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The impact of water scarcity on children in the Middle East and North Africa

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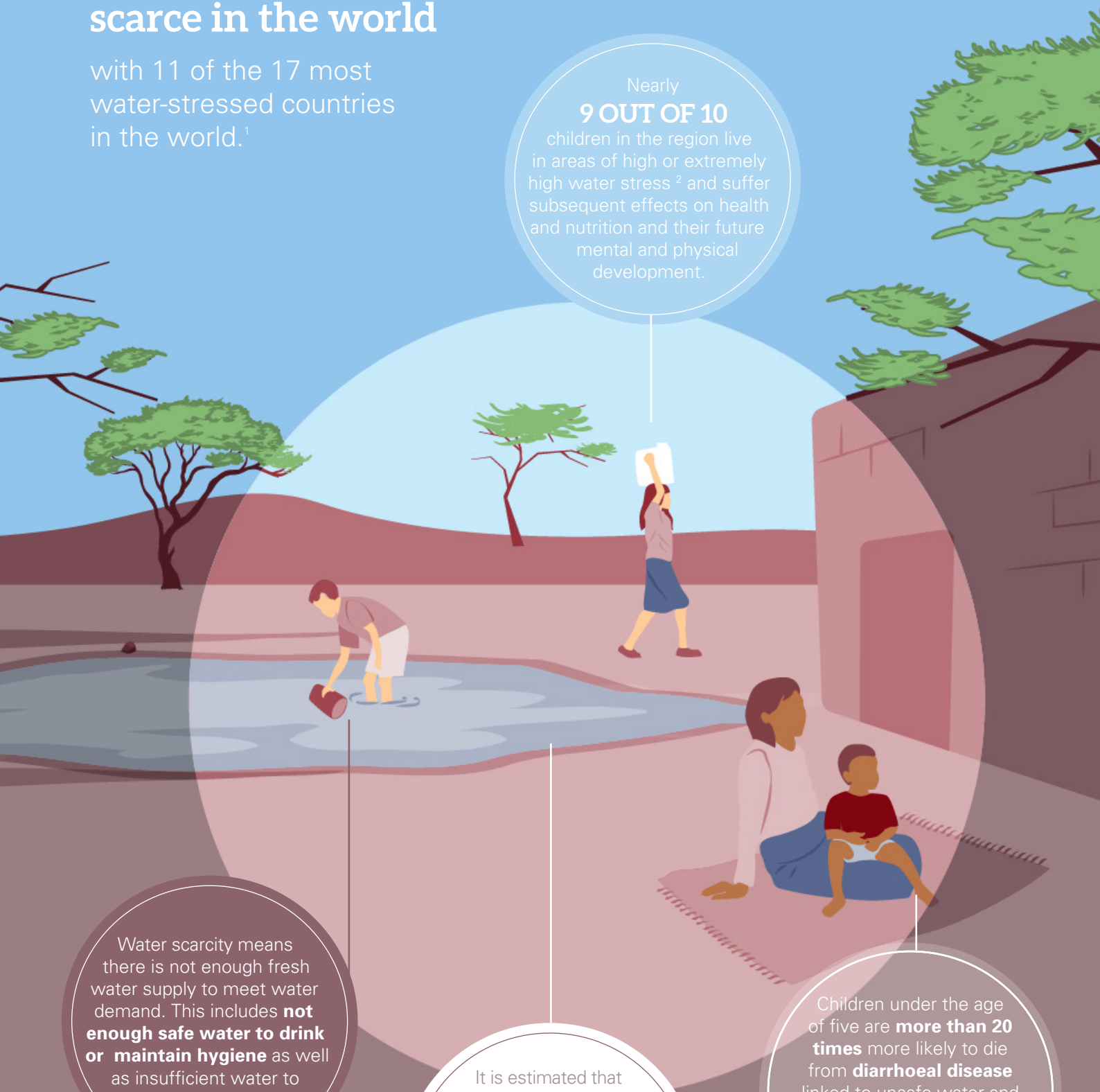
Summary: Unprecedented scarcity

01

The Middle East and North Africa (MENA) region is reported to be the most water scarce in the world

with 11 of the 17 most water-stressed countries in the world.[1]

Nearly **9 OUT OF 10** children in the region live in areas of high or extremely high water stress [2] and suffer subsequent effects on health and nutrition and their future mental and physical development.



