies		Financing
			Long-term demand management
SERVICE LEVEL	Water shortages disaster planning	Demand management	Promoting wastewater recovery and reuse
	Vulnerability mapping	Supporting vulnerable populations	Upgrading infrastructure/non-revenue water (NRW)
	Advocacy		Metering
	Communication strategies		Supply augmentation including alternative sources
			Climate resilient water safety planning
			Water and energy smart solutions
			Tariffs
			Financing
			Long-term demand management
			Behaviour change campaigns (creating positive social norms around water conservation)
USER LEVEL	Assess ways to increase use efficiency at household level (water saving taps, flushing etc)	Social norms	Behaviour change campaigns (creating positive social norms around water conservation)
		Reducing leakage at the Household level	

PROGRAMMING PRINCIPLES

A RISK-BASED APPROACH:
Understanding the full range of political, economic and social factors and conditions to which urban water supply is exposed – both current and potential risks; developing actions according to specific risks.

COLLABORATION AND COORDINATION ACROSS MULTIPLE SECTORS:
A whole of society approach,[57] working with diverse stakeholders, in particular other users of water (i.e. agriculture and industry).

SUPPORTING THE MOST VULNERABLE CHILDREN IN URBAN AREAS:
Promoting water and sanitation as a human right, and equity in accessing water resources. Ensuring the most marginalised do not experience restrictions on the use of basic amounts of water, or pay disproportionately higher water tariffs. Influencing practical actions towards meeting the human right to water and sanitation, while strengthening urban WASH systems to support access to water and sanitation for all. Sustainable and equitable WASH is the best way to ensure access to adequate levels of water for the most vulnerable during crises, and that broader services function during periods of shortfall.

A BALANCED APPROACH THAT VALUES WATER RESOURCES:
Technical approaches that seek to augment supply is only one approach. Efficiency measures (e.g. demand management and reducing leakage) is a more sustainable approach that should be considered before expanding supply – sustainably and equitably ensuring resources for future generations. A long-term vision should focus on different concurrent actions (institutional, coordination, behavioural, as well as technical).

57 As described in Cape Town's Water Strategy (2019)

PREPAREDNESS ACTIONS

ACTIVITIES WHICH CAN BE UNDERTAKEN PRIOR TO A WATER CRISIS

WATER DEMAND AND SUPPLY FORECASTING:
This involves undertaking an analysis of the risks faced by the water and sanitation infrastructure, services and their users, including (but not limited to) climate change, increased population (natural and migration), increased demand for water (including from other sectors), trends in equitable water access, and projections of future water availability and quality. This analysis could flag how water resources will be impacted by changes in climate, forecasted increases in water demand, and where the most likely potential gaps in capacity are. Such analysis should be periodically reviewed where it exists and undertaken where it does not exist, and reviewed and adjusted as necessary. Such an analysis should ensure that all WASH services have been considered (for example, to ensure that the impacts on wastewater are also considered). Such forecasting can help to highlight an overdependence on sources of water that may be vulnerable to changes in volume and quality, and can therefore promote the diversification of supplies, as well as water use efficiency. In many urban areas, while data on existing and projected demand may exist, the corresponding information on the projected water resources may not. Undertaking an analysis of the available data to identify gaps would be a good first step.

WATER SHORTAGES DISASTER PLANNING:
Action planning, which triggers different actions at specific levels, including restrictions, is necessary to enable a phased approach to mitigating water scarcity. This should be applied and implemented across all sectors and not just for domestic water use. Plans to support low-income groups in the event of crisis also need to be included. Emergency water station locations and

© UNICEF/UNI128289/Haiti

modalities, and the mapping of proposed water storage locations and transit routes should also be included. Different actions should be managed simultaneously, depending on the different levels of severity. These plans should be reviewed regularly and adjusted accordingly. Building capacity of relevant stakeholders may be required to help undertake such planning effectively and periodically.

