bsi.

Thirst for change:

securing a water positive future

August 2023

By Royal Charter

waterwise

Contents

Foreword

Martin Townsend
Director for BSI Centre of Excellence for Sustainability

Water is one of our most precious and undervalued resources. We need it to maintain good health and a biodiverse environment, to grow food and across every industry. Access to clean water is at the forefront of building a more equitable society, which is why the UN included this in the Sustainable Development Goals.

However, recent events have challenged the perception that drought and flooding are rare. As the climate crisis intensifies, communities are increasingly facing challenges arising from too little and too much water. Effective management of water has never been so important.

In some countries, water conservation is a key priority. But globally we do not always recognize this to the same degree as other environmental issues such as emissions reduction, where we have seen a willingness to partner and innovate. In fact, the two are intrinsically linked - water provision and use contribute around 10% to global carbon emissions[1].

This research aims to support a move from ambition to action on water stewardship. The good news is that the world is aware of the benefits of managing water better. In BSI's research[2], we found that two-thirds of consumers and 80% of small business leaders identified clean water and sanitation as part of the important debate on a sustainable future, while half of the former placed it in the top five issues to focus global resource and effort on.

With a growing, increasingly urban global population, we are placing greater demands on resources. Yet we have a finite amount of water to draw on. We have seen that drought and flooding often come at an enormous societal cost. Learning to manage water differently and applying strategies to move towards a water-positive future can benefit us all.

There are both supply and demand side considerations. Water usage has specific drivers for commercial and domestic purposes. We drink water to stay alive but choose to use it as consumers. Likewise, distinct actions can be taken in response, led by utility companies. This can include everything from Sustainable Urban Drainage Systems to water efficiency labelling and, more broadly, embedding a water-saving culture. Standardization and global collaboration can also play a role.

We are grateful to Waterwise for their collaboration to help to draw attention to a fundamental global challenge. By collaborating to address water security, we can accelerate progress towards a water secure future and a sustainable world.

Foreword from Waterwise

Nicci Russell
CEO, Waterwise

Water is fundamental to life. We need it to grow the food we eat, the coffee we drink and the cotton T-shirt we may wear. We need it to hydrate us and for our bodies to be healthy. It improves our quality of life and connects us to nature. It is therefore no surprise that civilizations are built around water. It deserves to be valued and used wisely.

Yet we face huge challenges across the globe in ensuring water is available for people, business and the environment. The United Nations reports that a quarter of the world's population already live in countries under water stress and over three and half billion people have inadequate access to water for at least one month per year. These shocking figures are predicted to get much worse and it is increasingly clear that we can't go on as we have been. It is just not sustainable.

A key part of the solution is making sure that we use the water that we do have wisely in our homes and workplaces; avoiding water wastage. By doing this we can help ensure that we adapt to the impacts of the climate emergency; reach net zero emissions; secure water supplies for people and businesses and protect and improve the environment. Our Vision at Waterwise is for water to be used wisely every day, everywhere, by everyone and we are delighted to have worked with BSI on this important project.

Introduction

It could be easy to believe the only barrier to securing a sustainable future is carbon reduction, given the prominence of the issue and the weight of the challenge.
But in fact there are numerous other stresses and strains placed on the environment and society, all of which present an opportunity for us to adapt and respond to them.

Carbon emissions reduction had a starting point and, although we still have a long way to go for all organizations and countries to become net zero, progress has been and continues to be made. This did not happen overnight, and we can learn from it when we identify and address other concerning trends.

Water is one of earth's most fundamental and precious resources and the importance of conserving it is real.

Currently, while water availability may have been a focus for a long time in regions like the western US or in certain countries, the global conversation about water security appears to be sitting where carbon emissions was more than two decades ago. That's when organizations began thinking seriously about their role and how they might have been contributing to the acceleration of climate change.

Water stewardship is gaining more attention, with investors and business leaders giving it more focus[3] as it becomes apparent how shortages affect our daily lives as individual consumers, organizations and society as a whole. This is not about moving away from the journey to net zero. In fact, these opportunities are interlinked – carbon emissions and water use impact each other and it is vital that we adapt and respond to them both.

BSI partnered with Waterwise to collate credible, referenced and traceable data related to water availability, water use and water efficiency/wastage from a number of countries. The resulting report covers the UK, US, Japan, China, Australia, France and Germany, noting that these are high water consuming countries, while also looking at the role of specific sectors, including retail, healthcare and the built environment. Where possible the information gathered is comparable between countries. In addition, we have created the BSI Water Security Indicator – a tool created in partnership with Waterwise which is a new high level indicator of how we are using water at a country scale. The Indicator considers seven factors including availability, use, risk and wastage to derive an overall score for each country.

It is important to note that water availability is a serious challenge around the world, not least in the Middle East and North Africa. Access to water in low-income countries, many of which are already heavily impacted by climate change, is a key challenge with geo-political ramifications. This report does not focus on addressing the specific challenges facing these countries but recognizes that addressing water security will need global solutions and collaboration across every country.

Executive summary

Water is one of earth's most fundamental and precious resources and the importance of conserving it is critical. BSI partnered with Waterwise to obtain and collate credible, referenced and traceable data, covering the UK, US, Japan, China, Australia, France and Germany.

A Global Challenge

Whilst water is abundant on Earth, only between 1-3% is freshwater, of which approximately 0.5% is considered accessible[4]. Water use has increased eightfold in the last century and is expected to grow through to 2050, driven by a combination of rising population, socio-economic development and changing consumption patterns[5].

Although definitions of water stress vary, increasing demand for water is putting available resources under greater and greater pressure.

The Blue Thread

Using the water we have efficiently, together with minimising wastage, can:

- Make us more resilient to climate change and drought
- Meet the rapidly increasing demands of a growing, more urban population
- Support economic growth, as water is essential for the production of raw materials, for agriculture and industry and for worker welfare
- Bring biodiversity gains
- Help ensure equity and affordability

Broader Insights and Trends

Leakage – Leakage from water supply networks and other sources is a significant issue both in terms of lost revenue and wasted resources.

Good design – This is critical for any water saving measure, as the examples of dual flush toilets and water-efficient showers demonstrate.

Smart water metering – The data from this could be an opportunity to reduce leakage and water consumption and a way for governments to drive change on a societal level.

Inefficient products and water efficiency labelling – Unlike with energy, in most countries it is challenging for domestic and business customers to make informed choices. Improved water labelling could be a key tool to reduce water use.

Embracing circularity – Reusing water provides a huge opportunity. This includes rainwater harvesting (RWH) systems, as part of a Sustainable Urban Drainage System (SUDS). Another potential technical solution is the use of desalination to remove salts from seawater.

Water neutrality and water positivity are emerging approaches – The former essentially means that the additional water demand on the environment arising from an activity is zero. Some organizations are going further and looking to use the approach to deliver a net gain to the environment – known as "water positive".

Conclusions

It is not sustainable for demand for water to continue to rise without action to ensure we are using it wisely[6]. Doing so can bring important benefits, including:

- Making us more resilient to climate change and to drought
- Reducing carbon emissions
- Meeting the needs of a growing, more urban population
- Supporting economic growth
- Protecting precious habitats and species
- Enabling equitable global access

Recommendations

01 Recognize water wastage as a serious challenge

Visible and meaningful effort by water utilities around the world to reduce network leakage, driven by government action to incentivize change, can have a direct impact and persuade individuals and organizations to acknowledge their own role and act to reduce wastage at homes and in workplaces.

02 Ensure it is easy to choose water saving products

If more countries facing water stress embrace mandatory water efficiency labelling, this could be helpful in accelerating progress towards a sustainable world.

03 Get smart when it comes to saving water

Embrace innovation and make better use of data. Smart water meters have the potential to be a game changer – through steps such as legislation, regulation, use of standards, enhanced funding and upskilling workforce capability, governments can facilitate progress so that water saving becomes the norm.

04 Encourage a water saving culture

We can effect change if we step up efforts to prioritize addressing water availability challenges and encourage a positive water saving culture amongst individuals, organizations and society, at home and in the workplace, and across different sectors.

05 Close the loop

Applying a circular economy mindset to the water security challenge can help tackle some of the key drivers of the issue. Reusing water provides a huge opportunity to reduce freshwater withdrawals/abstraction and to address rising water demand.

06 Collaboration is king

Water is the blue thread that connects our world. Collaborative effort across a wide range of players can help us address the growing challenges around water availability.

A global challenge

Fresh water – a finite resource

Whilst water is abundant on Earth, only between 1-3% is freshwater, of which approximately 0.5% is considered accessible[7, 8].

Water covers about 71% of the earth's surface, with 97% found in the ocean (too salty for drinking, growing crops and most industrial uses except cooling)[9]. The remaining 3% is freshwater, however 84% is unavailable: locked in glaciers, polar ice caps, the atmosphere and soil; highly polluted; or too far under the earth's surface to be extracted affordably or without environmental or safety implications.

Water scarcity is not a new concept and good water management practices have been in place for centuries in countries where water has been treated as a precious resource. Examples include the rainwater harvesting systems of the Indus Valley civilizations[10]; the urban water supply and sanitation systems of the Minoans in Crete[11] and the Roman aqueducts[12]. Yet, we are using more and more water – meaning its salience as an issue is growing.

Water use has increased eightfold in the last century, with global demand rising at around 1% per year over the last 40, and is expected to grow at a similar rate through to 2050, driven by a combination of rising population, socio-economic development and changing consumption patterns[13].

In fact water use has increased globally over the last century from around 500 billion m^3 per year to around 4000 billion m^3 per year[14] today.

Figure 1 shows the variation in the water abstracted per person (abstraction is the process of taking or extracting water from a natural source), with much of the variation down to the volume of water being abstracted and used in agriculture. The two countries with the highest per capita consumption also have the highest per capita withdrawals.

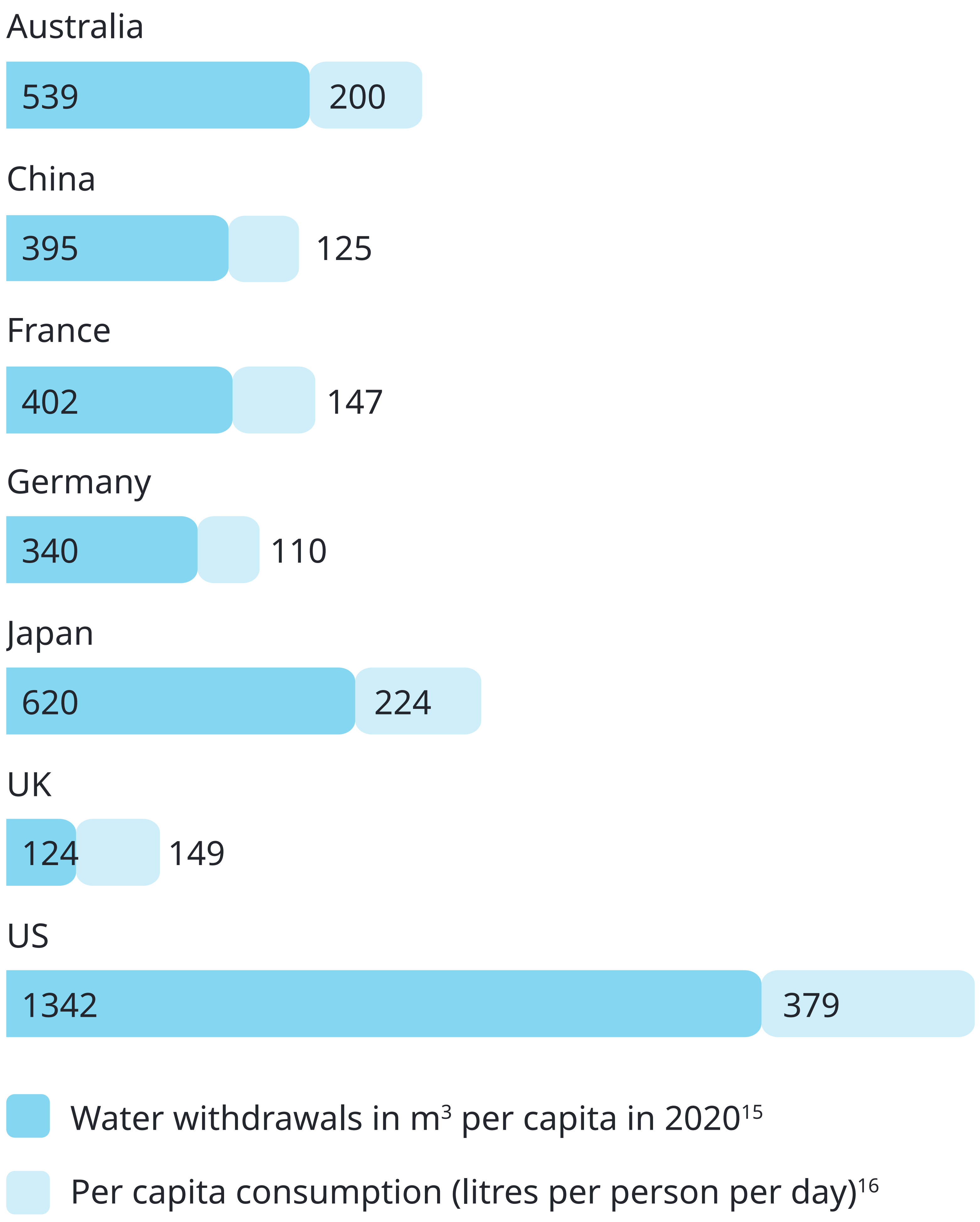


Figure 1

The growth in global water use since 1900 has largely been driven by population growth and, over the first five or six decades, was mainly for agricultural purposes.

Industrial use and use for municipal/public water supplies have become more significant since the 1960s[17].

As an example, in the UK personal water use rose from around 85 litres per person per day in the 1960s to around 150 in 2000 before policy interventions reversed the trend (although population growth has still pushed up overall water demand)[18].

Figure 2 sets out global water withdrawal or abstraction ratios[19], while the UN data contained in Figure 3 and Figure 4[20] shows how these ratios can vary by country.

