

Metrics for access to water and sanitation need structural changes



Climate change is a negative equaliser for access to safe water and sanitation around the world. Historically, low-income and middle-income countries have been the least likely to be on track for achieving Sustainable Development Goal (SDG) 6, which calls for the availability of water and sanitation for all.¹ However, recent climate-fuelled disasters are also highlighting the fragility of water and sanitation systems in high-income countries. In 2024, hurricanes Helene and Milton intensified rapidly in the Gulf of Mexico before hitting large areas of southern USA. Many residents in Asheville, NC, USA, were left without running water. Restaurants and schools were temporarily closed due to public health concerns of unsafe water, and many relied on buckets to flush their toilets.²

The effects of climate change on water and sanitation systems worldwide highlight that simply counting who does or does not have access to these services is not enough. Before the hurricanes hit, WHO's Joint Monitoring Programme for Water Supply, Sanitation, and Hygiene would have counted people in Asheville as having access to safely managed water and sanitation services. That status changed very quickly in the aftermath of hurricane Helene. Climate change affects the reliability, quality, and sustainability of water sources and infrastructure, which cannot be fully understood through a basic count of access alone.

The fate of water and sanitation systems is inextricably tied to natural disasters. The 2010 earthquake in Haiti crippled the nation's water and sanitation infrastructure, contributing to a cholera epidemic that killed almost 10 000 people later that year.³ Extreme flooding in Nepal in October, 2024, damaged hundreds of water supply systems and thousands of sanitation facilities, thus spreading fears about disease outbreaks.⁴ Flooding in early 2024 in Liberia, Nigeria, Mali, Niger, and Chad damaged toilets and water points that millions of people rely on.⁵ Climate hazards can damage every link in the sanitation value chain, from toilet superstructures to the water pipes and sewers beneath our cities.

Two changes need to be made on how progress towards water and sanitation access is measured in the era of climate change. First, metrics need to track when,

and for how long, water and sanitation systems are exposed to and disrupted by climate-related disasters. Socioeconomic and health consequences become increasingly adverse the longer disruptions to water and sanitation systems persist. Tracking the frequency and duration of service outages stemming from climate-related events will elucidate the extent to which a person's access to water and sanitation fluctuates over time as opposed to simply conceptualising this access as a binary. Such tracking will also help local governments better understand how quickly or slowly they are able to restore these services.

Second, access to water and sanitation needs to be tracked at subnational and community levels. Currently, the Joint Monitoring Programme only presents country-level water and sanitation access estimates.⁶ The threat from, and vulnerability to, climate hazards vary subnationally. Other climate exposures (such as heat and PM_{2.5}) can be tracked across entire countries in square kilometre grids. Data from the Climate Hazards Group InfraRed Precipitation with Station Data provides a similar degree of spatial resolution for flooding—a climate exposure that directly impacts global water and sanitation systems. Drainage system quality, for instance, varies substantially across districts and communities in India,⁷ and extreme flooding could overwhelm these systems, exacerbating the spread of disease. Increased geographical granularity and precision can point to how the resiliency of water and sanitation systems varies subnationally as a function of varying climate-related hazards.

Climate change means that access to water and sanitation yesterday does not guarantee access tomorrow. Water and sanitation systems in high-income countries are likely more resilient to these threats and can be restored more quickly if disrupted. However, hazards such as hurricanes and extreme flooding jeopardise progress towards SDG 6 for communities around the world. Metrics for access to water and sanitation need to more accurately reflect the complexity brought on by climate change and to go beyond simply measuring who has the resources and who does not.⁸ This goal can be achieved by tracking how long these systems are exposed to, and disrupted by,

climate-related hazards and more granularly tracking the places within countries that are most vulnerable to these threats. This approach will allow us to accurately assess access—a lesson that can be applied to other crucial forms of health and social infrastructure.

We declare no competing interests.

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