Sustainability Insights | Research

Lost Water: Challenges And Opportunities

Sept. 6, 2023

Non-revenue water or "lost water" deters investment in water infrastructure, representing a global sustainability challenge.

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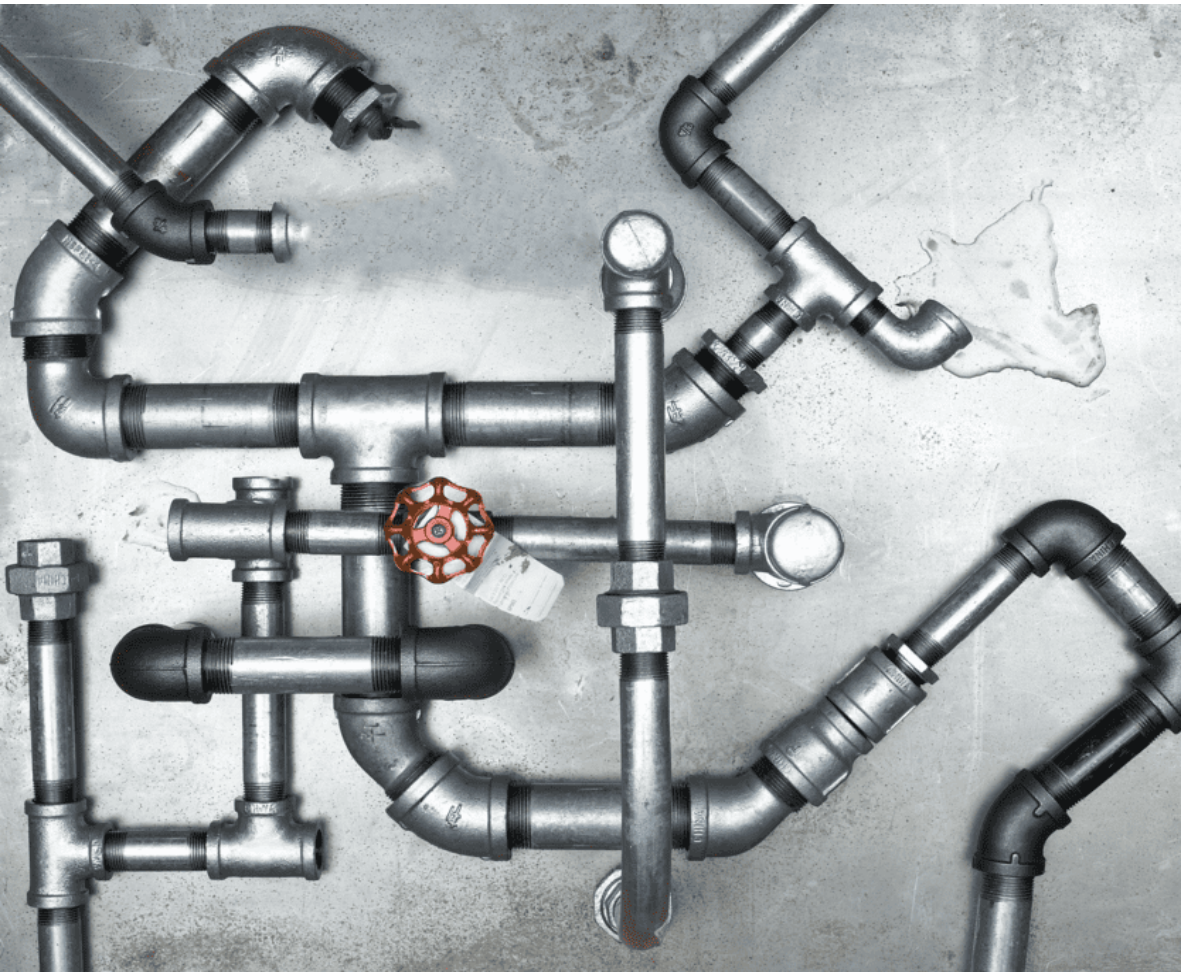
This report does not constitute a rating action.



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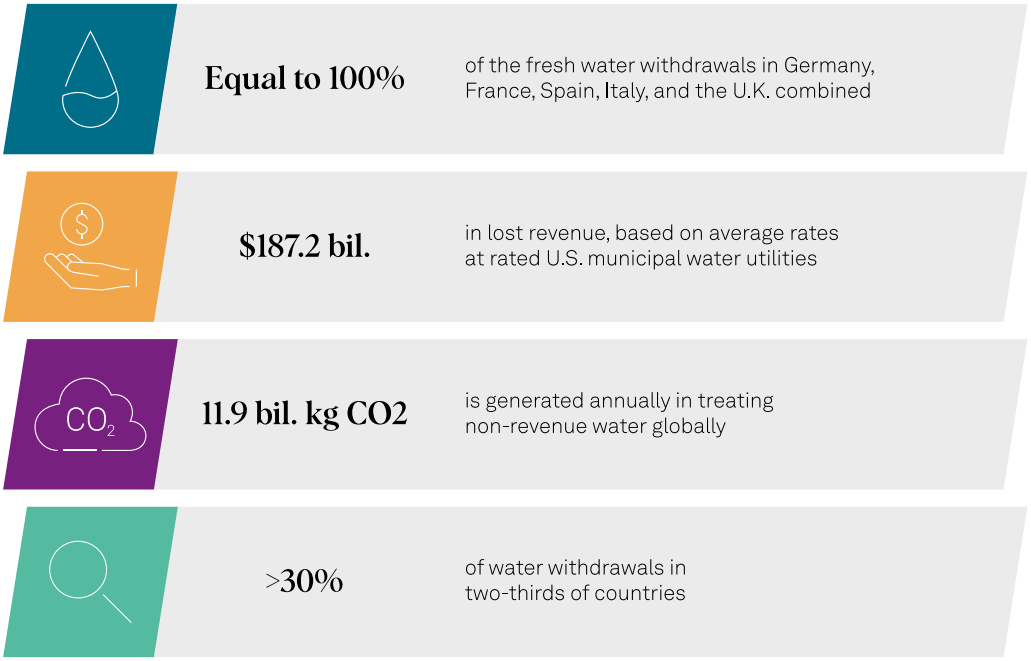
In this research, S&P Global Ratings looks at water infrastructure challenges through the lens of non-revenue water (NRW), meaning water that a utility sources and treats but for which it receives no financial compensation. We explore how water infrastructure is currently financed; whether there is a significant case for increasing investment in water infrastructure to reduce NRW for stakeholders and rated entities financing water infrastructure; and why underinvestment persists.

The data in this research largely come from Liemberger and Wyatt, which used a combination of observed and modeled estimates for NRW globally, at the national level; S&P Global Corporate Sustainability Assessment (CSA) data on leakage rates reported by globally listed utilities; and public data about U.S. public finance (USPF) not-for-profit municipal water utilities rated by S&P Global Ratings. To explore the credit materiality of NRW, we focus on the USPF subsector, since S&P Global Ratings maintains credit ratings on approximately 1,400 water utilities that represent diverse challenges in geography, water supply, system age, and affordability. However, the same factors could affect the creditworthiness of other water utilities in and outside the U.S.

Key Takeaways

- Non-revenue water (NRW), or lost water, deters investment in water infrastructure assets. Analyzing NRW can provide valuable information about the infrastructure's performance, financial vulnerability, and governance in the sector.
- Reducing NRW can have many benefits, including increasing universal access to safe water, mitigating water stress, reducing the impacts of freshwater withdrawals on ecosystems, and mitigating global greenhouse gas emissions.
- Investment decisions made today could significantly affect future NRW rates, yet in many cases--particularly emerging markets--access to private-sector funding is limited and regulatory incentives are insufficient.
- High NRW rates may pose operating risks for water utilities. In severe cases, this could contribute to downgrades, but these have been rare among the utilities we rate.

