

## Protect public health by making water services resilient in a changing climate

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### *Safe water, drainage, and sanitation are essential for public health—we need to make these services resilient*

This summer the worst floods in South Asia in 40 years killed around 1300 people, affecting 40 million in total. In August a mudslide in Freetown, Sierra Leone, left 400 people dead and 600 missing. In September, US newscasters described having been “beaten up” badly by Hurricane Harvey; Irma “tricking and swindling” as she feinted changes of course. Photographs of New Zealand’s July floods showed water with fresh faeces erupting from drains and sewers; while in the US, floodwaters from the two hurricanes mixed with concerns for underinvestment in sewerage infrastructure and contaminated land. In the US alone, these hurricanes left nearly 100 people dead, and the economic costs are estimated to be around \$150 billion and are predicted to reduce national GDP growth by 1%.

That health suffers when weather extremes hit is well understood. Our attention usually focuses on the immediate deaths, and on the injuries and infections that occur during and in the immediate aftermath of an extreme event. Only later does attention turn to restoring the basic services on which public health relies, even though these may be severely disrupted and damaged.

While the immediacy of floods captures news headlines and human imagination, this year has also seen widespread water shortages, including the most severe drought on record in northern China and ongoing concerns in the Horn of Africa. During drought, water sources may reduce or dry up, constraining even basic hygiene. People are forced to walk farther to collect water ([Calow et al](#)), reducing the volumes of water collected to as little as two to five litres per person per day. Such shortages increase the risk of diarrhoeal and skin diseases, and may explain why cholera outbreaks in inland Africa show a strong association with drought as well as with excessive rainfall events ([Rebaudet et al](#)). Climate change will increase the likelihood of outbreaks of cholera and other severe diarrhoeal diseases as warming seas and increasing salinity favour the survival of the bacteria *Vibrio cholerae*.

The populations exposed to water related hazards due to weather extremes and the associated disease burden are likely to increase—together they will place further stress on health systems. Nevertheless, the health consequences of defective, destroyed, and interrupted water and sanitation services—which persist long after an extreme event—receive little attention.

Extreme events, such as this year’s storms and floods, are not new. Debate about whether a specific event can be attributed to human caused climate change distracts attention from the growing need to adapt to the world we now live in. For those who do not believe in climate change, the events around us should still provide impetus for action. For believers and naysayers alike, the need to adapt to extreme events is immediate.

The long term investments needed for infrastructure-heavy sectors clash with the immediacy of loss of life and livelihoods, so while funds flow for disaster response, they are not accompanied by investments in adaptation and prevention. Perhaps this is also because of the weak evidence we currently have on cost effective adaptation. But the changing frequency of extreme events with climate change must surely start to change this sluggishness. Although it is challenging to evaluate measures that will improve resilience to infrequent and variable events, and to implement smarter, adaptive management practices, this should increasingly be where we focus our efforts.

In low and middle income countries, ensuring first time access to basic or improved services may distract from ensuring that those services are resilient. This is a longstanding issue in many countries where, even without climate change, there are huge problems with the sustainability of services. Work undertaken by the Overseas Development Institute suggests that there are positive benefit:cost ratios

across a range of adaptation options in Africa, including a benefit:cost ratio of 3.1 for climate sensitive interventions to prevent water point failure and of 2.7 for investments in flood resistant latrines in informal settlements in Sierra Leone (Oates et al).

Meanwhile, in high income countries there may often be complacency with infrastructure that has taken many decades to construct. Given the accumulated value of these long term assets, it may be difficult to accept that further investment is now required to ensure resiliency. Ongoing work at the Water Institute at UNC to catalogue water utility adaptation to climate change shows that while many are taking action, the focus is primarily on planning and utility operations, rather than investment in resilient infrastructure.

Conservatism and inertia in the water and sanitation sectors inhibit adaptation, push costs into the future, and are likely to exacerbate what might otherwise be avoidable impacts. The future human and economic costs of inaction will dwarf those of this year's events.

It was physicians, confronted by the toll on human health, who demanded the improvements in water supply, drainage, and sanitation that transformed 19th century public health. Effective health advocates are as critical today as they were in that "sanitary revolution." While today's risks involve greater uncertainty and affect wider communities, the core arguments are the same: reliable safe water, drainage, and sanitation for all are necessary for public health and benefit everyone.

Today, it is the health sector that must lobby for investments in resilient water and sanitation, and improve the evidence on what interventions yield the greatest and most cost effective benefits. We need leaders in public health to engage more closely with research on climate change and to learn from adaptation actions. We need health professionals to engage in difficult discussions about how resilience is defined and measured and how to protect health in a changing world. And we need them now.

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The views expressed are those of the authors and do not reflect the official position of the University of North Carolina, Department for International Development, or any other part of the UK Government.



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**Competing interests:** Jamie Bartram is the director of the Water Institute at the University of North Carolina at Chapel Hill, which has received research funding related to climate adaptation from entities including Wells Fargo Foundation and UNICEF.



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**Competing interests:** None declared.



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**Competing interests:** None declared.

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