

Climate Change Impacts on Freshwater Resources and Water-dependent Services



Water is predicted to be the primary medium through which early climate change impacts will be felt by people, ecosystems, and economies. Both observational records and climate projections provide strong evidence that freshwater resources are vulnerable and have the potential to be strongly impacted. However, impacts on water resources and water-dependent services have yet to be adequately addressed in either scientific analyses or water policy.

This study aims to fill in some of the gaps. No new research is presented; rather the aim is to pull

together what we know about the links between climate change and water, drawing on both the scientific and nonscientific literature, for an informed but non-specialist audience. Commissioned by WaterAid in the UK, this report has two broad objectives:

- ◆ To summarize current understanding of climate change projections and scenarios, and the impacts climate change may have on water resources, and water supply, sanitation and hygiene (WASH) in sub-Saharan Africa (SSA) and South Asia.

- ◆ To discuss implications of the above for policy and practice at a range of different levels—from funding for climate change adaptation at an international level to the planning and implementation of WASH interventions at a community level.

It is important to note the marked absence of literature on climate change and sanitation. As such, this report has largely focused on water resources and water supply. A key conclusion is that more research is required to better understand the impacts of climate change on existing sanitation systems and to identify effective responses to current and future climate change.

The key messages of the report can be distilled into three main areas.

Climate change impacts on water variables and implications for WASH

- ◆ There is large uncertainty with respect to climate change predictions and impacts on future water availability and quality in SSA and South Asia. Global warming is projected to cause an intensification of present climatic and hydrological variability in Africa and South Asia and may cause extreme events, such as tropical storms, floods, and drought, to increase in frequency and intensity.
- ◆ In terms of water availability, projected effects include more seasonal and higher intensity rainfall, increasing seasonality of river flows, modification of groundwater recharge patterns, and risk of significant reduction in the volume of reliable surface water resources. Implications include reductions in the reliability of rainwater-harvesting schemes, greater need for and reliance on both natural and man-made water storage, the potential breaching of (and damage to) low-capacity sewage and drainage systems, and increased dependence on groundwater in Africa and South Asia to meet future water demand.
- ◆ In terms of water quality, climate change is likely to exacerbate existing problems. More intense rainfall events will result in increased turbidity of surface water as well as higher (seasonal) contaminant loading of shallow groundwater, possibly leading to an increase in water-borne diseases. Increased flooding may also overwhelm currently used sanitary protection measures leading to damage of infrastructure and water contamination. In coastal areas, there is likely to be significant incursion of saltwater into aquifers as sea levels rise.
- ◆ Climate change will put a premium on information about water resources, yet few countries know about the quantity, quality, distribution, and reliability of their water resources, about how they are being used, or which water sources are functional. Monitoring systems need to be strengthened as a matter of priority, particularly for groundwater resources.
- ◆ Climate change is one of a number of pressures on water and livelihoods. In many countries, there are multiple, interrelated pressures, including demographic shifts, urbanization, changing patterns and levels of consumption, and pollution-drivers of change that will affect the supply of water, the demand for water, or both. These other drivers may pose bigger threats to water resources and water-dependent services than climate change, at least over the short-medium term.
- ◆ Water scarcity is not physically determined; access, entitlements, and equity also matter. Conventional notions of scarcity that focus on water availability, privileged in current climate change debates, sideline crucial supply-side issues of rainfall variability and water distribution and, on the demand side, downplay the importance of access and equity. The water 'crisis' is a crisis for the poor, with its roots in politics and institutions, rather than water availability. Hence, extending access to reliable and affordable water and sanitation services remains key to strengthening livelihoods and building resilience to climate change.
- ◆ Refocusing the debate on water security offers a way forward, emphasizing the importance of resource access and entitlements as well as water availability, quality, distribution, and reliability. Water security can be defined as the availability of, and access to, water sufficient in quantity and quality to meet the production, livelihood, and health needs of populations, together with an acceptable level of water-related risk.