Global water withdrawal or abstraction ratios

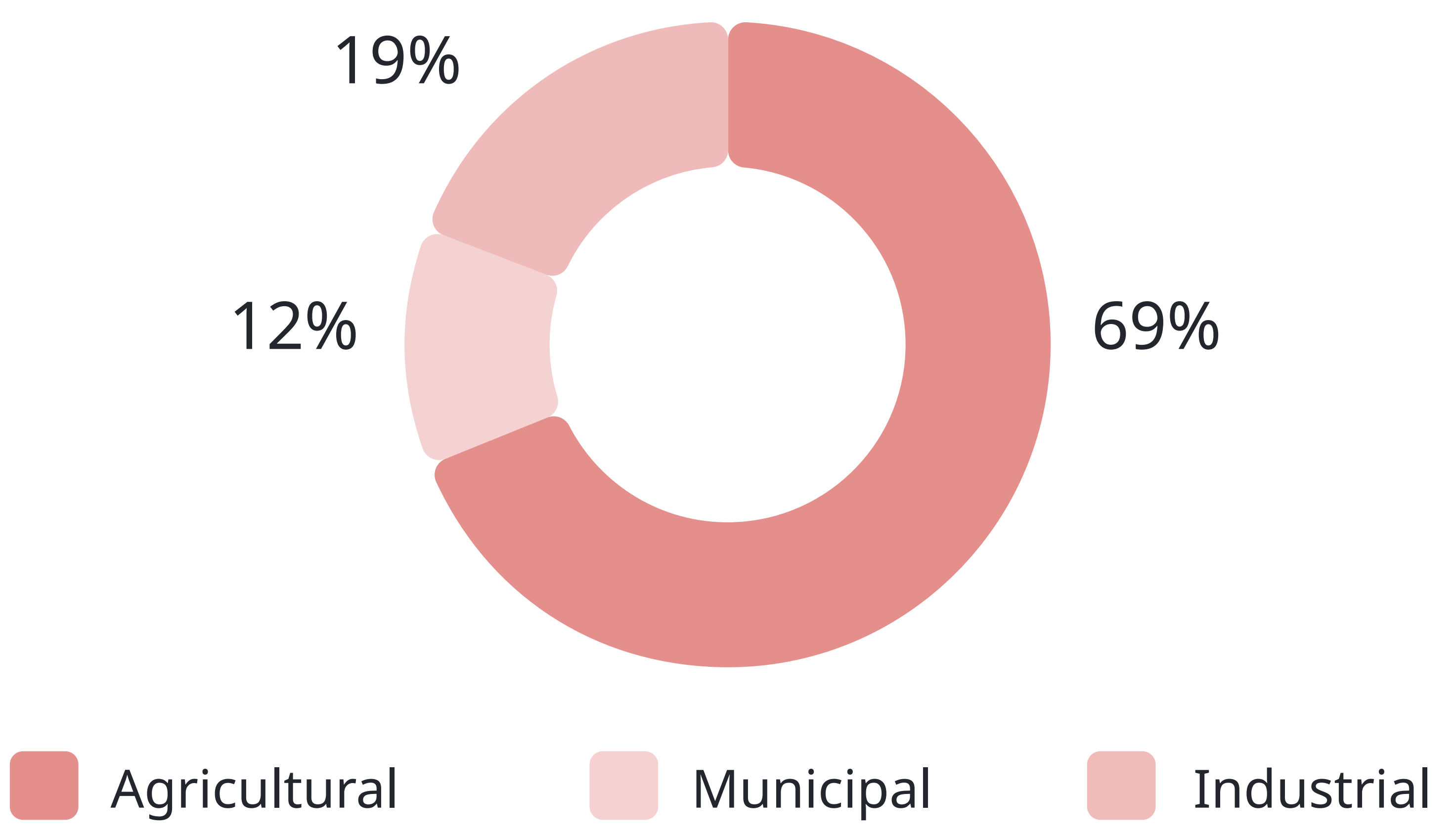


Figure 2

Withdrawal/abstraction in billion m^3 per annum in 2019[21]

	Industrial water	Municipal water	Agricultural water	Total water
Australia	2.73	3.50	8.70	**14.93**
China	133.50	79.40	385.20	**598.10**
France	18.54	5.31	2.98	**26.83**
Germany	17.68	10.39	0.40	**28.47**
Japan	10.60	15.00	53.50	**79.10**
UK	1.01	6.22	1.18	**8.41**
US	209.70	58.36	176.20	**444.26**

Figure 3

Proportion of overall withdrawals/abstraction by sector in 2019[22]

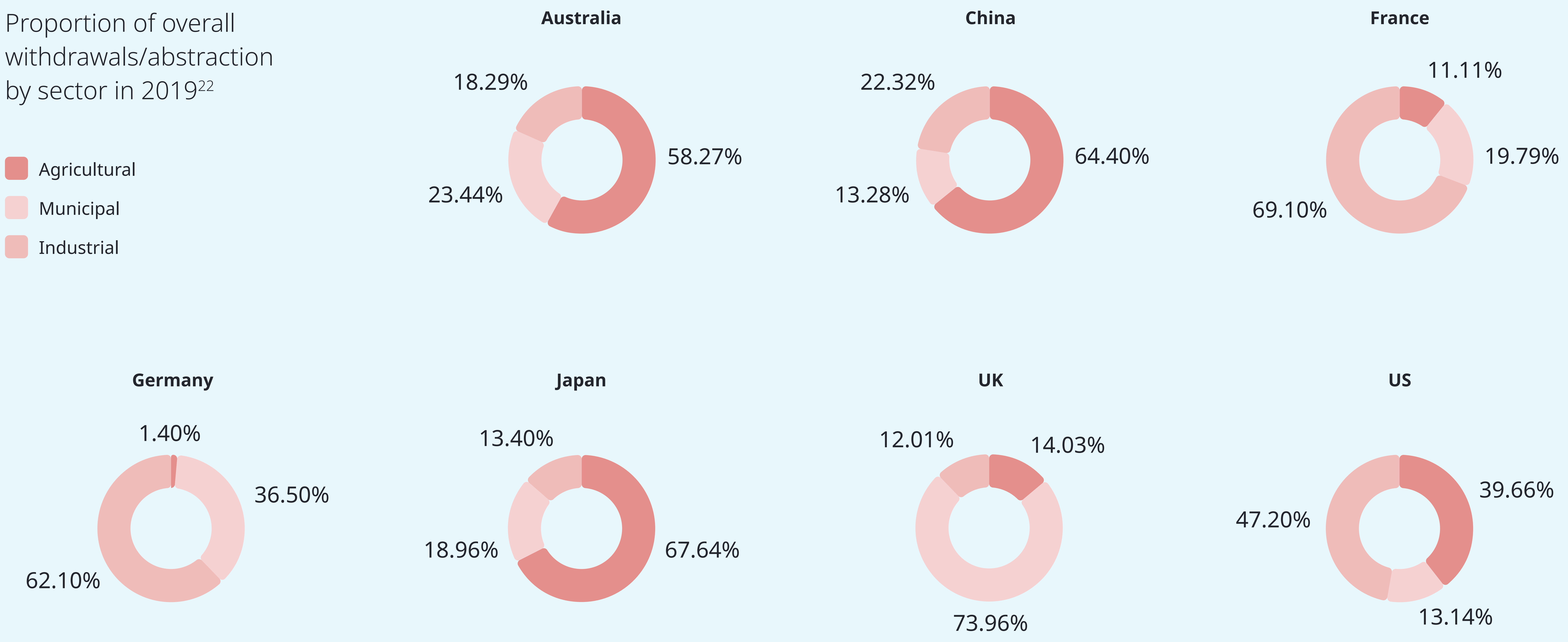


Figure 4

Despite being the most visible use of freshwater, municipal demands for most countries are small relative to agriculture and industry, while most countries withdraw less than 30% for domestic purposes. The UK is an outlier with around 74% used in public water supplies (up from 58% in 2002).

As highlighted on page 10 and 11 (Figures 2, 3 and 4), globally approximately 69% of freshwater withdrawals are for agriculture, with the average for low-income countries significantly higher at 90%; 79% for middle income and 41% for high income countries. China is the world's second largest agricultural water user after India, at approximately 385 billion m^3 in 2015, although this has plateaued in the recent past[23].

While there have been shifts in how we use freshwater, and while different countries have different usage profiles, water is the basis for all activity, whether industry or agriculture. With the availability of freshwater fixed, we may be unable to meet our societal needs if nothing changes.

Our demand for water continues to rise in the future

The global population is expected to reach 9.3 billion by 2050[24]. As populations grow and economies develop, water use is also predicted to continue to rise, with a further 20 to 30% increase in demand in that period. Water demand for all uses is projected to rise from about 4,600 km^3 per year to up to 6,000 km^3 per year[25].

Although definitions of water stress vary, increasing demand for water is putting available resources under greater and greater pressure, as Figure 5 shows.

We cannot simply increase the volume of freshwater. As demand increases, the volume available remains static or reduces due to deteriorating water quality[26]. Globally the amount of renewable freshwater per person has fallen by more than 50% since 1962 (Figure 6).

According to the UN, a country experiences 'water stress' when its annual water resources are below 1,700 m^3 per inhabitant.

1/4

Proportion of the world's population living in countries under water stress[27]

3.6 billion

People facing inadequate access to water at least one month per year: by 2050, that is expected to be more than 5 billion[28, 29]

5.7 billion

People expected to be living in water scarce areas at least one month per year by 2050 (already, just under half of the global population are in this situation)[30]

1/4

Cities globally that are already water stressed and experience perennial water shortages[31]

Figure 5

Renewable freshwater resources per capita (m^3)[32]

	1962	2018	Reduction
World	13,406.70	5,658.22	**57.80%**
Australia	45,801.53	19,693.64	**57.00%**
China	4,255.03	2,980.54	**29.95%**
France	4,174.94	2,181.75	**47.74%**
Germany	1,445.44	1,290.62	**10.71%**
Japan	4,529.51	3,398.30	**24.97%**
UK	2,723.00	2,005.26	**26.36%**
US	15,106.84	8,622.00	**42.93%**

Figure 6

The World Wide Fund for Nature (WWF) have developed a water risk score, as detailed in Figure 7. The score considers a number of variables[33], with any score over 2.6 considered to be medium risk. Both China and Australia are in that category, with China's risk rising significantly in the period covered[34].

Put simply, increasing demand is putting available water resources under ever greater pressure. Clear strategies to address water stress will be vital if we are to avoid more countries and regions experiencing water stress and the negative consequences by 2050.

WWF water scarcity risk score

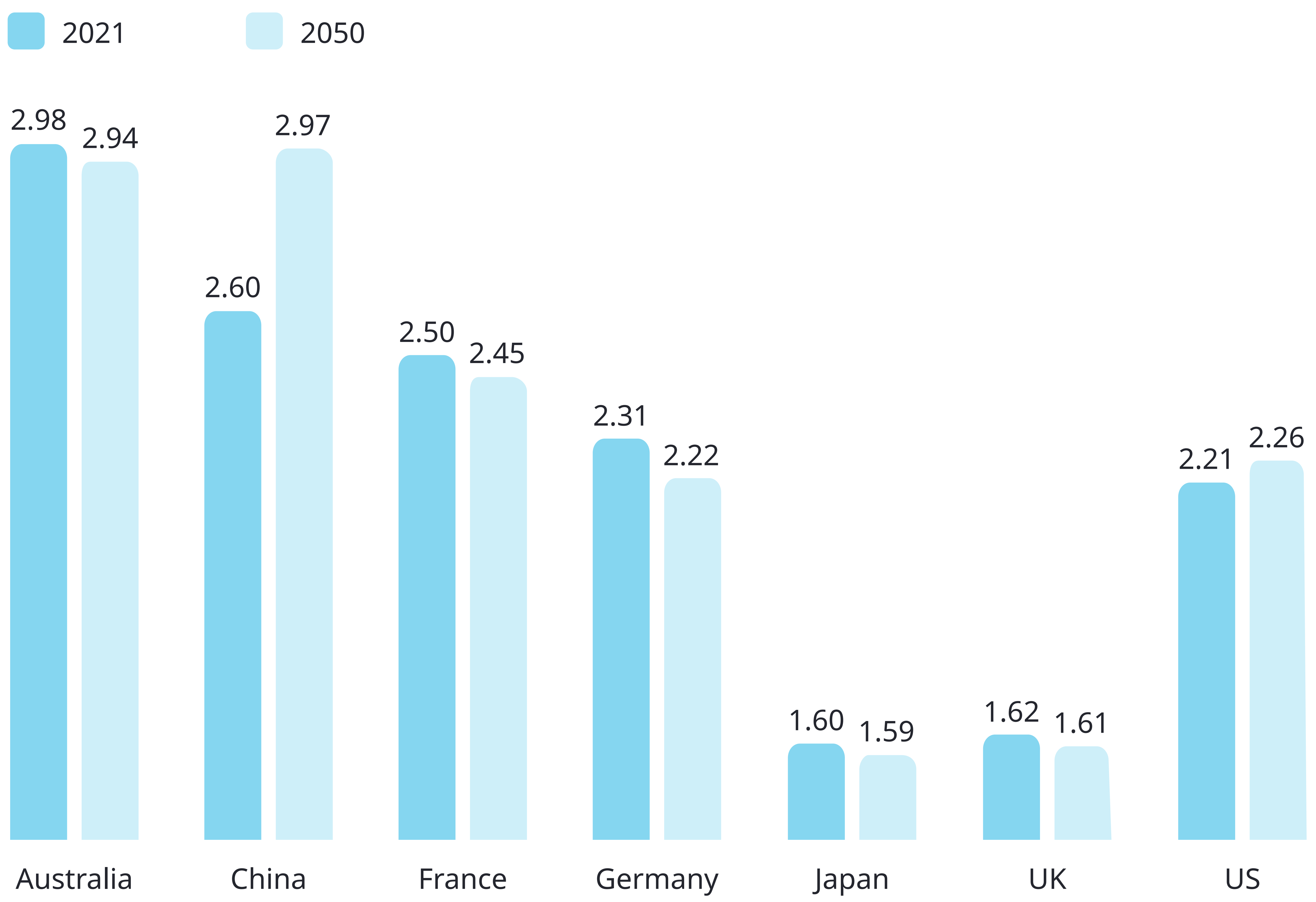


Figure 7

The blue thread – how using water wisely can accelerate progress towards a sustainable world

Adapting to a changing climate

Using the water we have efficiently, along with minimizing wastage, can help make the planet more resilient to climate change and drought.

Global warming, which is already seeing surface temperatures reaching 1°C above pre-industrial levels[35], is understood to be resulting in widespread, rapid changes in weather and climate in every region. Experts are clear that these pose a serious threat to the environment, society and global economy[36].

Drought is a significant and growing global challenge, as Figure 8 shows. Already, climate change is contributing to a greater frequency of droughts and water shortages as rainfall patterns change and temperatures rise. According to the UN, drought frequency and duration has increased by nearly a third since 2000. By 2050, it could affect more than three quarters of the world's population[37]. Today, an annual average of 15% of the land area and 17% of the EU's population is affected by drought[38]. Meanwhile, figures for July 2023 show that 26.87% of the US' lower 48 states (excludes Hawaii and Alaska) are in drought[39].

Limiting global warming to 1.5°C – the target set by the Paris Climate Agreement – could approximately halve the proportion of the world population expected to face water availability issues, albeit there is considerable variability between regions[40].

Figure 8

Contributing to net zero

As with any resource, every litre of water we use has a carbon footprint – estimates suggest the water sector contributes to around 10% of global carbon emissions[48]. Using water efficiently can offer the potential to reduce our Greenhouse Gas (GHG) emissions and help us reach net zero.

As of 2019, for example, annual GHG emissions from household water supply, water use and wastewater disposal in the UK were around 27 MtCO2e (Metric tons of carbon dioxide equivalent) and made up nearly 6% of the UK's total[49]. At a per capita water consumption of 138 litres per person per day, the total carbon emission per household due to water use in the UK can be calculated at around 1 tonne CO2e/property/year (based on per capita water consumption of 138 litres per person per day) – contributing a significant amount to overall carbon emissions[50].

Water consumption and energy are strongly linked. Abstracting, pumping, treating and heating water, and pumping and treating wastewater consumes energy and releases GHG emissions such as CO2[51]. If consumption is reduced, especially hot water, then less energy is used, emissions are reduced and we can accelerate progress towards net zero.

The way water is used means even modest reductions in water consumption offer the potential to deliver significant savings in greenhouse gas emissions. For example, a modest 5-6% reduction in UK domestic water consumption could save around 1.33 MtCO2e per year[52].

More than 80 water utilities globally have now pledged to reach net zero for their operational emissions including Melbourne Water and SA Water in Australia (by 2030)[53, 54] and Sydney Water (by 2040)[55]. The Metropolitan Water District of Southern California, which supplies 19 million people, has pledged to reach net zero by 2045, whilst China's Beijing Drainage Group has set a date of 2050[56].

However, although these water industry commitments are laudable, the larger proportion of emissions comes from how water is used rather than the way it reaches customers. Reducing hot water use, for example, through more efficient taps and showers has the potential to be a rapid, low-cost step.

