Water Conflicts Arise for US Communities as Climate Changes Arrive

Peter Plastrik & Darryl Young

This is the first of a planned set of reports.

Peter Plastrik is vice president of the Innovation Network for Communities and coauthor of *In Harm's Way: How Communities Are Addressing Key Challenges of Building Climate Resilience* and *Life After Carbon: The Next Global Transformation of Cities.* Darryl Young is an expert in sustainable development and climate action, an innovative leader in philanthropy, and former director of the Sustainable Cities Program at the Summit Foundation.

Climate change is intensifying rainfall and floods, deepening droughts, and shifting weather patterns across the globe, causing profound effects on terrestrial freshwater supplies and quality. Rising sea levels, reduced snowpacks, shrinking rivers, and declining groundwater threaten cities and rural communities and endanger forest, riverine, and other ecosystems across the United States.
Fifth National Climate Assessment[1]

One thing is clear: Utilities and communities make better progress on flood management and other climate challenges when they work together.
US Water Alliance[2]

Water Perils for Urban Sustainability

For American cities to thrive, they must have reliable supplies of water. Yet few urban leaders and sustainability planners have fully grasped and responded effectively to the looming threats that climate changes pose to this lifeline. As the planet's water cycle shifts and temperatures rise, our cities face the very real danger of having their drinking water supplies disrupted and stormwater systems overwhelmed, while swollen rivers and rising seas encroach on neighborhoods. The risk of waterborne diseases is also expected to surge, testing the4 limits of wastewater management.

These climate-driven water disasters are already hindering some communities' efforts to achieve goals like affordable housing, public health, economic development, social and economic equity, and other aims. And in some communities, residents in areas hit by chronic flooding or long-term drought are opting to migrate out of harm's way.

Nor have urban leaders reckoned with how to implement the comprehensive, integrated "One Water" approach to water planning and operations that is crucial to building the long-term water-system resilience of their communities. Moreover, they are not ready to handle the many potential intense conflicts to which solutions can lead: disputes over who gets water, who gets protected from water risks, who pays for resilience solutions, and limits on communities' development and growth. For instance, in **Norfolk**, Virginia, a coastal city of 232,000 with a large US Navy base, efforts to prevent disastrous flooding from extreme storms triggered residents' anger against a US Army Corps of Engineers' plan for an 11-foot-high floodwall running through their neighborhood and along the waterfront. At the same time, residents of the city's low-income, mostly Black Southside neighborhood complained that plans did not include walls to protect their properties.[3]

Compounding the problems around resilience solutions, it's clear that cities do not have the power to resolve many of these thorny conflicts. Instead, they may have to rely on a patchwork of state and federal governments, and the private and nonprofit sectors, to reach decisions. For example, the **Metropolitan Water District of Southern California**, which serves 7 million people in more than 20 communities, needed state and federal approval and more than $180 million to expand its water supply by recycling treated wastewater. And it had to develop partnerships with local water agencies, the county flood control district and water authorities in Nevada and Arizona.[4]

"A vast ecosystem of city departments, public agencies, and others hold various authority to address aspects of urban flooding," the US Water Alliance reports, including water utilities, municipal public works, municipal environment departments, elected officials, floodplain managers, flood control districts, regional planning agencies, the US Army Corps of Engineers and the Federal Emergency Management Agency.[5] There are also gaps in the water-governance structure, and prioritizing, implementing and paying for solutions to address these climate-induced water dangers are new challenges for most communities and water utilities.

Finally, as many city and climate-resilience experts say, most communities lack the financial resources to implement their resilience solutions, which nearly always cost millions of dollars and often billions. **Miami**, Florida will need to spend at least $3.8 billion in the next 40 years to keep the city of 460,000 residents dry from rising seas, according to a 2021 stormwater master plan. The money—about $100 million a year on average—would buy stormwater pumps, miles of sea walls, thousands of injection wells to send pumped water into aquifers, and a network of human-size pipes. That cost doesn't include the annual maintenance of the system. Funding, the plan suggests, could come from state and federal government grants and partnerships with private companies.