VULNERABILITY MAPPING:

Mapping areas (and populations) which are currently and/or projected to be vulnerable to water scarcity is critical. This helps ensure that areas and populations most at risk of water scarcity are identified and prioritised, and plans are made and implemented accordingly. The poorest are often dependent on private water solutions (for example, mobile tankers, kiosks and bottled/sachet water) during periods of water scarcity, paying disproportionally higher prices. Understanding how such vulnerable groups access water, and the cost/time/impacts of such is critical. Also vital are policy initiatives to regulate access in times of crisis, so that even the poorest households are always assured of an adequate quantity of safe water.

ADVOCACY:

UNICEF has an important role to play to highlight the impact of current and projected water scarcity on children and the most vulnerable. This includes highlighting the potential economic and societal benefits of investments in energy and water efficient interventions (for example, through cost benefit analyses, cost of inaction analyses, and the development of investment cases). Advocacy on the inefficient use of water by other sectors, through collaboration with other UN agencies, is also a potential advocacy area.

COMMUNICATION STRATEGIES:

Ensuring that all urban residents (and water users) are aware of the status of water resources, and the importance of their own individual role in water conservation, is critical. This can be achieved through regular awareness-raising campaigns on the latest levels of water scarcity, and ways to save water (e.g. the City of Cape Town's 'Water Dashboard').[58] Ensuring that there is public awareness of the content and timing of action plans, as well as the practical implications of the various levels of restrictions in terms of their water access, is also vital. It is also important that this information is widely communicated and regularly updated. Details on the use of Communication for Development (C4D) to influence behaviours for sustainable water services in Ethiopia is given at the end of this chapter'.

58 'Saving Water', <www.capetown.gov.za/Family%20and%20home/greener-living/water-wise-in-the-home/saving-water>. Accessed 23 December 2020.

IMMEDIATE ACTIONS

ACTIONS IN SUPPORT OF AUTHORITIES WHICH CAN BE TAKEN DURING A WATER SHORTAGE CRISIS

DEMAND MANAGEMENT:

Activities to support service providers to manage demand through two approaches:

- Restriction enforcement outlined during action planning: Examples include punitive tariffs on excessive water use, restrictions on per capita water use, and on commercial or industrial water usage; or restrictions on private water extraction from water supplies (i.e. private water users not connected to the water network, agriculture water users). UNICEF's role is to support decision-making, for example by ensuring that the most vulnerable have access to water during the crisis and are not disproportionately affected by restrictions.
- Network repair and reducing leakages: Scaling-up leakage reduction programmes on distribution networks and on private properties (i.e. at household level), as well as reducing water pressure across the water network. Communication campaigns can highlight progress on reducing leakage rates. Advocacy may be needed to draw attention to losses.

SUPPORTING VULNERABLE POPULATIONS:

In the short term, there is a need to understand whether vulnerable populations, often living in informal settlements, are being reached by adequate water services. This includes understanding how much water they are accessing, its quality and cost, and the time required to collect it. This is likely to include both formal and informal monitoring to ensure that water is reaching the most vulnerable communities, with adequate quantities of safe water available to households. UNICEF should work with and support local authorities, advocating to ensure an adequate and fair response to water shortages that do not leave vulnerable communities behind.

COMMUNICATION AND SOCIAL NORMS:

As the Cape Town crisis demonstrated, sharing information on the severity of the crisis, the role of each household and the measures underway can cultivate changes in behaviour and increase levels of trust in the government and utilities. When a water shortage begins evolving into a crisis, daily updates on the situation (water resources, consumption levels, etc.), reinforced by awareness campaigns to assist people to reduce their consumption, are critical. Such communications foster a sense of transparency, trust, and collective experience of the crisis, encouraging people to change their behaviour and adhere to restrictions. It is important to translate technical information into clear, relatable messages and visuals which can be quickly and easily understood by the public. Communications should be culturally appropriate but where possible, methods of acknowledging households that have saved water, could be explored (for example, through online platforms such as the public 'Water Dashboard' in Cape Town).

LONG-TERM ACTIONS

RESILIENCE-BASED APPROACHES TOWARDS SUSTAINABLE AND EQUITABLE WATER USE

UPGRADING INFRASTRUCTURE AND REDUCING NON-REVENUE WATER (NRW):

These actions aim to reduce leakage in the network, while ensuring that upgrades and water saving measures are cost-effective. Ensuring that water systems are both water and energy efficient is critical. Performance-based contracts (PBCs) can be an effective way to ensure public-private partnerships (PPPs) are focused on results to improve water and energy efficiency. Support to improve the management of NRW through developing long-term strategies and targets could also be provided, including developing ways to generate market interest. UNICEF has a potential role to play highlighting opportunities for collaboration and co-financing between utilities and the private sector, even when UNICEF is not directly receiving the funding.

