Linking Water and Climate

Towards a Carbon Neutral, Risk Resilient Water Sector

Water and Wastewater Companies for Climate Mitigation

WaCCliM

wacclim.org

Our Goals

The Water and Wastewater Companies for Climate Mitigation (WaCCliM) project supports water and wastewater utilities to reduce their carbon footprints and adapt to the impacts of climate change. Following a cross-sectoral approach that spans mitigation and adaptation, we consider the implications of greenhouse gases (GHGs) in the water–energy–carbon nexus.

WaCCliM envisions a climate-smart and sustainable urban water sector on a local, national and global scale. To make this a reality, we have undertaken a three-part mission between December 2013 and December 2022.

- We are providing user-focused technical support, approaches and tools that will enable committed water and wastewater utilities to assess, monitor and reduce their GHG emissions while enhancing their ability to adapt to climate change.

- We are constructing partnerships between the water and climate communities that position low-carbon and resilient water and wastewater management as key contributors to reaching climate policy objectives, including Nationally Determined Contributions (NDCs) to the Paris Agreement.

- We are scaling up and sharing our experiences, while building capacities and ownership among utilities, government agencies and international partners, to ensure the operational and financial sustainability of our activities.

WaCCliM is a joint initiative between the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the International Water Association (IWA). This project is part of the International Climate Initiative (IKI). The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

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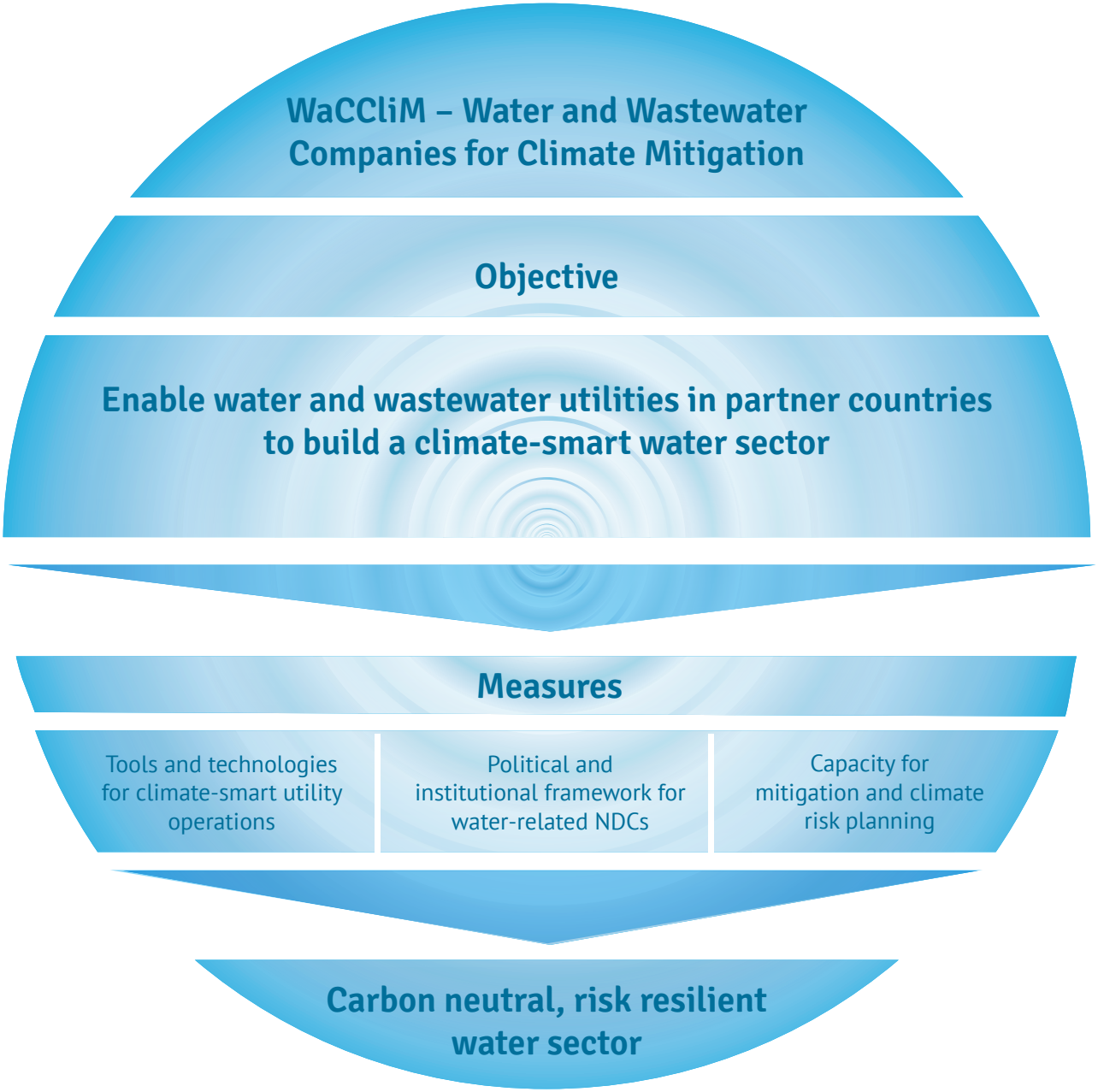

