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SECTOR IN-DEPTH

7 May 2021

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Municipal Water and Sewer Utilities – US

Climate threats and aging infrastructure portend rising credit risks for many utilities

Rapidly escalating infrastructure needs due to aging systems and growing climate challenges — drought, heat, floods, hurricanes and others — expose municipal water and sewer utilities to substantially increased costs, higher debt loads and rising customer rates.

» **With climate threats mounting, utilities face an accelerating need to address aging infrastructure that poses credit risks.**The greater frequency and severity of extreme weather events increasingly exposes utilities to compromised water quality and availability, damage to physical assets and costs of repair, and potential service area economic weakening. Unlike previous decades when systems could delay upgrades with limited short-term repercussions, climate events threaten to increase the consequences of inaction.

» **Local water and sewer utilities will bear the vast majority of $743 billion in needed infrastructure improvements through 2035.** The federal government will likely continue to make sizable contributions to infrastructure needs, but the bulk of the funding burden — estimated at about $743 billion sectorwide by the Environmental Protection Agency — will fall on utilities. The substantial burden will remain even if helpful aspects of the Biden administration's proposed American Jobs Plan are enacted. Utilities with aging infrastructure, operating inefficiencies and limited financial flexibility to invest in improvements stand to endure the most stress.

» **Substantial investment need will increase debt along with pace and size of customer rate increases.** Costs to finance upgrades and support higher debt loads will ultimately fall to ratepayers in the form of more rapid and larger increases in service charges. The upgrade costs will pose the biggest hurdle for systems with already aged infrastructure, weak ratepayer bases and limited flexibility to enact rate changes necessary to strengthen the system. Conversely, larger systems with well-managed capital assets, strong customer bases and rate flexibility will be the best positioned to handle future infrastructure needs.

With climate threats mounting, utilities face an accelerating need to address aging infrastructure that poses credit risks

Moody's affiliate Four Twenty Seven projects long-term changes in climate patterns will increase the frequency and severity of extreme and destructive weather events such as floods, hurricanes, droughts and wildfire, which can take a toll on utility systems' infrastructure and heighten credit risks. In addition, the effects of slower-moving environmental changes such as sea level rise and increasing heat are likely to become more acute through at least 2050. These threats are driven by increases in global temperatures, which have already "locked-in"an expected higher level of damaging climate effects over the next 30 years (see Exhibit 1). In prior decades, water and sewer utilities could defer infrastructure investments with little short-term impact. But the quickening pace of extreme weather events is heightening the potential consequences of inaction because aged infrastructure is more prone to failure and significant system disruption from extreme weather events. The combination of increasingly aged capital assets and more frequent severe weather accelerates the need to address these risks and avoid credit weakening due to poor asset management.

Four Twenty Seven methodology

Our approach to physical risk analysis and choice of scenarios draws significantly from our affiliate Four Twenty Seven's views on physical climate scenarios, laid out in its December 2019 publication, Demystifying Climate Scenario Analysis for Financial Stakeholders, and our March 2020 publication, Climate scenarios vital to assess credit impact of carbon transition, physical risks.

