

Building a resilient and healthy society – the intersection of climate change, water and health

Many of the health effects of climate change involve water as an intermediary. Climate-resilient water and sanitation infrastructure is a key part of managing the impact of climate change on health. This brief describes how climate change, health, and water and sanitation intertwine. It also provides an overview of Mott MacDonald's experience working globally across these sectors.

The vision of a healthy and resilient society

Evidence shows that we are already witnessing the impacts of human-induced climate change. Should the world warm beyond 2°C it is highly likely that there would be major disruptions to the global climate system. In 2015, the international community, through the Paris Agreement, adopted a long-term goal to limit the rise in global mean temperature to below 2°C – and if possible 1.5°C – above pre-industrial age levels to prevent dangerous climate change.

The impacts of warming on human health are increasing, driven by changes in acute extreme weather events and long-term changes to the global climate. Scientific evidence, as reviewed and reported through the Intergovernmental Panel on Climate Change (IPCC), now states that these extreme weather events have become more frequent, posing significant risks to communities. Some of the most significant consequences are manifested through the changing and dynamic nature of the hydrological cycle. For example, the World Health Organization (WHO) has reported that the entire population of Bangladesh is at risk of cholera due to frequent and widespread flooding.¹ In another study WHO estimated that by 2030 water-borne diarrhoeal diseases due to climate change would cause an additional 48,000 deaths of children under 15 years.²

Climate change challenges communities to find a path to resilience. Our vision of a resilient, healthy society builds on the WHO definition of health as a state of physical, mental and social wellbeing.³ A resilient and healthy society is thus characterised by the ability to maintain effective healthcare systems; access to basic services, such as clean water and sanitation; and the capability to sustain physically, mentally and socially healthy individuals and communities amid large-scale changes in climate.

In this paper, we draw on Mott MacDonald's experience working globally across the climate change, health, and water and sanitation sectors to demonstrate how working together and 'openness to connected thinking' can contribute to realising the vision of people-centred resilience.

¹ Ali, M et al (2012). The global burden of cholera. Bulletin of the World Health Organization. 2012; 90:209-18.

² World Health Organization. (2014). Quantitative Risk Assessment of the Effects of Climate Change on Selected Causes of Death in 2030s and 2050s.

³ World Health Organization. (2019). Constitution of WHO: principles.

Why are the climate change, water and health sectors so closely aligned?

The impacts of climate change on human health are increasing, driven by changes in acute extreme weather events and long-term changes to the global climate.

A WHO publication in 2014 considered the health effects of a warmer planet.⁴ It identified water-borne diseases (such as diarrhoea and cholera), water-related vector-borne diseases (including malaria and dengue fever), undernutrition, heat, injuries and mental health issues are identified as consequences of climate change. Injuries and mental ill health (such as farmer suicides) are caused largely by the trauma of the extreme events.

⁴ World Health Organization. (2014). Quantitative Risk Assessment of the Effects of Climate Change on Selected Causes of Death in 2030s and 2050s.

⁵ World Health Organization. (2018). COP24 Special Report: health & climate change.

⁶ The Guardian (2018). Heatwave temperatures may top 45C in southern Europe.

The link between the other health effects and climate change all involve water as an intermediary:

- Diarrhoea: infection is spread through contaminated drinking water or food, or from person to person as a result of poor hygiene. Severe diarrhoea leads to fluid loss and can be life-threatening, particularly for young children and people who are malnourished or have impaired immunity.
- Malaria and other vector-borne diseases: damage to sanitation and drainage infrastructure can create breeding sites for mosquitoes.
- Undernutrition: unreliable rainfall affects irrigation systems and food supplies.
- Heat: Heat-related deaths (which overwhelmingly affect older people): lack of improvements to housing and the outdoor built environment, such as providing more green spaces, painting roofs white, and activating health warning systems during particularly hot weather, as well as insufficient access to potable water.

In a special report on health and climate change in 2018, WHO examined the interconnections between the two issues and highlighted the critical role of water systems in exacerbating the negative impacts.⁵ The United Nations emphasised the integrated and indivisible nature of its global sustainable development goals (SDGs) to be achieved by 2030. These include targets on climate action (SDG 13), clean water and sanitation (SDG 6), and good health and wellbeing (SDG 3).

In 2003, the European heatwave that resulted in 20,000-60,000 deaths became one of the first extreme events that scientists could clearly attribute to human-induced climate change.⁶ A more extensive and intense heatwave in Europe in 2011 resulted in more than 15,000 deaths and has been ascribed to major societal change in many parts of the world due to its impact on basic food commodity prices. In mid-2018, Europe also experienced a prolonged period of record-breaking temperatures and drought. In southern Europe, this was compounded by dust storms from the Sahara and deadly forest fires.⁶ As a result, there

were widespread public health warnings about maintaining personal safety, preventing heatstroke and dehydration, and the risks of rising air pollution.