WaCCliM – Water and Wastewater Companies for Climate Mitigation
Objective
Enable water and wastewater utilities in partner countries to build a climate-smart water sector
Measures
Tools and technologies for climate-smart utility operations
Political and institutional framework for water-related NDCs
Capacity for mitigation and climate risk planning
Carbon neutral, risk resilient water sector

The Challenge

The water sector is currently estimated to contribute up to 5% of global GHG emissions: carbon dioxide (CO_2) from energy consumption, as well as emissions of methane (CH_4) and nitrous oxide (N_2O) from wastewater handling. Global demand for water is expected to **increase by 20–30% by 2050**,[1] also leading to an increase in the amount of wastewater. This means that unless appropriate measures are implemented in the sector, its emissions could rise at the same rate.

Limiting climate change to 1.5°C requires all sectors to increase their GHG reduction ambitions. In many countries, however, the opportunities to reduce emissions in the urban water sector are not included as part of the NDCs for the successful implementation of the Paris Agreement.

On the other hand, it is projected that **40% of the world's population will be living in river basins under severe water stress by 2050,**[2] in part due to the impacts of climate change. Climate change will primarily be felt through water – whether greater variability and uncertainty in hydrological cycles, prolonged droughts, extreme weather events, increased evaporation or sea level rise.

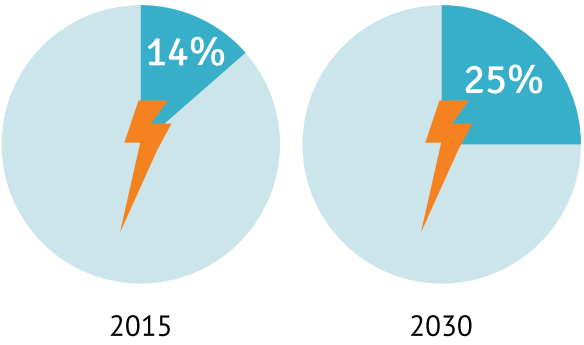
Urban communities in developing and emerging economies are highly vulnerable to such impacts, and their ability to adapt depends on climate-smart actions by the water and wastewater utilities that serve them. Emerging economies also generate disproportionately high emissions from their water sectors, especially in places where a large share of wastewater is untreated or poorly treated. There are, therefore, widespread benefits to be found in pursuing both mitigation and adaptation actions together in these parts of the world.

[1] UN Water (2019), World Water Development Report 2019.

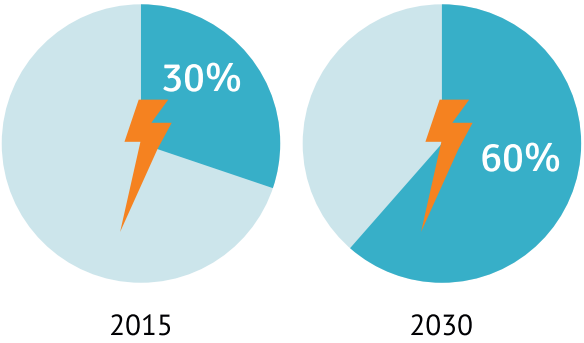
[2] OECD (2012), Water Outlook to 2050.

The water sector is becoming even more energy intensive in water-stressed countries

Percentage of gross national energy consumption used for water supply in Jordan.

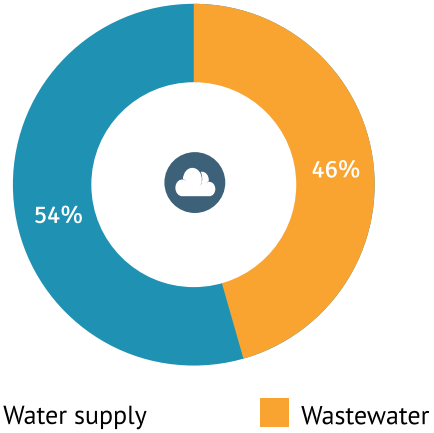


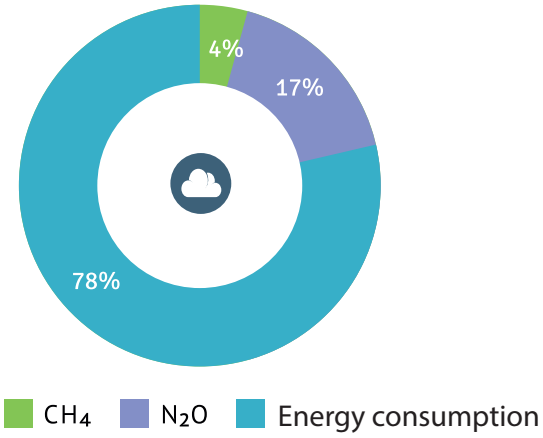
Percentage of municipal energy consumption used for water supply in Jordan.