About 126 billion cubic meters of water is lost every year



Source: S&P Global Ratings.

What Is Non-Revenue Water (NRW)?

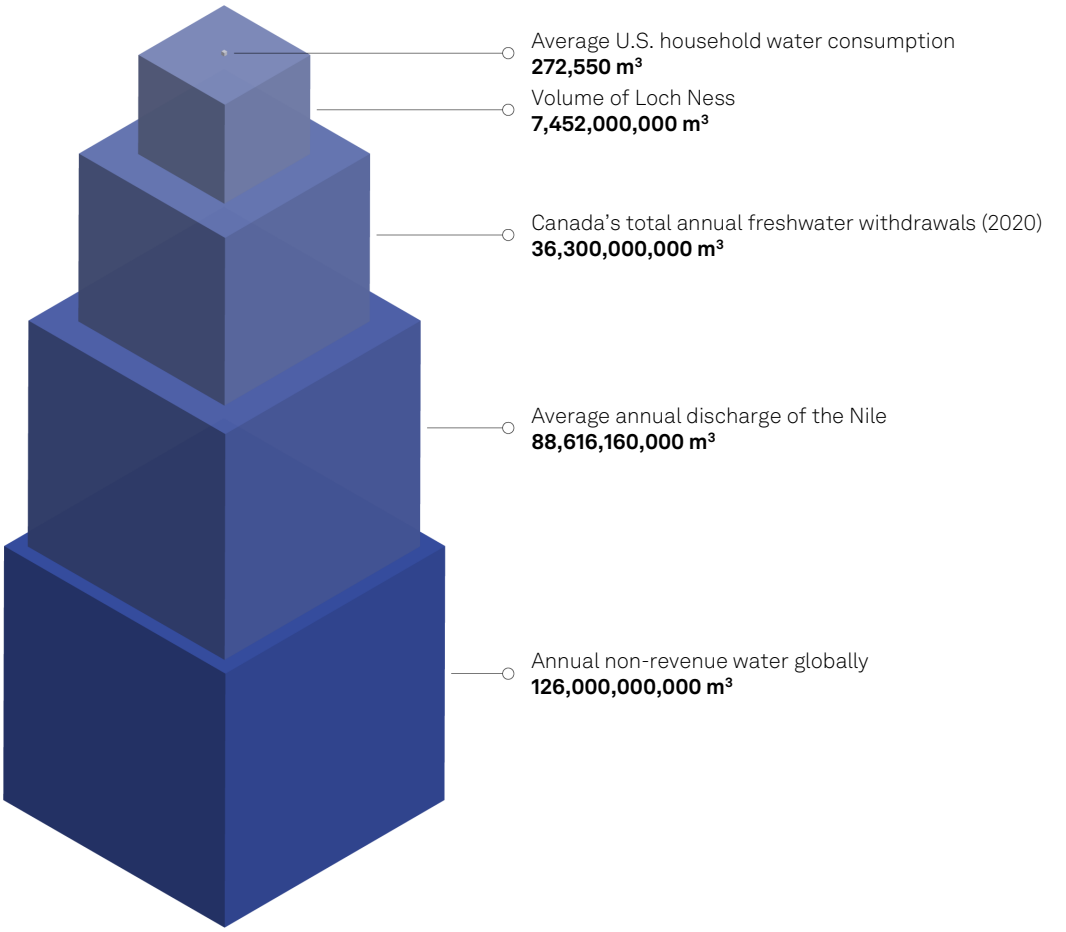
In many ways, the adage "out of sight, out of mind" applies to NRW

NRW, unaccounted-for water, apparent and real water losses, and leakage are all names for this global issue. These metrics generally refer to water that is withdrawn from groundwater or surface water sources and treated to local standards, but for which a utility does not receive payment. These losses result primarily from leakage from pipes and interconnections; aging meters that underestimate water usage; illicit withdrawals; or public policy decisions to provide some water without charge.

Underinvestment in water infrastructure is rarely visible unless a major main break occurs. By contrast, underinvestment in transportation may become apparent in train delays and expanding potholes, while power outages reveal vulnerabilities in electric infrastructure. Regarding NRW, loose valves or leaky pipes allow treated water to seep into the soil, accelerated by the high pressure needed to prevent contamination of the water supply. Furthermore, it is very difficult for utilities to gather information about the number, size, and location of illicit taps. Policies to provide free water services to municipalities or public agencies are rarely a line item on utility financial statements but, instead, are an off-budget item of potential revenue not received.

Chart 1

How big is the NRW issue?



Sources: NaturScot; AQUASTAT; "Large rivers: geomorphology and management," A. Gupta, 2007; S&P Global Ratings.

What makes measuring NRW challenging?

Although NRW data are tracked, it is often difficult to find reliable information for consistent analysis due to challenges in measurement and multiple data definitions. Some organizations, such as the American Water Works Association (AWWA), recommend against using percentage indicators due to the fractional element, the disconnect between loss rates and financial valuation, and the importance of local context in determining the materiality of different types of losses.

Key metrics and data sets

In this research, we rely on three primary metrics, as defined below. The choice of metric used is due to the data sources using different data definitions. These data may be reported on a volumetric basis, as a percentage of water withdrawn, or as a percentage of water treated by the utility. The resultant challenges in comparing data from multiple sources are common in the industry.

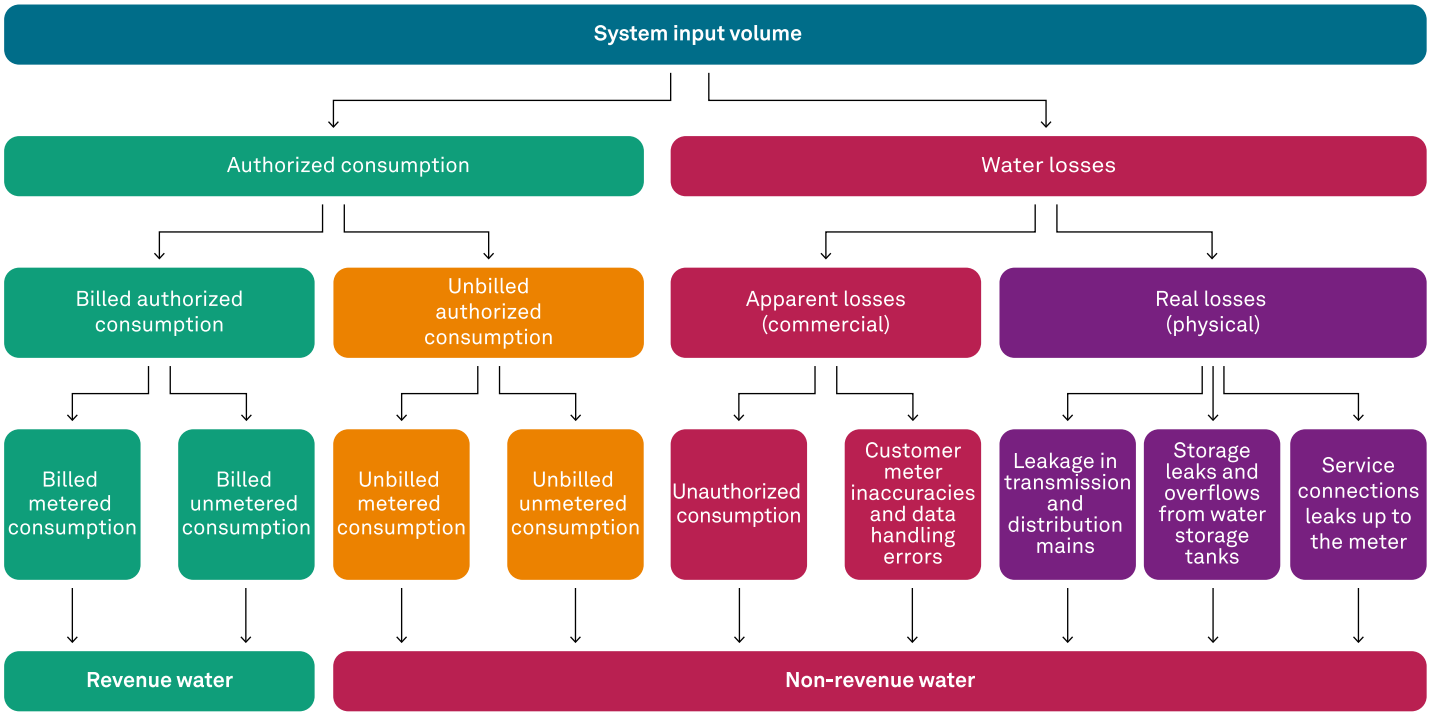
Leakage rate: Water treated by the utility but is physically "lost" before customer delivery due to leaks in utility infrastructure ("Real losses": purple in chart 2). The data set includes 20 listed companies that submitted to the CSA between 2017 and 2021, and are headquartered in Asia, Europe, and North and South America.

