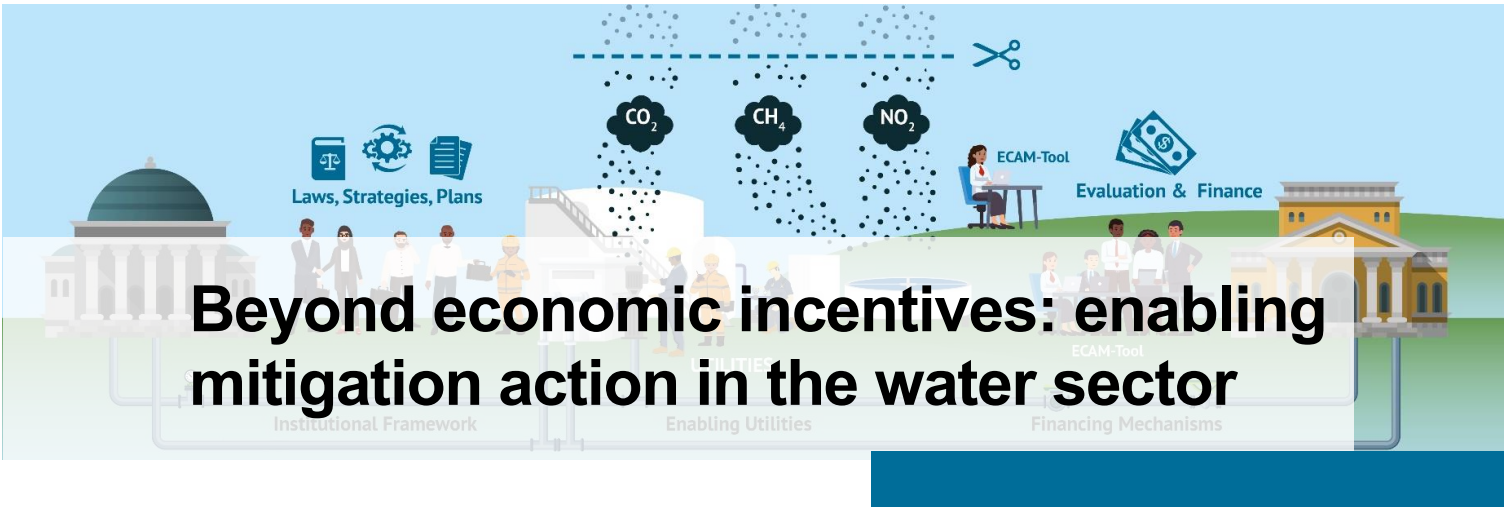

Beyond economic incentives: enabling mitigation action in the water sector

Experiences from the WaCCliM Project in Jordan, Mexico and Peru

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Abstract

Water and Wastewater Companies for Climate Mitigation (WaCCliM) was a global project funded by the German government through the International Climate Initiative (IKI). It was implemented from 2014 to 2022 by the Gesellschaft für Internationale Zusammenarbeit (GIZ) in cooperation with the International Water Association (IWA). The project supported water utilities and the national governments of Jordan, Mexico and Peru in reducing the GHG emissions of the water sector. Whilst successfully implementing climate mitigation measures in the pilot water utilities, WaCCliM's upscaling efforts largely relied on activities around the institutional framework conditions in the three project countries.

Based on the project experience, the policy brief shows that considering exclusively economic incentives for mitigation measures in utilities is not enough. The development of an enabling environment for mitigation in the water sector is crucial. This includes (1) climate commitments as a driver for sectoral mitigation action, (2) policy/regulation mechanisms for mitigation in the water sector, (3) access to climate-sensitive infrastructure finance, and (4) the development of capacities in utilities. The policy brief closes with recommendations for policy makers and financing institutions as well as actors who cooperate with them in the framework of international cooperation.

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1. Introduction

Water and Wastewater Companies for Climate Mitigation (WaCCliM) was a global project funded by the German government through the International Climate Initiative (IKI). It was implemented from 2014 to 2022 by the Gesellschaft für Internationale Zusammenarbeit (GIZ) in cooperation with the International Water Association (IWA) and had a focus on mitigation of greenhouse gas (GHG) emissions in the water sector[1]. The project partnered with the Water Authority of Jordan (WAJ), the National Water Commission CONAGUA in Mexico, the Ministry of Housing, Construction and Sanitation (MVCS) in Peru, as well as several water and wastewater utilities in those countries.

WaCCliM was based on the recognition that the water sector can significantly contribute to national GHG mitigation efforts. Apart from achieving concrete emission reductions in its pilot utilities, the project supported the development of institutional framework conditions in Jordan, Mexico and Peru that enable and mainstream GHG mitigation into the water sector.