Both water supply and wastewater are contributing to emissions

Breakdown of GHG emissions in the San Francisco del Rincón, Mexico, urban water cycle. CH_4 and N_2O are emitted during wastewater treatment processes.





Our Approach

WaCCliM employs a circular perspective on water management and considers mitigation and adaptation potential in all components of the urban water cycle, from water supply to wastewater and reuse. The project offers utilities a roadmap to achieve carbon neutrality and resilience to climate risks.

The **Energy Performance and Carbon Emissions Assessment and Monitoring (ECAM) Tool**, a carbon footprint tool for water and wastewater utilities, is a cornerstone of this approach. ECAM helps utilities understand their overall energy usage and total GHG emissions at a system-wide level and indicates areas to reduce emissions, considering all components of the urban water cycle, from water supply to wastewater treatment, sludge management and water reuse.

The mitigation-focused ECAM Tool integrates well with WaCCliM's activities in support of adaptation, which improve the capacity of utilities to develop climate risk plans, analyse the co-benefits of mitigation and adaptation measures, and prioritise measures for more climate risk-resilient water and wastewater systems.

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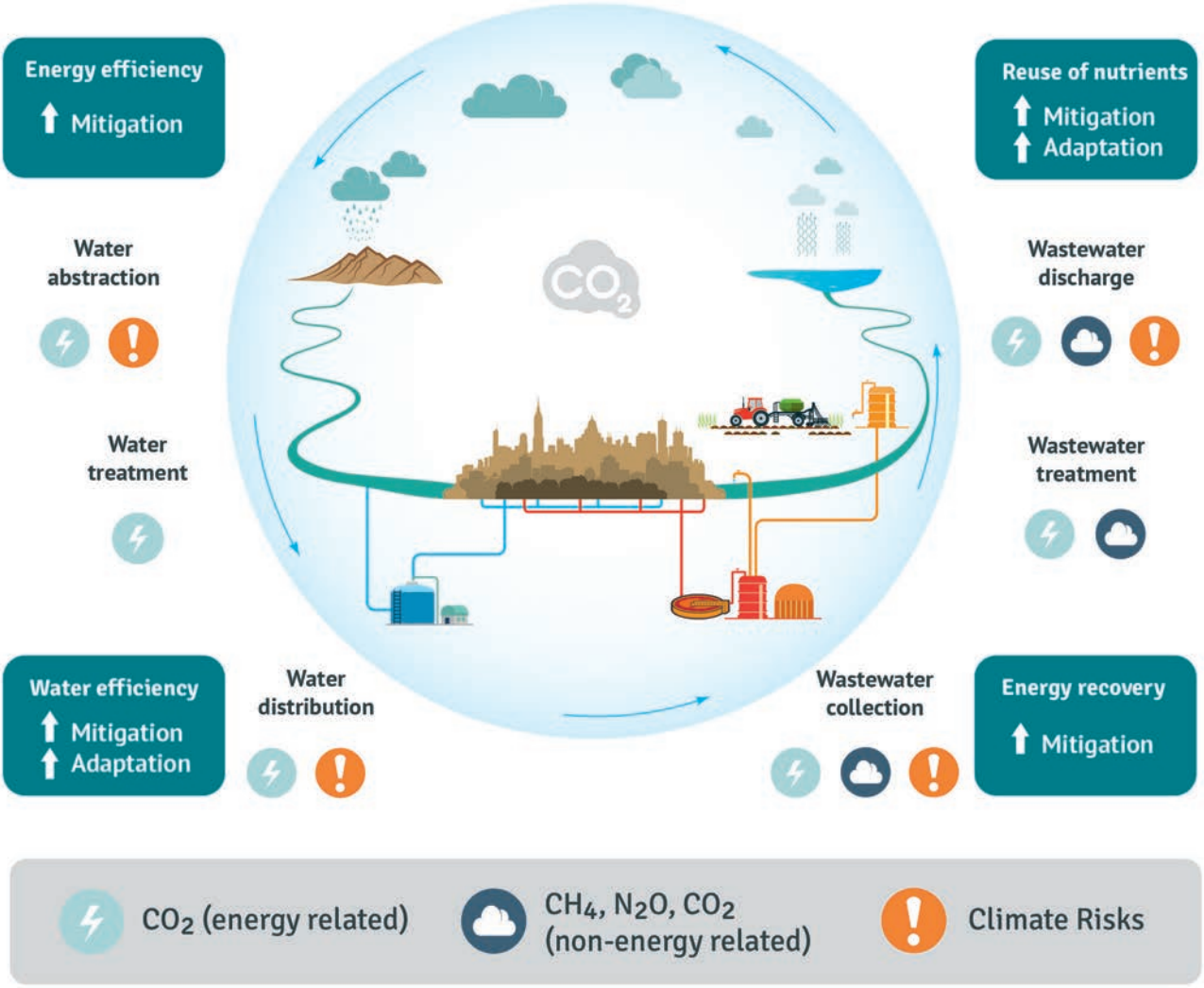
Mitigation and adaptation in the urban water cycle