This could extend to the water we drink, as Figure 9 shows. For total sales, the Asia-Pacific region represents the largest regional market, followed by North America and Europe.

Evidently drought is not a thing of the past, but is a rising challenge. Like any resource, the water we use has a carbon footprint, so steps to better manage water consumption – for example through reducing hot water use – have the potential to offer rapid, low-cost ways to also reduce carbon emissions.

900 times higher

Carbon intensity of bottled water compared to tap water per litre[57] (and that does not cover the emissions from the bottles)

73%

Growth of bottled water market from the decade to 2020, according to recent UN research[58]

460 billion

Projected litres of bottled water that will be sold by 2030, up from 350 billion litres in 2021

504 litres

Sales per capita of bottled water in Australia (one of the two leading consuming countries) – accounting for US$386 per capita in 2021.

Figure 9

Supplying a growing, more urban, population

Global population growth driving water availability challenges.

Crucially, Figure 10 shows that growth is not expected to be even across or within countries, with rises projected for the US and Australia but expected declines in Japan, China, France and Germany.

Rises are expected to be concentrated in urban areas, a trend that, as Figure 10 demonstrates, is already significant.

Using water efficiently can help ensure that we have enough to meet the rapidly increasing demands of a growing, more urban population. By 2050, nearly half of the world's large cities (population >1 million) are projected to be located in water-scarce regions, with the growth in urban populations and their associated water demand the main factor contributing to the increase in urban water availability challenges[59].

	Population size[60]			Population density (people per km^2)[61]	% living in urban areas[62]
	2000	2021	2050	2021	2021
World	6.1 billion	7.9 billion	9.4 billion	61	56%
Australia	18,903,000	25,796,000	30,289,000	3	86%
China	1.2 billion	1.4 billion	1.2 billion	149	60%
France	58,495,000	64,502,000	61,934,000	117	81%
Germany	81,562,000	83,390,000	74,031,000	239	77%
Japan	126,665,000	124,947,000	97,139,000	331	92%
UK	58,735,000	67,168,000	67,006,000	277	84%
US	280,817,000	336,496,000	350,461,000	37	83%

Figure 10

Using water efficiently can help ensure that we have enough to meet the rapidly increasing demands of a growing, more urban population.

0.8 to 4.4 billion

Increase in global population living in cities between 1950 and 2020 (a rise from 29.6% to 56.2% of the total)

6.7 billion

Projected global population living in cities by 2050[64], accounting for 68.4% of the total

2.373 billion

Global urban population projected to be facing water scarcity in 2050[63], up from 933 million in 2016

9 out of 30

Megacities[65] located in perennially water scarce regions, including Los Angeles and Beijing. Tianjin (China) and New York are seasonally water scarce[66]

Figure 11

Enabling economic growth

Economic growth relies on water being available, as it is essential for the production of many raw materials, for agricultural and industrial processes and for worker welfare.

For most organizations, water availability is critical for growth, as the figures from a survey of corporates carried out by CDP show (see Figure 12).

63%
Reported that having sufficient good quality freshwater available was 'vital' or 'important' for their direct operations[67]

Only 14%
Were encouraging or incentivizing innovation in their supply chains to reduce water impacts in products and services

Only 63%
Of global corporations undertook a water-related risk assessment[68]

Figure 12

Efficient water use – a UN Sustainable Development Goal (SDG) – would leave more water available to enable growth and add more economic value. In a sign of positive progress, Figure 13 shows that globally, water use efficiency rose by 9% from 2015 to 2018 (from 17.3 to 18.9 US$/m³).

Progress was greatest in the industrial sector (15% increase), followed by the municipal and agricultural sectors (8% increase)[69]. Not only that, the key countries of focus in this research all increased water use efficiency between 2010 and 2019, with the biggest gains in China, US and Germany[70]. The UK added the most value per m³, in part because so little goes to agriculture.

	Overall water use efficiency (US$ per m³)[71]		Agriculture, fishery and food (US$ per m³)	Industry (US$ per m³)	Municipal (US$ per m³)
	2010	2019	2019	2019	2019
World	–	19.4	0.62	32.43	114.02
Australia	72.73	82.19	0.37	114.24	261.28
China	12.79	24.81	2.28	44.23	101.46
France	71.90	84.93	1.69	21.11	354.33
Germany	72.40	112.78	4.74	48.75	225.81
Japan	51.17	57.08	0.75	112.64	218.72
UK	295.59	327.91	0.60	473.49	366.47
US	33.34	44.67	0.19	15.76	282.66

Figure 13

The cost of inaction is clear. In the EU and the UK, annual economic losses from drought are projected to rise to more than €65 billion[72]. Globally, drought contributed to a loss of US$ 262 billion between 1970 and 2019 with the largest losses occurring in Asia, Africa, Europe and North America.

Reduction strategies are available. Several business water use benchmarking tools have been developed, including in Australia[73] and the UK[74], while the Government has set a statutory water demand reduction target for England that includes a 9% reduction in non-household water use by 2038[75].

Collaboration to enable improved water stewardship around the world can help the global economy to thrive and ensure that individual organizations can flourish. With reduction strategies available, policymakers and businesses have the opportunity to lead the way.

Supporting a healthy environment

Preventing water wastage has the potential to also bring biodiversity gains; every litre saved leaves more in the environment to support precious habitats and species. This matters because, while freshwater ecosystems cover less than 1% of Earth's surface, they are home to at least 10% of Earth's species[76].

Figure 14 draws on WWF data to show the scale of the challenge. Globally, wetlands have declined three times faster than forests (more than 80% are estimated to have been lost since the pre-industrial era[77]), and freshwater vertebrate populations have declined by 84% since 1970[78]; twice the rate of decline of biodiversity in land or marine biomes. One quarter of critically endangered species are freshwater species[79].

Figure 14

Impact story 1

In England, to tackle the impacts of over-abstraction on wetlands and rivers[81], over 2,500 Ml/d (Megalitres per day) of reduction in water abstraction for public water supplies is now planned[82], with the water sector being asked to plan based on halving leakage by 2050. A statutory water demand reduction target has also been set to reduce distribution input (the amount of water put into supply) by 20% per head by 2038, which includes a 9% reduction in non-household water use[83].

The percentage of plants affected by drought has more than doubled in the last 40 years. In addition, about 12 million hectares of land lost globally each year to drought and desertification[84]. Action is underway to address this issue in locations including England (Impact story 1), Australia and the US.

In Australia the Murray–Darling Basin Plan is a AU$ 13 billion program to return water from irrigation use to the environment[85]. In California successive droughts have led to new and tougher regulation of abstraction to protect the environment[86], while proposals to protect the Colorado River have recently been announced, in recognition of severe drought affecting it[87].

12 million

Hectares of land lost globally each year to drought and desertification

There are steps that can be taken to address the impact of water availability on biodiversity; prioritizing these can help protect species under threat before it is too late.

Ensuring equity and affordability

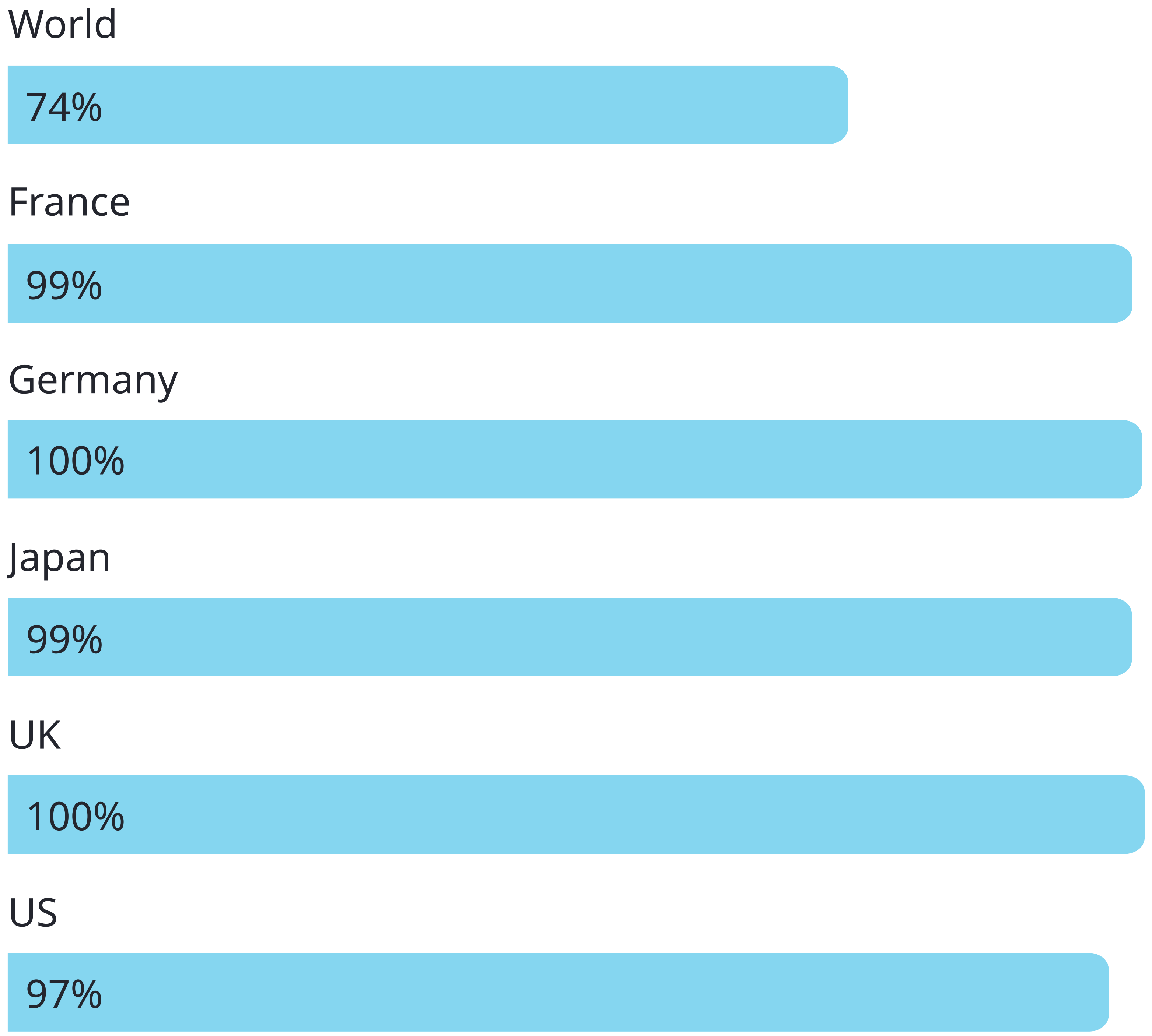
Access to safely managed drinking water and sanitation services is key, as set out in the United Nations Sustainable Development Goals (UN SDGs)[88].

Beyond the environmental consequences, water availability challenges can have significant impacts on individuals across society. However, these are not felt equally. Second only to flooding, droughts inflict the greatest suffering on women and girls in developing countries, in terms of education, nutrition, health, sanitation, and safety, with 72% of women burdened with collecting water (sometimes spending as much as 40% of their calorific intake carrying it)[89]. Water supply and sanitation systems that can withstand climate change could save the lives of more than 360,000 infants every year[90].

Access to water is critical to support sustainable development and growth. Clean, safe and accessible water supplies are essential for maintaining health, preventing diseases, and ensuring sanitation. Improved water stewardship can enhance agricultural productivity, contributing to food security and improved nutrition. The UN SDGs[91] lay out a 'shared blueprint for peace and prosperity for people and the planet '. While water access is only one component, it can be seen as a common thread.

To meet water availability challenges, build a more equitable global society and accelerate progress towards a sustainable world, everyone has a part to play[92].

% population using a safely managed drinking water service[93]*



% population with access to a safely managed sanitation service[94]

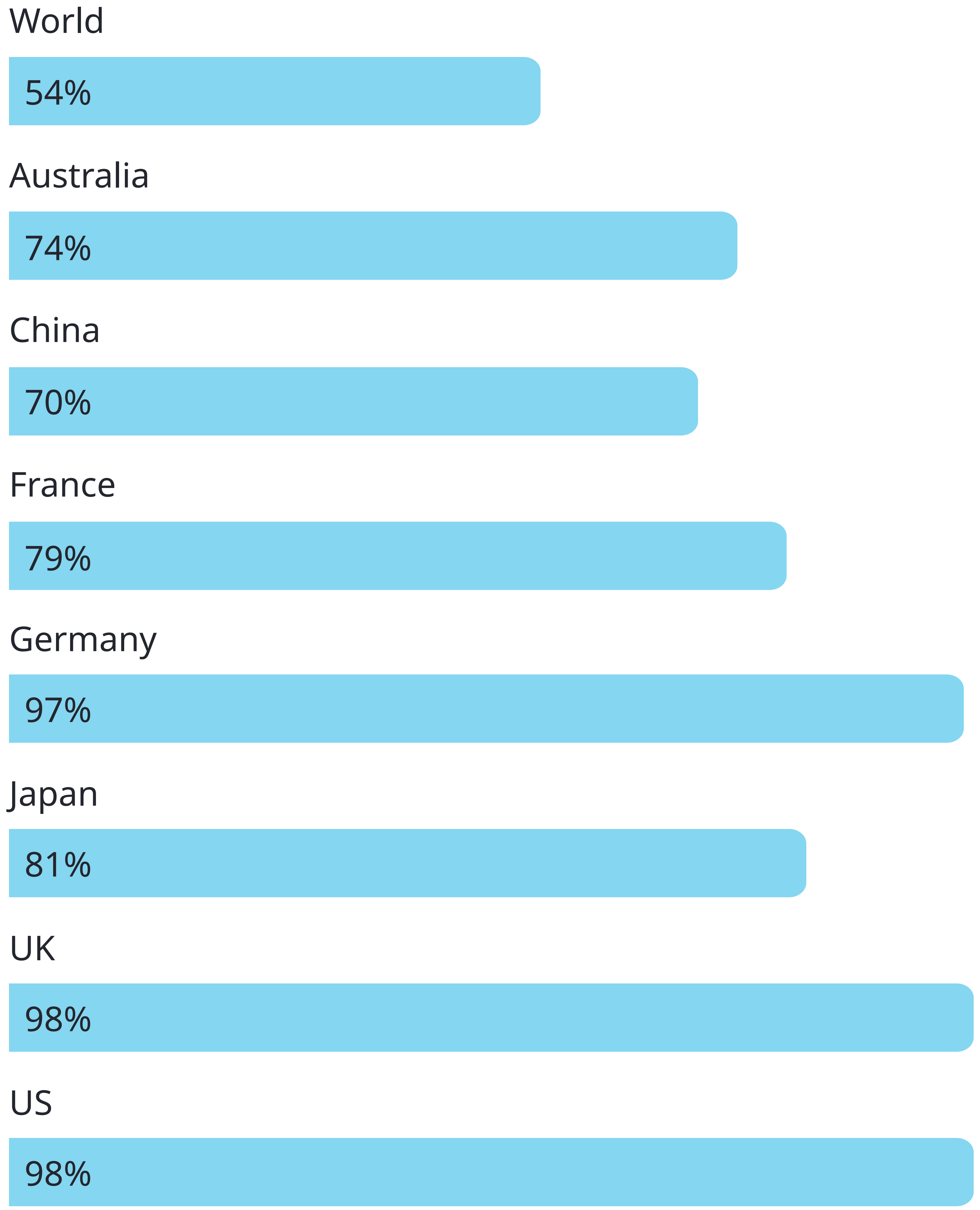


Figure 15

* Data for Australia and China was unavailable.