This policy brief presents incentives and factors that enable water and wastewater utilities to successfully mitigate. Successful in the project's understanding thereby means that besides reducing GHG emissions, the utility's service level increases or at least remains the same, that no adverse environmental or social effects occur, that the utility reduces costs in the long-term or if not, that increased costs are covered by a financing mechanism, and that the implemented measure can be operated and maintained.

The target audience of this brief are policy makers and financing institutions as well as actors who cooperate with them in the framework of international cooperation. It aims to facilitate an upscaling of WaCCliM's results by passing on insights to actors that may approach mitigation action in the water sector. The brief provides an overview of WaCCliM's pilot measures and the context in which they were developed and implemented. It then presents elements of an enabling environment for mitigation and concludes with recommendations for future approaches to reduce GHG emissions in the water sector.

2. Context and Experiences in the Project Countries

Climate change is projected to have an increasingly severe impact on freshwater quality and quantity in the years and decades to come, with significant impacts on human health and ecosystems alike (IPCC 2022). Based on these projections, the focus of the water sector remains largely on adaptation to the impacts of climate change. Adaptation finance in water and wastewater is estimated to be 20 times as much as mitigation finance in 2020 (CPI 2022). However, the water sector itself also contributes to greenhouse gas (GHG) emissions, either through the use of fossil energy or through direct methane (CH_4) and nitrous oxide (N_2O) emissions (SIWI 2022). A recent analysis estimates that urban water systems emit 1.8% of global GHG emissions and around 4.7% of global methane emissions (GWI 2022).

Mitigation measures implemented by the WaCCliM project have reduced around 66,000t CO_2-eq between 2014 and 2021, and are estimated to reduce up to 107,000t CO_2-eq until 2032. Depending on the local context, the approaches and implemented measures were selected individually.

Jordan is facing the impacts of climate change on its scarce water resources.

[1] In this document, the term water sector refers to the urban water and wastewater sector.

Around 53% of Jordan's water is extracted from groundwater resources. The water sector is heavily consuming energy for pumping. Sinking groundwater levels and a growing population are increasing energy consumption even further. 94% of Jordan's energy mix consisted of fossil fuels, mostly oil (IRENA 2021) and the energy sector accounts for about 73% of the total GHG emissions of the country. The water sector consumes about 15% of the country's total energy production, thus making it a significant contributor to GHG emissions.

Installing energy-efficient pumps as part of the WaCCliM project reduced emissions in a water supply system in Madaba by approx. 2,500t CO_2-eq/a. Newly installed pumps in a system in Russaifeh are estimated to reduce around 607t CO_2-eq/a from 2022 onwards.

The pilot utilities showed interest in the installation of modern technology (e.g. new efficient pumps) mainly in order to improve operations and service performance. Generally, the main priority on utility level in Jordan is to guarantee the continuity of service provision, with energy reduction being a secondary interest, as electricity bills are strongly subsidized by the government. Furthermore, long-term contracts of energy utilities exist to import energy. These are disincentivising the implementation of some clean energy-producing technologies such as co-generation from biogas utilization.

On a government level, energy reduction is considered relevant because of the associated cost-reduction. Additionally, international commitments by Jordan to reduce GHG emissions motivate mitigation action across sectors. In its 2021 first updated Nationally Determined Contributions (NDCs), Jordan has committed to reducing a total of 31% of its GHG emissions, including 26%, which are conditional to international support. As a major consumer of electric energy, the water sector must contribute to achieving these targets.

Installing new and energy-efficient pumps, as done by the pilot utility in Madaba and then replicated in Russaifeh, is therefore a measure which can link the interest of both government and utility levels, while the introduction of further climate smart technologies requires commitment and engagement of external actors (donors, international community).

In summary, Jordan's water sector emits significant amounts of greenhouse gases. Energy for pumping is strongly subsidised. At the same time, the government has committed to mitigation targets. Increasing pumping efficiency is the most suitable measure to lever the high mitigation potential of the Jordanian water sector while reducing costs.

Mexico was a leading party in the negotiation of the Paris Agreement; it has committed ambitiously to reducing 25% of its GHG emissions by 2030 and to push the target to 40% conditional to support. Mexico is estimated to be the country with the third highest methane emissions from wastewater (GMI 2014). Mexican water utilities, which are facing highly variable environmental conditions throughout the country, will need to contribute to this reduction, but they already face a difficult task in meeting the user demand. Low tariffs, high water consumption and a complex legal framework have led to unsustainable water abstraction, high energy costs, water losses and inadequate wastewater treatment.