CO_2 (energy related)

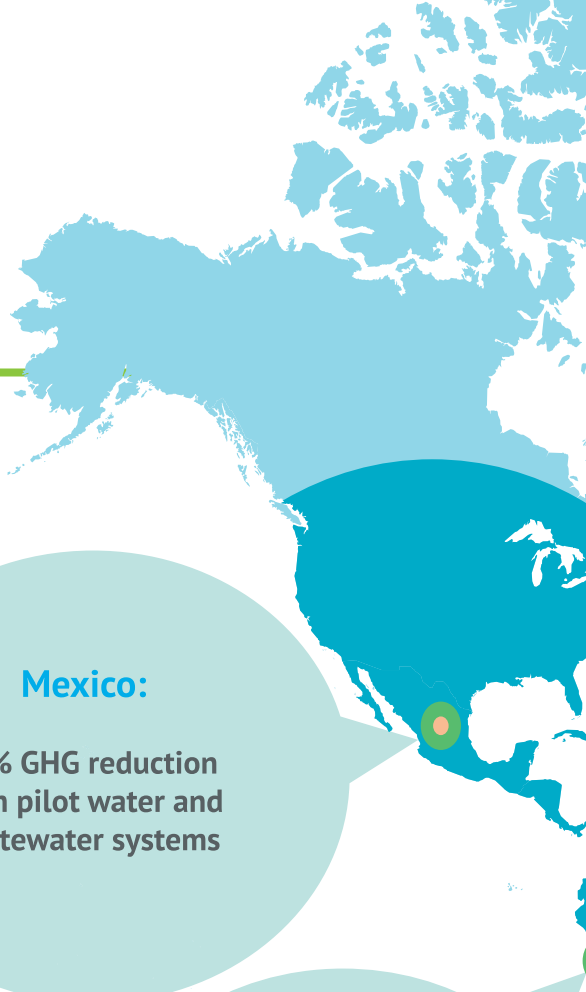
CH_4, N_2O, CO_2 (non-energy related)

Climate Risks

Where Do We Work?

WaCCliM is pioneering mitigation and adaptation solutions in the water sector in **Jordan**, **Mexico** and **Peru**. A fourth cooperation in **Thailand** concluded successfully at the end of 2018.

Meanwhile, utilities in many other cities around the world are using ECAM to analyse their energy usage and GHG emissions.



Mexico:

23% GHG reduction from pilot water and wastewater systems

Peru:

34% GHG reduction from pilot water and wastewater systems

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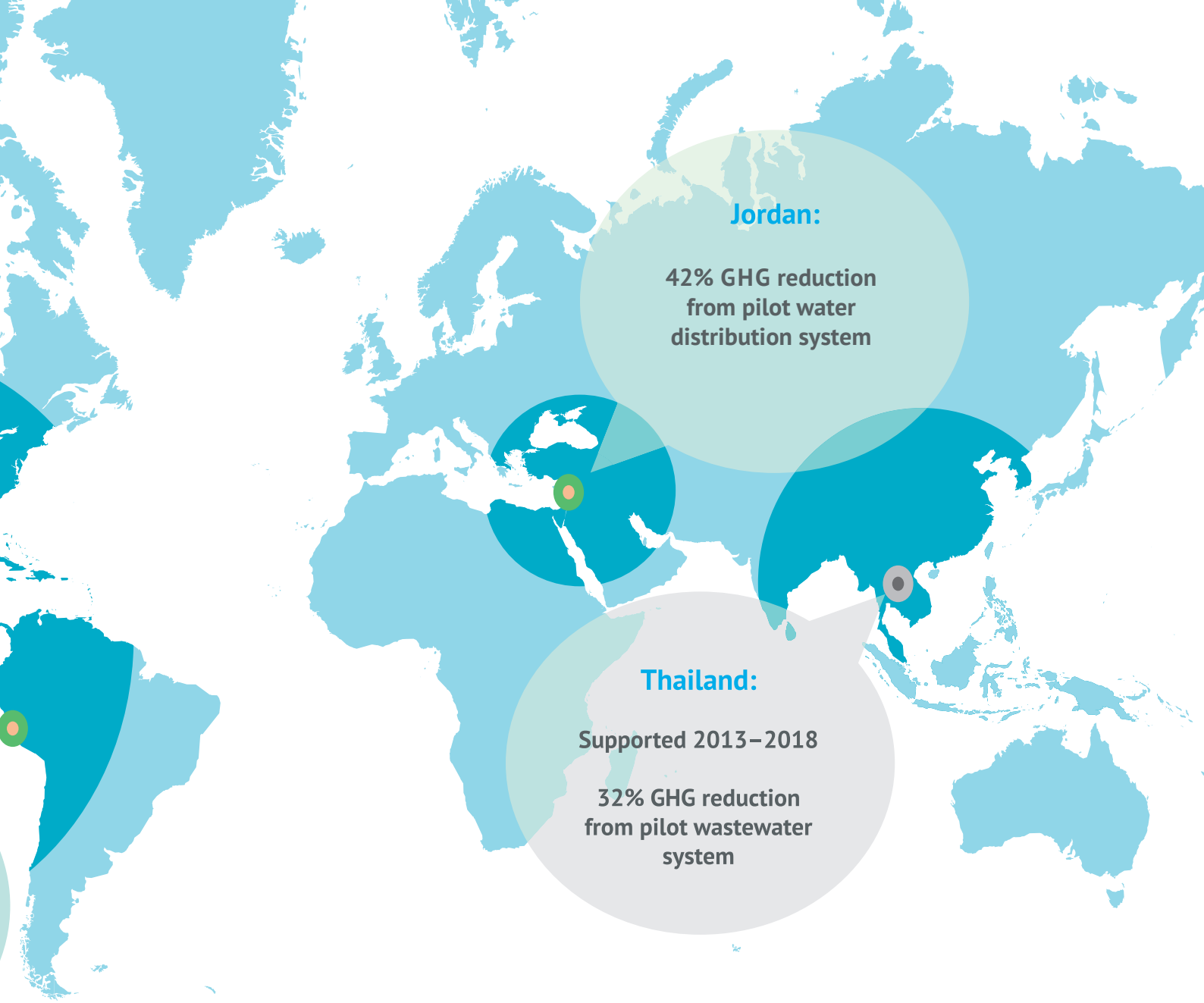
Jordan:
42% GHG reduction from pilot water distribution system
Thailand:
Supported 2013–2018
32% GHG reduction from pilot wastewater system