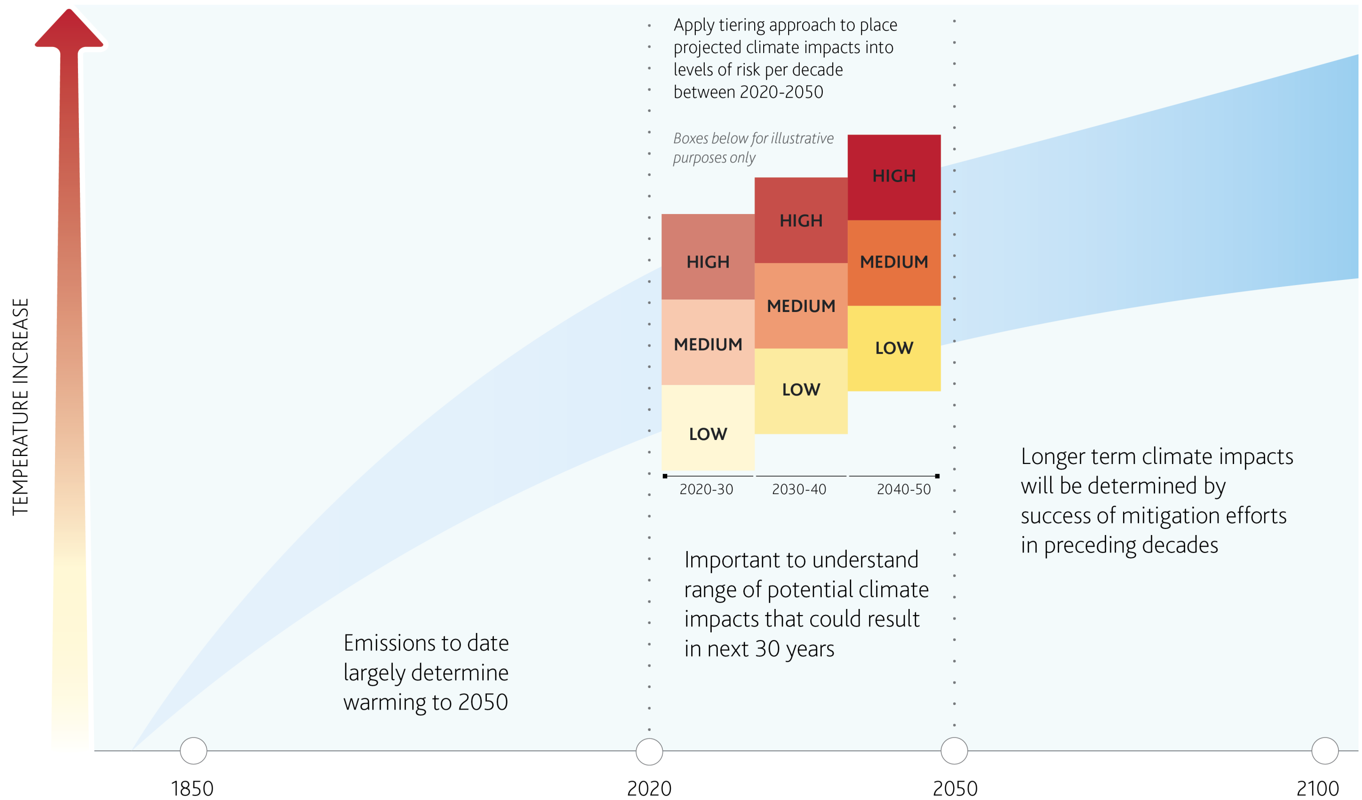
Four Twenty Seven's approach is characterized by the following key features, illustrated in Exhibit 1:

- Because of the inertia and time lag involved in how carbon emissions affect the Earth's climate, the negative effects of climate change through 2050 are largely already locked-in by emissions to date.
- Given the historical rate of emission, representative concentration pathway (RCP) 8.5 is applied to assess the broad range of possible climate outcomes through 2050. An RCP is a scenario that incorporates an array of projections for a wide range of greenhouse gas emissions and concentrations. An RCP uses this data to estimate the warming effect of those greenhouse gases in the atmosphere, as measured in watts per square meter.
- Until 2050, the range of potential physical climate outcomes is represented by the variability in RCP 8.5 climate models themselves. This includes a range of projected outcomes because of the climate impact of emissions to date.
- The possible outcomes of various climate models under RCP 8.5 are grouped by high, medium and low tiers. These percentile-based tiered scenarios are then used to assess the climate risk faced by individual entities in the most exposed sectors.