Connecting more households to wastewater treatment and improvements in biogas utilisation in San Francisco del Rincón have reduced approximately 4,300tCO_2eq/a, of which around 92% is methane. To achieve this, the pilot utility was supported by project experts who carried out baseline studies, energy diagnostics and trainings to strengthen capacities on low-carbon and resilient

solutions. As a result, operational improvements and measures were implemented that generated cost savings in energy, labour, chemicals, maintenance, and biogas generation. The follow-up for the successful implementation of the identified measures was primarily due to the strong commitment of the utility manager, his high technical skills and motivation for the utility to increase its efficiency.

At the national policy level, the expected implementation of the MRV system for the sub-national and local levels is foreseen, which would encourage the reporting of mitigation actions, including from the water sector. The obligation to report to this system would increase awareness of the contribution of the water sector to climate change mitigation.

In summary, the share of Mexico's water sector is significant regarding the country's mitigation targets. It is very heterogenous, with inefficiencies in the overall systems and methane emissions from wastewater being wide-spread challenges. Capacities and priorities in each individual utility are decisive for mitigation action. Reductions of methane from wastewater are the most suitable measures for the Mexican context.

Peru faces a severe water shortage in the coastal desert zone, where most of the population is settled and where the economy grows. In some cases, to supply drinking water to the increasing urban population, it is necessary to extract groundwater, generating considerable demand for energy. However, the electricity generation matrix is traditionally low in carbon emissions, due to hydroelectric generation (55%), followed by natural gas-based thermal power plants (37%), and renewable energy resources other than hydropower (8%). In the water sector, GHGs emit mainly from wastewater treatment systems and untreated wastewater (97%). In 2014, Lima hosted COP 20, which increased climate awareness of the government, including the water sector, and created a momentum for climate action in the country.

The optimisation of sewage sludge treatment and energy recovery by the water utility of Cusco (SEDACUSCO) have reduced emissions by approx. 26,000t CO_2-eq/a, 49% of which are methane emissions.

SEDACUSCO was mainly concerned with problems regarding untreated sludge, i.e. odor nuisance, negative health effects, and environmental pollution, in particular affecting vulnerable communities settled close to the wastewater treatment plant (WWTP). The implemented measure allowed for solving these issues while reducing GHG emissions. It also created the conditions for the energy autonomy of the San Jeronimo WWTP.

The successful pilot measure was a milestone for the Peruvian water sector and is a model for other utilities in Peru and the region. The Ministry of Housing, Construction and Sanitation (MVCS) is committed to scaling up SEDACUSCO's experience. Two water utilities are already planning concrete projects that include GHG mitigation measures in the design of the new WWTPs. Technical and financial feasibility studies are already in place and co-financing is guaranteed by the government and financing institutions. In addition, the bidding process is already in preparation. In further five cases, technical and financial feasibility studies are still needed.

In summary, the water sector's responsibility to contribute to Peru's mitigation efforts was increasingly recognised after 2014. Energy recovery from sludge through anaerobic digestion is a suitable mitigation measure for Peru, since it offers a local and environmentally friendly option for sludge management that helps avoid sending sludge to landfills, reduce GHG emissions and

produce renewable energy that can be used to power WWTPs and even achieve energy autonomy.

3. Enabling Mitigation in the Water Sector

The mitigation measures implemented as part of the WaCCliM project were planned based on detailed assessments of each country's respective conditions, considerations of relevant technical and economic factors of water utilities, as well as the potential impact of proposed investments in line with local climate change action plans and strategies. Nonetheless, the implementation of these measures in the pilot utilities did not happen automatically; neither did the replication in other utilities of the countries.

The project never assumed that GHG reductions as such would be the highest priority of water utilities and governmental agencies in the water sector. However, it was a hypothesis that making a convincing business case would be the decisive factor to get utilities on board to mitigate GHG emissions. In particular, the expected cost-saving was meant to incentivize utilities to follow the examples of the project pilots. Throughout the project implementation, it was obvious that economic feasibility was a necessary condition for mitigation action, but that other factors needed to be considered as well to achieve project results and motivate replication.

Many water utilities in WaCCliM's partner countries need most of their capacities to successfully operate the infrastructure. Covering their costs and being economically sustainable is a target to aspire to but often not expected. In some cases, requiring financial support from the government is commonplace and necessarily accepted. Especially in water-scarce Jordan, the priority of the water sector institutions and utilities is to ensure water supply regardless of the cost or emissions, so that the public has access to water and sanitation.