The UN Sustainable Development Goals

SDG 6 – Clean water and sanitation	This goal directly addresses the need for universal access to clean water and sanitation, efficient use and sustainable withdrawal of freshwater, and protection and restoration of water-related ecosystems
SDG 2 – Zero hunger	Water plays a critical role in agriculture. Improved water stewardship can enhance agricultural productivity, contributing to food security and improved nutrition
SDG 3 – Good health and well-being	Clean and accessible water is essential for maintaining health, preventing diseases, and ensuring sanitation
SDG 13 – Climate action	Water and the climate are intricately linked. Changes in climate patterns can impact water availability, quality, and distribution
SDG 15 – Life on land	Many ecosystems and species rely on freshwater habitats. Water stewardship can help protect these ecosystems and halt biodiversity loss
SDG 11 – Sustainable cities and communities	Rapid urbanization often increases pressure on water resources. A focus on sustainable water management is key to building resilient and sustainable urban spaces
SDG 12 – Responsible consumption and production	Promoting water efficiency in industries and encouraging sustainable use of water resources fall under this goal

Figure 16

Broader insights and trends

Leakage

There are many drivers of water availability challenges, but leakage from water supply networks and other sources is a significant issue both in terms of lost revenue and wasted resources. Conservatively valued at only US$0.31 per cubic metre, leakage amounts to US$39 billion losses per year.

Such leakage is treated water that goes unused by customers and so is often referred to as non-revenue water (NRW). It leads to water being wasted, but has a knock-on effect; unless people see tangible efforts and reductions in network leakage they may be less inclined to try to make savings themselves. In the UK, the ongoing issue of raw sewage being dumped in UK waterways by utility companies – repeated more than 300,000 times in 2022 alone[95] – risks lowering trust in those companies and could discourage individuals from taking any action to reduce water wastage.

$39 billion

Losses per year from leakage of treated water that goes unused by customers

Leakage levels vary by country but are typically between 15% and 40% of what is put into supply (Denmark and Netherlands are notably low at 7% and 5%[96]). The global volume of NRW has been estimated to be 346 million cubic metres per day or 126 billion per year.

If global network leakage was reduced by a third, estimates suggest it would provide enough water for 800 million people[97].

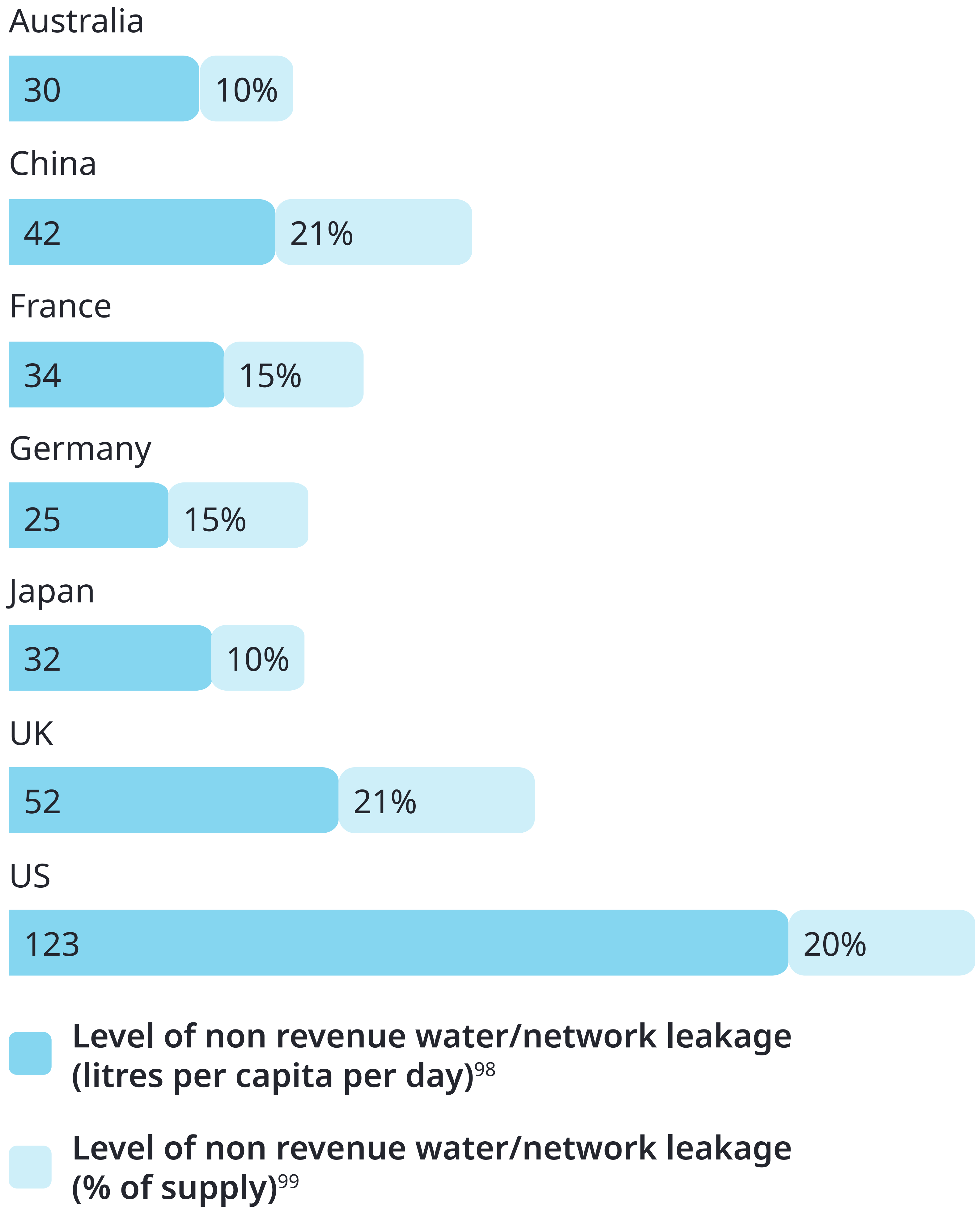


Figure 17

Leakage within commercial and domestic properties is emerging as another significant challenge. In the US around 13% of water ‘used’ in the home is thought to be through leaks such as from toilets and taps[100] with average daily per capita leakage in homes amounting to 29 litres per person per day.

In the UK the roll-out of smart water meters has highlighted that around 10% of homes have a leak and that around 30% of the water supplied to businesses is continuous flow and hence likely to be wastage. In the US smart meters are also highlighting water wastage in the home, but in a positive step the data from them is being used to quickly alert households of a leak, offering the potential to address it and save water[101].

Visible and meaningful effort by water utilities around the world to reduce network leakage, driven by government action to incentivize change, can have a direct impact and persuade individuals and organizations to acknowledge their own role and act to reduce wastage at homes and in workplaces.

The role of good design

There are many contributory factors to water wastage, but good design is critical whatever the water saving measure in question.

In one example, a plan to place floating 'shade' balls to conserve water in a Los Angeles reservoir turned out to be counterproductive when it emerged that manufacturing them required more water than could be saved from using them[102].

Dual flush toilets

Once seen as a water saving innovation, evidence suggests design problems with dual flush toilets mean this is not being achieved.

This is no small issue – and on top of household wastage, additional water will be lost from businesses and other non-domestic settings. There is an opportunity to improve water availability through better design, materials and maintenance (some manufacturers are now designing 'leak-proof' dual flush toilets[103]). Waterwise estimate this alone could contribute around 10% of the additional water capacity needed to cope with an extreme drought in England by 2050.

5-8%
Estimated number of toilets leaking in the UK, mostly dual-flush toilets with poorly fitting or degraded valves

400 million
Litres of water estimated to leak from UK household toilets every day (circa seven litres per person per day) – enough to supply the populations of Edinburgh, Cardiff, Belfast, Manchester, Sheffield, Liverpool and Bristol combined

>50%
People incorrectly identifying the short flush in five out of 18 designs[104] of dual flush toilets

Figure 18

Shower power

A key area of water use in the home is showering – the largest single use of water in UK homes at 25% of total use[105] whilst in the US it was around 20% (figures from 2016)[106] and in Australia 29%[107] – but it is also an area of active innovation to reduce both water and energy consumption.

Showering used to be considered more water efficient – indeed a five-minute shower with a flow rate of 8 l/min will use about half the amount of a typical bath of 80 litres. However, historically people may have had a weekly bath, they often now have a daily shower pushing up weekly water use. A 2019 UK survey identified that 54% of Britons shower once or more than once a day[108].

Showering can also be financially costly due to both the price of water and of the energy to heat it. Unsurprisingly innovators are actively looking at shower efficiency, for example developing water recycling showers[109] that claim they can reduce energy use by 70% and water use by 80%.

Embracing innovation may not solve every water security challenge, but it can be a key step forward in reducing the impact of everyday activities.

Smart water metering: a key enabler

Over the past 40 or so years, water metering has developed from manually read meters, to automatic meter reading (AMR) and now increasingly, advanced metering infrastructure (AMI) technology, otherwise known as smart metering[110]. This has the potential to be a game-changer.

Amidst water security concerns and, as the roll-out of smart meters grows, we can expect more scrutiny of in-property leakage. There is also the prospect of the insurance industry taking a more active role in encouraging customers to adopt kit to rapidly detect leaks and avoid property damage.

As Figure 19 shows, uptake is growing. Asia-Pacific (APAC) is expected to be the fastest growing region in the market in the next four years[111]. Meanwhile, France, Germany and the UK currently hold the biggest market share in Europe, with Spain and Scandinavia following behind[112].

Figure 19

The recent and projected increase in demand for smart water meters can be attributed to their ability to enable reduction in consumption including by detecting leaks, increasing availability and popularity of Internet of Things (IoT)-based devices, development of the supporting technology infrastructure, the development of smart cities (those that use data and technology to create efficiencies, improve sustainability, create economic development and enhance quality of life)[115] plus the need to replace ageing infrastructure[116].

This is being driven by government and utility companies. For example, in the US, under Department of Energy guidance, all federal buildings are required to be metered for water, and where possible for these to be smart meters[117]. The benefits can be sizeable. In France, the Eau du Grand Lyon water provider implemented a smart meter network back in 2015 and as a result saved 1 million m^3 of water annually and increased water network efficiency by 8% between 2014 and 2018[118].

Rolling out smart meters also offers the potential to introduce more sophisticated tariffs that can encourage water conservation and help address affordability. For example, through higher costs for water during droughts, companies could manage down the costs of the essential water allocations.

Smart meters are only the start of a digital transformation of water utilities' operations to smart utility networks – those which integrate smart meters with communication networks and data management systems to enable two-way communication with water utilities and their customers[119]. In the long-term, the benefits of using various types of digital technology across water utility operations and their networks could be wide-ranging, with benefits to the community, operations, finance and long-term resilience[120], including the provision of near real time alerts when there is a leak.

1 million m^3

Water saved annually thanks to implementation of a smart meter network in France

Smart water meters, and the data that they provide, could be an opportunity to reduce leakage and water consumption and a way for governments to drive change on a societal level.

Water efficiency labelling

Unlike with energy, in most countries it is challenging for domestic and business customers to make informed choices about the efficiency of the water using products they buy or specify.

Water labelling – as in place in Australia and New Zealand – could address this and could also be linked to requirements for new build properties and large scale retrofits, including via use of standards.

Other initiatives, such as a mandatory water labelling scheme linked to minimum fittings standards, as in place in Australia since 2005, can also be used to great effect. By 2017 it was already estimated to be saving over 300 Ml/d (Megalitres per day) of water and to have reduced emissions by 11 $MtCO_2e$ and household bills by AU$1 billion per year[121]. The International Water Association (IWA) undertook a review of international water labelling schemes in 2019[122], considering the Australian scheme as well as voluntary schemes in Europe, China and the US, concluding that the most effective were mandated.

According to the Energy Savings Trust, a mandatory labelling scheme in the UK could reduce personal consumption by over 27 litres per person per day. Over 25 years it could cut household utility bills by over £38 billion and cut UK carbon emissions by over 58 $MtCO_2e$[123]. The UK Government has committed to bring in a mandatory water label for domestic and commercial products by 2025[124].

>£38 billion

Amount household utility bills could be cut over 25 years in the UK if a mandatory labelling scheme is in place

Improved and wider-scale water efficiency product labelling could be a key tool to reduce water use. Internationally accepted best practice frameworks, such as Water efficiency labelling programmes. Requirements with guidance for implementation (ISO 31600:2022) can help here as well.

Embracing circularity

A circular economy, where resources are redeployed or reused, material use and resultant waste is addressed, and waste flows are turned into inputs for further production, can help reduce dependence on finite raw materials and the volumes cast off as waste. Reusing water provides a huge opportunity to reduce freshwater abstraction and to address rising water demand.

Rainwater harvesting (RWH) systems are part of this conversation and, as well as providing a water source, can also provide benefits as part of a Sustainable Urban Drainage System (SUDS). Germany is often seen as leading the way on RWH in Europe, alongside Japan and Australia globally. As of 2017 almost one third of new buildings built in Germany were equipped with a rainwater collection system for non-potable uses (mainly irrigation, toilet flushing, and laundry use)[125]. The drivers behind this included controlling the frequency, peaks and volumes of urban runoff to alleviate stresses upon the central wastewater infrastructure and the knock-on impacts on the environment.

Water reuse (closing the loop)

As set out by Arup and the Ellen Macarthur Foundation, a circular water system would include the following[126]:

- **Avoid use** – through rethinking products and services and eliminating ineffective actions
- **Reduce use** – driving continuous improvements through water use efficiency and better resource allocation and management
- **Reuse** – pursuing any and all opportunities to reuse water within an operation (closed loop) and for external applications within the surrounding vicinity or community
- **Recycle** – within internal operations and/or for external applications
- **Replenish** – efficiently and effectively returning water to the basin

Circular water systems around the world

Germany

Germany leads in Europe on grey water reuse systems (GWR) where, for example, shower water is captured and used for toilet flushing. There are now thousands of GWR systems in operation[127]. The primary driver appears to be environmental, although there is the potential for financial benefits. As a result of the self-build nature of the construction industry in Germany, about 95% of the supplied systems are installed in single and double-family households[128].

Australia

Australia has one of the world's highest levels of implementation of RWH systems, with about 1.7 million households having fitted rainwater tanks. More than a quarter of Australian homes collect and store rainwater for domestic use, contributing around 177 billion litres to residential water supplies[129]. Such tanks are commonly connected internally to things like toilet cisterns and cold-water taps supplying washing machines and are also often fitted to garden taps. Australia's widespread adoption of RWH systems is likely a result of government rebates to cover the capital costs. In addition, many Australian state governments have developed regulatory mechanisms to promote RWH systems. Rebate schemes have also been used to encourage GWR but have not been as successful as they are more complex to install and often more expensive.

Japan

In Japan, there is widespread support for the utilization of rainwater as there is high awareness of the need to conserve water, along with relatively high water costs in urban areas[130]. The regulatory framework combined with national government requirements to grant financial support for subsidy programs promoting RWH is expected to provide a nationwide move to promote rainwater use. In 2015 the Japanese government also approved the wider usage of RWH systems in newly constructed buildings by the state government or incorporated administrative agencies, aiming for a 100% installation rate[131]. In Tokyo, it is now mandatory to install a GWR system in large buildings.

Desalination – creating usable water

Whilst it is crucial that we use the water we have wisely, one potential technical solution to the decreasing volumes of available freshwater per capita is the use of desalination to remove salts from seawater, to “create” additional usable water. A 2018 UN study identified over 16,000 desalination plants operating in 177 countries, concluding that these will be needed to support delivery of UN SDG6[132]. Some Middle Eastern countries already use desalination to produce up to 90% of their drinking water needs[133] while others use it to provide water for industry[134].