But it also suggests increasing impact fees on new construction, which would likely raise costs for residents. Even if all of this is implemented, some neighborhoods in the city cannot be saved from rising seas because engineering solutions won't work for them; they will have to be abandoned.[6]

The time is now to confront these issues—building water-peril awareness, using a One Water approach, preventing and managing conflicts, navigating through the cumbersome governance maze, finding money—before more of our communities are caught unprepared. Large cities and smaller communities, coastal and inland, east and west of the Mississippi River, affluent or distressed, must recognize their risks, plan and prioritize actions, and implement effectively, or more and more of them—their residents, businesses, and futures—will fall victim to climate-driven water disasters.

In this report we review the emerging situations in about 20 urban areas—Boston, Corpus Christi, Kansas City, Miami, Nassau County, Phoenix, Richmond and others—as a wake-up call for urban sustainability professionals and city officials. In a subsequent report we will offer guidance points for addressing the new perils that communities and their water systems face.

The Climate Future is Already Here

For most of the past century, water for US cities has been abundant, reliable, and affordable. Nearly every urban American household and business has had ready access to drinking water and sanitation, and been safeguarded from most flooding and wastewater contamination. At the same time, weather patterns, especially temperatures and rainfall, were fairly stable and predictable based on historic patterns—a boon for the farming that feeds people in cities. And sea levels at coasts, where many cities sit, were rising very slowly, almost imperceptibly.

That era is coming to a close. "America's water system relies on last century's infrastructure," says Erik Olson, senior strategic director for health and food with the Natural Resources Defense Council. "And our outdated system is completely unprepared for this century's challenges of intense heat, drought and flooding."[7]

Climate risks are no longer hypothetical; they are happening across the nation. The specific climate threats each city faces vary depending on their location, weather patterns and condition of their water-management systems. Many cities are grappling with a host of climate-driven water threats. In **Kansas City**, Missouri, with more than 500,000 inhabitants, officials identified "flooding, drought . . . severe storms, and tornadoes" as the city's major climate threats, along with "standing water associated with flooding may lead to mold and mildew in houses, which can cause serious health issues . . . vector borne disease, and forced migration."[8] Sometimes big climate disasters are not forecast and come as surprises. In September 2024, for example, **communities along coastal North Carolina** braced for heavy rains, but when more than a foot of rain fell in just 12 hours, residents and officials were caught off guard.[9] About two weeks later, a different system—Hurricane Helene—devastated **Asheville** and other communities in western North Carolina that had been considered "safe" from such a disaster because they were located far from the coast.

Some communities are already experiencing how climate-driven water disruptions hinder their efforts to achieve their priority goals and may drive residents to migrate to other places considered less at risk. Here are examples of cities at the front line of this new struggle for sustainability.

- **Phoenix**, the fastest growing metropolitan area in the US with 1.6 million residents, was told that the State of Arizona would not permit new housing development because the city could not provide sufficient water from the Colorado River. An extended drought and rising temperatures that increase evaporation from the river have severely impacted water availability. Realtors predict rising costs for development as a result. "Housing affordability will be a challenge," warns a representative of area home builders.[10]

- **Clarksburg**, a West Virginia city of more than 16,000, must safeguard its drinking water system against the effects of rising summer temperatures, which can increase the presence of chemicals that are likely to cause cancers, reproductive problems and birth defects through long-term exposure.[11]

- **Honolulu's** famous beachfront, which attracts nearly $8 billion a year in visitor spending, is disappearing under rising water, stronger ocean swells, and heavy rainfall and flooding. The hotel-dense Waikiki neighborhood was built on top of a wetland that was drained and filled for development, and its iconic beach is man-made. Today, beaches flanking Waikiki have narrowed or vanished; during high tides, waves crash into walkways and soak passersby—with damaging economic implications for tourism.[12]

- **Houston**, the biggest city in Texas with 2.2 million residents, has become a poster child for heavy flooding. A tropical storm in 2024 flooded roads and highways and knocked out electricity for residents. Two weeks later, hundreds of thousands of households were still without power. Five years earlier Hurricane Harvey dumped 60 inches of rain on Greater Houston, killing 36 people and damaging 150,000 homes in Harris County, where the city is located.[13] A recent assessment found that residents in about 10 percent of the county's census blocks[14] were moving out, at least partially due to climate-related flood risk, and their homes were not being bought.[15] Historic flooding in **Jackson**, Mississippi, damaged a water treatment plan and left 150,000 people without safe drinking water for weeks. A storm surge in January 2024 flooded the waterfront of **Stonington**, Maine, downed electric lines and shut down the causeway that links the island community of 1,000 to the mainland. "We never thought it could happen here," says a member of the town's Select Board. "When you're smacked in the face with it, it's hard to deny."[16]