METERING:

Collecting data on water use is possible through metering, or smart metering where wireless technology is available and infrastructure exists. Data generated through metering can guide strategic approaches to restrictions, informing equitable tariff development and accurately identifying where leakages exist.

SUPPLY AUGMENTATION, INCLUDING ALTERNATIVE SOURCES:

Where additional water resource use is sustainable and will not have a detrimental impact on the environment, interventions to increase the volume of available safe water are a critical strategy of long-term planning for urban water supply. UNICEF supports the development of sustainable options which are climate-resilient, and these could include the identification of new water resources (using remote sensing or hydrogeological surveys), rainwater harvesting on urban rooftops,[59] increasing water storage capacity, as well as unconventional resources such as from desalination (using renewable energy and safe brine discharge).[60]

CLIMATE-RESILIENT WATER SAFETY PLANNING (CRWSP):[61]

Water safety planning is an assessment of

59 This is an option where the storage capacity is sufficient to ensure that the system can cope with variability and unpredictability in rainfall patterns.

60 An example of UNICEF support in desalination is the Gaza Seawater Desalination Programme in 2012. For more details see Peiris, et al. (2017).

61 'Climate resilient water safety plans: managing the health risks associated with climate variability and change'. <www.who.int/globalchange/publications/climate-resilient-water-safety-plans/en/>. Accessed 23 December 2020.

© UNICEF/UN0274916/India

the risks faced by a water supply, from 'the source to the sink'. It considers the quantity and quality of water, with plans developed to address and mitigate the identified risks. While water safety planning is not new, applying the perspective of climate resilience to the process is emerging as a key WASH intervention. CRWSP provides a simple method for service providers and communities to identify and manage risks (including climate hazards) to water safety in a holistic way, using a framework. The framework helps estimate potential hazards, and to develop adaptation plans so they can provide climate-resilient, sustainable and safe water services.

PROMOTING WASTEWATER RECOVERY AND REUSE:

Improving the collection and quality of treated wastewater (using renewable energy where possible) reduces the contamination risk for water resources, and provides water for uses that would otherwise consume valuable freshwater (for example, for irrigation of green spaces or agriculture, or recharge of aquifers). Resource recovery and reuse can present potential for business opportunities; PPPs can be explored as a potential way to implement such projects.

ADVOCACY ON SECTORAL ALLOCATIONS:

Ensuring minimum adequate quantities are available for domestic use is critical. Advocacy targeting the relevant decision-makers should be based on access to water as a universal basic human right, recognised by the UN General Assembly (UN Resolution 64/292). Strong evidence should be gathered and used to advise on appropriate policy measures for sectoral allocations, according to the context. For example, curbing high-water use by sectors through the use of permit systems, efficiency drives and quantity-based abstraction agreements for sectors such as irrigated agriculture.

SUPPORTING POLICY CHANGES:

Sector programming should introduce/support sustainable water supply options that make a big impact. This could include improving building codes to encourage the use of solar-powered systems and rainwater harvesting which can protect against over-extraction of groundwater.[62] It should also include ensuring that WASH is integrated into key national documents and strategies – especially those focused on climate change and climate resilience such as National Adaptation Plans, Nationally Determined Contributions and national climate strategies. Similarly, climate change and the urban context should be key elements of any national WASH or water strategies.

TARIFFS:

A review of the tariff structure (rates, blocks, quotas, amounts and increasingly punitive rates for excessive use) is important. Such structures help to make water systems fairer, while ensuring that the necessary operation and maintenance of systems can be sustained. Well-designed tariffs can also be adapted quickly during any crisis, in order to reduce consumption in the most efficient, yet equitable way.

FINANCING:

Climate financing is a potential area for UNICEF to explore in order to support sustainable options. This might include blended financing opportunities (using development funding to create increased private sector investment), or using carbon credits to increase water and wastewater services' efficiency.

