IRC

POSITION PAPER

Water, sanitation and climate action

Action for climate change mitigation must support the human right to safe water and sanitation

There is an urgent need for action to reduce the release of greenhouse gases in the water and sanitation sectors and to adapt to the effects of climate change by making communities and services more resilient. This is one of four short papers that highlight challenges, good practices and dilemmas and provide examples to inspire climate action in these sectors. They support policymakers and practitioners to promote ways to mitigate and adapt to climate change while strengthening efforts to fulfil the human right to safe drinking water and sanitation.

Mitigation is about measures to reduce greenhouse gas emissions while adaptation is about adjusting to change, including measures to prepare for extreme events such as floods and droughts and to make communities more resilient. Improving water and sanitation systems that are capable of delivering better services is itself an important means of adaptation. Strong systems are themselves resilient.

The papers are based on the experiences of Dutch-funded climate change adaptation and mitigation initiatives in the sectors and discussions with actors looking for ways to integrate climate action with activities to strengthen water and sanitation services for people in vulnerable situations. Papers have been developed on: (1) climate change mitigation, (2) climate change adaptation, (3) climate change resilience and vulnerability and (4) climate change and finance. This paper focuses on climate change mitigation – action taken to avoid or reduce greenhouse gas emissions.

From 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change[1] while nine out of ten environmental disasters are water related[2]. While disasters such as floods and tsunamis receive global attention, climate change relentlessly and with far less visibility undermines the lives of those who contribute least to man-made global warming. Extreme droughts, rising sea level, floods, and powerful storms multiply pressure on already overstretched water sources and mainly afflict the poor[3]. Women and girls make up the vast majority of the poor[4,5] and are traditionally responsible for securing water and sanitation; this is the epitome of climate injustice.

1 https://www.ipcc.ch/report/ar6/wg2/resources/spm-headline-statements/

2 https://www.unwater.org/water-facts/disasters/

3 https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/short-changed-on-climate-change.pdf

4 https://www.unwater.org/publications/world-water-development-report-2020/

5 https://www.un.org/en/chronicle/article/womenin-shadow-climate-change

Water and sanitation sectors face these challenges while making strenuous efforts to reach huge numbers of people who lack basic acceptable services. In 2020 a quarter of the world's population still had no access to safely managed drinking water while half the population lacked safely managed sanitation[6]. The WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) estimates that the rate of progress needs to be four times higher to achieve the relevant Sustainable Development Goal targets in SDG 6.

This drive to expand WASH services to the unreached is happening against a backdrop of increasing urbanization[7], population growth[8] increasing water consumption[9] and the COVID-19 pandemic. Climate change undermines all these efforts. The 2022 IPCC report[10] on adaptation states that climate-related extremes have reduced food and water security and are hindering efforts to meet the Sustainable Development Goals.

Many climate-resilient technologies and approaches demand collective behaviour change, policy changes and different methods of financing. However, water and sanitation sectors cannot easily access climate finance as many strengthening measures are regarded as 'business as usual' rather than 'climate action'. Sometimes existing methodology, done better and at a greater scale, is indeed what needs to be financed.

The Dutch Ministry of Foreign Affairs is giving climate change mitigation and adaptation a higher priority. The Netherlands WASH strategy 2016-2030 proposes that water and sanitation services "*contribute to climate change mitigation by using pumping systems that are energy-efficient and/or powered by renewable energy, or by using energy recovered from wastewater facilities*". A Ministry policy note "Do what we do best"[11] on international development and trade (June 2022) prioritises proven support programmes to build the resilience of the poor.

CLIMATE CHANGE MITIGATION

Climate Change Mitigation refers to efforts to reduce or prevent the emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour.[12]

There is a growing recognition of the potential of the sector to contribute to climate change mitigation by reducing the emissions generated in pumping water for drinking and treating wastewater through the use of renewable energy sources and by increasing water and energy efficiency. Drinking water measures that lead to a higher energy efficiency per litre of consumed water include reducing leaks, minimising raw and clean water transportation and protecting water sources so that less treatment is required. For sanitation, mitigation can be achieved through the production of biogas at centralized wastewater plants and at household level.