Exhibit 1

Physical climate effects projected to increase as temperatures rise through 2050

Climate impacts are "locked-in" over the next 30 years and then start to differ based on mitigation pathways post midcentury



Sources: Four Twenty Seven and Moody's Investors Service

Climate events pose multiple utility credit risks

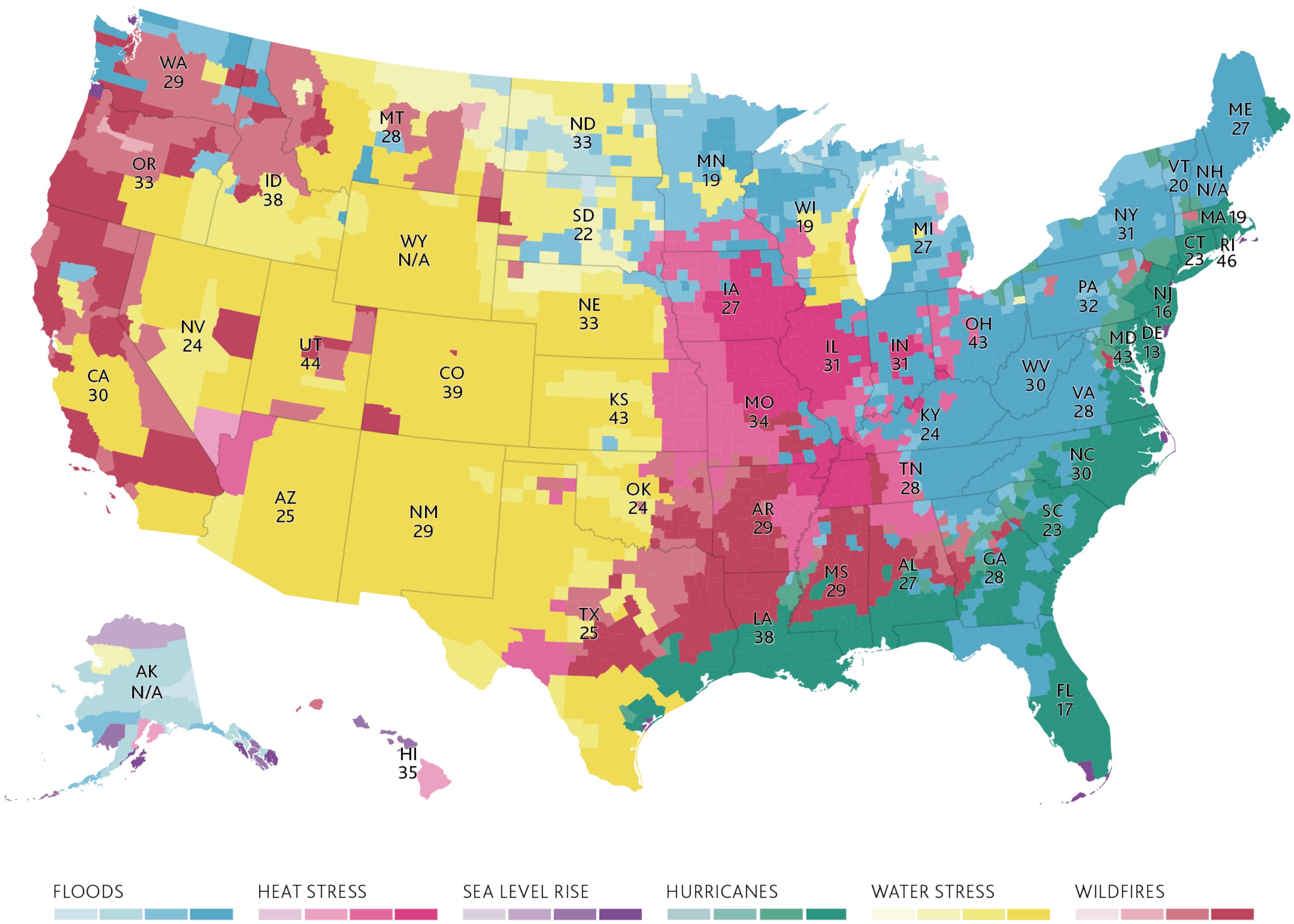
Extreme weather events such as drought, wildfires, floods and storms can lead to a variety of credit challenges for water and sewer utilities, including compromised water quality and availability, damage to system infrastructure and funding for repairs. Worsening climate events and trends may also weaken a service area's economy, making it harder for commercial customers and residential ratepayers to afford the higher rates needed to rehabilitate aging infrastructure and protect public health. For example, on February 14, the City of Jackson, Mississippi (Baa3 stable) endured an unusually strong winter storm that knocked out water and electricity for approximately 170,000 residents. Water service was not fully restored until nearly a month later. The incident highlights the stress facing Jackson's water and sewer system (Ba2 stable), which is contending with difficulties related to aging infrastructure and a $900 million consent decree requiring the city to upgrade sewer interceptors, expand wastewater treatment facility capacity and address sanitary sewer overflow. In response to the immediate system needs in the wake of the storm, the city requested $47 million from the state to address a variety of water and sewer needs, including the repair of water mains and distribution lines.