Water scarcity means there is not enough fresh water supply to meet water demand. This includes **not enough safe water to drink or maintain hygiene** as well as insufficient water to irrigate for agriculture.

It is estimated that **more than 70 per cent** of the region's gross domestic product (GDP) is generated in areas with high to very high surface **water stress**, compared with a global average of just 22 per cent.[3]

Children under the age of five are **more than 20 times** more likely to die from **diarrhoeal disease** linked to unsafe water and sanitation than violence during protracted conflicts, UNICEF reported in Water Under Fire.[4]

The Middle East and North Africa (MENA) region has faced water challenges for hundreds of years but the scale of water scarcity is now unprecedented as is its impact on children, the poor, the marginalised and the most vulnerable communities.

Climate change, while not the sole cause for water scarcity, is having a significant impact on the already fragile situation, resulting in less rain for agriculture and the deterioration of the quality of fresh water reserves due to salt water intrusion and pollution. Other factors include increasing population and urbanisation as people leave rural areas, rising agricultural demand, and deteriorating infrastructure. This is compounded in many countries by limited water management due to conflict including wars and territorial disputes.

Despite the scarcity challenges in the region, water continues to be undervalued. Limited political appetite for reform, economic challenges, and poor regulatory frameworks have led to an artificially low cost of water. It has been reported[5] that the region simultaneously has the lowest water tariffs and the highest proportion of GDP spent on domestic subsides for water. Where water is undervalued, water conservation is inhibited and water is wasted.

Intense water scarcity is expected to displace large numbers of people globally by 2030. By 2050, desertification alone will threaten the livelihoods of nearly 1 billion people in approximately 100 countries.[6] "Hydro-politics" will shape the 21st century.[7]

This report looks at the main drivers of water scarcity and its profound impact on children, their families and their futures.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Drivers of water scarcity

02

Recent challenges like climate change, armed conflict, regional fragility and population growth have exacerbated a complex set of existing drivers that influence water scarcity.

AGRICULTURE, UNSUSTAINABLE CONSUMPTION, POOR GOVERNANCE AND SHORT-TERM INTERVENTIONS

Water requirements for food production are enormous. Growing one kilogram of wheat requires 1,250 litres of water.[8] Feeding a single cow to produce one kilogram of beef requires 15,000 litres of water.[9]

Water scarcity in MENA, as in other regions of the world, is largely driven by agricultural intensification and the expansion of irrigated lands where aquifers have been used for crop production. Globally, agriculture accounts for an average of 70 per cent of water use.[10] However, agriculture in MENA is responsible for more than 80 per cent of overall water use.[11]

During the 1970s in MENA, widespread installation of motorised pumps ushered in an era of groundwater over-exploitation to fuel agricultural production.[12] Increasing aquifer depletion has been exacerbated by inadequate governance arrangements, including weak water resource management policies and a lack of regulation.

Unsustainable emergency schemes are implemented as a response to water scarcity, often becoming the norm as water scarcity becomes chronic and long term. Water trucking is commonly undertaken by the local, unregulated private sector and is a common response in MENA, where stakeholders, utility companies and aid agencies step in to provide water supply service during droughts or conflict.

The high level of emergency programming in MENA has also normalised water trucking as a water supply method in camps and host communities. In Rukban, at the north-eastern border of Jordan with Syria, the cost to undertake water trucking to the camp was approximately $500,000 per month. When UNICEF installed a borehole, water treatment plant and water network, the cost of providing water was reduced by approximately 85 per cent, while increasing the volume of water supplied.