Even water-rich areas have to contend with climate changes. **Seattle**, Washington taps two rivers for drinking water for 1.5 million customers, but these sources are being stressed by climate change that is reducing the winter snowpack that feeds the rivers. Eventually, the city's water system will have to secure legal rights to a new source of water and build out the infrastructure to deliver the water; it's an expensive process that could take decades.[17]

Climate-induced damage often occurs on a regional, rather than municipal, scale. Coastal communities in suburban **Nassau County** on Long Island, with 1.3 million residents bordering the Atlantic Ocean just east of New York City, are finding their groundwater is increasingly turning salty. This is due to ocean water seeping into aquifers depleted by freshwater pumping for homes and irrigation. While communities that lose their supply wells to seawater incursion usually can dig other wells further inland, the process is expensive.[18]

In addition, some cities face climate dangers from unique sources. **Juneau**, Alaska's capital with 32,000 residents, was flooded by frigid meltwater from a glacier. The deluge damaged 100 homes, floated cars in chest-high water, and forced residents to wade to safety. Flooding from the Mendenhall Glacier is becoming an annual summer event; in 2023 homes were damaged by record

amounts of flood water. Eventually, when the receding glacier moves further from the city, these particular floods will stop. But that relief could be decades away, says Eran Hood, a hydrologist with the University of Alaska Southeast in Juneau who studies the glacier's dynamics: "What we saw yesterday can happen again and likely will happen again in the future. And it could be bigger."[19]

Although wildfires are not usually thought of as a water-system problem, the growth of large wildfires in the US has been driven in part by reductions of moisture in trees, shrubs, and grasses—creating drier conditions that are leading to longer and more active wildfire seasons.[20] The scarcity of water for nature is becoming an urban problem. In August 2024, for instance, people in 600 homes within a quarter mile of **Denver** were evacuated when a wildfire—the second one burning in the region—reached the city's edge.[21] The electricity cooperative serving the area shut off power to residences near the fire for 48 hours to reduce fire risks, even as Denver, a city of 716,000 residents, recorded its highest temperature ever for one of those days—102 degrees.[22] It took hundreds of firefighters and their equipment, including two helicopters, to contain the blaze to 579 acres.

These place-based climate dangers are not the whole picture. Cities also rely heavily on some systems that are not within their jurisdictions, such as electricity production and transmission, which is susceptible to flooding and storm surges, and food production, which is vulnerable to drought. "The United States has no plan for the disruptions that will befall our food systems as critical water supplies dwindle, causing the price of some foods to skyrocket and bringing us closer to the time when we may have to consider pipelines to replenish or replace depleted groundwater," says Jay Famiglietti, science professor at Arizona State University.[23]

Lastly, the current climate-driven problems are just the beginning of serious difficulties; they are forecast to become much worse during the rest of the 21st century. For instance, in **New York City,** which needs protection from rising seas and floods due to heavy rainstorms, an estimated 2.2 million residents will be vulnerable to flooding by 2100.[24] Climate disasters are forecast to continue to hit hardest the communities with the fewest resources to prepare for and withstand disasters. In the **Washington DC region**, where 5 million people get their drinking water from the Potomac River, a 2024 analysis found that a short-term loss of municipal water services "will spark a devastating reduction in economic activity and severely disrupt federal, state, and local government revenues . . . these business losses will be borne disproportionately by small businesses and women-owned and minority-owned businesses."[25] **Richmond**, Virginia, home for more than 250,000 people, reports that as its weather becomes stormier and hotter because of climate change, "the impacts of this are hitting our historically underrepresented and economically disadvantaged communities the hardest. Those that live in poverty have fewer resources and receive less support, which reduces their ability to prevent, cope with, and adapt to climate change impacts."[26]

Water-Resilience Solutions, Briefly

The biggest threats to which water-resilience solutions for communities must respond are well-known: Lack of sufficient water supply for use by communities, agriculture, and nature. Too much water where it's not wanted, flooding communities, eroding shorelines, adding saltwater to aquifers from which people draw water. Degraded water that spreads diseases.