However, desalination can have significant environmental impacts such as toxic brine production and energy use and is relatively expensive, thus largely restricted to higher income countries[135].

Whatever the system, techniques to embed circularity in the water system have the potential to fundamentally shift how we use water and ensure we are preserving this precious resource in the best way possible.

Water neutrality and water positivity

Water neutrality and water positivity are emerging approaches to minimize the water demand footprint of developments and water using activities.

Water neutrality essentially means that the additional water demand on the environment arising from an activity is zero. It therefore doesn't add to any existing or future water availability challenge or impact on the environment. In concept it is similar to carbon neutrality or flood risk neutrality.

To achieve this, water demand is first minimized through efficient fittings, rainwater harvesting and water reuse. Any remaining additional demand is then offset locally through water saving interventions in the local community or supply chain.

To give an example, developers in an internationally important wildlife site in Sussex, UK, now have to submit a water neutrality statement explaining how proposed development will be water neutral[136]. There are other locations with similar water availability, growth and environmental pressures where water neutrality is being considered and the UK Department for Environment, Food and Rural Affairs is preparing guidance on this[137].

In some cases, organizations are going further than water neutrality and looking to use the approach to deliver a net gain to the environment – known as 'water positive'.

As Figure 20 shows, a number of organizations have made recent water neutrality or water positive commitments as they recognize the impacts and dependency of their operations and supply chain on water availability.

> Applying a circular economy mindset to the water security challenge can help tackle some of the key drivers of the issue. Organizations have an enormous opportunity to accelerate progress on water neutrality or even water positivity by leading by example in their own operations and working with their supply chains, just as many are doing on Net Zero with Scope 3 emissions.

Commitments across industry

BP	Water Positive[138] by 2035 (own operations and offsetting)
Hilton Hotels	Reduce water use intensity[139] by 50% by 2030
IHG Hotels	Reduce water footprint[140] of hotels in water risk areas
Mars	Water Balancing[141] at five sites by 2025 (match each litre demand with 1 recycled)
Meta	Water Positive[142] by 2030 (operations and offsetting)
Microsoft	Water Positive[143] by 2030 (own operations and offsetting)
Molson Coors	22% greater water efficiency[144] and offsetting
Sainsbury's	Water Neutral[145] stores and fully water neutral by 2040 (operations and offsetting)

Figure 20

Healthcare

The healthcare sector is a large water user and relies on a secure supply of water, whether in hospitals, for the manufacture of medicines by pharmaceutical companies, or to maintain hygiene in medical settings.

Figures vary between countries, as shown in Figure 21. A 2020 Lancet paper found that, as low-income countries develop and their healthcare expenditure increases, their water footprint increases disproportionately[146]. But it is not all bad news; due to technological innovation improving process efficiency, the water intensity of healthcare provision has declined rapidly[147].

For the pharmaceutical sector, ready access to a fresh water supply enables the production of vaccines and medicines and safeguards livelihoods. The pharmaceutical sector is a major consumer of water, used during synthesis, or as an excipient (an inactive substance that serves as the vehicle for a drug). A significant proportion of pharmaceutical companies have already set hard targets around water. Businesses are finding solutions to reduce consumption, but also to clean and reprocess water. Cleaning and controlling wastewater is critical from manufacturing sites as discharge from pharmaceutical production can lead to public health challenges like antimicrobial resistance – where antibiotic discharge into surrounding aquatic environments could be linked to local population’s resistance to life-saving antibiotics.

Efforts have been made to address water usage in healthcare. In 2013 the then UK Department of Health published best practice guidance including advice on water saving[148]. The US Environmental Protection Agency (EPA) also produced advice on water saving in hospitals in 2012[149], while similar guidance has been published by the Department of Health in Victoria, Australia[150].

The World Health Organization (WHO) and UNICEF’s Joint Monitoring Programme reported that, globally in 2021, 1.7 billion people lacked basic water services and 3.85 billion lacked basic hygiene services in their healthcare facility[151]. The report also highlighted that as of 2021, around 9% of healthcare facilities in China still had no water service (as was the case in 2019) and 64% lacked basic hygiene services.

83 million

litres of water per day in total used by the healthcare sector in England and Wales (3% of total non-household public water supply)[152]

7%

Proportion of total water use in commercial and institutional facilities in US hospitals and healthcare facilities[153]

4%

Proportion of total public water supply non-household use by healthcare sector in Australia’s most populous state, New South Wales[154]

25-30%

Proportion of total water withdrawals by France’s chemical industry, which includes pharmaceuticals (along with petrochemicals, phytosanitary etc.)[155]

Figure 21

>1,300
Number of hospitals in each of Japan, the US, the UK, France, Germany and Australia[156]

>8,000
Number of hospitals in Japan alone

40 billion
Estimated litres of water used annually by the UK NHS

21%
Reduction in water consumption by the health and care sector between 2010 and 2017, with further action being taken as part of the NHS' water efficiency pledge[157]

13.6%
Increase in water consumption between 2006 and 2016 by hospitals in Victoria, Australia[158]

300 to 600
Litres of water consumed in German hospitals per bed per day on average, three times that of residential buildings[159]

1,000
Litres of water consumed in US hospitals per bed per day on average[160] although this data is from 2013

Figure 22

Achieving greater water efficiency in the healthcare sector

Monitoring and benchmarking – a critical first step

Through monitoring water usage against comparable indicators, healthcare sector organizations have the opportunity to have much greater visibility of the water efficiency options available to them (and best suited to their operations). Benchmarking consumption using comparable indicators can enable healthcare organizations to monitor how effectively they are managing their water use and spot inefficiencies (including spotting leaks)[161].
The standard on water efficiency management systems. Requirements with guidance for use (BS ISO 46001:2019) is a relevant tool here.

Detailed, accurate water consumption data and subsequent benchmarking can put healthcare organizations in a stronger position to develop meaningful and effective water management strategies that drive greater water efficiency.

Detecting leakage through smart and AMR metering

Identifying and fixing leaks fast can potentially provide significant savings. Smart metering and AMR solutions provide the level of detail in water consumption that can be needed to spot leaks that would otherwise potentially go undetected. Given the nature of water usage at hospitals and other healthcare settings that operate 24 hours a day, understanding what 'normal' levels of consumption are at sites is critical for spotting anomalies that could suggest a leak. In the UK, effective leak detection from smart meters and/or AMR saw NHS Greater Glasgow & Clyde[162] save 6,700 litres of water, while NHS Lothian[163] was able to, reduce hourly consumption from 12m^3 to less than 4m^3. This equated to a cost saving of around £130,000 per year.

Alternative technologies and methods for water efficiency in healthcare

There are a number of strategies that can make an impact. For example, a study carried out at a District General Hospital in North Wales (UK) found that simply by medical professionals following current national guidelines and swapping to using alcohol-based rubs for subsequent scrubs (i.e. after initial scrub before surgery begins) during hand surgery can provide significant water consumption savings – 57.2% for hand trauma lists and 70.2% for high-volume CTR lists[164].

Impact stories 2

- In Victoria in Australia, efforts to reuse dialysis wastewater for local gardens and toilets at Epworth Healthcare saved 4 million litres[165]
- At Stanford Hospital and Clinics in the US, upgrading Sterile Processing Department equipment saved over 12 million gallons of water per year[166]
- At Bristol's Southmead Hospital in the UK, six sedum green roofs and therapy gardens were created and surface water collected for irrigation use, reducing water consumption by 25%[167]

Best practice and lessons learnt

An excellent example of proactive water management at a hospital is that of St Andrew's War Memorial Hospital in Brisbane[168]. The drivers of success here included ongoing education and training programmes (for staff, patients and visitors), integrating water management as a high priority within the organization's structure, requiring regular reporting against targets to monitor progress and keeping senior figures up to date on the costs of water and improvement plans.

The Global Green and Healthy Hospitals community highlight a number of recommendations on the road to a more water efficient healthcare sector globally. These include[169]:

- Establish a framework that aspires to water neutral hospitals
- Switch from water-intensive film-based radiological imaging equipment to digital imaging
- Remove use of bottled water where high quality potable water is available

Proactive water management strategies that look to increase efficient and sustainable water use can benefit healthcare institutions including hospitals, without hindering operations. Some key areas of focus include monitoring consumption, benchmarking, reducing leakage, fitting water efficient devices, using alternative water supplies such as rainwater harvesting or water reuse and, finally, promoting a water saving culture[170, 171].

Impact story 3: Cytiva

"Using water responsibly is one of Cytiva's sustainability[172] focus areas, centered on how we reduce water consumption and improve quality for the benefit of people and our planet. Our target is to improve water efficiency by 15% by 2025 and we are ahead at 39%. We developed a water risk tool which analyzes site water use per cost, current use, and water stress to 2030 and mapped those results against World Resources Institute's[173] 'Water Risk Atlas Tool' to prioritize our sites. We used a Water Stewardship tool to identify impactful areas for improvement.

"As a result of conducting the kaizen principles in Singapore, we have reduced water consumption by 8.6% (363m^3) as an example. In Uppsala, Sweden, we are rethinking actual operational processes to reduce consumption. One such process change resulted in 25% less water consumption and impacted water quality by removing 275 metric tons of chemicals and 322 metric tons of CO2e."

As a nice twist, we also increased production capacity up to 50% in identified processes proving out the theory that what is good for the environment can also be good for business."

Retail

Retail water use is estimated to account for nearly a fifth of public water supplies globally, driven not least by fast fashion, use of materials like cotton and the electronics market[174].

Fashion is a huge consumer (and polluter) of water, using it across the supply chain for everything from irrigating cotton to domestic washing of clothes[175]. Fast fashion – something linked to multiple negative environmental impacts – exacerbates this, although countries such as China are starting to actively address this through regulations[176] and enforcement, for example the 'umbrella' of policies under the national Five-Year Plan for water security which was released in October 2021.

Cotton in particular involves significant water use. The second highest produced fibre globally (24% of global production in 2020)[177], it is also one of fashion's thirstiest fibres[178]. In many cases, surface and groundwater sources are diverted to irrigate cotton fields with water being wasted through evaporation and inefficient water management[179]. China only has 7% of the globe's water resources and yet produces 27% of the globe's cotton[180]. The impact on water resources and the wider environment of this cotton production is particularly concentrated in regions such as Xinjiang Province[181]. Meanwhile research suggests Central Asia's Aral Sea has reduced in volume by around 10%, largely as a result of irrigation for farming cotton[182].

Conventional textile dyeing and the raw fibre finishing process also uses significant volumes of water. On average 100-150 litres of water are needed to process one kilogram of textile material (cotton, polyester and other materials[183]).

In a sign of progress, many retail chains report on their annual water use, with an increasing number setting targets to become water positive, including the Co-op Group, ICA Gruppen, Lidl, Walmart, Kingfisher and IKEA[184].

Increased awareness of water footprint and its impact 'on the ground' in stores – for example 'water footprint' labelling – could also help empower consumers to make sustainable choices. As is the case with water-using products, for example, in 2021 Lowe's sold 12 million products labelled WaterSense (a US voluntary scheme)[185].

Key steps that could improve the water footprint of the fashion sector

- Sourcing cotton from certified sustainable farms – organic cotton is produced with healthier soils that retain more moisture, benefiting overall sustainable water management[186]
- Water-saving or waterless dyeing and textile processing. This can not only reduce water used but also prevent excess pollutants ending up in local water bodies[187]. Examples include H&M's capsule collection jeans[188] and SIAM NITORI's waterless colouring process of kneading pigments directly into recycled raw materials[189]
- An increase in alternative sources such as effluent reuse to improve water efficiency[190]
- Brands providing clear instructions to consumers on how to reduce energy and water use when caring for items[191]
- Consumers choosing pre-loved clothing. GlobalData forecasts that the global apparel resale market will reach US$338.4 billion in 2026[192]

175 million
Litres of water are used by the retail sector in England and Wales each day making it the largest water-consuming sector overall

493 litres
Average use per day for the retail sector[193]

2030
Point by which water usage by the fashion sector is expected to double

2,700 litres
Water needed to produce just one cotton T shirt

19%
Estimated proportion of public water supplies globally accounted for by retail – higher than healthcare

93 billion m^3
Water estimated to be used by the fashion sector alone per year - equating to 4% of total global water extraction[194]

10,000-20,000m^3
Average amount of water used to cultivate a kilogram of cotton (depending where grown)[195]

Figure 23

Linked to the growth of the re-sale fashion market, extending the lifespan of electronic devices could also offer the potential to save both water and carbon. On average, 29% more water and 31% more carbon can be saved for each extra year a smartphone is used[196].

Establishing a water saving culture (both internally and externally with customers) is an integral part of water management strategies for retailers. For example, the Water Stewardship Action Committee formed at US consumer electronics retailer Best Buy in 2020, a group of staff who all share common goals for water saving[197].

Retailers may only just be capturing data that shows the new 'norm' following the pandemic when it comes to water consumption. There is an opportunity for retail organizations to implement data-driven water management strategies to prevent water consumption levels continuing to rise.

Impact story 4: Circular Computing

Circular Computing is an IT supplier that remanufactures laptop products at volume, to a consistently high standard. BSI awarded Circular Computing a BSI Kitemark™ for its unique Circular Remanufacturing Process in 2021, giving customers the confidence devices will meet the required standards. Each remanufactured laptop uses 190,000 fewer litres of water in production, as well as being a crucial step towards building a circular economy and reducing e-waste in the tech industry.

190,000

Litres of water saved in production from each laptop remanufactured by Circular Computing

As a consumer-facing industry, retail is perfectly positioned to inspire change that can accelerate progress towards a water positive future. Action here will be inextricably linked to addressing the broader challenges around fast fashion and moving towards a circular economy mindset with all retail goods.

Built environment

It is estimated that buildings and construction use over 15% of global freshwater use, although it could be much higher, given that concrete production alone is reported to make up around 9% of global industrial water withdrawals.

An accurate global water usage figure for the sector is challenging, particularly as often the figure is combined with the water footprint of buildings[198]. However in England and Wales, a reported 12.2 million litres of water per day are used for the construction of buildings alone, which does not consider their day-to-day running once built. The average number of litres used is 1,660 litres, although this will vary greatly depending on the scale of the project. Key areas of water use in construction include within on-site cabins, general cleaning, hydro-demolition and dust suppression[199].

Examples of construction product manufacturing processes that use water include: pre-cast concrete and cement-based products, plastics and resins, rainwater goods, wood panels; ceramics, glass, paint coatings and steel[200]. Water saving is not currently high up the agenda on many construction sites, likely due to a lack of incentives (and in some cases legislative pressure) and cost and space restrictions[201]. Education programmes that help create water-saving cultures on site could have a significant impact.

Nevertheless, there are plenty of opportunities for construction sites and workers to be efficient with water use. In England, the new demand reduction target[202] for non-household water use provides increased 'top-down' pressure for sustainable construction, including in terms of the amount of water used. The inclusion of minimum standards for water efficiency in relevant policies and regulations (including through labelling schemes for fittings) can help ensure new buildings are water-efficient from the start, avoiding costly retrofits. Examples of action in this area include Willmott Dixon, who are aiming to achieve a 50% absolute reduction in water use on site by 2030 through measuring their performance against targets[203]. KB Home in the US install WaterSense water-saving products in every home that they build, saving homeowners on average US$500 a year[204].