LONG-TERM DEMAND MANAGEMENT:

UNICEF can encourage a range of diverse stakeholders from communities and different sectors to be involved in discussions, for example around planning future water supplies, or the development of targets for water consumption. Water efficient devices (for example, aerated taps, or low water flushing mechanisms) can be supported by working with the private sector and the government, including exploring the use of subsidies and rebates to increase take-up.

BEHAVIOUR CHANGE CAMPAIGNS:

Increased public awareness, education and incentivisation can impact consumer behaviour related to water consumption, and establish positive social norms. Education clubs in schools can teach students about water scarcity and climate change, including through relaying simple practical information, such as understanding the volumes of water used for brushing teeth and handwashing.

ACTIONS TO ADDRESS WATER DEMAND AS A LONG-TERM ACTION IN UNICEF'S WASH PROGRAMME IN IRAQ

Smart water meters and sensors are being used in a pilot in two locations in Baghdad and Kirkuk governorates. The meters and sensors serve two functions: to increase efficiency and measure household water consumption more accurately; and to highlight irregularities related to flow in the water network. The automated household meters reduce errors associated with low flow, and with manual readings (such as reporting and data entry or lack of physical access to the meter). The meters and sensors can highlight fraud, as well as identifying areas of leakage, reverse flow, changes in temperature, pressure changes and contamination. The project has successfully increased the understanding of water and energy saving for households. The data generated has also improved utilities' understanding of consumption patterns and the network, helping to reduce operational costs and improve the management of the water supply.

62 See City of Cape Town advisory regarding water savings for high pressure solar water systems. Available here.

© UNICEF Ethiopia

URBAN WASH C4D ACTIONS IN ETHIOPIA

The ONEWASH Plus Programme in Ethiopia was implemented from 2013 to 2019, and was an integrated urban programme that focused on WASH services in eight small towns and their satellite villages. The behaviour change element of the programme was developed to create the demand for water and sanitation services, increase the accountability of WASH service providers, and to establish behavioural norms that would support the sustainability of the services. The behaviour change component of the programme was critical to ensure households would invest in sanitation improvements and services (reducing open defecation and increasing the usage of sanitation facilities), alongside water services uptake, in line with the rapid scale of Ethiopia's urban growth.

The programme included a training component, which both increased demand for water and sanitation services and enabled households to understand the WASH services which were available. The training raised the community's awareness of cost sharing mechanisms, the importance of timely bill payments and understanding how tariffs were set. By promoting such a broader understanding of the system behind their water and sanitation services, households understood their role and influence on the protection and sustainability of water sources – establishing and normalising water efficiency behaviours in the community.

FURTHER RESOURCES

WORLD BANK 'WATER SCARCE CITIES INITIATIVE'

Toolbox and strategies for cities to support water resilience with knowledge products that highlight integrated water solutions: https://www.worldbank.org/en/news/feature/2017/05/15/water-scarce-cities-initiative and http://documents.worldbank.org/curated/en/281071523547385102/pdf/125187-REVISED-WP-W17100.pdf

Contact waterscarcecities@worldbank.org for more information

CAPE TOWN WATER CRISIS DOCUMENTATION

Water Outlook 2018 (document outlining actions taken during crisis): https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/Water%20Outlook%202018%20-%20Summary.pdf

Our Shared Water Future Cape Town's Water Strategy: https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies,%20plans%20and%20frameworks/Cape%20Town%20Water%20Strategy.pdf

Water Dashboard: https://coct.co/water-dashboard/

Various tools, resources and documents about restrictions are available on Cape Town's website: http://www.capetown.gov.za/Family%20and%20home/residential-utility-services/residential-water-and-sanitation-services/make-water-saving-a-way-of-life

Cape Town Critical Water Shortages Disaster Plan – October 2017: https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2C%20plans%20and%20frameworks/Critical%20Water%20Shortages%20Disaster%20Plan%20Summary.pdf

WASTEWATER REUSE AND WATER SAFETY PLANNING

Guidelines for Safe Use of Wastewater and Excreta in Agriculture and Aquaculture (WHO, 2006): http://www.who.int/water_sanitation_health/sanitation-waste/wastewater/wastewater- guidelines/en/