POPULATION GROWTH AND CLIMATE CHANGE

Population growth and its associated increase in food and energy demand are contributing to a surge in water demand. The MENA region has some of the highest rates of population growth in the world, with Lebanon and Jordan reported to be in the world's top five growing populations (impacted by the refugee influx).[13] Much of MENA's population growth, as in other regions of the world, is concentrated in cities. In regions surrounding urbanised areas, heavy pumping is reducing water levels in aquifers and dams that supply cities.

Climate change will likely result in an increase in water demand for irrigation due to reduced rainfall,

shorter rain-fed growing seasons and higher temperatures. MENA has the greatest expected economic losses from climate-related water scarcity, estimated at 6 -14 per cent of GDP.[14]

When water becomes so scarce that livelihoods are no longer viable, families migrate to urban areas, adding an additional burden onto already underserved communities. With climate change, it is expected that displacement will increase.

DETERIORATING INFRASTRUCTURE AND THE IMPACT OF ARMED CONFLICT

MENA has traditionally performed well in terms of progress towards targets for drinking water access, however, the WHO and UNICEF Joint Monitoring Programme highlighted that more than 41 million people lacked access to at least basic drinking water services.[15] [16] The data do not consider the impact of armed conflicts in Syria, Yemen, Libya and other countries, that dramatically affected access to drinking water services.

The region contends with reduced human and institutional capacity to manage, plan and invest in infrastructure, partly due to migration of skilled staff from conflict countries. This is associated with high rates of non-revenue water, which is predominantly comprised of leakage and unaccounted for water, with rates of 41-46 per cent reported in the Gaza strip[17] and up to 52 per cent in Jordan.[18]

Ongoing armed conflicts in the region are shifting patterns of water use, further straining limited water resources. The influx of refugees, especially from Syria, is the largest in recent history and has had an unprecedented impact especially in water-scarce locations, such as Egypt, Jordan and Lebanon. Utilities have been unable to provide an adequate supply of drinking water for host populations and displaced people.

DEPENDENCE ON TRANSBOUNDARY WATERS

Countries in MENA are highly dependent on the flow of transboundary waters, including lakes, rivers and groundwater, often shared by more than one country. Sixty per cent of surface water resources in MENA are generated outside the region with the region having three shared river systems.[19]

All countries in the region share at least one aquifer with a neighbouring country. Several countries, most notably Egypt, Syria and Iraq, depend upon relatively large quantities of surface water that originate from outside their boundaries. Some shared water resources have several dependent states. Ten different countries share the Nile River[20] and four countries share the Jordan River[21], both have been severely depleted by over-use and pollution.

The Tigris-Euphrates basin illustrates most of the challenges the region faces. The basin originates in Turkey but most of its length lies in Iraq with Iran, Syria, Saudi Arabia and Jordan all sharing the river basin. Drastic reductions in water flows in downstream countries have been experienced in recent years, primarily due to upstream dam construction and regional droughts.

Basra, the last location reached by the Tigris and Euphrates rivers after they meet in Shatt Al-Arab in southern Iraq, has experienced consistent reductions in water flow. This has led to an increase of highly salinated water flowing up from the Gulf, which was reported to be a key factor in the uprisings and political instability of 2018.

CASE STUDY: IRAQ (BASRA)

Climate change and drought coupled with reduced water flow from the Tigris and Euphrates rivers have allowed saline waters from the Persian Gulf to flow upstream, leading to severe water scarcity in Basra, south of Iraq.

In 2018, at least 118,000 people, half of them children, had to go to hospitals because of an outbreak of water-borne diseases that doctors related to poor water quality, including viruses (such as norovirus), parasites (giardia or cryptosporidium), bacteria (e. coli), and toxic metals from sewage and agricultural and industrial pollution.

Nadia was one of those infected from drinking contaminated water, along with five members of her family, including two of her five children.