Construction sites can also look at using similar measures to those encouraged to be installed in homes, including waterless urinals (as Wates have done)[205], aerated taps, hoses with triggers and using alternative water supplies for cleaning such as rainwater or greywater[206]. For construction sites paving the way in delivering water efficient construction practices, the Common Assessment Standard[207] can also accredit UK projects across different areas of risk management including sustainability.

2.2 million

Litres of water per day used for the construction of buildings alone in England and Wales

Building water efficient buildings

Building operations including landscaping are estimated to make up around 12% of total water use in the US[208]. Meanwhile, of the 21% of water abstracted used for public supply in Europe, buildings are responsible for the majority of this (around a third of water consumption specifically)[209]. That means there are significant gains to be realized from creating buildings in a water efficient way and ensuring they have water efficient measures, systems and fittings in place once they're in use.

The Building Regulations Part G2 for England includes requirements for water efficiency in new dwellings that limits consumption per person/per day to 125L. Sustainability reporting requirements for buildings such as those covered in the US Government's Guiding Principles for Sustainable Federal Buildings and Associated Instructions[210] (these include water efficiency in addition to carbon emissions reduction) can also be an effective way of driving action.

Equally, it is not simply about new construction projects. There are enormous benefits to be realized by retrofitting existing buildings to meet water demand and wider sustainability targets[211]. There are standards for retrofitting for energy efficiency, why not a standard for retrofitting for water efficiency?

Considerations for achieving water efficient buildings[212, 213]

- Upholding water efficient practices during the construction process (dust suppression, wheel washing, washing concrete wagons)
- Considering, and where possible mitigating, water footprint of building materials
- Installing alternative water supply systems where appropriate
- Installing water efficient fixtures and fittings (including plumbing systems, taps, toilets, urinals, irrigation systems, dishwashers etc.), ideally using any available labelling schemes as a guide
- Metering (ideally smart meters) and sub-metering where needed
- Effective soil management and use of plants suitable to the local climate
- Taking inspiration and learnings from best practice case studies[214] around the world
- Setting targets as part of a water management strategy
- Seeking relevant green building accreditation to drive improvement and reward progress
- Water efficiency labelling schemes, such as the US WaterSense scheme

Construction in all its facets puts pressure on our water supplies and the wider environment due to the various embodied impacts of increased water demand. But with the population rising, there is the opportunity for the sector to lead the way in building water efficiency into our built environment. Water neutral developments can enable sustainable growth without increasing the demand for water.

BSI Water Security Indicator

The BSI Water Security Indicator – a tool created in partnership with Waterwise, is a new high-level indicator of the extent to which water is being used at a country scale; with a focus on municipal/public water supplies. It brings together publicly available data on water availability, water use, water risk and water wastage to derive an overall index score for each country. It provides an inter-country comparison showcasing, at a high level, where there may be opportunity for improvement.

The Indicator is designed to provide an inter-country comparison showcasing, at a high level, where there may be potential for improvement. The methodology has been applied to countries in Europe together with Australia, China, India, Japan and the US.

How the Indicator has been calculated

The Indicator has been calculated using publicly available data from a number of sources for seven key contributory factors pertinent to how water is being used, focusing on municipal/public water supplies.

For each of these contributory factors a scale of 1 to 5 has been developed by Waterwise[215], with 1 representing the best relative state, where countries have taken action already to accelerate progress towards a water secure future. The scores across the 7 factors are then added to give an overall Indicator score out of 35. The higher the Indicator score the greater the importance of the country taking action to ensure water security in its municipal or public water supply system. The scores linked to the 7 factors can help shed light on where action to accelerate progress could be focused.

The full Indicator is available at Appendix 3.

More detail on the scoring for each of the contributory factors is provided in Appendix 2.

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

Analysis of results

The varied scores allocated to different countries indicate the positive impact that can be had if countries collaborate to take action to enhance water security.

Europe

Both France and the Netherlands have mid-high range overall scores, although the Netherlands had the lowest leakage per capita across all countries. Meanwhile, France has a much lower level of renewable resources available per capita.

China

China scores highly, facing the twin challenge of low levels of renewable water available per capita and high levels of utilization. Its water resources are under pressure while the price of water relative to GDP is low. The cities of Chengdu, Tianjin, Xi'an, Beijing and Shanghai face severe water stress.

US

Whilst the US has moderate water availability challenges, it has very high levels of personal consumption and leakage per capita with municipal water also being very cheap relative to GDP. Additionally, states such as Arizona, California and New Mexico are in very challenging positions.

Japan

Relatively high levels of renewable water utilization and personal water consumption coupled with the low price of water relative to GDP result in a high Indicator score.

UK

The UK has one of the lowest levels of renewable water resources available per capita. Coupled with a relatively low price of water, high levels of personal consumption and leakage, this results in a relatively high score. Plans to reduce consumption and leakage and to trial pricing tariffs could reduce this.

India

India is vulnerable to water scarcity risks. High levels of leakage compound the challenge. Levels of personal water use are currently low but this could leave the country highly vulnerable if this changes, while large cities including Mumbai and Bangalore face severe water stress[216].

Australia

Surprisingly, Australia's score is lower than many European countries, including the UK, due largely to high levels of renewable water available per capita and low levels of its utilization.

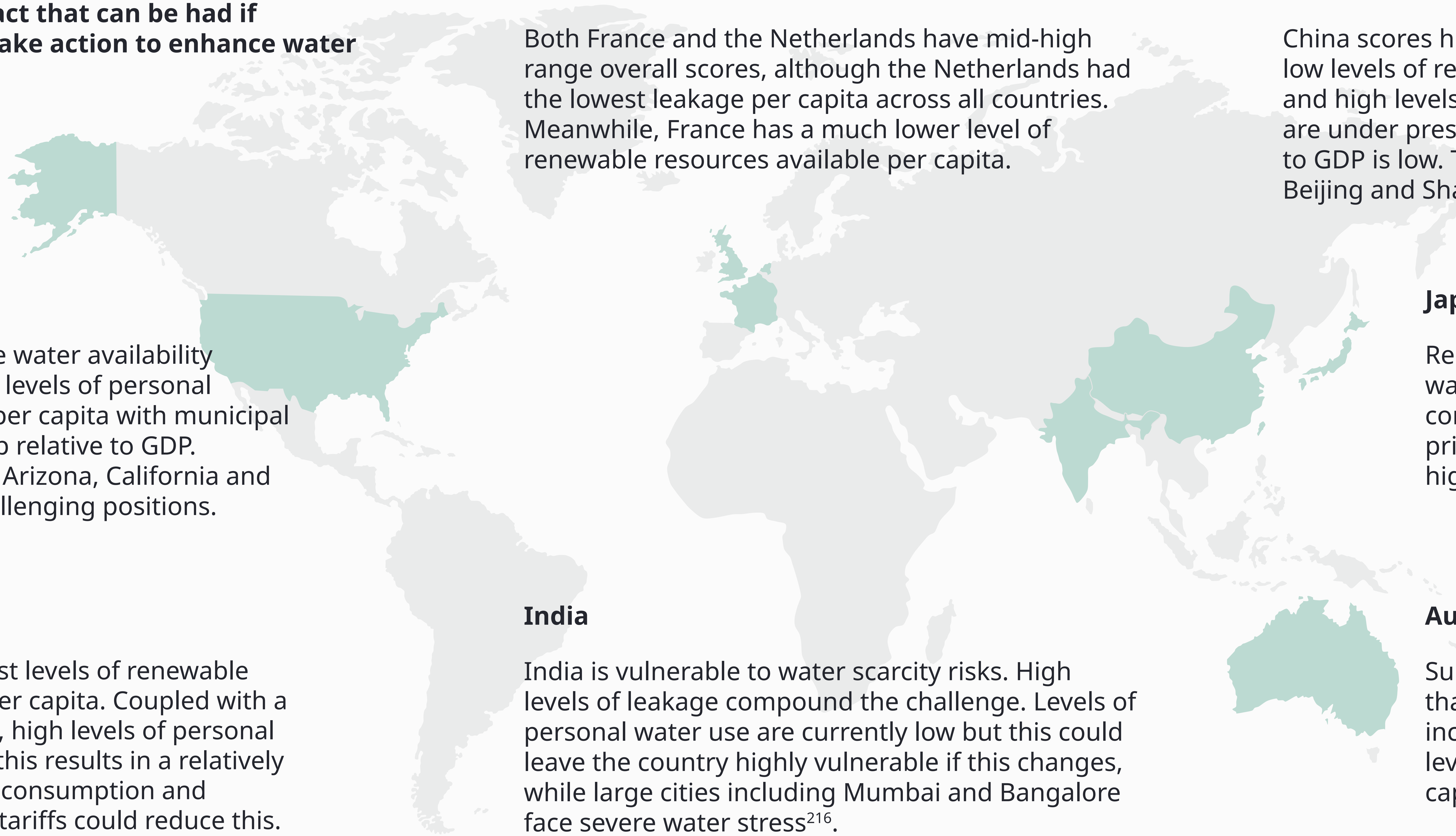


Figure 24

The BSI Water Security Indicator

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m^3	Per capita consumption	Leakage per capita	Overall Indicator Score
Australia	19,072.72	4.23	2.98	261.29	20,558.88	200.00	30.00	**19.00**
China	1,991.93	43.98	2.60	101.46	36,930.29	125.00	42.00	**26.00**
France	3,271.22	23.00	2.50	354.33	17,966.67	147.00	34.00	**19.00**
Germany	1,846.74	33.50	2.31	225.81	16,358.98	110.00	25.00	**20.00**
India	1,362.20	66.49	3.41	24.84	18,805.00	94.00	86.00	**26.00**
Japan	3,441.46	36.05	1.60	218.72	34,484.82	224.00	32.00	**23.00**
Netherlands	5,209.82	17.00	2.26	304.54	27,907.20	126.00	9.00	**18.00**
UK	2,188.54	14.35	1.62	366.48	21,237.58	149.00	52.00	**20.00**
US	5,678.82	28.16	2.21	282.67	36,779.37	379.00	123.00	**27.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

Conclusions

Whilst water is abundant on Earth, the fact just 0.5% is considered accessible freshwater[217] means that managing its use is critical. As our research shows, levels of water scarcity are soaring in major economies including the US and China and annual water use is rising dramatically. With a rising global population, we are looking at a future where demand only rises – unless we act now to secure a water positive future.

The drivers of this differ around the world. For example, in the UK the majority of water abstracted is for public water supplies whereas in China, Japan and Australia it is for agriculture and in France and Germany it is industrial use. Equally, there are wide variations globally in terms of both the amount of water wasted through leakage and the level of personal consumption. Yet the consequences are in a sense the same – in terms of impacting water availability, both are contributing to rising demand.

What becomes clear from this research is that a combination of population growth, climate change and economic development are driving increasing demand and putting growing pressure on our finite supply of water. The fact that by 2050 more than 5 billion people are expected to be facing inadequate access to water at least one month per year[218] means water security deserves as great a focus as the wider climate challenge. Indeed given that water provision and how we use water contribute around 10% to global carbon emissions[219], we cannot tackle one without the other.

It is simply not sustainable for demand for water to continue to rise without action to ensure we are managing it efficiently. But taking steps to secure a water positive future is about accelerating progress for people and planet. Among the many benefits that can be realized, a new approach to water has the potential to make us more resilient to climate change and to drought and protect precious habitats and species. In an increasingly urbanized world, it can meet the needs of this population and support vital economic growth, while also ensuring more equitable global access.

Ultimately, all of us stand to benefit from turning ambition into action to secure our future water supply and accelerate progress to a sustainable world.

Recommendations

01

Recognize water wastage as a serious challenge

Acknowledge the issue and act – with utility companies leading the way

There is a huge opportunity to reduce the amount of water being wasted if we are willing to recognize the challenge and partner across society to take steps to do so. This initially means those supplying water taking a lead, as leakage not only wastes water but involves costs from the chemicals used to treat it and the energy used and carbon emitted to get it to us. Visible and meaningful effort by water utilities around the world to reduce network leakage, driven by government action to incentivize change, can have a direct impact and persuade individuals and organizations to acknowledge their own role and act to reduce wastage at homes and in workplaces.

02

Ensure it is easy to choose water saving products

Accelerate progress by enabling sustainable choices

It can be challenging for anyone purchasing or specifying a water using product to understand whether it is water efficient or not. Countries including Australia and Singapore are leading the way to enable sustainable choices by implementing mandatory product water efficiency labelling systems, aligned with the relevant standard (ISO 31600:2022), where a simple indicator is visible at the point of sale – and this is already having a positive impact[220]. Reviews have also shown that such labelling has encouraged the market to innovate and to develop more water efficient products. If more countries facing water stress embrace mandatory water efficiency labelling, this could succeed in accelerating progress towards a sustainable world.

03

Get smart when it comes to saving water

Embrace innovation and make better use of data

Smart water meters have the potential to be a game changer when it comes to saving water, with the high resolution usage data they provide supporting far richer engagement with both household and non-household water users on consumption levels and patterns. The data can also enable the rapid detection of in-property leaks which show up as continuous flow, which can keep bills down, help the water utility by reducing overall demand and help the insurance industry by reducing the likelihood of large scale claims for internal flooding. While the next decade is likely to bring significant innovation, wider usage of smart water metering could start now. Through steps such as legislation, regulation, use of standards, enhanced funding and upskilling workforce capability, governments can facilitate progress by supporting water utilities on the rapid roll-out of smart water meters and better use of the data they provide so that water saving becomes the norm[221].

04

Encourage a water saving culture

Prioritize protecting our planet through water management

Whilst water saving technology can help reduce water demand, we can also effect change if we step up efforts to prioritize addressing water availability challenges and encourage a positive water saving culture amongst individuals, organizations and society, at home and in the workplace, and across different sectors of industry. In a world where water availability is a growing issue, we all have a role to play and having a focus on how we can use water wisely is key. There is little point having a water efficient shower if we then spend twice as long in it, or in becoming water positive in one sector but not addressing wastage in another. If governments, the water sector and other players collaborate on a large scale, we can begin to address water availability challenges.

05

Close the loop

Make water recycling and reuse the norm where possible

Applying a circular economy mindset to the water availability challenge can help tackle some of the key drivers of the issue. Reusing water provides a huge opportunity to reduce freshwater withdrawals/abstraction and to address rising water demand. This could mean ensuring that in water stressed areas, water recycling and water reuse are included in new buildings or expanding the use of rainwater harvesting for flushing the toilet rather than using quality drinking water. Such technologies can be most cost effective when they are built into new developments as opposed to retrofitted into existing properties. Where development is proposed in water stressed areas, governments can drive progress by using regulation and multi-stakeholder standards to encourage water reuse and even water neutrality. Likewise, we can collaborate across society to encourage greater monitoring of progress on water recycling and reuse measures in a standardized way.

06

Collaboration is king

Partner for impact

Water is the blue thread that connects our world. Everyone, even in areas where water stress is not currently a concern, has a part to play in meeting the water availability challenges we face as a global population. Collaborative effort across a wide range of players from government and regulators to the water industry – and ultimately all of us as water users – can help us address the growing challenges around water availability. We can learn lessons from the past and from each other, including from countries that are already responding to water availability challenges. We can also collaborate at a catchment scale to progress nature-based solutions that support the environment in adapting to the future.

Appendix 1

How BSI is supporting a water positive future

BSI has the expertise and resources to help you understand and implement sustainable practices and standards, for example:

Environmental management
BSI can help make sure businesses put environmental management at the heart of their operations to help meet environmental regulations, improve efficiency and environmental performance aligned with ISO 14001.