Groundwater recharge with recycled municipal wastewater criteria for health-related guidelines: https://www.who.int/water_sanitation_health/wastewater/wsh0308chap2.pdf

Guidelines for Safe Recreational Water (WHO, 2003 and 2009 addenda): http://www.who.int/water_sanitation_health/water-quality/recreational/en/

Water Safety Plan Manual – a step-by-step risk management for drinking-water suppliers. (WHO, 2009): http://apps.who.int/iris/bitstream/10665/75141/1/9789241562638_eng.pdf

World Bank *Managing Urban Water Scarcity in Morocco*, working paper: https://openknowledge.worldbank.org/handle/10986/29190

Orange County Water District – Groundwater Replenishment System: https://www.ocwd.com/media/8861/ocwd-technicalbrochure_web-2020.pdf

STRATEGIES ON WATER AUGMENTATION AND RESILIENCE STRATEGIES FOR WATER UTILITIES

Indicators on Urban Water Resilience (International Water Association): http://www.iwa-network.org/wp-content/uploads/2016/07/Indicators-on-Urban-Water-Resilience.pdf

UNESCO Urban Water Management Programme (UWMP): https://en.unesco.org/uwmp; and urban water series resources: https://en.unesco.org/uwmp/resources

WATER EFFICIENCY, DEMAND MANAGEMENT BEHAVIOUR CHANGE AND SOCIAL NORMS

The 'Water Efficiency Strategy for the UK', has a section on cities and behaviour change ('Water, People and Communities'): https://www.waterwise.org.uk/wp-content/uploads/2018/02/Waterwise-National-water-strategy-report.pdf

Water Demand Management in the City of the Future- Selected Tools and Instruments for Practitioners by WEDC: https://repository.lboro.ac.uk/articles/Water_demand_management_in_the_city_of_the_future_Selected_tools_and_instruments_for_practitioners/9585266

The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries. How the Private Sector Can Help: A Look at Performance-Based Service Contracting. The World Bank, Water Supply and Sanitation Sector Board Discussion Paper Series: https://siteresources.worldbank.org/INTWSS/Resources/WSS8fin4.pdf

Government of Singapore's 'Save Water' page on its website has resources targeted at residents on ways to save water: https://www.pub.gov.sg/savewater

City of Cape Town water-saving tips, leak detection guidelines and household water use guidelines at the household level: http://resource.capetown.gov.za/documentcentre/Documents/Graphics%20and%20educational%20material/Water%20Saving%20Checklist%20to%20Avoid%20Day%20Zero.pdf

http://resource.capetown.gov.za/documentcentre/Documents/Graphics%20and%20educational%20material/Find%20and%20Fix%20Water%20%20at%20home.pdf

http://resource.capetown.gov.za/documentcentre/Documents/Procedures%2c%20guidelines%20and%20regulations/Household%20water%20usage%20guide_MH.pdf

REFERENCES

Alexander, C. 'Cape Town's Day Zero Water Crisis, One Year Later', *Citylab* [online], 2019. Available at: https://www.citylab.com/environment/2019/04/cape-town-water-conservation-south-africa-drought/587011/ [accessed 1 September 2019]

City of Cape Town, *Critical Water Shortages Disaster Plan,* Cape Town, 2017. Available at: https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2C%20plans%20and%20frameworks/Critical%20Water%20Shortages%20Disaster%20Plan%20Summary.pdf

City of Cape Town, *Disaster and Demand FAQs.* Cape Town, 2018. Available at: http://resource.capetown.gov.za/documentcentre/Documents/Procedures,%20guidelines%20and%20regulations/Disaster%20and%20demand%20FAQ.pdf [accessed 11 January 2021]

City of Cape Town, *Water Outlook 2018 Report.* Cape Town, 2018. Available at: http://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/Water%20Outlook%202018_Rev%2030_31%20December%202018.pdf

Donnenfeld, Z., C. Crookes, and S. Hedden, 'A delicate balance: water scarcity in South Africa'. *Institute for Security Studies (ISS),* 2018. Available at: https://issafrica.s3.amazonaws.com/site/uploads/sar13-2.pdf [accessed 1 April 2019]

Kaufman, L., 'High and Dry: La Paz adapts to a world without water', *Popular Science*, March/April 2017.