These examples highlight the extensive interdependencies between climate change, water and human health. They also suggest that our responses need to be based on understanding these natural linkages to ensure comprehensive solutions.

In early 2018, Cape Town experienced one of the worst droughts in living memory. Residents were required to minimise water use. This led to authorities warning of the dangers of faecal-oral contamination of water, food and hands. There were also consequences for food production and food security, waste management, income generation and livelihoods – with poor and disadvantaged people most severely affected.

Connected thinking: the climate change-H₂O-health interface

Figure 1 illustrates the multiple, overlapping and interconnected relationships between climate change, water and health.

The third line shows the various stages of the water management cycle. This starts from abstraction at source, whether this is groundwater or surface water. In some settings extracted groundwater may be consumed directly, while in others it may be transmitted to a treatment plant before flowing into a piped distribution system.

Sanitation may be centralised through the construction of sewers and wastewater treatment plants or may be decentralised using pit latrines, for example, or even open defecation.

Irrigation of crops is the final part of the hydrological cycle and is the single largest use of water.

There is firm evidence that climate change has significant impacts on the global hydrological cycle.⁷

Increases in extreme precipitation can cause the quality of drinking water sources to deteriorate through erosion and sedimentation. Impacts on sanitation can be even more profound if sewage systems are flooded, resulting in widespread overflow of faecal matter into the environment and drinking water sources. This poses a serious risk of losing public health gains made through improved sanitation services.⁸

Decreases in precipitation can reduce the quantity and quality of water resources. In many places this has led to supplies in urban areas becoming intermittent. The subsequent low water pressure allows contaminants into the supply, causing illness

and water shortages for those at the edges of the network, who are typically the poorest.

Lower levels in surface water bodies receiving wastewater also translate to higher concentrations of harmful contaminants and pathogens and can increase the risk of diarrhoeal and other water-borne infections.

Disruptions to the hydrological cycle are associated too with land degradation and changes in irrigation practices, a consequence of which is inconsistency in food supplies. This may cause nutrition deficiency and can also create the conditions for the spread of vector-borne diseases, such as malaria, dengue and yellow fever.⁹ Some linkages are more indirect. For example, extreme acute weather events and a rise in sea level can lead to loss of assets,

population displacement, water insecurity and conflict. These in turn can be associated with trauma, injury and mental ill health.¹⁰

The effects of climate change on water systems and human health can be acute and short term, or long term. To address the health impacts, it is vital to invest in climate-resilient water and sanitation.

Climate change presents the single biggest threat to sustainable development and to the overall achievement of the UN SDGs. Its impacts are likely to burden the poorest and most vulnerable disproportionately. Our joined-up work in climate change, health and water thus tackles the SDGs as a whole, as well as the individual goals for health, water and sanitation and climate change (SDGs 3, 6 and 13 respectively).