Mitigation action thus requires more than a convincing business case. On the one hand, the policy and regulatory framework needs to provide normative incentives for mitigation. On the other hand, utilities need to be enabled to respond to such incentives successfully and sustainably. For the WaCCliM project, a favourable institutional framework in the countries combined with human capacity development proved to be a strong lever for upscaling. Based on project experience, an enabling environment for mitigation action in the water sector includes the following:

Climate commitments as driver for sectoral mitigation action: As national governments make international climate commitments and design national climate strategies and policies; these obligations have to be met by sectoral achievements. In this context, the water sector must develop sectoral monitoring of GHG emissions and develop or improve political processes for utilities to mitigate. This can create a strong momentum for changes in the water sector towards mitigation. The WaCCliM project experienced this after COP 20 in Lima. In all partner countries, the coordination between environmental/climate ministries and water ministries was essential to include realistic water sector contributions in national reporting systems and mitigation strategies. This was achieved in Jordan with the listing of measures of energy efficiency in the water sector in the NDCP Action Plan. In Peru, several mitigation measures prioritized by water utilities were included in the NDC process, thus the water sector is contributing to the commitments assumed by the Peruvian government to reduce 40% of its GHG emissions by 2030.

Policy/regulation mechanisms for mitigation in the water sector: To mainstream GHG mitigation in the water

sector, norms, standards, or specific planning processes can be necessary to oblige utilities to consider GHG emissions. Such policy/regulation mechanisms need to take into account the utilities' capacities and ideally create co-benefits for utilities in line with their priorities. Having focal points for mitigation in water sector institutions proved helpful to continuously drive such policy processes. In Peru, GHG mitigation was included as a mandatory requirement for water utilities to develop Climate Change Mitigation and Adaptation Plans (PMACCs) by the sectoral legal framework – the *Framework Law for Management and Provision of Water and Sanitation Services*. Consequently, GHG mitigation was embedded as a cross-cutting approach in the National Water and Sanitation Plan for 2022 – 2026, which is the main instrument for sectoral policy's implementation. This means that water utilities must consider GHG mitigation strategies when planning water and sanitation services. Thereby, they can develop the required GHG mitigation measures from bottom up, based on their needs, which created acceptance and ownership among water utilities.

Access to climate-sensitive finance: To introduce technology with high investment costs, access to finance is indispensable. Making GHG assessments and standards a pre-condition for the funding of infrastructure can ensure GHG mitigation in the water sector. A comprehensive and IPCC-compliant tool to assess the carbon footprint of existing and planned water sector infrastructure projects is the ECAM tool (ECAM (climatesmartwater.org)), which was already used by development banks such as the Inter-American Development Bank (IDB) to assess water sector loans. In Mexico, the tool was institutionalised for measuring a performance indicator in a national sector investment programme.

Development of capacities in utilities: Especially in developing and emerging countries, many utilities need all their capacities to operate the existing infrastructure and equipment successfully. Installing, operating, and maintaining complex technologies as well as monitoring mitigation achievements require the development of technical and managerial capacities. Access to modern technology is often limited, and tendering processes for the required equipment can be beyond the utility's legal/commercial capacities. In Jordan e.g., energy-efficient pumps with variable frequency drives were procured from Austria with support from WaCCliM. In all countries, the project provided consultancy services throughout its implementation and trained over 600 people in the partner countries and beyond. This necessary capacity development should be planned when approaching mitigation in the water sector. And it should be considered when assessing the economic costs and benefits of a mitigation measure.

4. Recommendations

To leverage the water sector's mitigation potential, water and wastewater emissions should be considered in national GHG inventories and mentioned explicitly in their NDCs. Key measures to facilitate these commitments are:

- High level events, which can significantly accelerate processes.
- Coordination between environmental/climate ministries and water ministries to include realistic water sector contributions in national reporting systems and mitigation strategies.
- Assigning focal points with dedicated responsibilities for climate mitigation at the ministry and utility levels.
- Using existing water and wastewater sector plans and regulation instruments as entry points to

integrate mitigation targets; as political processes for climate adaptation are developed, GHG mitigation should be included as low-hanging fruit.

The first step towards mitigation in the water sector is monitoring GHG emissions. The biggest challenge is then actually implementing mitigation actions while maintaining the focus on the continuous provision of water and sanitation services. Climate mitigation is often not a priority, even if it is economically viable. It is therefore necessary to:

- Develop favourable policy/regulation conditions for mitigation, e.g., by institutionalising mitigation planning from utilities or introducing mitigation norms and standards.
- Highlight the co-benefits of mitigation measures for utilities (e.g. access to green finance; process efficiency) and/or for the population served (e.g. improved service delivery, smell reduction) to increase acceptance and ownership.
- Enable access to financing, which is vital to introduce technologies with high investment costs particularly in developing and emerging countries. GHG assessments should be a pre-condition for infrastructure funding in the water sector.
- Develop technical and managerial capacities for procuring/importing, installing, operating and maintaining complex technologies as well as for the monitoring of mitigation achievements

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