> **I got water-borne disease and barely arrived at the hospital," she said. "All of us were affected by a skin disease, which looked like scabies. Myself, my son and my daughter suffered from severe diarrhoea as well as throwing up**

Nadia's family is one of thousands of families who have benefitted from UNICEF's support of the "R-Zero" water treatment plant, which was in urgent need of rehabilitation. "R-Zero" pumps fresh water to eight major water treatment projects, supplying clean drinking water to part of Basra city and became the only fresh water supply to Basra in 2018 when river salinity reached record highs. "We finally have safe water for domestic use," said Nadia.

The needs in the Basra governorate are immense. More than 300,000 residents in the city of Basra are not connected to the water and sewage network and there is a lack of public health awareness systems to inform people when a community's drinking water was contaminated and how to mitigate harm from it.

Livelihoods are also at risk. Agriculture is the main source of income for rural communities in Basra governorate, but crop production has been reduced substantially because of irrigation with saline water that damages soil and kills plants.

At the beginning of the 2018 health crisis, UNICEF responded to needs through focusing on recovery of water treatment in key facilities,

including “R-Zero”, through quick interventions installing new pumps, fixing others and replacing broken mechanical parts. UNICEF contracted water trucking to 159 schools to temporarily provide clean drinking water to more than 100,000 children in the most deprived communities of the Basra governorate.

In the medium-term, UNICEF is supporting Iraqi authorities with capacity-building, including through training staff in the water and sewage general directorates. Looking further ahead, UNICEF is working at the country-level to ensure infrastructure capacity through public and private co-operation.

In December 2020, the Netherlands Government committed $6.41 million to support UNICEF and the United Nations Development Programme to provide nearly 1 million residents in the Basra governorate with access to safe drinking water. The three-year project will focus on improving “R-Zero’s” power supply and automation. It will also reach 100 schools by installing solar powered, micro water desalination units in Abu Al Khasib and south Zubair districts.

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Impact on children and youth

03

The impact of water scarcity on children is the result of direct and indirect factors. Direct factors include insufficient amounts of safe drinking water. Indirect factors include water-related illnesses due to poor water quality and reduced access to nutritious food as well as the additional time and physical burden required to collect water.

CHILD SURVIVAL

Illnesses, typically diarrhoea, are common in communities lacking access to safe water and sanitation facilities. People who experience water shortages and variability in water supply are more likely to resort to unsafe sources, including ditches, ponds, open wells and unregulated water tankers. These sources are often contaminated with harmful bacteria and viruses. Regular bouts of diarrhoea in young children inhibit their absorption of key minerals and nutrients, irreversibly impeding their mental and physical development.

Around 66 million people in MENA lack basic sanitation services.[22] The proportion of wastewater which is adequately treated in the region is very low,[23] and much of the untreated sewage is contaminating already limited water resources, threatening children's health. More frequent cholera outbreaks are occurring, such as the widespread 2016 cholera epidemic in Yemen that affected more than 1 million people.[24]

In the Gaza Strip, in the State of Palestine, large amounts of pollutants including raw sewage and wastewater have contaminated scarce groundwater and led to widespread nitrate pollution. Water from the majority of wells in the Gaza Strip, used for domestic water purposes, contains much higher levels of nitrates than WHO-recommended limits for drinking.[25] A WHO study found that the incidence of methaemoglobinaemia, or blue baby syndrome, among infants in the Gaza Strip was caused by elevated concentration of nitrates in well water.[26]

Unsafe water and sanitation also causes malnutrition, making children even more vulnerable to disease. In parts of Yemen, acute malnutrition rates among children under the age of five were the highest ever recorded in late 2020.[27]

Poor sanitation is also one of the contributing factors in the transmission of polio[28] because infected faeces can spread through water. In 2013, a polio outbreak was reported in Syria which subsequently spread to Iraq,[29] the first time the disease was detected in the region for nearly 14 years.

Over-extraction of deep groundwater has led to skeletal fluorosis, which occurs when water with high concentrations of fluoride is consumed and can cause permanent disability in children. Water with high levels of fluoride is prevalent throughout MENA, including in rural areas of Iran[30] and Yemen.[31] High concentrations of arsenic,[32] nitrates,[33] radioactive elements, such as radium,[34] and salinity[35] are also present in deep groundwater and can have adverse impacts on children's health.