Adaptation to climate change
BSI can assist with the process of anticipating the future, and developing strategies to minimize the effects of shocks and stresses of future events is called future-proofing. It is a process because it is not a one-off course of action; it will be ongoing. When our organization is vulnerable, we need to adapt, become resilient, and future-proof it. The activity is aligned with BS 8631:2021: Adaptation to climate change – Using adaptation pathways for decision making. Guide

Flood resistance
BSI provides certification to the British Standard BS 851188, and the BSI Kitemark™ for flood resistance, providing reassurance to those vulnerable to flooding – as well as construction companies, insurers, local authorities, and manufacturers of flood-resistant products and systems – that certified flood resistance products are fit for purpose and will provide protection when it’s most needed.

The Kitemark™ for regulation 4 water fittings
The Regulation 4 Kitemark is a certification program designed for manufacturers of water fittings intended for installation in domestic properties within the UK. This certification demonstrates that the products comply with the UK’s Water Supply (Water Fittings) Regulations and Byelaws, ensuring consistent, high-quality products that prevent contamination and water waste.

The scheme covers a broad range of products, including valves, taps, mixers, pipes, and appliances that come into contact with drinking water, such as tanks, cisterns, water meters, washing machines, dishwashers, and steam ovens. Regulation 4 certification applies to non-metallic products, such as rubbers, coatings, cement, resins, and sealants.

The Kitemark™ for inclusive services
To help consumers have confidence in trusted services when they need them most, and to allow businesses to showcase their best inclusive service practices, BSI has created a Kitemark scheme, formulated using the best practice from BS ISO 22458 (formerly BS 18477) and the requirements of some of the UK’s leading regulatory bodies. BSI offers a water industry specific consumer vulnerability Kitemark certification aligned with the requirements of Ofwat.

Eco-Management and Audit Scheme
EMAS is a voluntary EU initiative designed to improve the environmental performance of organizations. BSI works with organizations to improve their environmental performance on a continuous basis.

Standards

BSI in its role as the UK National Standards Body has published the following standards.

Water management

Water efficiency labelling programmes. Requirements with guidance for implementation
BS ISO 31600:2022

Water efficiency management systems. Requirements with guidance for use
BS ISO 46001:2019

Principles for effective and efficient corporate governance of water utilities
BS ISO 24540:2023

Activities relating to drinking water and wastewater services. Guidelines for the assessment and for the improvement of the service to users
BS ISO 24510:2007

Activities relating to drinking water and wastewater services. Guidelines for the management of wastewater utilities and for the assessment of wastewater services
BS ISO 24511:2007

Activities relating to drinking water and wastewater services. Guidelines for the management of drinking water utilities and for the assessment of drinking water services
BS ISO 24512:2007

Drinking water, wastewater and storm water systems and services. Adaptation of water services to climate change impacts – Part 2. Stormwater services
BS ISO 24566-2

Environmental management systems. Requirements with guidance for use
BS EN ISO 14001:2015

Environmental management systems. Guidelines for using ISO 14001 to address environmental aspects and conditions within an environmental topic area – Water
BS EN ISO 14002-2:2023

Service activities relating to drinking water supply, wastewater and stormwater systems. Vocabulary
BS ISO 24513:2019

Guidelines for the management of assets of water supply and wastewater systems – Drinking water distribution networks
BS ISO 24516-1:2016

Guidelines for the management of assets of water supply and wastewater systems – Waterworks
BS ISO 24516-2:2019

Water management continued

Guidelines for the management of assets of water supply and wastewater systems – Wastewater collection networks
BS ISO 24516-3:2017

Guidelines for the management of assets of water supply and wastewater systems – Wastewater treatment plants, sludge treatment facilities, pumping stations, retention and detention facilities
BS ISO 24516-4:2019

Activities relating to drinking water and wastewater services. Crisis management of water utilities
BS ISO 24518:2015

Service activities relating to drinking water supply, wastewater and stormwater systems. Guideline for a water loss investigation of drinking water distribution networks
BS ISO 24528:2021

Principles for effective and efficient corporate governance of water utilities
BS ISO 24540:2023

Industry

Water supply. Requirements for systems and components outside buildings
BS EN 805:2000

Specifications for installations inside buildings conveying water for human consumption – General
BS EN 806-1:2000

Specification for identification of pipelines and services
BS 1710:2014

Provision and management of temporary water supplies and distribution networks (not including provisions for statutory emergencies). Code of practice
BS 8551:2015

Code of practice for the sampling and monitoring of hot and cold water services in buildings
BS 8554:2015

Process for designing and implementing Biodiversity Net Gain. Specification
BS 8683:2021

Appendix 2

How the BSI Water Security Indicator – a tool created in partnership with Waterwise has been calculated

The Indicator has been calculated using publicly available data from a number of sources for seven key contributory factors pertinent to how water is being used, focusing on municipal/public water supplies.

Renewable water resources per capita

1	2	3	4	5
>20,000	<20,000	<10,000	<5,000	<1,000

- **Definition** – maximum theoretical yearly amount of water available for a country at a given moment per person
- **Source of data** – UN measure of total renewable water resources[222] for 2019 and UN population data[223] for 2021
- **Metric** – m^3 per person per year

Proportion of freshwater available being abstracted

1	2	3	4	5
<5%	<10%	<25%	<50%	>50%

- **Definition** – ratio of total freshwater withdrawal to total renewable freshwater resources, after taking into account environmental flow requirements
- **Source of data** – UN data[224] for 2019
- **Metric** – %

Water scarcity risk

1	2	3	4	5
1.0-1.8 Very low risk	1.8-2.6 Low risk	2.6-3.4 Medium risk	3.4-4.2 High risk	4.2-5.0 Very high risk

- **Definition** – WWF water scarcity risk score is a composite index derived from an aridity index; a water depletion score, baseline water stress score, a blue water scarcity score, an available water remaining score, a drought frequency probability score and a projected change in drought occurrence score
- **Source of data** – WWF water scarcity risk score for 2021[225]
- **Metric** – Score from 1 to 5

Water use efficiency

1	2	3	4	5
>$400	>$300	>$200	>$100	<$100

- **Definition** – overall value added from use of municipal water supplies by people and the economy
- **Source of data** – UN data[226] for 2019
- **Metric** – US$ per m^3

Price of water

1	2	3	4	5
<10,000	<20,000	<30,000	<35,000	>35,000

- **Definition** – a measure of the price of water relative to GDP per capita
- **Source of data** – IBNET data on the price of water[227], GDP per capita data from the World Bank[228] for 2021
- **Metric** – GDP per capita in US$ / price of water per m^3 in US$

Personal consumption

1	2	3	4	5
<75	<100	<125	<150	>150

- **Definition** – personal water use in the home
- **Source of data** – International Water Association data[229] from 2019
- **Metric** – litres per person per day

Leakage

1	2	3	4	5
<5	<50	<75	<100	>100

- **Definition** – levels of network leakage per person
- **Source of data** – International Water Association data[230] from 2019
- **Metric** – litres per person per day

Appendix 3

The BSI Water Security Indicator

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m³	Per capita consumption	Leakage per capita	Overall Indicator Score
Albania	10,552.06	6.80	2.88	28.18	6,834.63	72.00	185.00	**20.00**
Australia	19,072.72	4.23	2.98	261.29	20,558.88	200.00	30.00	**19.00**
Austria	8,716.63	9.64	1.68	376.38	23,422.58	125.00	29.00	**17.00**
Belgium	1,580.04	51.58	2.73	477.01	18,434.17	87.00	29.00	**18.00**
Bulgaria	3,070.05	40.08	2.81	43.94	9,474.03	98.00	135.00	**24.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

The BSI Water Security Indicator

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m³	Per capita consumption	Leakage per capita	Overall Indicator Score
China	1,991.93	43.98	2.60	101.46	36,930.29	125.00	42.00	**26.00**
Croatia	25,864.18	1.49	1.62	76.41	8,002.40	125.00	23.00	**14.00**
Cyprus	628.53	31.57	3.93	157.29	17,336.15	230.00	61.00	**27.00**
Czech Republic	1,249.52	22.90	2.14	200.37	12,247.12	83.00	23.00	**17.00**
Denmark	1,027.22	25.57	1.89	588.61	19,655.43	128.00	12.00	**18.00**
Estonia	9,628.57	10.89	2.31	230.19	22,177.54	107.00	93.00	**21.00**
Finland	19,877.12	7.11	1.61	320.17	20,095.43	120.00	28.00	**15.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

The BSI Water Security Indicator continued

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m³	Per capita consumption	Leakage per capita	Overall Indicator Score
France	3,271.22	23.00	2.50	354.33	17,966.67	147.00	34.00	**19.00**
Germany	1,846.74	33.50	2.31	225.81	16,358.98	110.00	25.00	**20.00**
Greece	6,526.09	20.46	3.48	89.01	17,407.41	97.00	42.00	**21.00**
Hungary	10,687.49	7.71	1.91	132.84	16,872.16	84.00	52.00	**17.00**
Iceland	460,704.61	0.39	1.65	178.52	35,983.04	120.00	28.00	**17.00**
Ireland	10,469.10	21.57	2.95	260.66	No charge per m³	149.00	65.00	**23.00**
India	1,362.20	66.49	3.41	24.84	18,805.00	94.00	86.00	**26.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

The BSI Water Security Indicator continued

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m^3	Per capita consumption	Leakage per capita	Overall Indicator Score
Italy	3,222.65	29.75	2.95	138.80	24,935.31	120.00	52.00	**23.00**
Japan	3,441.46	36.05	1.60	218.72	34,484.82	224.00	32.00	**23.00**
Latvia	18,516.16	1.05	1.79	232.66	18,715.22	120.00	52.00	**16.00**
Lithuania	8,734.40	1.83	1.98	223.45	16,945.21	70.00	26.00	**14.00**
Luxembourg	5,511.81	4.09	1.79	1,176.93	43,233.04	120.00	28.00	**17.00**
Malta	96.93	81.00	4.10	266.32	10,147.48	120.00	52.00	**25.00**
Netherlands	5,209.82	17.00	2.26	304.54	27,907.20	126.00	9.00	**18.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

The BSI Water Security Indicator continued

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m^3	Per capita consumption	Leakage per capita	Overall Indicator Score
North Macedonia	3,036.05	2.05	2.80	21.41	11,157.67	128.00	255.00	**24.00**
Norway	72,885.76	31.10	1.45	317.97	32,538.07	200.00	165.00	**22.00**
Poland	1,576.38	12.32	2.02	163.45	12,857.07	119.00	32.00	**20.00**
Portugal	7,516.02	6.01	3.36	171.47	14,119.25	161.00	47.00	**21.00**
Romania	10,931.73	6.33	2.15	122.36	12,079.84	91.00	122.00	**19.00**
Serbia	22,122.20	2.40	1.83	37.83	13,573.82	143.00	120.00	**20.00**
Slovakia	9,182.55	6.38	2.04	208.73	12,437.15	83.00	50.00	**17.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

The BSI Water Security Indicator continued

	Total renewable water resources per capita	Total freshwater withdrawal as a % of available freshwater resources	WWF 2021 Water Scarcity Score	Water use efficiency (municipal)	GDP per capita/ Price per m^3	Per capita consumption	Leakage per capita	Overall Indicator Score
Slovenia	15,040.11	39.83	1.52	175.22	21,859.25	104.00	45.00	**19.00**
Spain	2,352.42	3.55	3.75	208.50	19,297.12	141.00	61.00	**21.00**
Sweden	16,703.47	6.50	1.50	387.70	20,548.38	145.00	126.00	**19.00**
Switzerland	6,169.99	45.71	2.00	577.16	31,078.24	142.00	33.00	**20.00**
Turkey	2,505.36	38.70	3.35	89.19	16,102.00	95.00	177.00	**25.00**
UK	2,188.54	14.35	1.62	366.48	21,237.58	149.00	52.00	**20.00**
US	5,678.82	28.16	2.21	282.67	36,779.37	379.00	123.00	**27.00**

1	2	3	4	5
<15 Very low risk	<18 Low risk	<21 Medium risk	<24 High risk	>24 Very high risk

End notes

About this report

Waterwise compiled this report on behalf of BSI, drawing on data sources and documents together with engagement with the following organizations:

- International Water Association – Global including Asia
- Alliance for Water Efficiency – US
- The Water Conservancy – Australia

The report was produced between June and August 2023.

About Waterwise

Waterwise is the leading independent voice in the UK for using water wisely, for the benefit of people and the planet. Our vision is that water is used wisely every day, everywhere, by everyone. We are the UK's conscience on water efficiency, on behalf of people and the planet, and are experts in water efficiency policy, regulation, research, behaviour and campaigns. Waterwise is a people-led organization which prioritises the wellbeing of its staff.

Forewords

1 Global water industry net zero commitments top 72 million people served, Water UK, November 2021

2 Research carried out by Malvern Insight and Yonder. Consumers: Data based on 1,020 interviews (514 UK, 506 USA) with nationally representative sample of adults, conducted 16 – 18 May 2023. SMEs: Data based on 223 interviews (120 UK, 103 USA) with decision-makers within SMEs (up to 249 employees), conducted 16 – 18 May 2023

Introduction

3 Wall Street is paying more attention to the business risks posed by water, Quartz, May 2023

Executive summary

4 Water security is a national security issue: What's needed now, World Economic Forum, accessed July 2023

5 Are We Running Out of Water?, Earth.Org, accessed July 2023

6 UN World Water Development Report 2023, UNESCO, March 2023

A global challenge

7 Water security is a national security issue: What's needed now, World Economic Forum, accessed July 2023

8 Are We Running Out of Water?, Earth.Org, accessed July 2023

9 Water Facts – Worldwide Water Supply, US Bureau of Reclamation, accessed July 2023

10 Hydrology and water resources management in ancient India, HESS, May 2020

11 Water harvesting and distribution systems of the minoan civilization, The Archaeologist, August 2021

12 Roman Aqueducts, National Geographic, accessed August 2023

13 UN World Water Development Report 2023, UNESCO, March 2023

14 Global freshwater use over the long-run, Our World in Data, accessed July 2023

15 Aquastat, Food and Agriculture Organization of the United States, accessed July 2023

16 Quantifying the global non-revenue water problem, Water Supply, July 2018

17 AQUASTAT – FAO's Global Information System on Water and Agriculture, Food and Agriculture Organization of the United States, accessed July 2023

18 The long term potential for deep reductions in household water demand, Artesia Consulting, April 2018

19 AQUASTAT – FAO's Global Information System on Water and Agriculture, Food and Agriculture Organization of the United States, accessed July 2023

20 UN Water, United Nations, accessed July 2023

21 UN Water, United Nations, accessed July 2023

22 UN Water, United Nations, accessed July 2023

23 Agricultural water as a share of total water withdrawals, 2017, Our World in Data, accessed July 2023

24 World Population Prospects 2022, UN Department of Economic and Social Affairs Population Division, accessed July 2023

25 Reassessing the projections of the World Water Development Report, Nature, July 2019

26 Renewable freshwater resources per capita, Our World in Data, accessed July 2023

27 Water Scarcity, UN Water, accessed July 2023

28 "Wake up to Water" urge Water and Climate Leaders, World Meteorological Foundation, March 2023

29 Adapt Now: A Global Call for Leadership on Climate Resilience, Global Commission on Adaptation, September 2019

30 Water scarcity hotspots travel downstream due to human interventions in the 20th and 21st century, Veldkamp, T. I. E. et al, June 2017