SANITATION AND CLIMATE CHANGE MITIGATION

Sanitation and wastewater systems contribute to greenhouse-gas emissions (GHG) both directly through the breakdown of excreta, toilet paper and soap discharged into the environment or during treatment processes, and indirectly through the energy required for treatment steps. The decay of human excreta is a source of methane, which is a more potent greenhouse gas than carbon dioxide by a factor of about 30[13], although it remains in the air for only 12 years, rather than the thousands of years that carbon dioxide stays in the atmosphere. Addressing methane emissions is often mentioned as a "quick win"[14] in the battle against warming. It is estimated that pit latrines contribute 1% of global anthropogenic (human-caused) methane emissions. However, emissions from sanitation are largely under-researched and underestimated. A 2022 Nature publication[15] looking at the sanitation chain in Kampala, concluded that sanitation may represent more than half of total CO_2 city-level emissions and there are substantial opportunities to reduce overall emissions through improved management. The study found that wet anaerobic systems (e.g. septic tanks and treatment plants) have the highest methane emissions and that operational emissions, e.g., from trucks for pit-emptying, are small compared to the total

6 https://washdata.org/report/jmp-2021-wash-households-LAUNCH-VERSION

7 Just under 1-in-3 people in urban areas globally live in a slum household and by 2050 it's projected that more than two-thirds of the world population will live in urban area (https://ourworldindata.org/urbanization)

8 Low-income countries have annual population growth estimated at 2.6% https://data.worldbank.org/indicator/SP.POP.GROW?locations=XM

9 Per person consumption going up due to lifestyle changes, commodities, and access to better services.

10 https://www.ipcc.ch/report/ar6/wg2/

11 https://www.government.nl/documents/policy-notes/2022/10/10/policy-document-for-foreign-trade-and-development-cooperation-do-what-we-do-best

12 https://www.unep.org/explore-topics/climate-action/what-we-do/mitigation

13 https://www.sciencedaily.com/releases/2014/03/140327111724.htm

14 https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions

15 https://www.nature.com/articles/s43247-022-00413-w.pdf

A truck offloading faecal sludge from pit latrines and septic tanks at Sanivation's circular economy treatment plant in Naivasha, Kenya. The treated waste will be converted into briquettes and sold to industries to replace firewood, covering the plant's operation and maintenance costs.

Sanivation: Fuel from human waste

A social enterprise in Kenya has succeeded in reducing methane production from pit latrines by turning waste into non-carbonized briquettes. Based in Naivasha, Sanivation aims to improve the health and environment of urbanising communities in East Africa by delivering clean, safe, and efficient sanitation services in partnership with local governments. It has successfully utilised market-based approaches, combined with integrated stakeholder engagement, to create, implement, and operate lasting sanitation solutions, including circular economy treatment plants. At Sanivation's premises, waste is rendered safe for reuse and transformed into human-waste briquettes that are sold to industries. The use of the briquettes replaces firewood in industrial processes, ultimately saving trees and supporting the environment. This public-private approach to delivering sanitation services has significant potential to increase sustainable access to sanitation, reduce the demand for groundwater, and improve the quality of water resources.

https://sanivation.com/

emissions. The study also found that emission rates are no lower in "safely managed" systems than in any other system.

Mitigation measures include the use of composting toilets, trapping methane and using it to generate energy, regular emptying of septic tanks, and effective wastewater management. This represents climate change mitigation because the methane from the waste substitutes for other fuel. The Nature publication recommends interventions that focus both on improved management of on-site sanitation containment (better and more frequent emptying and transport), and modifications to treatment, while continuing to improve the safe management of faecal matter from a public health perspective. Where new or upgraded on-site sanitation investments are planned, the publication suggests the use of smaller tanks, or container-based systems, both of which might have a net positive impact on emissions because sludge moves more quickly through the system, and if well transported and processed releases less methane. The addition of methane-capture technology at the treatment plants could offer significant returns in terms of conversion of methane to power but requires upfront investment.