Water losses: Leakage rate plus other apparent losses due to unauthorized consumption, and billing errors due to mismeasurement or data management errors ("Water losses": purple and red in chart 2). S&P Global Ratings assembled the data set using public data for 29 of the largest water utilities that it rates. The sample is available in table 2.

Non-revenue water: "Water losses" in chart 2, plus other water provided for no charge due to public policy decisions ("Unbilled auth. consumption": orange). Liemberger and Wyatt's data includes observed and estimated NRW rates at the national level for 220 countries.

Chart 2

Terminology determines what types of non-revenue water are included in the metric



Source: S&P Global Ratings, American Water Works Association.

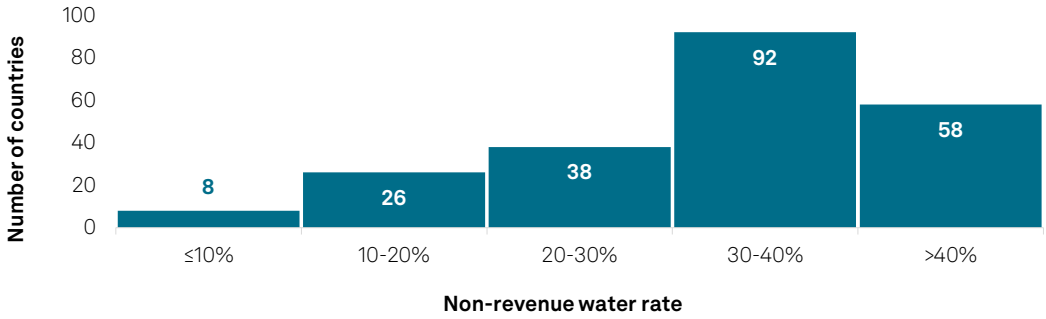
The invisibility challenge means NRW can increase significantly before attracting management or public attention. Liemberger and Wyatt estimate the global volume of NRW at 346 million cubic meters per day, or 126 billion cubic meters per year (see chart 3) for the 220 countries in its study. This equals the freshwater withdrawals of Germany, France, Spain, Italy, and the U.K. combined, according to Aquastat. More than two-thirds of countries in the Liemberger and Wyatt study have NRW estimates of more than 30% of water withdrawals. Using an estimate of 31 cents per cubic meter, Liemberger and Wyatt estimate the annual global value of NRW at $39 billion. This figure, however, might vastly understate the value of NRW. The Liemberger and Wyatt estimate equates to a value of $7.04 for 6,000 gallons, S&P Global Ratings' assumption for monthly U.S. consumption. Using an estimate of $33.75 for 6,000 gallons of water service--the average for all U.S. municipal utilities rated by S&P Global Ratings based on the most recently available data--this same volume would have a value of $187.2 billion annually.

Leakage rates that private utility companies report and water-loss rates among large, rated USPF issuers show similar issues (charts 4 and 5, listed in table 2). Although the USPF sample appears the strongest performer on NRW of the three data sets, two-thirds of the utilities report water loss rates of more than 10%, with some--particularly larger, older systems--reporting rates of 30% or higher. These data sources are not directly comparable with national NRW estimates: we would expect lower values, since these utilities will generally have greater capacity in terms of financial and human resources to monitor, invest in, and report on infrastructure performance. U.S. Environmental Protection Agency (EPA) data show that small utilities tend to experience far more environmental violations, which is often attributed to lack of capacity or greater affordability pressures. In addition, the data definitions for leakage rates and water loss are narrower than for NRW. This is consistent with the data.

Estimates of the global volume of NRW are equal to the annual freshwater withdrawals of Germany, France, Spain, Italy, and the U.K. combined.

Chart 3

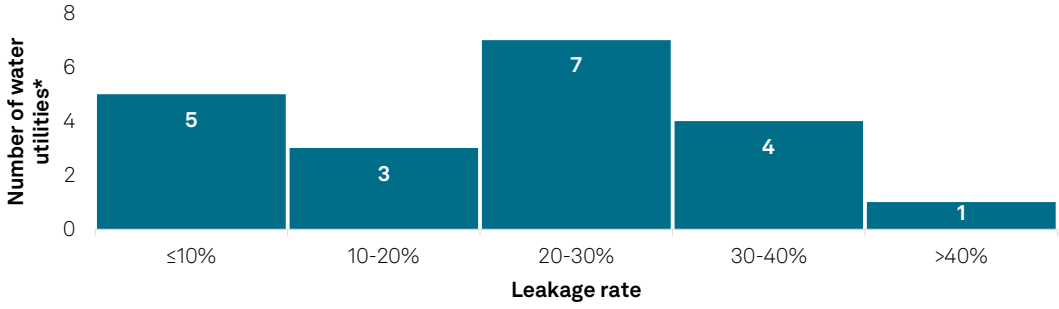
Two-thirds of countries have NRW rates above 30%



Source: S&P Global Ratings, Liemberger and Wyatt.

Chart 4

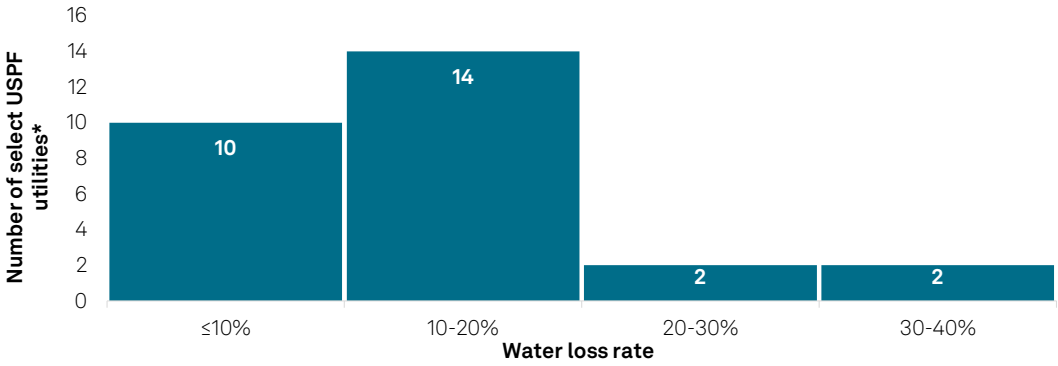
More than half of reporting companies have leakage rates higher than 20%



*Includes publicly listed water utilities that are CSA respondents. Source: S&P Global Ratings, Corporate Sustainability Assessment.