In Jordan, naturally occurring carcinogenic radium isotopes have been recorded in a deep "fossil" aquifer at concentrations of up to 2,000 per cent higher than international drinking-water standards.[36] Severe health implications can result from radium in drinking water because it accumulates in bone and tissue, increasing lifetime cancer risks. Children have less body mass than adults so any water-borne chemicals and toxins may be dangerous for a child at concentrations that are relatively harmless for an adult.

MIGRATION, DISPLACEMENT AND PROTECTION

Although conflict is currently the primary cause of displacement in MENA, there are indications that water scarcity will become the primary driver forcing the displacement of people. Water scarcity is already linked to displacement in the southern region of Iraq, driving 630 families to become displaced in 2018,[37] The Iraqi environment ministry expects four million displaced people over the next eight years because of the water crisis, exceeding the number of people internally displaced due to security developments.[38]

"At first we had to collected water using jerrycans and buckets. We used to do the dishes and laundry on the ground because there was no water connection. But now since they connected us, we use the sink and it's much cleaner. And it's much easier!" Sidra, 16, Za'atari Refugee Camp

CASE STUDY: JORDAN

Jordan is one of the most water-scarce countries in the world. Climate change has brought less rain and more drought, making it more urgent than ever to protect water sources and limit water wastage.

Pressure on available water sources has been further amplified by the arrival of refugees from neighbouring conflicts including in Palestine, Iraq and most recently Syria. It is estimated that Jordan hosts 1.3 million Syrian refugees. One such refugee site, Zaatari camp, hosts nearly 80,000 people, including 45,000 children, making it the fourth-largest urban area in Jordan since the camp opened in 2012.

For years, the camp was dependent on water trucking, with as many as 65 trucks arriving each day. Water supplies were fed by boreholes that raised the risk of over-exploitation of groundwater aquifers.

“We used to go and fill up our buckets with water from the public taps and sometimes the trucks. When the trucks came and we went to get water, it would get really crowded,” said Amina who lives in the camp. “As a housewife, I use water for the toilet, baths, dishwashing, cleaning, laundry and for everything really. Because water is life!”

Thanks to a close partnership between UNICEF and the Jordanian Ministry of Water and Irrigation, Zaatari camp now has a water and sanitation network with every household having access to water, a storage tank, and a toilet connected to the wastewater system. Water is pumped from deep boreholes which are monitored closely to limit over-abstraction.

The wastewater system safely collects and treats the wastewater, limiting the risk of contamination of the underlying aquifer, and has eliminated thousands of cesspits and standing pools of wastewater that can increase the spread of disease. The treated effluent from the wastewater treatment system is also used by agricultural users, reducing further the impact of the camp on limited regional water resources.

“We used to go far over there, far away, where the water was, said Diaa, Amina’s grandson. We had jerry cans and buckets and would go to fill them up. We would either bring them in a wheelbarrow or carry them home. It would take us an hour to bring the water all the way home. But now we have no worries. We sit in our homes and have access to water anytime.”

The implementation of the water and wastewater networks were completed over a seven-year period through a process of incremental improvement, with a total investment of over $55 million generously supported by Germany as well as Canada, UK and US. The network has reduced operating costs for the camp by about 66 per cent and allowed 3 million litres of water to flow daily, providing a minimum allocation of 35 litres of safe drinking water each day for each person living in the camp.

FRAGILITY AND ARMED CONFLICT

Water scarcity and its related challenges are key drivers of conflict situations. In Syria, a multi-year drought has been identified as one of the driving factors leading to deteriorating social structures[39] and unrest, which then expanded into a full-fledged war. Political instability and conflicts are rarely caused by a single factor, however, water scarcity can be a contributing factor.