Kingdom, B., R. Liemberger, and P. Marin, 'The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries. How the Private Sector Can Help: A Look at Performance-Based Service Contracting'. The World Bank, *Water Supply and Sanitation Sector Board Discussion Paper Series*, Paper No. 8, 2006.

Farthing, L., 'We are in shock: historic Bolivia drought hammers homes and crops', *The Guardian*, 2016. Available at: https://www.theguardian.com/global-development/2016/nov/25/bolivia-drought-water-rationing-crops. [accessed 23 December 2020]

Government of Jordan, 'Wastewater substitution and reuse policy (2016), Ministry of Water and Irrigation, 2016.

Government of Singapore, 'Singapore Water Story', <https://www.pub.gov.sg/watersupply/singaporewaterstory>, [accessed 1 September 2019]

Institute of Civil Engineers (ICE), WaterAid and Oxfam, *Managing Water Locally*. ICE, London, 2011.

Low, K., et al., 'Fighting Drought with Innovation: Melbourne's response to the Millennium Drought in Southeast Australia', *WIREs Water*, 2015. Available at: http://water-pire.uci.edu/wp-content/uploads/2015/05/wat2-1087.pdf [accessed 23 December 2020]

Lu, X., et al. 'Textile wastewater reuse as an alternative water source for dyeing and finishing processes: A case study'. *Desalination*, Vol 258, 2010, pp 229-232.

Martinez, R., 'With melting glaciers and mining, Bolivia's water is running dangerously low', *PRI news*, 2017. Available at: https://www.pri.org/stories/2017-01-04/la-paz-short-water-bolivia-s-suffers-its-worst-drought-25-years [accessed 23 December 2020]

McDonald, R., et al., 'Water on an urban planet: Urbanization and the reach of urban water infrastructure', *Global Environmental Change,* Vol 27, 2014, pp 96-105.

McDonald, R., et al., 'Urban growth, climate change and freshwater availability', *Proceedings of the National Academy of Sciences of the United States of America (PNAS),* Vol 108, 15, 2011.

'Melbourne water supplies: Don't flush successful conservation strategy down the drain', *The Sydney Morning Herald*, 2014. Available at: https://www.smh.com.au/opinion/melbourne-water-supplies-dont-flush-successful-conservation-strategy-down-the-drain-20140202-31ux0.html [accessed 1 September 2019]

Miranda, V., 'The Water Crisis in La Paz: Changes and Water Rationing', *Temas Sociales,* 43, 2018. Available at: http://www.scielo.org.bo/pdf/rts/n43/n43_a05.pdf [accessed 23 December 2020]

Mitlin, D., et al., *Unaffordable and Undrinkable: Rethinking Urban Water Access in the Global South (Working Paper),* World Resources Institute, Washington, D.C., 2019. Available at: https://files.wri.org/s3fs-public/unaffordable-and-undrinkable_0.pdf

NITI Aayog (National Intuition for Transforming India), *Composite Water Management Index*, 2018.

Peiris, M., G. von Medeazza, and Z. AbuZuhry. *Seawater Desalination Transforming the Gaza Strip*, 2017. Available at: https://repository.lboro.ac.uk/articles/conference_contribution/Seawater_desalination_transforming_the_Gaza_Strip/9589283

Robins, S., ''Day Zero', Hydraulic Citizenship and the Defence of the Commons in Cape Town: A Case Study of the Politics of Water and its Infrastructures (2017–2018)', *Journal of Southern African Studies*, Vol 45, Issue 1, 2019.