Chart 5

Two-thirds of select USPF utilities have water loss rates of more than 10%



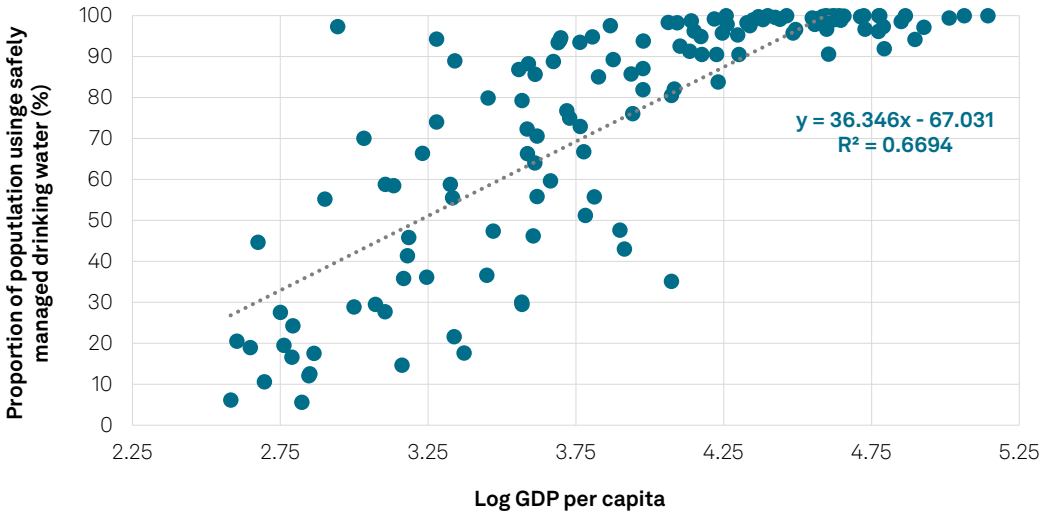
*Utilities selected by revenue size and geographic diversity. Source: S&P Global Ratings.

There is little correlation between per capita GDP and NRW

Access to essential infrastructure and services--including access to safe water--correlates with per capita GDP levels. This means that, as countries become more affluent, more people have access to safe water. Per capita GDP alone accounts for two-thirds of the difference in rates of safe water access between countries, given the R2 value of 0.67 (see chart 6).

Chart 6

GDP levels appear to correlate with access to safe water



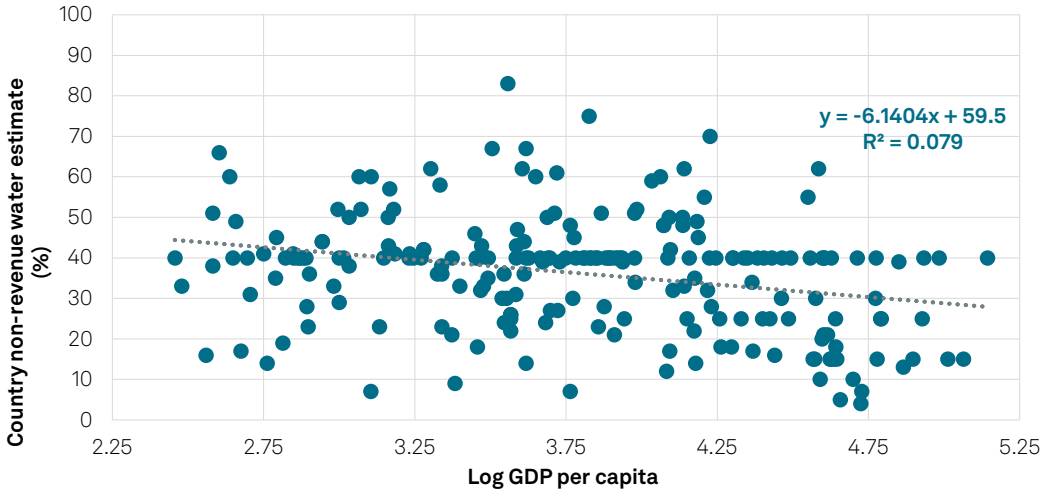
Source: S&P Global Ratings, Liemberger and Wyatt, United Nations.

We cannot assume that higher levels of global development and wealth will mean lower NRW.

However, there appears to be little correlation between per capita GDP and NRW (chart 7). In other words, we cannot assume that higher GDP per capita will mean lower NRW. National infrastructure investment, the system's age and geography, subsidies that reduce the financial relationship between water value and retail price, as well as weather patterns and system design, can all affect NRW levels. Foregone revenue due to NRW might be more manageable financially for governments, utilities, and ratepayers in more affluent countries, but NRW creates many sustainability challenges in addition to financial management. There is also the possibility that statistics on NRW are more reliable in high-per-capita countries (although we were unable to verify this).

Chart 7

GDP levels appear to have little correlation with NRW rates



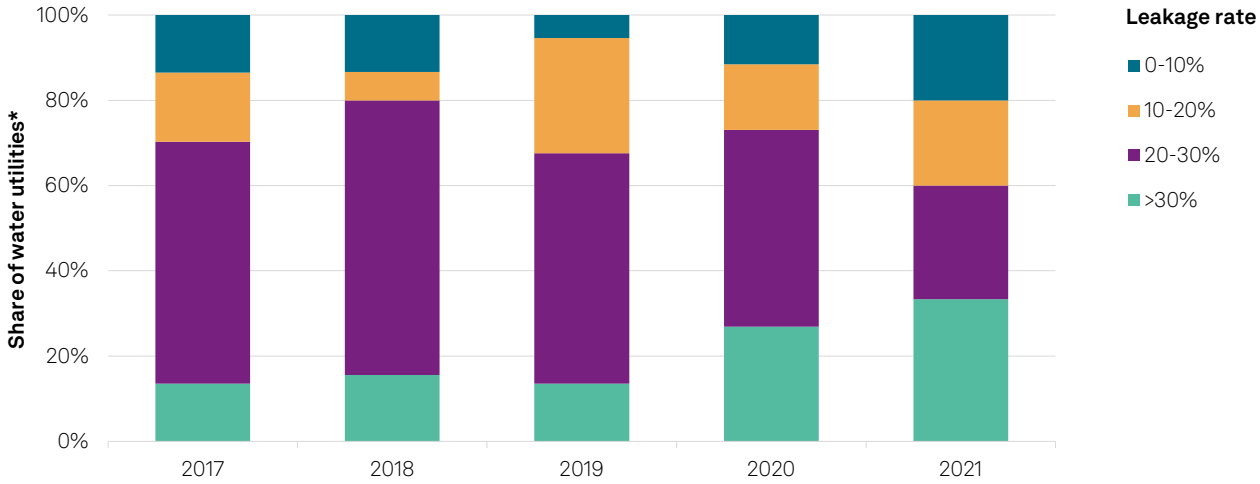
Source: S&P Global Ratings, Liemberger and Wyatt.