Policy responses and policy engagement

- ◆ Adaptation to the impacts of current and future climate change is unavoidable, whether planned or unplanned. Adaptation is now viewed as an essential component of any climate change policy. Arguments now focus on which countries need to adapt, which sectors/areas/groups are most vulnerable, how best to provide support, and the level and type of finance required.
- ◆ Adaptation aimed at enhancing the capacity of systems to respond and adapt to climate change will require greater efforts to address the underlying causes of vulnerability and longer term planning beyond 'immediate needs.' Promoting flexible forward-looking decisionmaking and governance is needed to reduce the risks of maladaptation.
- ◆ At a global level, the policy response to adaptation is primarily being carried out under the United Nations Framework Convention on Climate Change (UNFCCC). Planning focuses on three issue-areas: developing a shared vision on adaptation, identifying means to implement adaptation, and enhancing financial and technical support for adaptation.
- ◆ At a national level, government responses have centered on the creation of national adaptation programs of action (NAPAs) and reporting actions through national communications. NAPAs focus on assessing vulnerability to climate change, identifying adaptation strategies, and identifying means to implement adaptation strategies, typically project-based. While the process of NAPA preparation has generally been successful in raising awareness of climate change and encouraging dialogue, adaptation plans have not been mainstreamed into broader development policies, including poverty reduction strategies and water resource management. Nonetheless, most NAPAs identify water as a vulnerable 'sector' and attach importance to water-related adaptation.
- ◆ A number of approaches, including vulnerability assessment, scenario-based planning, adaptive management, mainstreaming, and community and ecosystem-based management, have been developed to facilitate the adaptation, planning, and implementation process. However, the value-added of 'new' approaches is sometimes

questionable: the most effective form of adaptation will remain robust, climate-resilient development.

- ◆ Stakeholders can engage in the adaptation planning process at global, national, and local levels. Areas of engagement include feeding into vulnerability, hazard and adaptation assessments to fill existing knowledge gaps; disseminating climate-related knowledge (on impacts and adaptation options) to local and national levels to facilitate the decisionmaking process; and climate-proofing ongoing and future programs and projects.

Operational responses and pro-poor adaptation

- ◆ Both WASH and water resource management investments can be 'screened' for climate risks using the tool kits described in this report. Screening aims to ascertain the extent to which existing development projects consider climate risks, identify strategies for incorporating climate change into projects, and guide project managers toward risk-minimizing options. A major challenge is to ensure that a 'top-down' approach is combined with 'bottom-up' inputs. An aggravating circumstance in most countries is also the gap in knowledge in terms of both observational data and in understanding how climate change will affect the hydrological cycle and water-dependent services at the temporal and spatial scales relevant to decisionmaking.
- ◆ To promote pro-poor adaptation, existing approaches such as water safety planning could be extended to include screening for climate change risks and impacts. New frameworks have also been developed such as CRISTAL, a community-based screening tool kit. Drawing on a Sustainable Livelihoods Framework (SLF), it aims to help users understand links between livelihoods and climate and to assess a project's impact on community adaptive capacity. This tool kit could potentially be applied to water resource management interventions, but further analysis and field-testing are required to determine its effectiveness. In view of the 'data gap' in most developing countries and difficulties in downscaling climate projections at the basin scale and below, scenario-based approaches that consider a range of different climate futures are recommended.

- ◆ Lessons have been learned from implementing community-level adaptation projects. These include the need for a wide-reaching communication strategy, the need for interventions that build on existing coping strategies, the importance of broad-based livelihood improvement and vulnerability reduction, and the importance of national and local ‘political’ support. Equity issues—the distribution of climate change costs and the benefits arising from planned adaptation interventions—have only been patchily integrated into project design thus far.
- ◆ Given the uncertainties surrounding the impacts of climate change on water, planning around technology choice should be ‘robust of uncertainty’ (i.e., appropriate to a range of different rainfall and runoff conditions). This implies a greater focus on the reliability of different sources, for example, siting boreholes and deeper wells in more productive aquifers, favoring development of larger springs, and the strengthening of sanitary protection measures. However, the use of more vulnerable sources, such as shallow wells, should not be ruled out completely, especially in combination with other technologies that, collectively, spread risk and provide water for different uses.

Source

Climate change, water resources and WASH: A scoping study by Roger Calow¹, Helen Bonsor², Lindsey Jones¹, Simon O’Meally³, Alan MacDonald², Nanki Kaur³. ODI Working Papers Overseas, Development Institute,

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