'Several unauthorized colonies in New Delhi face water shortage', *Business Standard*. 12 June 2019. Available at: https://www.business-standard.com/article/news-ians/several-unauthorised-colonies-in-delhi-face-water-shortage-119061201502_1.html [accessed 1 September 2019]

UN DESA, *The World's Cities in 2018*. UN DESA, New York, 2018. Available at: https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

UNICEF, *Strategy for WASH (2016-2030*). Available at: https://www.unicef.org/wash/files/UNICEF_Strategy_for_WASH_2016_2030.PDF

UNICEF, *Water Scarcity Guidance Note: Programmatic Approaches*. UNICEF, New York, 2021. Available at http://uni.cf/PA2wsg

UNICEF, *UNICEF Guidance Note – How UNICEF Regional and Country Offices can Shift to Climate Resilient WASH Programming*. UNICEF, New York, 2020. Available (internal) at: https://unicef.sharepoint.com/sites/PD-WASH/Climate%20Resilience/Forms/AllFlat.aspx?id=%2Fsites%2FPD%2DWASH%2FClimate%20Resilience%2FClimateShiftPaper%2DLR%2Epdf&parent=%2Fsites%2FPD%2DWASH%2FClimate%20Resilience

UNICEF, Global annual results report 2019: Goal Area 4. UNICEF, New York, 2020. Available at: https://www.unicef.org/reports/global-annual-results-2019-goal-area-4

'Water Shortages in India', *Nasa Earth Observatory*, 28 June 2019. Available at: https://earthobservatory.nasa.gov/images/145242/water-shortages-in-india [accessed 1 September 2019]

Watts, G. and M. Anderson M (eds), *Water climate change impacts report card, 2016 edition*. 2016. Available at: https://nerc.ukri.org/research/partnerships/ride/lwec/report-cards/water/

WHO/UNICEF Joint Monitoring Programme, *Thematic Report on Safely Managed Drinking Water, 2017*. WHO, 2017a. Available at: https://data.unicef.org/resources/safely-managed-drinking-water/

WHO/UNICEF Joint Monitoring Programme, *Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG baselines*. WHO, 2017b. Available at: https://www.unicef.org/publications/files/Progress_on_Drinking_Water_Sanitation_and_Hygiene_2017.pdf

WHO/UNICEF Joint Monitoring Programme, *Progress on Household Drinking Water, Sanitation and Hygiene 2000-2017: Special Focus on Inequalities*. WHO, 2019. Available at: https://www.who.int/water_sanitation_health/publications/jmp-report-2019/en/

Winter, K '5 lessons learnt from Cape Town's water crisis', 2018. Umthombo, Issue 1, Available at: https://www.uct.ac.za/sites/default/files/image_tool/images/328/research/publications/Umthombo/UCT_Umthombo_2018-01.pdf [Accessed September 2019]

World Bank, 'Promoting Water Conservation in Colombia' in *World Development Report 2015: Mind, Society, and Behavior*. World Bank Group, Washington, D.C., 2015. Available at: http://pubdocs.worldbank.org/en/736401482349933418/Spotlight-5.pdf

World Bank, *Beyond Scarcity: Water Security in the Middle East and North Africa*. World Bank Group, Washington, D.C., 2018.

ACKNOWLEDGEMENTS

Special thanks to Gisela Kaiser, former Executive Director of Water & Waste, City of Cape Town for her time and provision of information describing responses to the Cape Town water crisis.

This document was researched and written by Leslie Morris-Iveson, Consultant with support from Fiona Ward, UNICEF WASH Specialist (Water & Environment) with oversight, guidance and management from Silvia Gaya, UNICEF Senior Advisor, Water & Environment. This paper has benefited from discussions and review by UNICEF WASH Programme Division (Bisi Agberemi and Jorge Alvarez-Sala); Regional Advisors (Evariste Kouassi Komlan; Chris Cormency, Therese Dooley, Sam Godfrey and Alban Nouvellon); Regional teams (Carmen Natalia Zarate Montalvo); partners (Virginia Newton-Lewis of WaterAid and Alejandro Jiménez of the Stockholm International Water Institute) and contributions from country offices (Ali Al-Khateeb of UNICEF Iraq country office and Lavuun Verstraete of Ethiopia country office for support on the country office examples).

Author
UNICEF, Water and Environment team,
WASH/Programme Division/ NYHQ

Layout and design
Giovanna Burinato

For further information, please contact:

Silvia Gaya
sgaya@unicef.org

Fiona Ward
fward@unicef.org

Jorge Alvarez-Sala
jalvarezsala@unicef.org

Bisi Agberemi
bagberemi@unicef.org

unicef
for every child