For each threat, there is a growing set of solutions. Some are traditional answers, such as conserving water or upgrading storm sewer capacity, but are coming into greater use because of widespread climate change impacts on water. Others are more recently developed and may be

departures from typical practices such as recycled wastewater for human consumption, green infrastructure, restoration of wetlands.

Which solutions might matter in a particular community depends on the place's climate context—some regions are more susceptible to drought or extreme storms, for example—as well as the community's capacities. Which solutions are actually adopted and implemented also depends on the planning and prioritization decision-making processes for water management that are used in the community.

Below we've listed some of the solutions that communities are using to boost resilience to address each of the major threats to water systems.

Supply Solutions

- Voluntary conservation of water to reduce demand (e.g., use of drought-tolerant vegetation and low-flow showers and toilets)
- Mandatory reduction of water use (e.g., bans on water for lawns and other landscapes)
- Reduction of leakage from water infrastructure
- New sources of surface and groundwater (e.g., new reservoirs, aqueducts)
- Recycled wastewater for appropriate purposes (e.g., wastewater treated to be potable, non-potable water for toilets, industrial uses)
- Rainwater harvesting
- Desalination to produce freshwater
- Increase efficiency of irrigation systems for agriculture (e.g., use of drip irrigation systems)
- Injection of freshwater into coastal aquifers to serve as a barrier to saltwater intrusion

Flooding Solutions

- Upgrade stormwater systems to manage heavier storm flows
- Land use planning (e.g., discourage building in high-vulnerability areas and location of transportation infrastructure)
- Preserve and increase open space to protect ecosystems
- Use of green infrastructure to reduce flooding (e.g., rain gardens, permeable pavements)
- Restoration of floodplain to reduce flooding
- Elevation of buildings, roads, sidewalks, and other physical infrastructure
- Increase stormwater storage capacity to capture and slow down stormwater flow
- Relocate infrastructure (e.g., treatment plants, pump stations)
- For sea-level rise: construction of new infrastructure (flood barriers), maintenance and restoration of wetlands (remove barriers to tidal and riverine flows), use of natural coastal protections (e.g., plant submerged aquatic vegetation, plant dune grasses, add sand fencing, increase shoreline setbacks, natural breakwaters), "hardening" of shorelines with seawalls, breakwaters and bulkheads

Waterborne Disease Solutions

- Increase surveillance for disease emergence in water supply
- Encourage use of green roofs, street trees and other natural elements that filter pollutants from stormwater runoff
- Reduce runoff of nutrients and bacteria from wastewater treatment and agricultural fields

- Increase household water treatment
- Assess effectiveness of disease-prevention tools such as chlorination and water filtration
- Reduce heat absorption of exposed water pipes and tanks by painting them white
- Increase public education about reducing risk of waterborne illness (e.g., rinsing body with clean water after swimming)
- Increase recreational water management to monitor beaches, lakes, etc., and close them if necessary

Conflicts Over Water Resilience

Building water-system resilience can be extremely challenging work because potential solutions may lead to conflicts that involve multiple stakeholders with competing interests, which makes agreements elusive for urban leaders. The key sources of contention, with examples from cities, are:

- Allocation of Water***—who will receive water—households, agriculture, industry or natural environments—when it becomes scarce because of drought, changes in rainfall and snowpack patterns or depletion of groundwater sources?***

In the US most water is used by agriculture, with households consuming less than 10 percent of freshwater. But reductions in water supplies force decisions about who gets how much water, with many communities starting by incentivizing or mandating water conservation measures such as prohibiting watering of landscapes around homes and offices or telling restaurants to stop providing water to diners unless they ask for it. However, climate changes are pushing communities into new allocation behaviors to deal with worse-than-usual water stress and *long-term* supply issues. Phoenix's challenges in finding water for new housing, mentioned earlier, is just one example. (Internationally, in a possible of sign of conflict-to-come for some US cities, we're now seeing tourist-destination communities wrestling with water allocations in response to drought. In September 2024 the *New York Times* reported that "Water scarcity is becoming the next battleground in overtourism, as residents in places like Barcelona, Spain; Casablanca, Morocco; Mexico City and Sicily, grapple with the impacts of climate change and compete with tourists to get their share of the dwindling supply. Fearful of deterring visitors, governments dependent on tourism dollars are reluctant to impose restrictions on hotels and restaurants. In Sicily, for example, the local authorities have admitted to prioritizing water supply to hotels, and earlier this year in Barcelona, only residents, not tourists, faced water restrictions.")[27]