The Impact

Jordan

With many competing demands on strictly limited water resources, Jordanian utilities rely on energy-intensive water pumping to meet everyone's needs; as a result, energy consumption in the water sector accounts for 14% of Jordan's national emissions. It is estimated that without a change in direction, the need for pumping will increase twofold by 2030. Jordan is therefore facing a long-term need to reduce its water and energy consumption – not only to adapt to potentially greater scarcity ahead, but also to meet its mitigation goals and reduce energy costs.

WaCCliM works in cooperation with the Water Authority of Jordan (WAJ) and the Ministry of Water and Irrigation (MWI). Together these partners have adopted the WaCCliM Roadmap to achieve sustainability and reduce emissions in a number of utilities in Jordan. By analysing and documenting these project experiences, WaCCliM is advising WAJ on the development, ratification and implementation of the National Energy Efficiency Action Plan in the water sector.

As a pilot, WaCCliM and its partners have supported the work of Miyahuna Water Company in Madaba, a Jordanian utility that is implementing energy and GHG emissions reduction measures. After evaluating different improvement scenarios for climate mitigation using ECAM, the utility found that the installation of highly efficient pumps controlled by variable frequency drives would result in the highest energetic and economic savings. First readings show a **37% decrease in energy consumption** from these pumps while serving almost 17,000 additional people. While Jordan only joined the project in 2016 and operation of the new equipment only began in 2019, these first measures have already achieved mitigation of **1,000 t CO_2 equivalent (CO_2e) per year** – comparable to taking 200 cars off the road – and saved the utility some €210,000 in annual costs.