NRW is not improving consistently

There does not appear to be a consistent trend of improvement in leakage rates. Chart 8 shows the distribution of leakage rates reported to the CSA over a five-year period. Although the share of companies reporting relatively low rates (below 10%) has increased in the past five years, the share of utilities reporting the highest rates (more than 30%) has also risen. The share of utilities reporting leakage rates above 20% (purple and green) has remained very close to 60% throughout the five-year period. If these utilities--with their greater financial and human resources--could not improve leakage rates in the past half-decade, we believe it is unlikely that the broader sector, including smaller utilities, made outsize gains.

Chart 8

Utility reporting shows inconsistent improvement in leakage rates



*Includes publicly listed water utilities that are CSA respondents. Source: S&P Global Ratings, Corporate Sustainability Assessment.

NRW Poses Multiple Challenges For Stakeholders

This section speaks to stakeholder materiality, which we consider in our sustainable finance opinions. This section does not apply to our credit ratings. Stakeholder challenges are not always material for credit ratings; however, they are important considerations for our sustainable finance opinions such as our second-party opinions on debt labelled as sustainable. Water is essential for human and environmental health as well as many economic activities. Therefore, from a stakeholder perspective, we believe withdrawing, treating, and transporting billions of gallons of water that are not used for household, agricultural, or industrial uses--or high levels of NRW--could exacerbate stakeholders' concerns, including water stress, maintaining healthy ecosystems, and the feasibility and affordability of providing safe water to the public. High NRW can even increase the challenge of meeting the Paris Agreement target of limiting global climate change to well below 2 degrees Celsius.

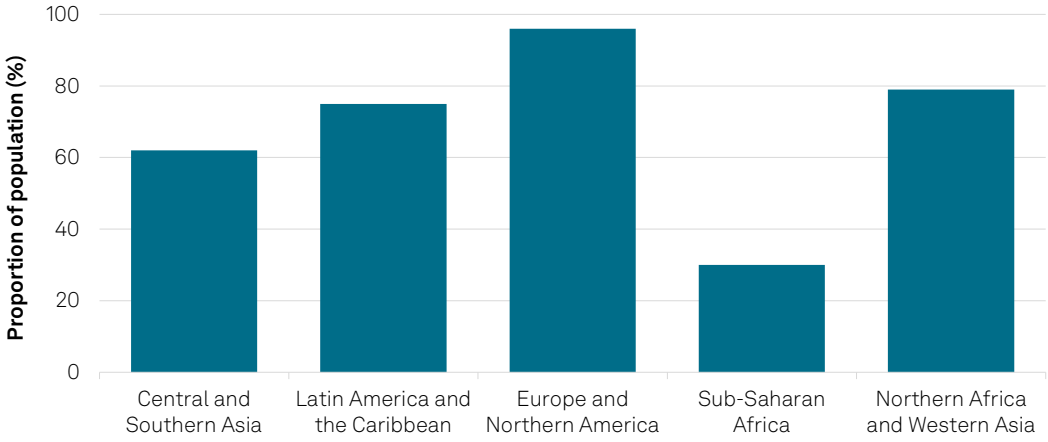
High levels of NRW could exacerbate stakeholder concerns.

Access to safe drinking water has numerous public health benefits

The World Health Organization estimates that more than 829,000 people die from diarrhea each year as a result of unsafe water and sanitation practices; water contamination and poor sanitation are also linked with the transmission of cholera, dysentery, hepatitis A, typhoid, and polio, among other diseases. Several types of NRW, particularly leakage, represent clean, safe water that a utility produces but does not deliver to the community. Therefore, we see this as a missed opportunity to increase access to safe water. Furthermore, many of the same factors that result in treated water not reaching its final destination, such as breaks in water mains, could also compromise the safety of the water that is delivered. This is because sufficient water pressure is required to prevent contaminants from infiltrating the piped water supply.

Chart 9

Proportion of population with access to safe water varies significantly by region



Source: S&P Global Ratings, UN-Water.

NRW can challenge affordability

In addition to affecting access to clean water, NRW can also make it more difficult for low-income populations to afford safe water, and for utilities to pay for necessary infrastructure investments. We have found that many of the factors that contribute to NRW, including poor-performing assets that underestimate water consumption, illicit use, and authorized unbilled consumption, also narrow the sources of utilities' revenue, forcing utilities to increase rates for

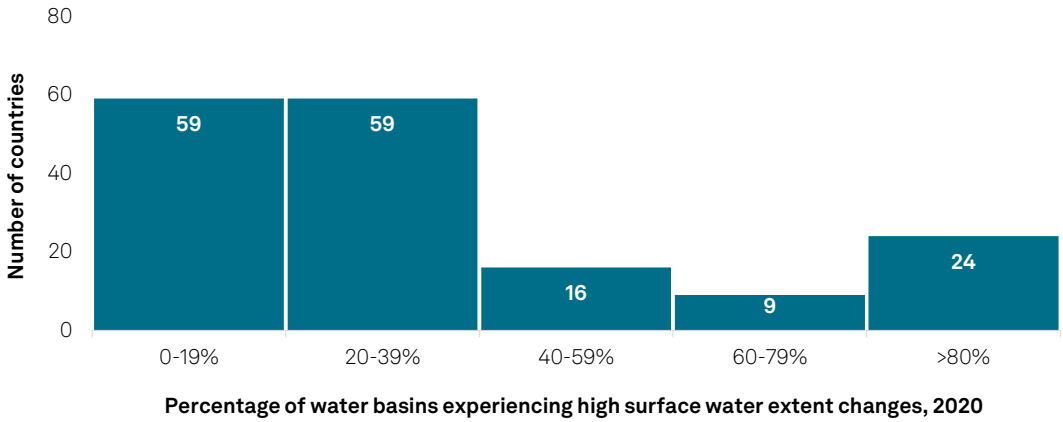
ratepayers. In the absence of reliable safe water from a centralized system, the alternative is often on-site pumps, or relatively expensive bottled water. We believe that affordability pressure also applies to utilities' finances. In extreme--but not unusual--circumstances, NRW is so high that it is no longer economical, or feasible, for utilities to make major capital investments for deferred maintenance, extend service to new areas, or upgrade treatment facilities.

Excess water withdrawals can stress aquatic ecosystems

To compensate for NRW, utilities increase their water withdrawals from rivers, lakes, and aquifers. Whether this water is truly "lost" to the ecosystem will depend on whether it evaporates or filters into groundwater stores, seeps back into the local ecosystem, or is transported to another ecosystem. Changes in the quantity of water can also affect water quality, including temperature, salinity, dissolved oxygen, and other factors that affect species. Our research finds that excess withdrawals resulting from NRW can affect both the quantity and quality of waterbodies, harming their aquatic ecosystems. In 2020, almost 30% of countries that reported data said that 40% or more of their water basins showed high changes in the extent of their surface area (see chart 10). With climate change expected to further affect precipitation patterns and other factors affecting water availability, excess withdrawals to compensate for NRW could make it more difficult to manage risks to the biodiversity that lives in these waters.

Chart 10

One in five countries report significant changes in the extent of surface waters



Source: S&P Global Ratings, UN-Water.