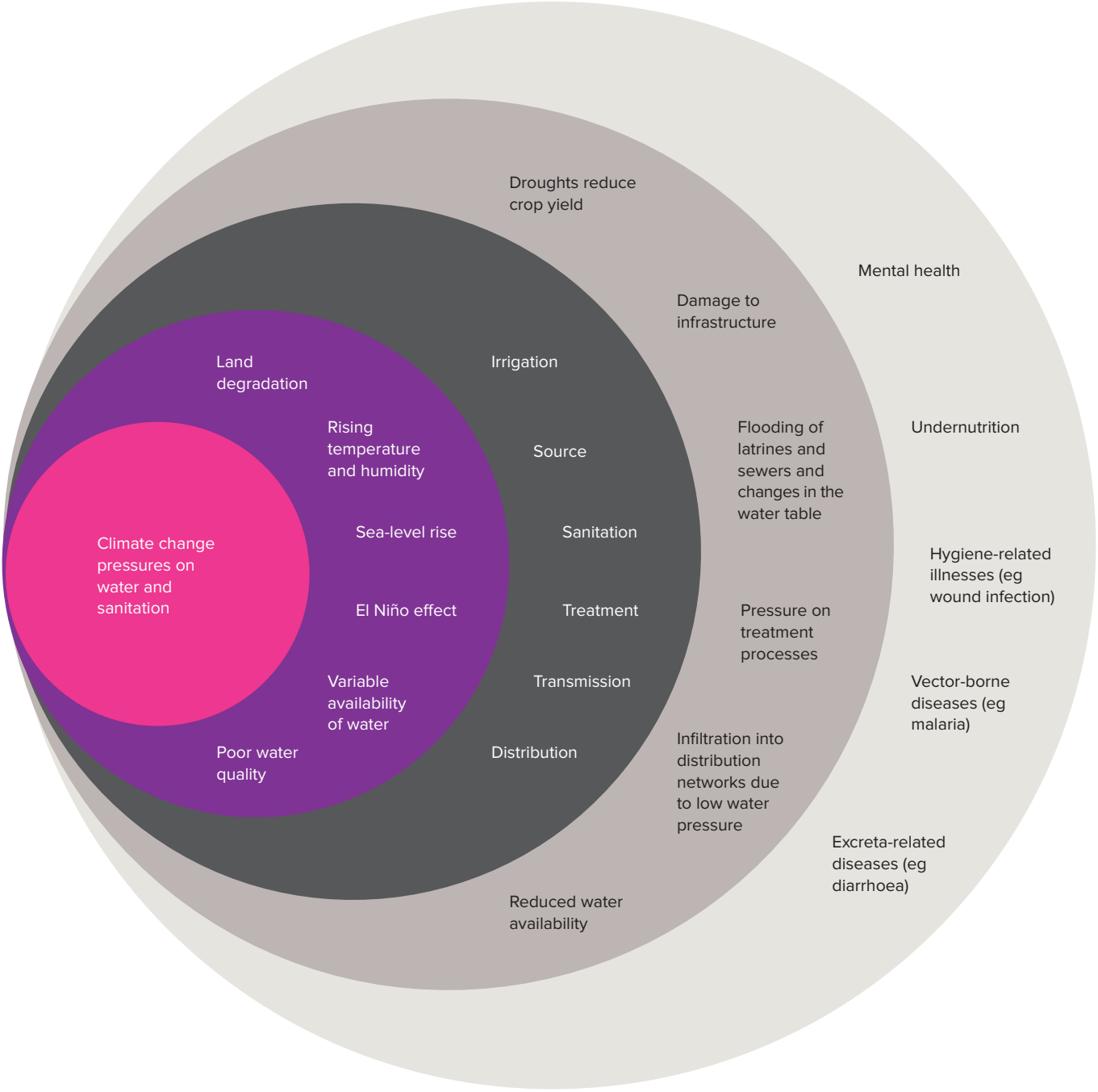


Figure 1 — Climate change pressures on water and sanitation

⁷ UNESCO. 2017. Facts and figures: climate change is intensifying the global hydrological cycle.

⁸ Howard, G., Calow, R., MacDonald, A., Bartram, J. (2016). Climate change and water and sanitation: likely impacts and emerging trends for action. Annual Review of Environment and Resources 41 pp. 253-276.

⁹ World Health Organization. Climate Change and Infectious Diseases.

¹⁰ For a more detailed account of the relationship between health and climate change see: Watts, N. et al. (2018). The Lancet countdown on health and climate change: from 25 years of inaction to a global transformation for public health. Lancet 2018; 391: 581–630.

Connecting climate change, water and health in Bangladesh – a case study



The flat and fertile char lands of Bangladesh are extremely vulnerable to the impacts of climate change

Mott MacDonald's experience in Bangladesh shows how, by working across sectors, it is possible to build more resilient and healthy communities, even in the most challenging contexts.

The Char Development and Settlement Project is a series of schemes over more than 20 years that have helped to transform newly accreted land (chars) in Bangladesh. The project is exceptional because it brings together several government ministries (covering agriculture, infrastructure, land, public health and water), as well as international donors and non-governmental organisations.

The char lands in Bangladesh are unique, sedimentary mudbanks formed by rivers flowing into the Bay of Bengal. Although they are flat, fertile and attractive for farming, they are also

vulnerable to erosion, flooding and the impacts of climate change, as well as the devastating cyclones associated with the pre- and post-monsoon seasons. In this difficult environment, local communities have struggled against the threat of displacement, land grabs, corruption and piracy along the coastline. Before the project, there was minimal infrastructure or access to fresh water supplies and farming techniques were unsustainable. Women were particularly vulnerable to impoverishment, gender-based violence and ill health.

Since 2011, Mott MacDonald has provided technical assistance to support the development of infrastructure to provide protection from climate change, including embankments, sluices, culverts, roads, cyclone shelters, forestry

initiatives and canals (CDSP IV). Training in hybrid agriculture techniques has improved food security and 1300 deep tubes now supply reliable drinking water. All families have their own latrines, so important in reducing incidences of diarrhoea. Microfinance and enterprise training are helping communities to diversify and increase their income; the project has achieved notable success in gender development and women's land rights.

Over seven years, CDSP IV transformed 30,000ha into a functioning and sustainable homeland for about 186,000 people from 29,000. By raising the status of women, there has been a fall in child marriage, gender-based violence and improvements in health outcomes. This collaborative effort has helped to establish a healthier, more secure community that is less vulnerable to uncertainty and displacement.

Moreover, it now has far more capacity to sustain this unique environment.