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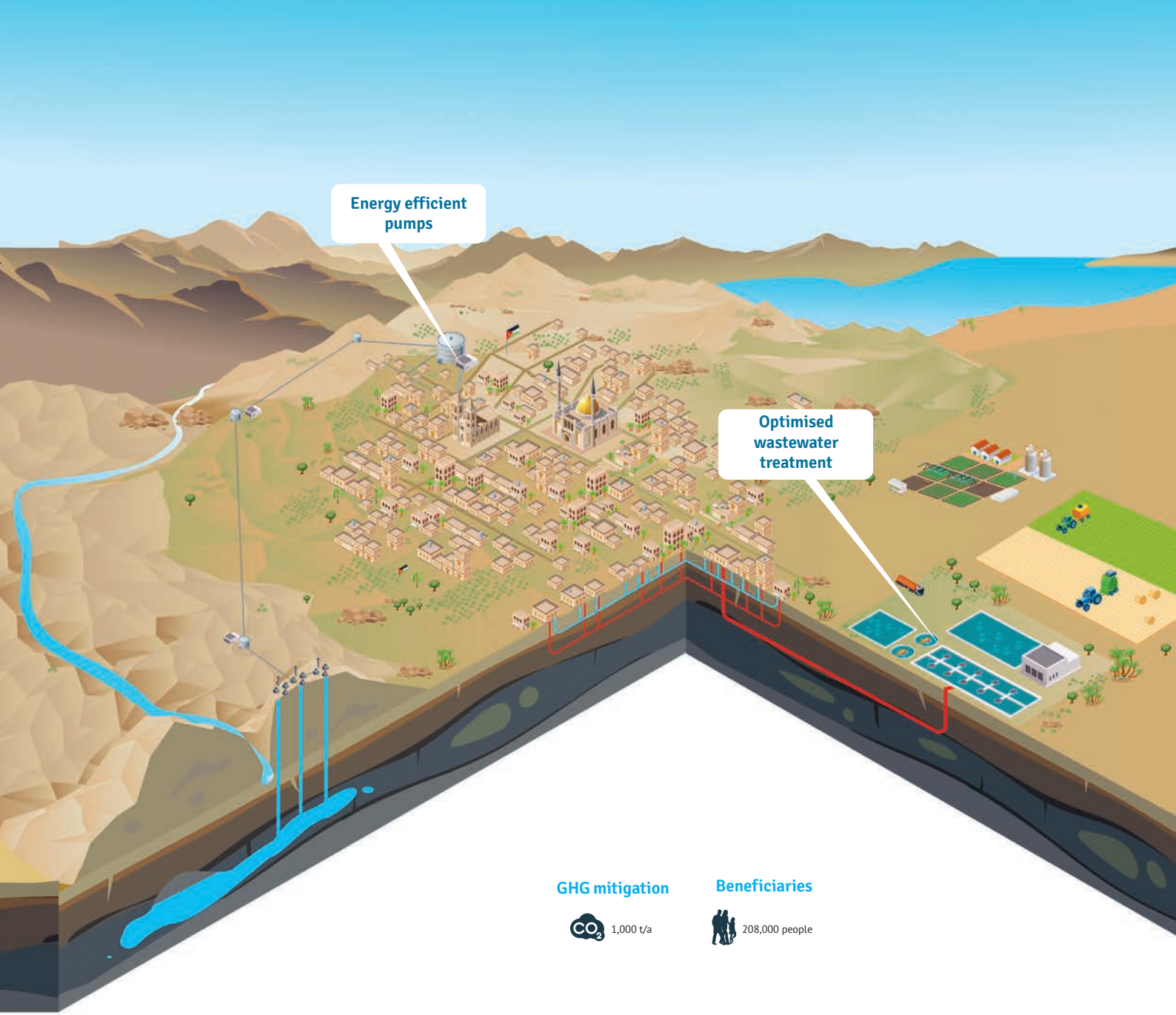

GHG mitigation

1,000 t/a

Beneficiaries

208,000 people

Mexico

Mexico was a leader in the negotiation of the Paris Agreement; it has committed ambitiously to reducing 22% of its GHG emissions by 2030 compared to baseline scenario, and raised the potential to push the target to 40%. Mexican water utilities will need to contribute to this reduction, but they already face a difficult task in meeting users' demands. Low tariffs, high water consumption and a complicated legal framework have led to unsustainable water abstraction, high energy costs, water losses and inadequate wastewater treatment, which contribute to high emissions and make communities more vulnerable to climate risks.

The WaCCliM project is working with the National Water Commission (CONAGUA), the Ministry of Environment and Natural Resources (SEMARNAT) and the National Water Association of Mexico (ANEAS). These partners have participated in the dissemination of the low-carbon approach in the water sector, including through network meetings of utilities and the development of standards for biogas and energy generation projects.

Two pilot utilities in the city of San Francisco del Rincón, the Wastewater Treatment and Deposition Service (SITRATA) and San Francisco Drinking Water and Sewage System (SAPAF), are together paving the way to sustainable, low-carbon urban water management. They are avoiding emissions of **2,500 t CO_2e per year**, comparable to planting 12,400 trees annually. Most significantly, they have achieved this by expanding wastewater treatment coverage from less than half of the city to more than 80%. The partners are now investigating further measures to reduce emissions and operational costs and increase resilience to climate risks in the city's water supply and wastewater system.