31 GAR Special Report on Drought 2021, United Nations Office for Disaster Risk Reduction, 2021

32 Renewable freshwater resources per capita, Our World in Data, accessed July 2023

33 WWF Risk Filter Suite, WWF, accessed July 2023

34 WWF Risk Filter Suite, WWF, accessed July 2023

The blue thread

35 FAQ Chapter 1, IPPC, accessed July 2023

36 Causes and Effects of Climate Change, UN, accessed July 2023

37 World ‘at a crossroads’ as droughts increase nearly a third in a generation, UN, May 2022

38 Drought in Numbers 2022, UNCCD, accessed July 2023

39 National Drought Status, U.S. Drought Monitor, accessed July 2023

40 Water Cycle Changes, IPCC Sixth Assessment Report, accessed July 2023

41 Addressing water-related disasters and climate impacts, UN, accessed July 2023

42 Drought in Numbers, UN, May 2022

43 Drought in Numbers 2022, UNCCD, accessed July 2023

44 Drought in Numbers, UN, May 2022

45 Drought in Numbers, UN, May 2022

46 National Drought Status, U.S. Drought Monitor, accessed July 2023

47 2021 State of Climate Services: Water, World Meteorological Organization, 2021

48 Global water industry net zero commitments top 72 million people served, Water UK, November 2021

49 2019 UK greenhouse gas emissions, provisional figures, Department for Business, Energy & Industrial Strategy, March 2020

50 Pathways to long-term PCC reduction, Water UK, August 2019

51 Energy & Emissions, Discover Water, accessed July 2023

52 Net Zero and the Role of Water Efficiency, Waterwise, February 2021

53 Our Path to Net Zero, Melbourne Water, accessed July 2023

54 Reaching net zero carbon, SA Water, accessed July 2023

55 Mapping Water’s Carbon Footprint, GWI, November 2022

56 Mapping Water’s Carbon Footprint, GWI, November 2022

57 Net Zero 2030 Routemap, Water UK, November 2020

58 Global Bottled Water Industry: A Review of Impacts and Trends, UN University's Institute for Water, Environment and Health, March 2023

59 Future global urban water scarcity and potential Solutions, Chunyang He at al, August 2021

60 Net Zero 2030 Routemap, Water UK, November 2020

61 World Population Prospects 2022, UN, accessed July 2023

62 Data, UN, accessed July 2023

63 Future global urban water scarcity and potential Solutions, Chunyang He at al, August 2021

64 World Urbanization Prospects 2018, UN, accessed July 2023

65 in which population is more than 10 million

66 Future global urban water scarcity and potential Solutions, Chunyang He at al, August 2021

67 Global Water Report 2022, CDP, March 2023

68 Global Water Report 2022, CDP, March 2023

69 Partnerships and cooperation for water, UNESCO, March 2023

70 UN Water, UN, accessed July 2023

71 UN Water, UN, accessed July 2023

72 Drought in Numbers, UNCCD, May 2022

73 Compare your business water use, Water Corporation Au, accessed July 2023

74 Business water saving calculator, Thames Water, accessed July 2023

75 Plan for Water: our integrated plan for delivering clean and plentiful water, Defra, April 2023

76 Freshwater biodiversity, WWF, accessed July 2023

77 Progress on Integrated Water Resources Management, UNEP, August 2021

78 Living Planet Report 2022, WWF, October 2022

79 Freshwater biodiversity, WWF, accessed July 2023

80 Freshwater biodiversity, WWF, accessed July 2023

81 Alleviating low flows in rivers, National Rivers Authority Thames Region, 1992

82 Summary of Regional Plans for Water Resources, WRSE, November 2022

83 Plan for Water: our integrated plan for delivering clean and plentiful water, Defra, April 2023

84 World 'at a crossroads' as droughts increase nearly a third in a generation, UN, May 2022

85 Mind the Gap! Reconciling Environmental Water Requirements with Scarcity in the Murray–Darling Basin, Australia, MDPI, January 2022

86 Everything you need to know about California's historic water law, Guardian, February 2020

87 Biden-Harris Administration Announces Historic Consensus System Conservation Proposal to Protect the Colorado River Basin, US Department of the Interior, May 2023

88 Snapshots, UN Water, accessed July 2023

89 World 'at a crossroads' as droughts increase nearly a third in a generation, UN, May 2022

90 Remarks at launch of the New Climate Economy report, UN, September 2018

91 The 17 Goals, UN, accessed July 2023

92 UK Water Efficiency Strategy to 2030, Waterwise

93 Snapshots, UN Water, accessed July 2023

94 Snapshots, UN Water, accessed July 2023

Broader Insights and Trends

[95] Raw sewage dumped into English waterways 800 times a day, The Times, March 2023

[96] Quantifying the global non-revenue water problem, Water Supply, May 2019

[97] Quantifying the global non-revenue water problem, Water Supply, May 2019

[98] Quantifying the global non-revenue water problem, Water Supply, May 2019

[99] Quantifying the global non-revenue water problem, Water Supply, May 2019

[100] Residential End Uses of Water, Version 2, WRF, April 2016

[101] Smart Practices to Save Water: An Evaluation of AMI-enabled Proactive Leak Notification Programs, Alliance for Water Efficiency, March 2023

[102] Why 96 million plastic 'shade balls' dumped into the LA Reservoir may not save water, PBS, July 2018

[103] Cistermiser launches EasyFlushEVO for leak-free WC flushing, Installer Online, accessed July 2023

[104] Dual Flush – WRAS share findings of survey, WRAS, accessed July 2023

[105] At home with water, Energy Saving Trust, February 2018

[106] Residential End Uses of Water, Version 2, Water Research Foundation, April 2016

[107] How much water do we need?, Hunter Water, accessed July 2023

[108] Three quarters of Brits shower too much, YouGov, January 2019

[109] Flow loop turns your existing shower sustainable in 1 hour, Flow Loop, accessed July 2023

[110] A Fundamental Guide to Building the Water Utility of the Future, Sensus, accessed July 2023

[111] Smart Water Metering Market by Meter Type, Markets and Markets, December 2022

[112] Tech dive: why smart water meters are getting smarter, AquaTech, October 2019

[113] Smart Water Metering: Digitizing to Survive? Wastewater Digest, April 2021

[114] Tech dive: why smart water meters are getting smarter, AquaTech, October 2019

[115] Global Smart Water Meter Market (2022 to 2027), Business Wire, March 2022

[116] Smart Water Metering Market by Meter Type, Markets and Markets, December 2022

[117] Water Metering Resources, Federal Energy Management Program, accessed July 2023

[118] Smart Water Metering: Digitizing to Survive? Wastewater Digest, April 2021

[119] A Fundamental Guide to Building the Water Utility of the Future, Sensus, accessed July 2023

[120] A Strategic Digital Transformation for the Water Industry, IWA, October 2022

[121] Water Rating, Australian Government, accessed July 2023

[122] Review of international water efficiency product labelling, IWA, February 2019

[123] Water Labelling Phase 2 Project – Technical Report, Waterwise, October 2019

[124] Consultation on Mandatory Water Efficiency Labelling, Defra, September 2022

[125] Independent Review of Costs & Benefits of RWH and GWR Options in the UK, Waterwise, September 2020

[126] Water and Circular Economy, Arup, accessed July 2023

[127] Independent Review of Costs & Benefits of RWH and GWR Options in the UK, Waterwise, September 2020

[128] Independent Review of Costs & Benefits of RWH and GWR Options in the UK, Waterwise, September 2020

[129] Making Every Drop Count: How Australia is Securing its Water Future, National Geographic, accessed July 2023

[130] Independent Review of Costs & Benefits of RWH and GWR Options in the UK, Waterwise, September 2020

[131] Independent Review of Costs & Benefits of RWH and GWR Options in the UK, Waterwise, September 2020

132 The state of desalination and brine production: A global outlook, Science of the Total Environment, 2019

133 How technology and entrepreneurship can quench our parched world, World Economic Forum, June 2022

134 Is Desalination a Solution to Freshwater Scarcity in Developing Countries?, Membranes (Basel), April 2022

135 Towards sustainable desalination, UNEP, May 2019

136 Water Neutrality, Horsham District Council, accessed July 2023

137 New plan for cleaner and more plentiful water, Defra, April 2023

138 Water positive, BP, accessed August 2023

139 Environmental Impact, Hilton, accessed August 2023

140 BSI to supply

141 Mars targets 'water balance' at manufacturing plants facing water stress, Edie, August 2021

142 Facebook is committed to being water positive by 2030, Meta, August 2021

143 Microsoft will replenish more water than it consumes by 2030, Microsoft, September 2020

144 Water, Molson Coors Beverage Company, accessed August 2023

145 Neutral turns out positive, Sainsbury's, accessed August 2023

Healthcare

146 The environmental footprint of health care: a global assessment, The Lancet, July 2020

147 Howell TA Enhancing water use efficiency in irrigated agriculture. Agron J. 2001; 93: 281-289

148 Environment and sustainability Health Technical Memorandum 07-04, Department of Health, 2013

149 Saving water in hospitals, EPA, accessed July 2023

150 Reducing water use at healthcare facilities, Department of Health Victoria, accessed July 2023

151 Progress on WASH in health care facilities 2000-2021, Unicef, August 2022

152 Water Efficiency dashboard, MOSL, accessed July 2023

153 Commercial and Institutional End Uses of Water, Dziegielewski, et al, American Water Works Association Research Foundation, 2000

154 Environmental impacts of Australia's largest health system, Malik et al, Resources, Conservation and Recycling, June 2021

155 French industry faced with the threat of water scarcity, Le Monde, August 2022

156 Total number of hospitals in select countries worldwide in 2020, Statista, accessed July 2023

157 Our pledge to become more water efficient, NHS, accessed July 2023

158 Water consumption and benchmarks, Department of Health Victoria, accessed July 2023*

159 The health sector must become greener, Bio Pro, October 2022

160 EPA: Hospitals use most water, but are not among top facilities tracking use, Healthcare Facilities Today, January 2013

161 Water consumption and benchmarks, Department of Health Victoria, accessed July 2023

162 Hospital saves over £3,700 with Automatic Meter Readers, Wave Utility, accessed July 2023

163 NHS Lothian, Business Stream, accessed July 2023

164 Sustainable Hand Surgery: Incorporating Water Efficiency Into Clinical Practice, Cureus, April 2023

165 A Review of Sustainable Healthcare, the Australian Commission on Safety and Quality in Health Care, 2022

166 How to Save Over 12 Million Gallons of Water with One Decision, Stanford Hospitals & Clinics, accessed July 2023

167 Reimagining rainwater in hospitals, Greater London Authority, accessed July 2023

* In 2015-16 the Department of Health invested in a new environmental management system which increased the number of facilities consumption was measured from, meaning the data from previous years cannot be directly compared.

[168] Water transformed: Sustainable water solutions for Climate change adaptation, The Natural Edge Project, 2009

[169] Water, Green Hospitals, accessed July 2023

[170] Water transformed: Sustainable water solutions for Climate change adaptation, Natural Edge Project, 2009

[171] Water, Green Hospitals, accessed July 2023

[172] Designing in sustainability, Cytiva, accessed July 2023

[173] Aqueduct Water Risk Atlas, World Resources Institute, accessed August 2023

Retail

[174] Water Intensity Indicators in the Global Retail Sector, SpringerLink accessed August 2023

[175] The Issues: Water, Common Objective, accessed July 2023

[176] End of Fast Fashion, China Water Risk, accessed July 2023

[177] Preferred Fiber & Materials Market Report 2021, Textile Exchange, January 2021

[178] Fixing Fashion, House of Commons Environmental Audit Committee, February 2019

[179] Cotton, WWF, accessed July 2023

[180] China Water Risk, accessed July 2023

[181] Towards environmental sustainability: Life cycle assessment-based water footprint analysis on China's cotton production, Journal of Cleaner Production, June 2021

[182] The country that brought a sea back to life, BBC, July 2018

[183] The state of the apparel sector, GLASA AND SFA, September 2015

[184] Potential of rainwater harvesting in the retail sector: a case study in Portugal, Environmental Science and Pollution Research, January 2023

[185] Lowe's: Water Consumption in 2021, GlobalData, accessed July 2023

[186] Organic Cotton, Soil Association, accessed July 2023

[187] The Issues: Water, Common Objective, accessed July 2023

[188] Press release, H&M, March 2022

[189] Nitori: Water Withdrawal in 2021, GlobalData, accessed July 2023

[190] The Issues: Water, Common Objective, accessed July 2023

[191] The Issues: Water, Common Objective, accessed July 2023

[192] Cost of living crisis will drive more consumers towards secondhand fashion, with the global apparel resale market set to grow 85.5% between 2022 and 2026 to $338.4 billion, says GlobalData, GlobalData, October 2022

[193] Water Efficiency dashboard, MOSL, accessed July 2023

[194] A New Textiles Economy, The Ellen MacArthur Foundation, accessed July 2023

[195] The state of the apparel sector, GLASA AND SFA, September 2015

[196] China Water Risk, accessed July 2023

[197] Best Buy: Water Withdrawal in 2021, GlobalData, accessed July 2023

Built environment

198 Water, energy, and carbon dioxide footprints of the construction sector: A case study on developed and developing economies, Pomponi and Stephan, February 2021

199 Three ways construction sites can be more water efficient, Construction Management, July 2022

200 Water Efficiency: the contribution of construction products, CPA, 2015

201 Three ways construction sites can be more water efficient, Construction Management, July 2022

202 Plan for Water: our integrated plan for delivering clean and plentiful water, Defra, April 2023

203 Water management, Willmott Dixon, accessed July 2023

204 How do water-saving features help you financially?, KB Home, accessed July 2023

205 Saving water on a construction site with Innovation Partner Loowatt, Wates, accessed July 2023

206 Three ways construction sites can be more water efficient, Construction Management, July 2022

207 What Is the Common Assessment Standard?, CHAS, accessed July 2023

208 Green Building 101: How does water efficiency impact a building?, LEED, May 2014

209 Level(s) European framework for sustainable buildings, European Commission, accessed July 2023

210 Guiding Principles for Sustainable Federal Buildings, Sustainable Facilities Tool, accessed July 2023

211 Greening Our Existing Homes, CLC, May 2021

212 Green Building 101: How does water efficiency impact a building?, LEED, May 2014

213 Save Water on your Construction Site, Construction Leadership Council, March 2023

214 The Green Building Information Gateway, accessed July 2023

BSI Water Security Indicator

215 For water scarcity risk we have used the 1 to 5 scale developed by WWF

216 City with highest levels of water stress worldwide as of 2018, by score, Statista, accessed July 2023

Conclusions

[217] Water Facts – Worldwide Water Supply, Bureau of Reclamation California-Great Basin, accessed July 2023

[218] UN Water, United Nations, accessed July 2023

[219] UN Water, United Nations, accessed July 2023

Recommendations

[220] Water Rating, Australian Government, accessed July 2023

[221] Smart Metering for Water Efficiency, Global Infrastructure Hub, accessed July 2023

Appendix 2

[222] UN Water, UN, accessed July 2023

[223] World Population Prospects 2022, UN Department of Economic and Social affairs, accessed July 2023

[224] UN Water, UN, accessed July 2023

[225] WWF Risk Filter Suite, WWF, accessed July 2023

[226] UN Water, UN, accessed July 2023

[227] Tariff Benchmarking (Current USD), IB Net Tariffs, accessed July 2023. All data is 2021 other than China, India, Cyprus, Malta, Greece Luxembourg and Switzerland where "All Data" has been used

[228] GDP per Capita, World Bank, accessed July 2023

[229] Quantifying the global non-revenue water problem, R. Liemberger; A. Wyatt, Water Supply, July 2018

[230] Quantifying the global non-revenue water problem, R. Liemberger; A. Wyatt, Water Supply, July 2018

Read more about our
services and products
on our website
bsigroup.com