During conflict, water infrastructure can sometimes come under attack, undermining the capacity of utilities to supply water while also limiting access to fuel, water treatment chemicals and staff to operate the systems.[40]

Ongoing protests in Iraq and Iran[41] are examples of how water crises can lead to tensions and violent unrest. In Sudan, disputes over scarce water resources and grazing land continues to be a trigger for conflicts, especially in Darfur, and a lack of access to water remains one of the main drivers of the ongoing conflict.[42] In arid areas, access to land and water are critical for the livelihoods of marginalised groups. The allocation and management of water are the foundations for either conflict or cooperation.

Before a malnourished child is given plumpy nut paste, a health worker assists a woman to wash her child's hands.

CASE STUDY: SUDAN

People living in the village of Asalaya in a remote part of East Darfur state in Sudan had to walk long distances to collect water. People often had to use water sources that were shared with animals, which led to multiple health problems including diarrhoea and intestinal worms.

We had to walk very far, two kilometres on the other side of the village, a long distance to get water from unsafe sources such as stagnating pools, said Amina, a resident of Asalaya.

The one available borehole pumping safe water was out of service, needing rehabilitation and maintenance.

The water crisis in Asalaya is not unique to Sudan which faces increased desertification exacerbated by climate change and intense farming that reduces arable soil. Most farms are fed by rainwater and provide about 80 per cent of livelihoods in Sudan. Changing rain patterns have forced many Sudanese to relocate because of poor agricultural production.

The need to collect water meant that children's school attendance and performance were under pressure, said Ahmed, a head teacher in Asalaya.

The school has 350 students. Children walk two kilometres one way every day to get water into their five-litre cans," he said. "The students are not settled for their classes because of the water challenge. The ten teachers and their families are not comfortable staying at school because of water problems."

The poor quality of water and open defecation expose children to water-borne diseases, like cholera. Over 11 per cent of child deaths in Sudan are caused by diarrhoea, attributed mainly to poor sanitation, water and hygiene. Two million children in Sudan suffer from acute malnutrition, 50 per cent of which is associated with repeated diarrhoea or worm infections.

Most of Sudan's currently accessible underground water is shared with surrounding countries. Sudan uses part of the Nile River Basin for irrigation and energy production but there is often tension with neighbouring countries.

In 2019, UNICEF rehabilitated the water system in Asalaya, encouraged ownership of water points, trained water-use committees on management and maintenance of water points, and delivered key hygiene messaging.

Life is much better now that I have clean water near my house, said Rukiya, a mother of five in Asalaya. I don't walk all day in the heat to find water. In less than 40 minutes' walk [there and back], I fill my water jerry can by turning a tap at the borehole. The water project has saved every woman in this village a lot of hardship and time.

Villagers have more time to work in the fields and spend less time carrying water while diarrhoeal and other diseases have decreased dramatically. Children are able to prioritise their education instead of spending time hauling water.

My children, and even myself, used to fall sick because of dirty water," said Rukiya. "Now we don't run to the hospital complaining of diarrhoea anymore. With clean water, we enjoy good health.

HEALTHY DEVELOPMENT

Children live with the impact of water scarcity for their entire lives. For example, severe droughts have been linked to stunting. A recent study by the World bank[43] based on data from rural Africa showed that girls born during severe drought grow up to be physically shorter because nutritious food was less available.

Arid, low-income countries with issues with governance and political instability, as experienced in several MENA countries, have been identified as areas where drought could have the largest impact on child stunting.[44] The consequences of water shocks can ripple through generations, harming not only the women who experience them but also their children.

Access to education is also affected. When water scarcity leads to the drying up of traditional water sources, children are often forced to collect water from alternative sources at longer distances. This reduces the opportunities for children to attend school. Lack of water in schools for hygiene is especially impacting girls' attendance, particularly during menstruation. When families are forced to migrate, education is often interrupted or halted.

LIVELIHOODS

The link between water scarcity, economic growth and job creation was the topic of the 2016 United Nations World Water Development Report (WWDR).[45] According to the report, 78 per cent of jobs worldwide are highly dependant on water.