Near **Las Vegas**, Nevada, with a population of 665,000, a proposed housing development that could have led to thousands of new homes, became tangled up in lawsuits after the state warned it would harm water supplies. After the state Supreme Court affirmed the state's authority to block the development, a lawyer for the developers said that hundreds of millions of dollars of infrastructure would be "useless."[28]

A proposed housing development outside of **Helena**, Montana—35,000 inhabitants—was halted when a judge ruled the state government had failed to place adequate limits on new construction that relies on groundwater, which is being depleted. The ruling may compel the state to apply a tougher standard before approving similar developments.[29]

Corpus Christi, Texas, with more than 400,000 people in its metropolitan area alongside the Gulf of Mexico, announced in December 2023 that it would not release water from its drought-depleted reservoirs, which were less than half full, to support coastal bays and estuaries. Those wetlands

depend on freshwater inflows to support aquatic species. Studies suggest that a lack of sustained water supply has already permanently impaired the natural systems.[30]

Cities may become ensnared in larger fights over water decision-making. In Idaho, state government ordered farmers in areas of declining surface water to reduce the amount of water they were drawing from wells. When farmers objected, the state's Supreme Court backed up the ruling, which experts say will make it easier for the state to order others to cut back water use.[31]

Cities in Texas face supply shortages down the road. The State Water Plan forecasts that, due to drought, increasing demand and aging infrastructure, a quarter of the state's population would face municipal water shortages by 2070 unless additional supplies are provided.[32]

- Protection from Water Risks***—whose lives, health, property, and businesses will be shielded from flooding caused by extreme storms or rising seas?***

When a community develops a plan for its climate resilience, it will likely need to embrace a number of solutions, with different approaches to address different climate risks in different neighborhoods. Different solutions have different costs and different timelines for implementation. They also cause different degrees of disruption to life as usual in the community. And different climate risks pose different potential harms to different parts of the community. As a result, implementing solutions usually requires prioritization by city officials, but priorities can be extremely controversial and often may favor more politically valued, affluent residents, especially when there's not enough money to do everything. "We'll probably figure out ways to protect large sections of **New York City**, **Boston**, and **Miami** because they contain huge numbers of people and billions of dollars in infrastructure," says geographer Alex de Sherbinin, "but countless other coastal communities situated in between major cities are going to have a more difficult time adapting."[33]

Compounding the problem, two federal agencies with resilience-related responsibilities, the Federal Emergency Management Agency (FEMA) and the US Army Corps of Engineers, have policies that lean more toward protecting property and sustaining the economy than saving lives.

In **Norfolk**, when residents saw plans for a floodwall cutting through their neighborhoods, they wanted to know if property owners would be compensated for loss of property value due to the wall. Southside residents were angered when they learned that a study of how to protect their neighborhood was being postponed. "The community has the impression, as my grandma used to say, that we were bamboozled from the beginning," a local leader says.[34]

In **Miami**, where rising seas threaten prime coastal real estate, wealthier people have been purchasing additional homes in low-income neighborhoods with higher elevations; this market trend has driven up prices and pushed Latino communities out of safer areas.[35] At the same time, rent prices and evictions have surged in low-income districts on higher ground. "As floods have worsened everywhere else, they've come to be seen as prime real estate," says Marco Tedesco, author of a case study on the area.[36]

- Costs of Resilience***--who will pay the cost of investments in securing new sources of water and protecting cities from flooding and coastal erosion, and for the increased cost of water services and essentials such as insurance, food, health care and electricity due to water-caused disruptions?***

Climate resilience is not free. Someone has to pay for drainage infrastructure upgrades, water supply acquisition, coastal protection and other solutions, as well as the increased operating costs of water systems. Historically, water systems have relied on three sources of capital: their ratepayers' payments, federal and state loans and grants for infrastructure, and long-term, low-risk borrowing in private bond markets. But each of these sources has important constraints and the combination has not kept up with the financial needs of water systems, especially for infrastructure.