Exposure to climate risks varies across the country (see Exhibit 2), presenting different infrastructure challenges based on location. Nationwide, improvements in water distribution and transmission are generally the greatest need, but the level of other needed investments reflects localized risks. For example, in California, which is contending with the threat of drought and wildfire, water storage infrastructure represents 14% of total water infrastructure needs statewide. In contrast, in Florida and North Carolina, which are facing elevated exposure to hurricanes and extreme rainfall, water storage accounts for only 7% of total infrastructure needs. In acknowledgment of its growing exposure to sea level rise and flood risk, voters in the City of Miami (Aa2 stable) approved a $400 million bond measure in 2017 calling for $192 million in funds dedicated for flood mitigation.

Exhibit 2

Leading climate risks and asset conditions vary across the US

Exhibit shows median remaining useful life in years at the state level and relative gross exposure to certain climate risks at the county level



Remaining useful life of capital assets is calculated by dividing net fixed assets by most recent year's depreciation expense. The median data point is derived from Moody's- rated utilities.
Sources: Moody's Investors Service and Four Twenty Seven

Water and sewer utilities will have greater difficulties in deferring infrastructure investment without short-term consequences as extreme weather events increasingly force immediate repair and recovery work. The risk of continuing to defer required investment in aging systems has not gone unrecognized by water and wastewater system managers. For its 2019 State of the Water Industry Report, the American Water Works Association surveyed nearly 2,000 water industry leaders who ranked renewal and replacement of aging water and wastewater infrastructure as the top issue facing the sector for the fifth year in a row. In addition, 63% of respondents ranked the issue as critically important. The second-ranked issue in the survey was financing for capital improvements, which was deemed critical by 55% of respondents.

Local water and sewer utilities will bear vast majority of $743 billion needed for infrastructure improvements through 2035

Water and sewer systems will bear the brunt of the EPA's estimated sectorwide $743 billion to upgrade aging infrastructure. This figure includes approximately $472 billion for water systems (a 10% increase from the previous assessment) and $271 billion for sewer systems. The federal government has provided much of its financial support for local water and sewer systems through its water and sewer state revolving fund programs (SRFs).

State revolving fund loan programs

The EPA provides aid to state revolving fund (SRF) programs, which provide low-interest loans to municipal entities within their respective state for eligible drinking water and clean water projects. The states contribute an additional 20% to match the federal monies. As the loan principal and interest are repaid over time, the payments are typically recycled for new loans, hence the revolving nature of the programs.