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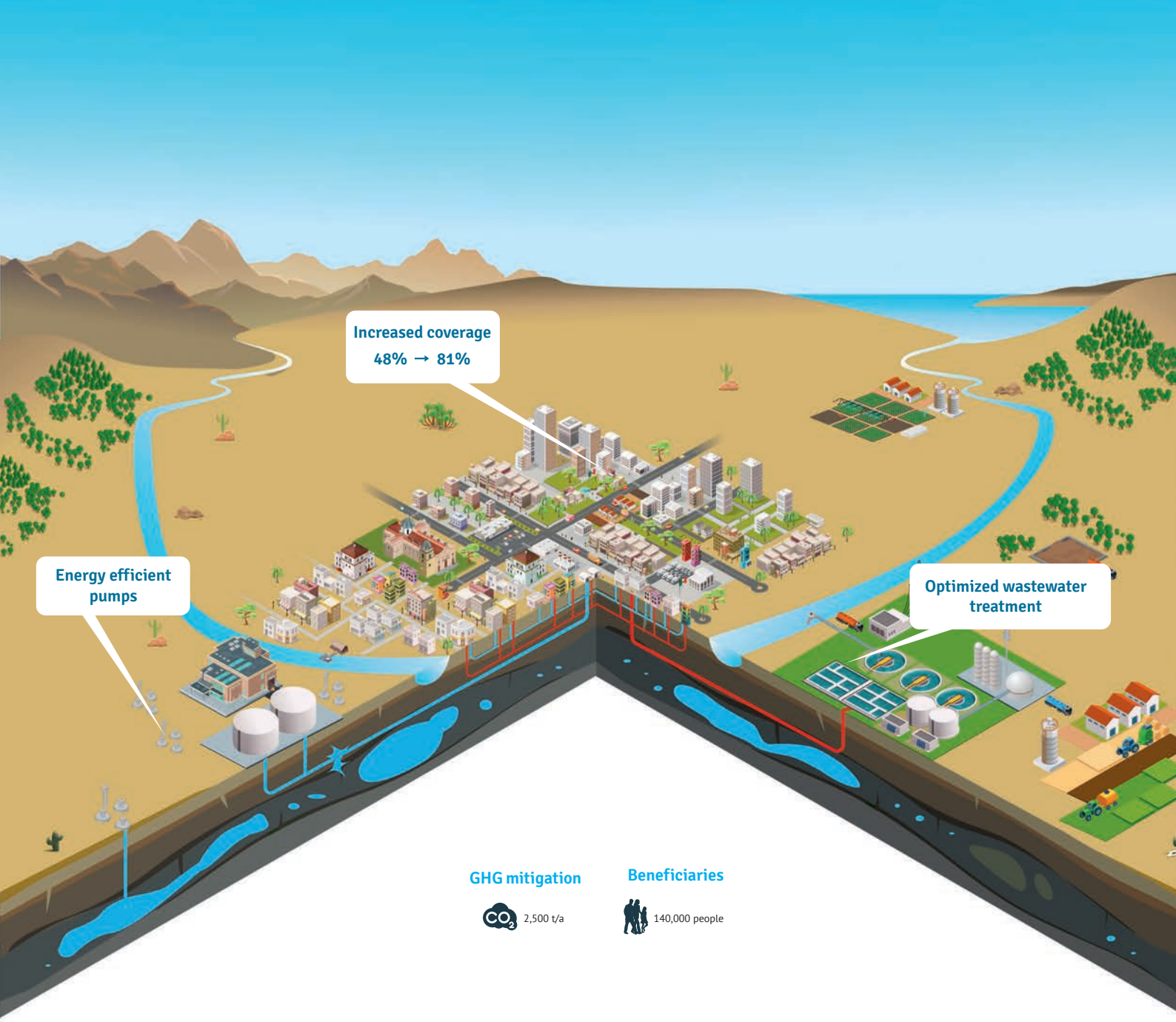

GHG mitigation

CO_2 2,500 t/a

Beneficiaries

140,000 people

Peru

Peru is particularly vulnerable to the impacts of climate change. Droughts, melting ice in the Andean glaciers, intense rainfall events and mudslides affect drinking water and wastewater services. These impact the availability and quality of water and often damage utilities' infrastructure. In response, water and wastewater utilities in Peru are pioneering new ways to address climate change by reducing their carbon footprints and their vulnerability to climate change at the same time.

The utilities have started to prepare Mitigation and Adaptation Plans for Climate Change (PMACCs), developed by WaCCliM in collaboration with the BMZ-funded PROAGUA II programme. PMACCs help utilities account for their GHG emissions, and then identify mitigation and adaptation measures that can contribute to their sustainability as well as enhance their services. WaCCliM works with the Ministry of Housing, Construction and Sanitation (MVCS) and utilities across the country to scale up the project approach.

As a pilot, WaCCliM and MVCS have supported the water utility of Cusco, SEDACUSCO, to identify and achieve mitigation measures. Improved sludge management has proven highly effective in the city, with multiple benefits. It has avoided emissions of **7,454 t CO_2e per year** – equivalent to 5,300 passengers flying economy from Lima to Frankfurt and back – while bringing a serious local odour problem under control. The utility is moving forward to install a cogeneration system for biogas valorisation, which they expect will save around €260,000 in annual electricity costs and avoid a further **544 t CO_2e per year** in emissions.