Average household water and sewer bills have increased about 50 percent in the last decade.[37] The elected officials and utility managers who set the rates usually worry about a public backlash if they ask for what would be perceived as too much money. Many ratepayers with low incomes are seriously burdened by water costs and many are behind in making their payments. Studies find that about 10 percent of US households face water affordability concerns because their bills for water and sewer service amount to more than 4.5 percent of their annual income, the standard set by the federal government.[38] Several years ago it was estimated that one in eight households in California had water debt—a total of roughly $1 billion in unpaid household bills, depriving utilities of funds for operations, maintenance and infrastructure.[39]

Government investment in water infrastructure throughout the US chronically lags behind what is needed for upkeep and expansion, and few communities have fully reckoned with the additional investments that will be needed to build water-system resilience and which can run into the billions of dollars.

The private bond market only approves long-term lending to utilities that can demonstrate a reliable ability to pay back the loans from their revenues, and many utilities—especially smaller ones—are not in sufficiently strong financial positions to borrow.

In general, *new* money for water-system resilience projects comes from these sources:

- **Ratepayers** of water utilities who prices are raised. Rhode Island's Water Resources Board worked with large water suppliers to add a small surcharge on customers' monthly water bills, with a portion of the revenue going to preserve water sheds that provide drinking water.[40]

- **Property taxpayers** in a community, which spreads the cost quite widely and without consideration of water usage or need. For instance, a utility or city or county government could fund water resilience by increasing the local property tax rate and then borrowing money that would be repaid for the increased future revenues.

- **Taxpayers across a state**, which spreads costs even more widely, also without consideration of usage or need. In 2023, for instance, 77 percent of Texas voters approved a constitutional amendment to create a Texas Water Fund to finance water projects using a $1-billion appropriation. At least a quarter of the funding must be used for new water supply projects.[41] In California voters were asked in November 2024 to approve a $10-billion "climate bond" issue by the state that includes $3.8 billion for water projects, half to improve water quality, the remainder for protecting the state from floods and droughts, and other activities, including restoring rivers and lakes. Much of the rest of the money would be spent on wildfire and extreme heat projects, $1.95 billion, and coastal lands, bays and ocean protection, $1.2 billion.[42]

- **Targeted users within a specific service area**, such as a business improvement district, with the revenue spent on solutions for those users only. California and Maryland have developed a new financing mechanism, known as a "resilience district" that expands the financing tools that local communities can use for this purpose. In **Washington DC**, a stormwater retention credit program requires new real estate development to either install green stormwater infrastructure or purchase stormwater credits with offsite green stormwater projects.[43]

As pressure grows for resilience investment, various financing innovations are being tried. "Resilience bonds," a subset of the growing "green bonds" market, allow communities to borrow private capital for resilience projects that protect assets. According to the World Economic Forum in 2023, some private loans for resilience now include clauses that allow lenders to postpone loan repayments if pre-agreed climate disasters occur. Other lenders are reducing their risks by blending their resilience-investment capital with below-market rate capital from government or philanthropies. Or they are incentivizing measurable results from resilience investments, with financial rewards for projects that deliver the outcomes.[44] A Forest Resilience Bond for restoration of public lands in California raised $4 million from private and philanthropic investors along with $2.6 million from state government and $1.5 million from Yuba Water Agency, which focuses on reducing flood risks, providing water to eight irrigation districts, and generating hydropower.[45]

- Development of Communities***--who will build, live, and work where, as chronic flooding leaves some neighborhoods and communities uninhabitable and insurance companies stop writing property-protection policies in climate-vulnerable areas?***

The development of **Phoenix**, **Las Vegas** and **Helena** has been constrained, as mentioned earlier, by a lack of water supply for new housing. At the same time, a number of cities are starting to deal with the possibility that sea-level rise and chronic flooding will make some of their districts impossible to protect or prohibitively expensive to defend.

Researchers report that some homebuyers are avoiding entire states—California, Texas, and Florida, in particular—because of their climate vulnerabilities. US Census Bureau surveys found that *every year* 2-3 million Americans are forced from their homes by hurricanes, floods, and other climate-driven disasters. Many of these dislocated people choose to relocate permanently.[46] There's a strong prospect of additional abandonment as property insurance becomes unavailable or extremely expensive.

Abrahm Lustgarten, author of *On the Move: The Overheating Earth and the Uprooting of America,* notes that in states where insurance companies have been losing money due to climate disasters, property owners have been mostly insulated from the losses because state governments prevent the insurers from raising rates significantly. Eventually, he predicts, homeowners in vulnerable areas will have to pay the true cost of their coverage and this will cause their properties' value to fall.[47]

Who's In Charge?