Over the last 30 years, the federal government has provided approximately $80 billion to state SRFs. However, this amount is only 11% of total projected water and sewer infrastructure needs through 2035. We anticipate that the SRF program will continue to be funded at levels consistent with historical levels, though two bills at varying stages of the legislative process would substantially increase federal resources for local water and sewer systems. The Biden infrastructure initiative or American Jobs Plan proposes spending $111 billion on a variety of water initiatives, including $56 billion for grants and low-cost loans for water, wastewater and stormwater systems. Also, the proposed Drinking Water and Wastewater Act of 2021 would provide $35 billion to projects to remediate aging infrastructure and address challenges posed by climate change.

The federal government will likely continue to make sizable contributions to water and sewer infrastructure not only through the SRF programs but also smaller sources such as the Water Infrastructure Finance and Innovation Act (WIFIA), the Department of Agriculture's Rural Utilities Service and Department of Housing and Urban Development's Community Development Block Grants.

Still, the bulk of water and sewer utility infrastructure funding will come from local utilities, continuing a long trend noted by the American Society of Civil Engineers (ASCE). The ASCE observes that since the 1980s state and local governments have accounted for, on average, approximately 66% of capital spending for water infrastructure. In addition, from 1977 to 2017, the federal government's share of capital spending in the water sector fell to 9% from 63%. At these rates, without a marked increase in the availability of federal resources, local water and sewer utilities will be left to fund approximately $490 billion to $680 billion of needed infrastructure improvements.

Cost of infrastructure needs varies by system location and size

California ($51 billion), Texas ($45 billion), New York ($22.7 billion), Florida ($21.8 billion) and Pennsylvania ($16.7 billion) account for 33% of total national drinking water infrastructure needs.

While the distribution of costs largely conforms to state population size, there is a discrepancy with respect to utility system size. Large (over 100,000 customers) and medium (3,300 to 100,000 customers) water systems have infrastructure needs that are generally in line with their share of the overall population (see Exhibit 3). However, small (less than 3,300 customers) systems, which serve only about 8% of the population, account for 17% of the infrastructure need.

Exhibit 3

Large- and medium-sized utilities have considerable water infrastructure needs, but small systems have disproportionate share

System customer size	Water infrastructure need	% of need	% of population served
Large (100k+)	$174.4 billion	38	46
Medium (3.3k-100k)	$212 billion	46	46
Small (less than 3.3k)	$76.6 billion	17	8

Source: US Environmental Protection Agency, Drinking Water Infrastructure Needs and Assessment, Sixth Report to Congress

As a whole, the credit quality of larger systems will face fewer challenges from infrastructure needs in part because of their lower proportionate share of costs, which reflects more consistent investment in the system. Such investment is one example of key credit strengths for the systems, which also include strong management teams that maintain updated capital plans and large ratepayer bases that consistently generate revenue necessary to implement those plans.

System needs will be more of a credit challenge for water and sewer utilities with already aged infrastructure, weak ratepayer bases and limited financial flexibility. These utilities will face increasing difficulties in striking an efficient balance between managing sharp increases in rates and debt while trying to control the maintenance and operating expenses of increasingly inefficient infrastructure.

Substantial investment need will increase debt along with the pace and size of customer rate increases

The cost of financing water and sewer system infrastructure improvements will ultimately fall to local ratepayers in the form of more rapid and larger increases in service charges to support systems' higher debt loads and other operating costs. Systems best positioned to manage this dynamic will benefit from a variety of credit strengths including competitive rates, solid service-area economies, low-to-moderate climate risk exposure, strong financial flexibility, strong asset management and effective governance and strategic planning.

The Miami-Dade County water and sewer (Aa3) system, for example, has very high exposure to heat stress and hurricanes, but its large ratepayer base will support a fourfold increase in system debt to fund a $7.5 billion capital plan. The significant capital program is needed to meet regulatory requirements, including a consent decree driven in part by aging infrastructure (asset condition as measured by remaining useful life is 25 years). The system's rates increased by 8% in fiscal 2017 and have risen by another 6.2% in 2021. While these increases represent a significant jump, the system's rates remain among the lowest of major utilities in the Southeast.