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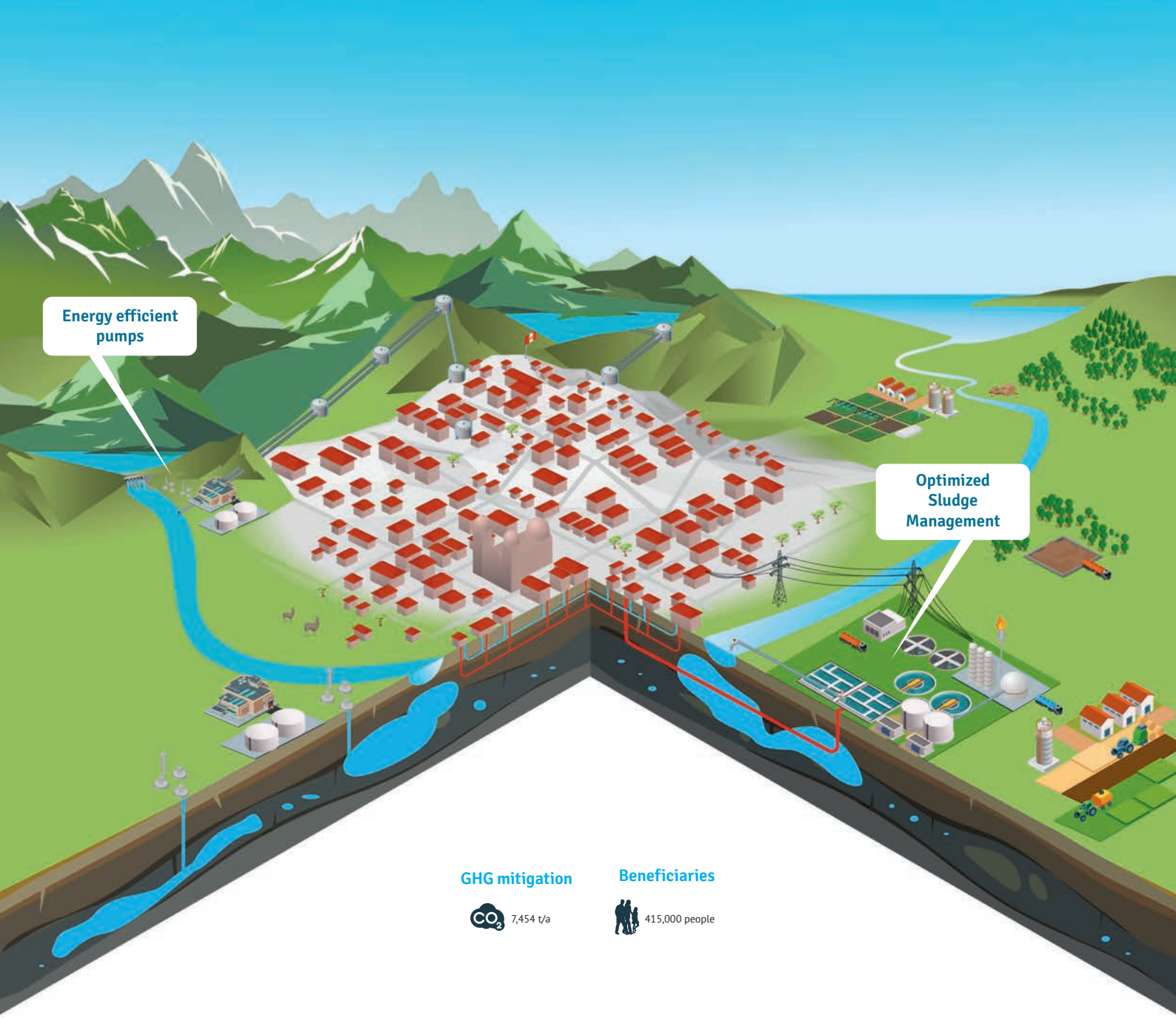

GHG mitigation

7,454 t/a

Beneficiaries

415,000 people

The Benefits of Linking Water and Climate

The measures implemented by WaCCliM's partner utilities have led to **a total mitigation of more than 10,000 t CO_2e per year.** This is a mitigation success comparable to planting 50,000 trees per year, and illustrates how the benchmarking of carbon footprints can become a powerful tool to enhance climate mitigation measures in the water sector.

At the same time, truly climate-smart urban water and wastewater systems also further climate adaptation and enhance services to urban communities. Most countries recognize the specific relevance of water resources in their climate strategies and plans; water is the most prioritized sector for adaptation to climate change within NDCs to achieve the Paris Agreement. Water utilities now have the opportunity to connect the implementation of adaptation and climate risk resilience strategies with meaningful activities to reduce emissions, providing evidence for an increased consideration of mitigation actions through water in the next round of NDCs.

Through these many links and interconnections in the water sector, the WaCCliM project has multiplying effects that span many of the Sustainable Development Goals (SDGs). WaCCliM is helping to make progress towards climate action, but also towards clean water and sanitation; affordable and clean energy; sustainable cities and communities; good health and well-being; and industry, innovation and infrastructure, among others.

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3 GOOD HEALTH AND WELL-BEING
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
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Our Partners

WaCCliM works with multiple national and international partners to achieve progress towards climate change mitigation and adaptation in the urban water sector.

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San Francisco del Rincón

San Francisco Drinking Water and Sewage System (SAPAF)

Wastewater Treatment and Deposition Service (SITRATA)

National

Ministry of Environment and Natural Resources (SEMARNAT)

National Water Commission (CONAGUA)

Madaba

Miyahuna Water Company

National

Ministry of Water and Irrigation (MWI)

Water Authority of Jordan (WAJ)

Cusco

SEDACUSCO

National

Ministry of Housing, Construction and Sanitation (MVCS)

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and Nuclear Safety

of the Federal Republic of Germany

Implemented by:

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IWA the international water association

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