WARS, SALINISATION AND CLIMATE

drive the demand for small, dual water plants

Research results from the Mekong Delta are transferable to many regions worldwide, according to the Institute for Environmental Engineering & Management (IEEM).

Fig. 1: Service water is distributed via the house network and can be taken from the outside water tap, while drinking water is only provided in small quantities when required at the stainless steel sink outside the operating building

Water is becoming scarce in more and more regions worldwide, with technologies that were originally intended for use in arid regions being on the rise in Germany. The IEEM has developed a new concept for small waterworks, as part of a project funded by the German Federal Ministry of Education and Research (BMBF).

This is intended to help where one natural water source alone is no longer sufficient. Small waterworks should be "multi-fed", or fed from several water sources, in addition to being able to process groundwater, surface water, rainwater and, if necessary, treated wastewater, depending on the climate, current availability and demand. Since most of the supply water is used for washing, cleaning, and other uses, it is worthwhile to produce service and drinking water in parallel — a process known as "dual water" — whenever there is a shortfall of clean natural water. Therefore, IEEM has developed a technology called Multi-fed dual water system (MFDWS) and tested it at three pilot plants in the Mekong Delta, in cooperation with the industrial partner Wilo/Martin Membrane Systems. Project leader Dr Karl Rudolph expects growing demand for this new type of system: "The need is not only for remote settlements in coastal regions and river deltas but in all areas where central systems do not work. In addition to countries plagued by war and turmoil, this also includes cities where the public water supply fails or does not deliver reliably — whether for technical reasons or simply due to state failure."

ViWaT is a German-Vietnamese research project and is jointly supported by the respective ministries of both countries, BMBF in Germany and Ministry of Science and Technology (MOST) in Vietnam. The Ruhr-University Bochum is in charge of ViWaT-Planning, the University of Karlsruhe for the ViWaT-Engineering and IEEM is responsible for the project ViWaT-Operation. Part of the ViWaT-Operation includes a work package that helps to develop small waterworks for people living in the remote areas of the

Mekong Delta that are not accessible via central supply networks.

After decades of over-exploitation of groundwater reserves and severe droughts, as well as increasing pollution from wastewater discharges into water bodies, there is a shortage of clean raw water in many places. In those areas, small water pilot plants produce water supplies from low-polluted rainwater, frequently polluted groundwater and heavily polluted surface water from a river or canal. Groundwater needs to be conserved as much as possible in those areas, because the available reserves are running out and the lowering groundwater levels in the Mekong Delta will lead to permanent salinisation of the soils and soil subsidence, which could have enormous damage to structures and nature.

This scenario was the impetus behind the ViWaT-Operation project. Depending on the season, location and current conditions, comparatively clean rainwater is preferred as the first choice of raw water supply. As the second choice, depending on the current demand situation and pollution, surface water is used. Only after the previous two options have been exhausted that groundwater is used as the third choice, to save as much of the groundwater reserves as possible. Additionally, wastewater can be treated for water reuse. A successful pilot for this has already been conducted by a shrimp farm to refill ponds for breeding sensitive baby shrimps, which can only survive in high-quality water.

For the small waterworks, automation-capable mechanical-physical processes were used and chemical or biological components were dispensed with. The heart of the plant is an ultrafiltration module, with an upstream protective filter. To ensure operation under optimal working conditions, the unit prepared for remote monitoring and maintenance using the Aquacube made by Wilo/Martin Membrane-Systems. The company is responsible for water recycling

Fig. 2: Participants of a ViWaT-Operation workshop in front of the ViWaT-MobiLab, which is used for the monitoring of the pilot plants in the Mekong Delta

in cruise ships, with the technology being adapted to fit the specific requirements in the Mekong delta and equipped with advanced UV irradiation for water disinfection.

Due to the disadvantageous combination of the natural water resources with iron and manganese, salt and organic contaminants, which are measured as total organic carbon (TOC), an additional pre-treatment system had to be installed at two of the three pilot sites. This pre-treatment consists of a free-air drip aeration with a gravity downflow multi-layer filter, which was manufactured by local craftsmen, using a design template from IEEM.

To desalinate the raw water during dry periods, it was necessary to install a reverse osmosis (RO) system at two of the three sites for post-purification of the otherwise clean water from the Aquacube. To reduce the operating costs from this process, portable water was made available with a separate tap made specifically for that purpose and offering domestic water, made without downstream RO treatment, through another tap, as seen in Fig. 1. Thus, the RO system runs only when the salinity would otherwise exceed the permissible values, and only for the partial flow that is called up for drinking water.

As similar needs exist and are emerging from not just the Mekong Delta, but also in many other regions across the world, IEEM expects growing demand for this new type of water supply plant. According to Dr Rudolph, not only would this demand come from the coastal regions and river deltas, but also inland areas affected by salinisation of inland waters.

In addition, he said, the need for MFDWS systems is expected to expand to regions where centralised systems of water are unable to be implemented. This would apply not only to countries plagued by war or civil turmoil, but also where the public water supply systems fail, or do not work reliably enough — whether for technical reasons, or simply due to state failure. In these places, consumers who depend on a reliable water supply would desire for decentralised small waterworks, even if they are only able to supply themselves autonomously in the event of a malfunction. For instance, in developing and emerging countries, better-quality hotels would have their own water reservoir for safety, in case of supply interruptions. The larger, top-quality hotels would often maintain the quality of their own drinking water supply which the hotel management and their customers could trust — at least as precaution.