The 2050 climate scenario for the MENA region forecasts the greatest expected economic losses from climate-related water scarcity, estimated at 6 to 14 per cent of GDP.[46] More than 70 per cent of MENA's GDP is water-related, making it extremely vulnerable to variations in the quantity, quality and cost of water.

The economic pressure that vulnerable families experience due to water scarcity is illustrated by research conducted in Yemen in 2013, prior to the current conflict. The research demonstrates that during drought periods, families had to employ a set of intricate and time-consuming measures to meet household water needs.[47]

When money is available, families pay inflated rates for reduced quantities of water from private water tankers but when money is short, families are forced to sell assets (including livestock) and arrange for migration of family members to search for work abroad. Women and children devote increased time and effort to meet household water needs, such as searching for water from irrigation boreholes that are far away and often unsafe, or are forced to borrow and barter small amounts of water throughout the day.


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Recommendations

04

Water scarcity is a critical threat across the whole MENA region and must be addressed alongside other regional issues including conflict, inequality and governance.

UNICEF is committed to continue supporting governments, the civil society and the private sector to address the vulnerability of water resources. We recommend the following actions:

1. Preserve the individual's human right to access water and sanitation services, without it being compromised by other water uses (such as using water for industry and agriculture), and to protect water infrastructure from targeting in conflict settings.

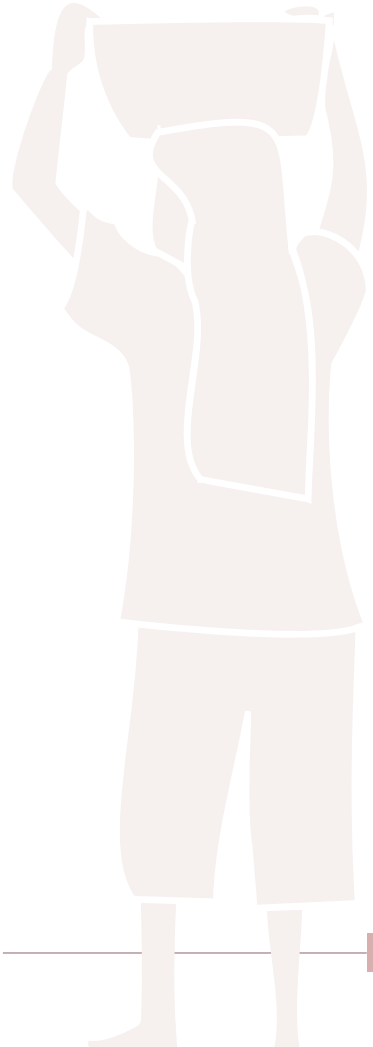
2. Create strong national policy and regulatory systems that address scarcity, including overextraction of groundwater, water accounting, data analysis and review of current water regulatory frameworks, including equitable tariff structures.

3. Create inter-ministerial water scarcity coordination groups with key sectoral actors, including ministries of water, agriculture, energy and finance and representation from the private sector, to support policy revisions, increased technical capacity and the development of sustainable water management plans.

4. Engage civil society and local communities, especially with youth as agents of change, on the value of water and water conservation as well as the urgency of the water scarcity crisis.

5. Include water scarcity as a priority component in climate change response plans, including National Adaptation Plans and Nationally Determined Contributions, and allocate sufficient national budget to address water scarcity.

6. Support capacity building of key sector actors, including regulatory bodies, private sector operators, and national water utilities among others. Support water utilities and operators to develop sustainable operation and maintenance plans and capital investment strategies that continuously upgrade ageing infrastructure to improve efficiencies and reduce wastage.



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United Nations Children's Fund (UNICEF)
Regional Office for the Middle East and North Africa

15 Abdel Qader Al-Abed Street | P. O. Box 1551 | Amman 11821 Jordan | Tel: +962-550-2400
www.unicef.org/mena | menaro_Info@unicef.org