Looming over these crucial questions is another question: who decides?

The governance of water systems and climate resilience efforts is complex and often fragmented. What's clear is that in many cases who makes these decisions about water-system resilience and

how they make them will not be entirely, or at all, under the control of communities. Authority over water systems lies within a patchwork of municipal, county, state, tribal and federal government laws and agencies spelling out public and private rights, regulations, and the formation, management, and financing of public and private water entities, as well as local businesses, corporations, and insurers—and may vary city by city. Within the federal government alone, the Bureau of Reclamation, FEMA, US Army Corps of Engineers, Environmental Protection Agency (EPA), Fish and Wildlife Service, Forest Service and Geological Survey are among entities with water authority.

It was a state government agency that blocked permits for new housing in **Phoenix** due to water scarcity. As water supplies become more stressed, some states have fought over access to freshwater. Mississippi sued Tennessee over **Memphis**'s heavy use of the Sparta-Memphis Sand Aquifer, while Florida sued to limit Georgia's use of the Chattahoochee River.

A combination of state and federal government decisions about assistance was needed to help **Princeville**, North Carolina, the oldest American community founded by formerly enslaved people, to begin to relocate entirely from a floodplain after a 2016 hurricane submerged the community of 1,200 residents under 10 feet of water.

In northwest Ohio, the board of directors of the region's water and sewer district sets rates for customers, while in California the state's Public Utilities Commission sets rates for regulated water systems, and in Seattle the city council approves rates. The federal EPA sets pollution limits for discharges into drinking water supplies, which states then enforce. Many states produce water plans but, reports the National Caucus of Environmental Legislators, "few fully incorporate climate change and modern concepts of integrated water resources planning."[48]

In some cases, there are gaps in authority over water systems. As **Boston** planned to address its sea-level rise problem, there were no government entities authorized to address resilience building at coastal floodplains, beaches, salty marshes, tidal rivers and other ocean-adjacent environments. In August 2024 the state's Office of Coastal Zone Management convened a task force to consider the design and creation of coastal resilience districts to facilitate regional projects and partnerships.[49] It proposed structuring districts along natural landscape features—watersheds, river basins, coastal islands. Future design elements could include governance structures for the resilience districts and financial tools the districts can use to pay for resilience solutions.

Assembling strategies to address these water dangers and paying for the solutions is a new challenge for most communities and water utilities. In 2024, when Boston established a new Office of Climate Resilience to coordinate responses to rising sea levels, inland flooding, and extreme heat, city officials stressed the need to involve multiple city departments, state and federal agencies and businesses to implement its complex climate-resilience plans. Boston needed "an all-of-government delivery approach," says Brian Swett, the city's climate chief.[50]

Conclusion

The challenges that climate change poses to urban water systems are urgent and multifaceted. Without decisive action and a commitment to shared learning and best practices, urban areas risk falling victim to escalating water crises and conflicts, jeopardizing their sustainability and the well-being of their residents and businesses. ***Urban leaders and sustainability planners must recognize the growing threats to water availability and quality, prioritize water-resilience***

planning, and engage diverse water stakeholders in decision-making processes. They must confront the reality that America's water systems are unprepared for this century's challenges of drought, flooding and water-quality degradation due to climate changes.

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We intend to look at ways that cities and other communities can handle the difficult challenges of building long-term water system resilience in our next report

Notes

[1] https://nca2023.globalchange.gov/chapter/4/.
[2] US Water Alliance, "Water Rising: Equitable Approaches to Urban Flooding," July, 2020, 1, https://uswateralliance.org/wp-content/uploads/2023/09/Final_USWA_Water-Rising_0.pdf
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[5] US Water Alliance, "Water Rising: Equitable Approaches to Urban Flooding," 13.
[6] https://www.tampabay.com/news/2021/04/22/miamis-sea-level-rise-bill-4-billion-by-2060-still-wont-keep-every-neighborhood-dry/.
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[11] https://www.epa.gov/newsreleases/biden-harris-administration-awards-255-million-new-grants-combat-impact-climate-change.
[12] https://www.usatoday.com/story/travel/2024/08/01/hawaii-beaches-climate-change/74624517007/.
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