Greater water scarcity exacerbates the potential for conflict

Water scarcity can increase stakeholder conflicts over access to limited water supply for competing purposes such as household use, agriculture, industrial consumption, ecosystem health and services, hydropower generation, and recreation. Excess withdrawals from freshwater sources to compensate for NRW increase the overall demand on existing natural resources, which could exacerbate water scarcity. As a result, we believe that NRW has the potential to intensify conflicts over equitable division of common water resources. Although many of these disagreements have remained in the courts--in some cases, for decades, such as the U.S. Appalachicola-Chattahoochee-Flint and Alabama-Coosa-Tallapoosa river systems disputes--they have also resulted in physical violence. As noted in "Water Conflicts Are Heightening Geopolitical And Social Tensions Globally," (published July 7, 2020) the number of water conflicts, and the number of associated deaths, has risen in recent decades.

Treating and transporting NRW has a large carbon footprint

Even where water stress is not a risk, and the utility and rate base have sufficient financial capacity to make necessary ongoing investments, NRW contributes to global climate change. The International Financial Institutions Technical Working Group on Greenhouse Gas Accounting finds that the greenhouse gas-intensity of water varies widely and depends on factors including the quality of source water, the types of treatment used, the carbon intensity of the local electric grid, and the geography for pumped water conveyance (see table 1). That said, treating water is energy intensive, and even if we conservatively estimate the greenhouse gas footprint of NRW just for conventional standard treatment (not including disinfection technologies, energy needed for desalination of brackish or seawater, or energy to pump water from one location to another), Liemberger and Wyatt's estimate of 126 billion cubic meters of NRW has a baseline annual carbon footprint of 11.85 billion kilograms of carbon dioxide.

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Table 1

Energy intensity can vary based on treatment type and transportation distance

	Energy intensity (kWh/m3)	Increase in energy intensity above CST (%)
Treatment technologies		
Conventional standard treatment (CST)	0.198	N/A
Disinfection (chlorine, ozone, ultraviolet)	0.0025 - 0.042	13 - 21
Brackish water desalination	0.951 - 1.942	480 - 981
Seawater desalination	4.000	2020
Conveyance and distribution		
Pumped local conveyance	0.029	15
Pumped long-distance conveyance (over 200 km)	0.790	399
Pumped distribution	0.140	71
Gravity-based conveyance and distribution	0.000	0

Sources: S&P Global Ratings, International Financial Institutions Technical Working Group on Greenhouse Gas Accounting.

The Sustainable Development Goals (SDGs), which the United Nations (U.N.) set up in 2015, created an agenda for achieving sustainable development by 2030. From a stakeholder standpoint, we believe that NRW, by reducing utilities' revenue and requiring greater water withdrawals to provide a given quantity of water to end users, might influence progress against a number of these goals, including:

SDG 3

Good health and well-being

Ensure healthy lives and promote well-being for all at all ages.

SDG 6

Clean water and sanitation

Ensure availability and sustainable management of water and sanitation for all.

SDG 9

Industry, innovation and infrastructure

Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.

SDG 10

Reduced inequalities

Reduce inequality within and among countries.

SDG 11

Sustainable cities and communities

Make cities and human settlements inclusive, safe, resilient, and sustainable.

SDG 13

Climate action

Take urgent action to combat climate change and its impacts.

SDG 14

Life below water

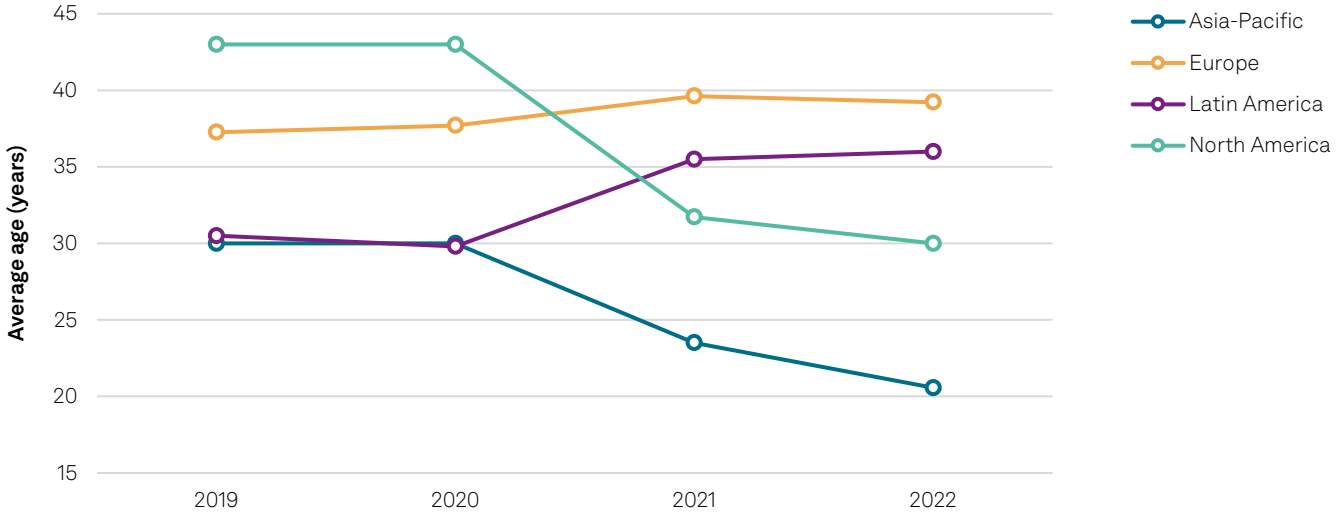
Conserve and sustainably use the oceans, seas, and marine resources for sustainable development

Near-Term Funding Uncertainty May Have Long-Term NRW Implications

In the previous section, we highlighted the various impacts we think NRW could have on stakeholders. Therefore, we think maintenance is essential to preventing NRW. However, whether capital investment is sufficient will become apparent sooner in metrics such as the average age of pipes. As the average age of pipes rises, the risk of leaks increases. Likewise, as meters age, the difference between water delivered and water billed increases, and not in the utility's favor. Similar to the combination of simultaneous rising and falling in leakage rates utilities reported in the CSA, other metrics, like the average age of pipes (see chart 11) also demonstrate inconsistent progress. If leading indicators like average age do not improve, we believe it will be difficult to achieve reductions in outcomes like NRW.

Chart 11

Average age of pipe at water utilities has declined in some regions but risen in others*



*Includes publicly listed water utilities that are CSA respondents. Source: S&P Global Ratings, Corporate Sustainability Assessment.

We also believe today's investment decisions could significantly affect future NRW rates, yet the amount of investment is highly uncertain. A study by Wyatt for the Inter-American Development Bank found that, for utilities in 16 of 27 countries, significant NRW-reduction projects could have a payback period of less than five years; and seven countries had potential payback in five to 10 years. So why does underinvestment persist at water utilities?

For utilities in 16 of 27 countries, significant NRW-reduction projects could have a payback period of less than five years.

Access to private-sector funding is limited

Much of the water infrastructure around the world is financed through government budgets with the assistance of development banks. This can subsidize water, so that prices do not always cover the investment needs, which further limits utilities' revenue generation. This makes NRW even more of a priority. As an example, the Asian Development Bank (ADB) has described NRW reduction as a key strategy in urban water projects, along with increasing clean water supply capacity and extending access to service. It also notes the importance of continued investment over time to help prevent a cycle of waste and inefficiency.

In addition, we find that, globally, water infrastructure is built, operated, and maintained under a range of public and private financing models. This can influence the extent to which debt is a source of financing for investing in water. In some countries, sovereign or subsovereign governments play a large role in infrastructure planning and asset ownership. In other cases, it may be more decentralized and operated by a mix of private corporations and municipal utility systems. Depending on the model, utilities' investments may be funded by ratepayers or from appropriated public funds. Some ratepayer models bill based on consumption, others use flat fees per connection, and some use a combination of both methods.