Evidence from the CDSP shows the positive outcomes of the community's reduced vulnerability made possible by the new infrastructure, as well as security of land tenure, higher incomes and other socio-economic improvements. People have invested in better housing, more resilient farming practices and effective local institutions capable of dealing with changing conditions. This holistic approach in CDSP, with interventions across a range of sectors, is a model for the development of coastal communities to avoid future risks associated with climate change. The government of Bangladesh is now trying to replicate this model in other char areas so that the coastal communities can adapt too.

Making the whole greater...

This case study from Bangladesh illustrates that it takes an ‘openness to connected thinking’ to ensure the whole becomes greater than the sum of the parts. Although there are challenges in applying these principles in different settings, there is growing recognition of the need to work across sectors and at different levels, as illustrated in Figure 2, and the value of sharing expertise and experience.

Ideas for further cross-sector working include:

Model working

Mott MacDonald’s water resource specialists use hydrosocial modelling to look at water management in its wider social context. Acknowledging the requirements of different stakeholders, the technology uses simulator models to test different scenarios – for example, droughts of varying severity and future growth predictions – to identify optimal supply and demand solutions. Experts in health, climate change and other disciplines could work with these models to identify future issues for a range of sectors.

Using technology

Applying digital technology and thinking to physical assets. This offers the potential to use the assets more intelligently, finding efficiencies and better meeting society’s needs. Smart infrastructure enables us to derive more from assets by improving our understanding of the way they perform now and in the future, and enabling better decisions over how we design, operate and maintain them.

Responsive facilities

In the case of health facilities, smarter infrastructure is about creating more efficient, eco- and user-friendly buildings as well as designing buildings to be flexible to respond to shifts in health needs (climate change being a factor here) and to technological developments. For smart water infrastructure this may provide real-time monitoring of assets and system performance, ensuring that critical infrastructure is protected, and water quality continually monitored.

Natural allies

To tackle the health effects of climate change we need to address, among other issues, the consequences on water and sanitation systems. This is not a quick fix. Solutions need to be tailored to communities and contexts. The climate change, water and health sectors are natural allies in addressing these challenges.

Resilient investment multiplier effect

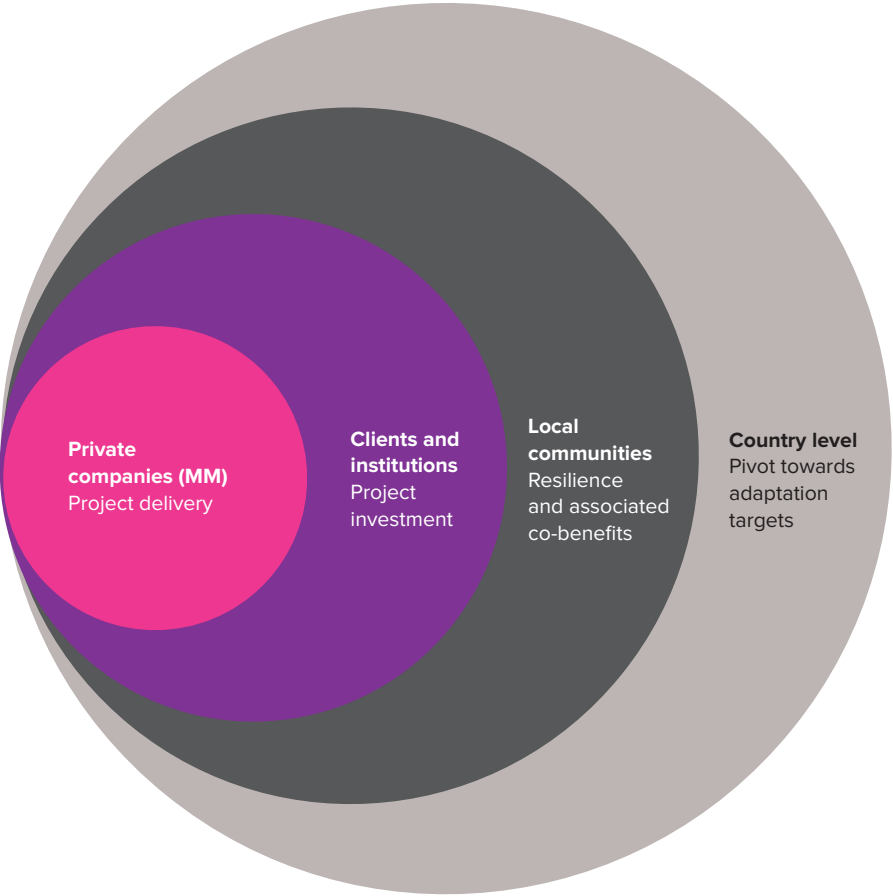


Figure 2 – Remember the bigger picture – positivity

Opening opportunities with connected thinking.