DRINKING WATER AND CLIMATE CHANGE MITIGATION

In urban areas gains in climate change mitigation can be achieved by improving management systems for drinking water supply rather than by huge investments in new infrastructure. The main reductions in emissions can be achieved by reducing water leaks, which is the most wasteful element of non-revenue water and by saving energy in the process of capturing, transporting, treating and distributing water for drinking purposes.

The International Water Association (IWA)[16] estimates the global volume of NRW to be 346 million cubic metres per day or 126 billion cubic metres per year, which is more than 150 times the water consumed daily by the 17,5 million population of the Netherlands. Where local water resources are overexploited or polluted, more distant sources may need to be found, resulting in water being pumped further or from deeper aquifers with a negative climate impact because of higher energy needs. Making these sources safe may also require larger energy needs. For example, despite improved reverse osmosis technologies, desalination needs between 3.5 and 4.5 kWh m^3 to produce drinking water as against 0.2–0.4 kWh m^3 for conventional water treatment[17]. This extra energy use pushes up emissions.

Flexible decentralised options for providing drinking water rather than traditional centralised systems may be better for some regions that face high uncertainty. A market study by Dalberg[18] estimates that Safe Water Enterprises (SWEs) could find a potential customer base of 3.1 billion people who don't have access to safe drinking water and live in water stressed areas. The study says that decentralised operations, flexibility in response to (climate) stress events and less capital-intensive production make such enterprises highly adaptive and cost-effective. However, such approaches rarely get support from national governments, and they deliver water at a relatively high cost for consumers. This approach has not yet been tested at scale.

The depletion of water sources and the need for their protection is a local, regional, and global issue. Groundwater quality can be degraded by use, if for example pumping causes saltwater or brackish water to encroach into fresh groundwater sources. The increasing withdrawal of groundwater for domestic water supplies and agricultural uses therefore represents a major challenge for water governance, in particular for monitoring and management. Pumping deep groundwater sources and additional treatment in the form of desalination both increase the energy requirements significantly. The short- and long-term impacts of accessing deep groundwater sources or using surfaces water should be evaluated prior to considering desalination plants.

NWSC staff being trained in drilling supervision by WE Consult Uganda at a borehole site drilled by TGS Water in Kole District, Uganda. The training in groundwater development is part of the NWSC capacity development component under the VEI – Water WorX programme in Uganda.

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Water Operator's Partnership Kampala

The WaterWorX Water Operator's Partnership (WOP) in Kampala, Uganda, has the overall objective of strengthening the sustainable delivery of cost-effective water services to a rapid growing urban population. The partnership between the Dutch water utilities VEI and the National Water and Sewerage Corporation (NWSC) developed an asset management system that enhances reliability while optimising costs. This partnership shares an information system and has standardised groundwater abstraction, monitoring and management. In the second phase the WOP is focusing on reducing leaks by better design to reduce the likelihood of pipe bursts due to erratic water pressure.

NWSC is applying what it has learnt in other areas of Uganda. VEI and NWSC are also supporting the Ministry of Water and Energy with embedding the methodology in umbrella authorities which are responsible for the management of smaller utilities in Uganda.

https://www.vei.nl/projects/waterworx-project-wop-uganda

16 https://iwaponline.com/ws/article/19/3/831/41417/Quantifying-the-global-non-revenue-water-problem

17 https://www.ohchr.org/sites/default/files/2022-03/climate-change-3-friendlyversion-final.pdf

18 http://safewater.enterprises/wp-content/uploads/2020/12/Rapport-v5.pdf

Solar-powered desalination unit with upgraded Water ATM supported by the DFCD project.