While Miami-Dade has the size and capacity to provide funds to address significant increases in debt without deterioration in its credit profile, the $743 billion estimated by the EPA to address system needs nationwide is a substantial burden for the sector as a whole, representing more than 4.0x the $176.6 billion of total outstanding debt for water, sewer and combined wastewater systems. Even the $490 billion remaining after projected federal support in the form of grants and low-interest loans is still 2.7x larger than currently outstanding debt.

With threats from changing climate conditions and aging infrastructure growing, the need to finance infrastructure upgrades is increasing in urgency. Asset condition, the remaining useful life of capital assets calculated by dividing net fixed assets by annual depreciation expense, has steadily declined, indicating that depreciation is outpacing investment. In 2003, the median remaining useful life of water and sewer assets was 34 years. In 2020, that figure had fallen 21% to 27 years. Failure to properly maintain capital assets threatens to increase expenses for repairs, maintenance, upgrades and regulatory compliance. Also, heightened public health concerns related to clean drinking water are a reputational, social and financial risk. The remaining useful life metric likely overstates the remaining asset life since it reflects water and wastewater utilities we rate, which are typically larger and have more resources than the universe of generally smaller credits we don't rate. Those systems are more likely to have less robust capital plans and fewer resources relative to their infrastructure needs.

Median total debt service coverage for water and sewer utilities we rate is approximately 2.0x. Maintaining this level of coverage while incurring substantial new debt will require regular and often sizable rate increases. According to the Bureau of Labor Statistics' consumer price index, the growth of water and sewer rates has outpaced inflation each year since 2001. In addition, EPA guidelines suggest that combined water and sewer bills greater than 4.5% of median household incomes are unaffordable. In the short term, the COVID-19 pandemic has slowed additional rate increases as utilities around the country have delayed rate changes and capital projects in the wake of economic uncertainty. Over the longer term, rate adjustments will be needed to manage the credit risk of taking on increased debt to diminish the hazards of aging infrastructure in the face of a changing climate.

Moody's related publications

Methodology

- General Principles for Assessing Environmental,Social and Governance Risks Methodology, April 26, 2021

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- Local government - US: Cities' heightened focus on mitigating climate risk is credit positive, January 17, 2019
- Local government - US: Growing exposure to heat stress mitigated by economic and fiscal strengths, September 24, 2019
- Local government - US: Farm-based local governments will maintain credit quality, though climate risks loom, May 19, 2020
- Environmental: Global Heat map: 11 sectors with $2.2 trillion debt have elevated environmental risk exposure, September, 25 2019
- ESG - Global: Climate scenarios vital to assess credit impact of carbon transition, physical risks, March 10, 2020
- Electric Utilities and Power Companies - US: Nuclear operators face growing climate risk but resiliency investments mitigate impact, August 18, 2020
- Real Estate - US: REITs can manage climate risk, investments needed to address growing challenges, September 1, 2020
- Sovereigns - Global: Sea level rise poses long-term credit threat to a number of sovereigns, January 16,2020
- Cross-Sector - US - Housing and Housing Finance: Climate change risks present challenges for housing related sectors, April 16, 2019
- State and local government - US: Increasing HUD's role in administering disaster relief funds brings credit challenges, September 23, 2019

Sector Comment

- State and Local Government - New Jersey: Proposed overhaul of land use rules will reduce climate risk vulnerability, February 14, 2020
- ESG - California: Public safety power shutoffs highlight links between environmental and social risks, October, 28, 2019
- Local Government - Texas: Voter approval of ballot measure to help local governments lessen flood damage is credit positive, November 7, 2019
- Local government - California: Wildfires amid pandemic compound social and economic risks, but unlikely to hurt credit quality, August, 26, 2020

REPORT NUMBER 1263647

MOODY'S INVESTORS SERVICE