Climate impacts on water, sanitation & health

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Climate threats to water and sanitation services

- Changes in climate will pose both water quantity and quality threats.
- This may be combined – increased water scarcity both means less available water (quantity) and decreased dilution of pollutants (impacting on drinking water sources and receiving waters).
- Interruption of services is a key problem and maybe a result of cascading multiple hazards.
- The impacts of climate on water and sanitation services have important implications for water-related infectious and non-communicable disease.
The climate wheel of impacts
### Examples of climate impacts on water supplies

<table>
<thead>
<tr>
<th>Rain and Flooding</th>
<th>Drought</th>
<th>Increased Temperature</th>
<th>Sea-Level Rise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased upstream erosion and run-off</td>
<td>Intermittent supply and associated ingress</td>
<td>Higher water demand</td>
<td>Saltwater intrusion into distribution networks</td>
</tr>
<tr>
<td>Damage to assets and infrastructure</td>
<td>Increased concentration of pollutants</td>
<td>Increase in algae blooms (± toxigenic)</td>
<td>Saltwater intrusion into aquifers</td>
</tr>
<tr>
<td>Overwhelmed water treatment and distribution facilities</td>
<td>Increased competition for scarce water resources</td>
<td>More favourable growth conditions for pathogens</td>
<td>Inundation of critical assets and infrastructure</td>
</tr>
<tr>
<td>Release of contaminants from reservoir sediments</td>
<td></td>
<td>Reduced stability of residual chlorine</td>
<td></td>
</tr>
</tbody>
</table>
### Examples of climate impacts on sanitation

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<th><strong>RAIN AND FLOODING</strong></th>
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<tr>
<td>Damage to sanitation assets and infrastructure</td>
<td>Ground movement leading to broken pipes</td>
<td>Higher water demand</td>
<td>Reduced efficiency of biological treatment processes due to saltwater</td>
</tr>
<tr>
<td>Flooding and/or collapse of on-site systems</td>
<td>Increased corrosion of sewer pipes</td>
<td>Increase in algae blooms (± toxigenic)</td>
<td>Damage to underground infrastructure from rising groundwater levels</td>
</tr>
<tr>
<td>Overflow of overwhelmed storm- and wastewater containment systems</td>
<td>Impeded function and use of water-reliant sanitation systems</td>
<td>Reduced efficiency of biological wastewater treatment</td>
<td></td>
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<tr>
<td>Spillage from bypassed wastewater treatment plants</td>
<td>Reduced capacity of receiving water bodies to dilute wastewater</td>
<td>Quicker drying of faecal sludge in waterless latrines</td>
<td>Damage to wastewater treatment works in low-lying/coastal areas</td>
</tr>
</tbody>
</table>

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Important to look beyond the obvious

- Floods and droughts are the most common threats – or at least most commonly considered.
- But emerging issues are important:
  - **Wildfires**: increasing occurring in previously unaffected areas (e.g. Scandinavia, Scotland): catchment damage, loss of yield, short and medium term water quality changes.
  - **Melting permafrost**: damages infrastructure, evidence from North America and Arctic circle that increasing risks for pathogen transport in groundwater.
  - **Algal blooms**: challenges these pose for water treatment.

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What action is needed?

- Making sure services are more resilient – i.e. can withstand the effects of climate change threats
- This is crucial as access to these services is fundamental to wider societal resilience
- Resilience may require adaptation:
  - Possibly changes in infrastructure or technology
  - Probably more important is adaptive management extending to economic and regulatory instruments, infrastructure, environment, end-user behaviour
- Resilience is increasingly understood as being both adaptation and use of low-carbon energy
What are the approaches and challenges?

- Need strong risk management approaches
  - WSPs+ (IWRM/catchment management)
  - Protocol programme of work basis for action on risk management and to build capacity

- Monitoring and reporting on resilience remains challenging:
  - Some good examples, but lack of consensus making comparison difficult (esp for small systems)
  - Experience-sharing and shared learning is important
GHG emissions

- Water and sanitation – significant contributor to emissions (estimated 1.6% of global total emissions in 2010)
- Multiple sources – but largest is wastewater/sanitation
- Methane is a particular issue – COP26 raised the profile
- Efforts required to work at sector level accepting that some GHGs unavoidable if we are to protect public health
- Examples include: catchment interventions to create carbon sinks, as well as obvious aspects such as methane capture
- Important to capture water and sanitation actions in future NDCs

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Key future needs

- Support actions by utilities for action through regulatory reform and incentives
- Knowledge sharing and dissemination of experience
- Establish common method for resilience assessment and reporting
- More attention to modelling climate impacts on water-related disease – using risk assessment models
- The Protocol provides a sound platform for addressing these issue across countries
- Integrate water and sanitation in NDCs and NAPs
Thank you

(http://www.bristol.ac.uk/engineering/research/water-and-sanitation/)