Solar powered desalination for Rural Water Supply Kenya

In Kitui County, Kenya, many drinking water wells contain salts and fluoride, making the water unsafe for consumption. A project to treat the groundwater aims to produce high-quality drinking water for 400,000 people. Mobile containers house reverse osmosis water treatment, solar panels and a 'water ATM' which allows citizens to purchase drinking water using their mobile phones. Each installation will run on renewable energy without the use of expensive battery storage or electricity from the grid. Upon full deployment, it is estimated that the installations will have the capacity to desalinate over 1,500 m^3 of brackish water per day and produce over one GWh per year of self-supporting clean energy to power the systems.

The Dutch Fund for Climate and Development (DFCD) has agreed to co-finance and co-develop these installations. Under an agreement reached with Solar Water Solutions and the Kitui Government, the fund is initially co-financing the pilot phase and will eventually co-finance up to 200 units in Kitui county, covering many of the poorest communities. The CI2's[1] Construction Equity Fund will contribute about USD 15 million, with the intention of expanding across East Africa if implementation is successful in Kenya. The development of the project is managed by SNV Netherlands Development Organisation and World Wildlife Fund for Nature Netherlands. https://thedfcd.com/2020/12/02/cfm-to-partner-with-solar-water-solutions-to-support-development-of-solar-powered-desalination-in-rural-kenya/

This is an example of technical innovation being used to provide safe water to consumers and support action on climate change. However, such schemes require a service delivery model that is strong enough to keep the technology up and running over time. For long term sustainability, robust arrangements must be in place to ensure the availability of spare parts and sufficient finance to pay the operators. Government oversight is needed to settle any disputes over user rights.

THE HUMAN RIGHT TO WATER AND CLIMATE CHANGE ACTION

This paper has focused on climate change action in the WASH sector in low- and middle-income countries. However, the biggest emissions take place – and therefore the biggest mitigation can be achieved in the more developed and wealthier countries and areas, specifically in urban areas where people already have access to piped water and sewerage systems. The potential for climate change mitigation interventions for the services of the poor are limited since low service levels (quantity), weak institutions and difficult scaling of solutions make mitigation investments unattractive. However, in lower income countries where services are currently lacking there is a clear opportunity to ensure that all new services are developed with climate change mitigation in mind. In the best options those receiving services for the first time could be leading the way in developing services that create low emissions. The worst option would be that climate change mitigation investments for water and sanitation are diverted from funds needed to deliver on the human right to basic water and sanitation. It is important therefore to look for win-wins that strengthen resilience. For example, when investments are made to reduce NRW, people in vulnerable situations must benefit from the capacity

1 Climate Investor Two ("CI2") is a blended finance private equity fund that invests in water, sanitation and ocean infrastructure projects in emerging markets of Africa, Latin America, and Asia.

gains.

CONCLUSIONS

Climate change mitigation interventions in water and sanitation can help to reduce carbon emissions, especially by limiting methane gas emissions from sanitation which has a much stronger warming effect than carbon dioxide gases. More systematic assessment of greenhouse gas emissions from technologies across the sanitation service delivery chain is needed to inform better decision-making.

For drinking water, climate change mitigation that targets utility performance can boost the quality of services provided by urban utilities. It is also important that climate action decision makers and the water and sanitation sector should promote investments that benefit the most vulnerable people - the poorest communities that have the lowest service levels and suffer most from climate change.

Important gains in climate change mitigation can be achieved in urban areas by improving management (systems) rather than huge investments in (new) infrastructure. This can be achieved by improving the management of the sanitation service delivery chain, with better containment of faecal sludge and more efficient transport to (aerobic) treatment, and by improving the management of water utility operations, in particular focusing on minimising NRW. Such interventions will significantly increase service levels, reduce health risks and improve the financial sustainability of the operations. Sanitation in rural areas provides fewer possibilities for reducing greenhouse gases because the technology is more basic, and populations are less dense. Where the practice can win cultural acceptance, the reuse of human faeces for fuel is a potential area of development that can bring environmental and economic benefits.

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