In some regions, water infrastructure faces heightened barriers to access private-sector funding. As an example, in most of Sub-Saharan Africa, the public rather than the private sector historically funded and administered most water infrastructure planning, investment, and development. We found that there is a lack of investor or lender experience in providing financing to small and midsize enterprises (SMEs), private companies, or public-private partnerships providing water on the continent. After decades of water infrastructure being treated as a government service, some market participants assume the sector is uniformly unprofitable. Simultaneously, some potential borrowers assume that the cost of funds will be prohibitively high and forego private funding. Another impediment to higher investment in water infrastructure in Africa is a more generalized problem of arrears on public utilities, for example, in the energy sectors in Ghana and South Africa.

Regulatory incentives are insufficient. Another reason for low access to private-sector sources could be that utilities have underinvested in maintenance and may continue to do so in the coming years since they face the simultaneous challenges of rising interest rates and increased customer affordability concerns. Some water providers are also not yet covered by regulatory frameworks, while others could benefit from more supportive regulations for attracting private capital.

Diverse revenue models and regulatory frameworks further complicate understanding of risk and return assumptions.

Regulatory frameworks in France, Italy, England, Wales, and Spain provide visibility on water companies' financial performance and remuneration schemes that aim to ensure recovery of operating and capital costs. Utility remuneration is less sensitive to water volumes distributed when its structure emphasizes predetermined revenue over the annual water consumption of customers. In England and Wales specifically, regulation enables utility companies to consistently recover capital expenditure (capex) based on budgets agreed on with the regulator. Connections for new property developments are typically funded by the developers.

The variety of country-specific regulatory frameworks has also made it difficult to attract private capital for water infrastructure projects. The diversity of revenue models and regulatory frameworks further complicates the process of understanding risk and return assumptions, raising the cost of finance.

New regulations and climate-adaptation financing might spur water infrastructure investment

Although the sector has not yet seen much private capital investment, there are early signs that this could change. To address the financing gaps, some governments, financial institutions, and nonprofit organizations, among others, are creating more opportunities for risk sharing through mechanisms such as the African Guarantee Fund to encourage private-sector participation. Many countries have experimented with greater private participation, particularly from SMEs, to accelerate investment. Others are focusing on providing technical assistance, to both target available financial subsidies to yield the greatest impact and to help financial institutions increase their knowledge of the sector.

New regulatory requirements could take effect during the next decade. An EU directive will set leakage rate targets by 2028, after which member states will need action plans to reduce leakage rates from 2030. In 2013, the U.S. EPA said that up to 75% of water loss is recoverable, and the agency provides resources and encourages utilities to conduct water audits to understand flows and finances. Las Vegas, with a water loss rate below 5%, demonstrates the gains that can be made when water is treated as a high-value commodity. Some U.S. states and public service commissions have set their own limits or policies to promote NRW management; for example, the State of Wisconsin requires water loss control plans from utilities with NRW above 30% or water loss exceeding 15% or 25% depending on utility size, and Georgia requires annual water system audits for all utilities serving at least 3,300 people.

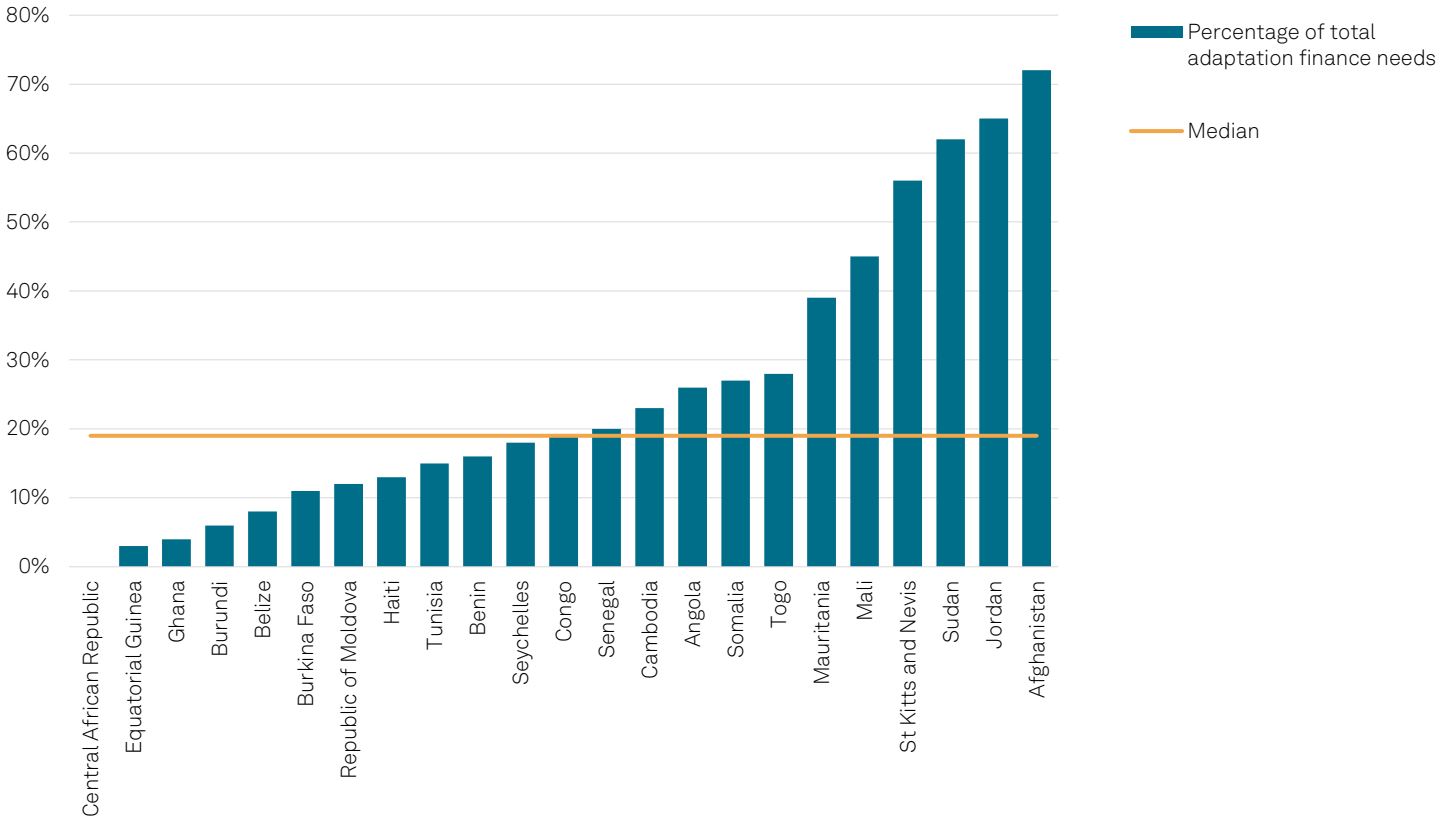
We believe climate-adaptation finance could also help increase funding. Financing related to a country's plans to combat and adapt to climate change could present an opportunity to improve the performance of water utility assets, including reducing leaks and allowing more accurate measurement, thereby reducing NRW.

Of the developing countries that have estimated their adaptation finance needs, water infrastructure features in all of their calculations. We found that among the 25 countries that disclose information, investments of at least $37 billion are needed to ensure water infrastructure is resilient, with most indicating a 2020-2030 or 2020-2040 investment horizon. On average, investments in water infrastructure make up 19% of the total investments needed for countries' adaptation plans (see chart 12). In other words, countries cannot adapt to climate change without investing in water infrastructure.

On average, investments in water infrastructure make up 19% of the total investments needed for countries' climate adaptation plans.

Chart 12

Water investments represent a large share of some countries' adaptation finance needs



Source: S&P Global Ratings, UNFCCC Nationally Determined Contributions Registry.

NRW Poses Operating Risks For Water Utilities

NRW can influence the credit quality of public water utilities rated by S&P Global Ratings in the U.S. While we have not observed an impact in other regions, we could consider NRW in our assessment of a utility's enterprise and financial risk profiles, since it can be a proxy for overall the system's operational health and the adequacy of ongoing maintenance and reinvestment. Our sample of USPF water utilities that we rate is much larger than elsewhere (we rate approximately 1,400 USPF water utilities compared with less than 50 regulated utilities in Europe and the U.S.). Although we focus here on the USPF sector, these issues can also affect the creditworthiness of utilities in other segments, including corporates and international public finance.

NRW informs the operational management assessment

Above-average NRW can be a function of age, pipe failure or leaks, improperly maintained water meters, or deferred maintenance. S&P Global Ratings evaluates the impact of NRW through the assessment of operational management using our U.S. public finance rating methodology. The strongest asset management includes water audits based on industry-accepted performance standards that are incorporated into the annual budget, and evidence that NRW is immaterial. We view dedicated investment to improve the measurement and reporting of NRW as well as the reduction of losses as positive. These factors can mitigate credit risks.

The strongest asset management includes water audits based on recognized performance standards and evidence that NRW is immaterial.

In some cases, factors outside of management's control cause NRW, rather than poor operational management. These include topography, such as the number of pressure zones and remoteness of transmission assets. However, even with sophisticated planning and remediation, meaningful improvement can take decades to achieve and can be costly, which we reflect in the rating.

Sufficiency of supply in drought-prone areas can be pressured

Higher levels of NRW or seepage can strain utilities facing water-scarcity issues. The frequency and magnitude of hydrological volatility is expected to increase, as is aridification, leading to rising water stress for many utilities. For example, during periods of droughts, mitigating water loss or seepage might be crucial in determining whether agricultural producers need to fallow land or retail customers need to increase conservation measures, both of which can impair revenue generation.

Steps can be taken to mitigate risks of water loss or seepage, which we view favorably. For example, the All-American Canal lining project, managed by Imperial Irrigation District, lined 23 miles of canals, resulting in meaningful savings of 67,700 acre-feet per year of Colorado River water, a significant return on infrastructure investment. Reducing water loss will remain a strategically significant investment for utilities prone to water scarcity.

Rate-setting flexibility can be weakened, especially in lower-income areas

NRW also affects our view of a utility's market position because water loss can necessitate more significant rate increases since the cost of service is higher than it would be if the infrastructure was not deficient. This can increase affordability pressure for ratepayers and reduce a utility's rate-setting flexibility if other financial needs arise.

Utilities with weaker demographics can be disproportionally exposed to risks associated with NRW. In particular, this is true in areas with large numbers of customers living at or below the poverty line. For example, S&P Global Ratings lowered its rating on the City of Prichard, Alabama to 'CCC' (the rating was later withdrawn), in part, due to unbilled water ranging from 45%-55% of total water purchased, which increased water costs and required substantial additional capital improvements that we believed would be difficult to implement given affordability pressure. Often, utilities that serve customers with lower incomes have less financial flexibility and higher deferred maintenance, which can result in even greater risks that NRW can impair some utilities' financial and operational performance, affecting credit ratings.

Changes In NRW Rates May Not Move Credit Ratings

NRW might influence a utility's financial performance. The effects of NRW include reduced revenue, lost water resources (which has a significant monetary value), and increased operational costs. Corrective actions to address high NRW can also increase leverage or stress coverage depending on cash on hand or the ability to pass through costs to customers. The higher the variance between water delivered and water billed, the greater the potential stress on the utility.

Despite the potential impacts of NRW, high NRW rates do not necessarily lead to lower ratings if the utilities have strong operational and financial planning that supports financial and operational resilience. In reviewing many of the largest utilities in the U.S. public finance sector, as measured by operating revenue, water-loss rates average 15%, with a high of 31%. Higher levels of water loss are prevalent in the eastern portion of the U.S., where some utilities have older infrastructure. Several issuers have high ratings and above-average water loss; however, they also demonstrate good or strong asset management, including vulnerability assessments, industry-accepted water audits, dedicated renewal and replacement budgeting, and climate risk assessment (see table 2).

Many of the regulatory frameworks rely on cash flow visibility to create the conditions for private-sector capital to flow. Therefore, persistent high NRW rates can create a negative feedback loop, since it is symptomatic of underinvestment and can discourage future investments as less water is billed. Conversely, intervention in improving NRW rates can lead to better cost recovery and make water infrastructure assets more attractive for private capital.

Table 2

Water loss rates at select U.S. public water utilities

Obligor	Current rating	Water loss * (%)
Atlanta	AA-	30.2
Austin, Texas	AA	15.4
Boston	AAA	18.0
Chicago,	A+	11.6
Dallas	AAA	18.0
DC Water	AAA	27.8
Denver	AAA	4.0
East Bay Municipal Utility District, Calif.	AAA	10.0
Fort Worth, Texas	AA+	18.1
Honolulu	AAA	15.0
Houston	AA+	19.0

Indianapolis	AAA	14.0
Jacksonville Electric Authority, Fla.	AA+	10.3
Kansas City, Mo.	AA	29.0
Las Vegas Valley Water, Nev.	AA	4.6
Los Angeles	AA+	7.2
Mesa, Ariz.	AA-	6.5
Miami Dade County, Fla	AA-	11.2
New York Water, N.Y.	AAA	16.4
Philadelphia	A+	31.7
Phoenix	AAA	9.5
Portland, Ore.	AA+	17.0
Richmond, Va.	AA	9.2
San Antonio, Texas	AA+	17.0
San Diego, Calif.	AA+	9.0
San Francisco	AA-	9.3
Seattle	AA+	6.0
Washington Suburban Sanitary District, Md.	AAA	18.6
Average		**14.8%**

*Calculated by S&P Global Ratings based on publicly disclosed water audits and other public sources. Source: S&P Global Ratings.

Looking Ahead

The ADB has called reducing NRW the first option to address service coverage and water demand. The National Bank of Kenya has started a water investment initiative by partnering to install advanced metering infrastructure to address the 40% of the country's water that is unbilled. However, many argue that NRW and related metrics like water losses and leakage rates are distractions.

True, the factors contributing to NRW are myriad, and the sustainability and financial materiality of NRW can vary significantly. And there can even be sound policy justifications for some NRW, like providing free water for firefighting. But many factors, like physical losses and illicit use, drain natural capital and can affect utility finances in a meaningful way. Although NRW might not be financially material for all utilities, a thorough water audit can increase knowledge of a utility's assets. Understanding what these losses are is a starting point for calculating their associated impacts on water stress and the environment, safe water service, and financial capacity, and could be instrumental in making a stronger case for needed investment.

The lost water opportunity might become an opportunity lost, since governments and utilities are managing lean capital budgets, conflicting capital needs to address climate impacts and improved pollution management, and rising affordability pressure. Utilities could struggle to make even those investments with quick payback periods. Greater focus on climate resilience and adaptation projects could provide new avenues to increase investment in water infrastructure, including reducing NRW. But more investment in water infrastructure might also require more explicit attention from both the public and private sectors.

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