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Addressing the wastewater challenge with low-cost solutions

STORIES OF TRANSFORMATIONAL CHANGE

Inspirational examples highlighting transformations towards greater environmental and climate sustainability

Agenda 2030 - Target 6.3: "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally".

The wastewater treatment challenge

About 80% of the world's wastewater remains untreated. The hygiene and environmental problems caused by untreated wastewater are well documented and include a contribution to diarrhoeal diseases that kill an estimated 1.5 million children under the age of five each year; as well as weakening the general health of the population with impacts on people's productivity and quality of life.
In fact, the wastewater component of the sustainable development goal "Clean Water and Sanitation" has proven a far greater challenge than the clean water part of the goal.

There are multiple reasons why this goal has proven difficult, but it is important to underline that people are prepared to pay for a good such as water. However, paying for an improved service when such a service can be obtained for free, does pose a challenge. Wastewater treatment is such a service and is in competition, for instance, with open defecation, which is considered free (but does not include health, safety and environmental costs). In traditional sewage networks with municipal treatment plants, this treatment service can cost up to 140% of the cost of supplying clean water to the same utility customers. Where people are poor, that cost is prohibitive.

Countries are thus confronted with a challenge: how can the cost of wastewater solutions be reduced, while meeting the goals of hygiene and treatment?

Implementing low-cost solutions facilitates sanitation for all

To meet the cost challenge, major cost savings for utilities can be made in many circumstances, by encouraging the use of decentralized low-cost latrines with septic tanks (non-piped systems). Multiple initiatives have made many incremental improvements to decentralized wastewater treatment, such as making latrines and septic tanks cheaper, more hygienic, more user friendly, and more attractive; and the programmes that promote them sharper and more focused. They have had widespread success, although there is still a way to go to achieve universal coverage of access to sanitation services.

Addressing wastewater treatment the nature-based way

Utilities are now putting greater reliance on nature-based wastewater treatment in order to lower costs. These lagoon and constructed wetland systems have lower energy costs and low operational costs. In addition, they are cheap to build (where land values are low). Where land costs are higher, lagoons

"Creating a toxic-free environment requires more action to prevent pollution from being generated as well as measures to clean and remedy it."

The European Green Deal[1]

3.3 million people

living in Kampala will have low-cost septic sludge treatment services with just three purifying plants

can be aerated, which reduces their surface area and extensive constructed wetlands can be replaced by smaller sand filters. These options are used widely for treatment plants for large urban areas. It should be stressed that these solutions are not only used in developing countries such as Bolivia or Burkina Faso but also in countries such as France, Germany and the United States.

Lagoons and constructed wetlands: cost-effective wastewater treatment

A good example of this approach can be found in Kampala, Uganda. Decentralized wastewater treatment, using latrines and septic tanks, is well established in many parts of the city), especially by institutions such as churches, schools and government offices. A network of private, licensed operators form the backbone of this system. They are contracted by property owners to haul the septic sludge to the treatment plant(s). Therefore, only a small area of the city is served by sewers. This system eliminates the need for additional capital intensive infrastructure – and much-needed local jobs are created instead. The city's need for treatment of the septic sludge produced by these latrines was recognised and three new septic sludge treatment plants were planned in the 2004 "Sanitation Strategy & Master Plan for Kampala City". Septic sludge needs to be treated using nature-based lagoons (unaerated). In a similar system in Zambia, hygiene inspectors check that septic tanks are properly installed and maintained, according to standard approved designs. Plus, advocacy and communication campaigns target the general public and schools too, to encourage the proper application and use of septic tanks.

One such plant has already been built. To give an idea of the cost savings, the next plant to be built plans to treat the septic sludge from 800 000 people for a cost of around EUR 10 million and the capacity that is needed is only 400 m^3/day. This is less than one hundredth of the flow (50 000 m^3/day) that would need to be treated if a sewage network (with hundreds of millions of Euros in investment costs) was to be planned instead. Improvements in the application of these lagoon systems will thus be incorporated in this next plant. Treated water quality will be improved using constructed wetlands with reed beds. Since the plant's energy use is low, solar power will be used to cover the plant's power needs.

Impact on livelihoods: a cleaner environment for citizens

Once the third plant is built to the east of Kampala, the whole of the capital city (3.3 million people) will have provision for septic sludge treatment at low cost. This will help encourage

[1] European Commission: Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions on The European Green Deal, December 2019, COM(2019) 640 final, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588580774040&uri=CELEX:52019DC0640

the building of latrines and their septic tanks in the knowledge that septage will be treated. These latrines substantially improve the hygiene of large parts of the population.

Impact on available water: re-use of wastewater for irrigation

To reuse treated municipal wastewater, higher effluent water quality standards are required for hygiene reasons. Nature-based constructed wetlands or simple sand filtration are both low cost solutions to meet these needs.

- At the Nobriya wastewater treatment plant in Egypt a constructed wetland at the end of the plant will enable 50 000 m³/day of wastewater to be recycled cheaply to the Nile for additional irrigation and groundwater recharge, benefiting farmers and the environment.
- In Tunisia, slow sand filtration is used at the end of the Médenine treatment plant to allow recycling of wastewater to the Oueljet El Khoder irrigation area providing a valuable extra water resource to irrigators.

Impact on disposal: creating a value chain for wastewater products

Even where decentralised latrine and septic tank systems are predominant, the septage from these septic tanks still needs sanitary treatment and disposal. The success of the plant in Kampala is in no small part due to the parallel development of licensed private operators who are paid by organisations and private individuals to empty septic tanks and bring the sludge to the plant. At the end of the treatment chain, final disposal of sludge can be a major problem and costs of traditional solutions can quickly mount. However, many innovations in selling treated sludge as a product are being developed. This can reduce disposal costs and can partially pay for the treatment. However, the value chain management that these solutions require involves marketing sanitary controls, licensing and support to users which should not be under-estimated.

In Kampala, solar drying beds are used to dry the sludge. The dried sludge is provided to farmers as fertilizer. Treated sludge is soon to be made into pellets with 90% dry solids for better distribution to farmers and for possible sale for combustion in local kilns.

Next steps

These nature-based solutions for low cost wastewater treatment help expand sanitation coverage around the world and build value chains for wastewater products. This green transformation is underway in many countries including Brazil, Zambia, Bolivia and Morocco. These cases show that, despite the daunting nature of the sustainable development goal for sanitation, costs can be controlled to help achieve them.

Dried sludge can be used by farmers as fertilizer

50 000 m³/day
of recycled wastewater will benefit farmers and the environment in Egypt

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Environment and climate change mainstreaming is a legal EU requirement, essential to meeting international and internal commitments, and to supporting sustainable development worldwide. The EU is actively doing its part through the European Green Deal and will support partners to do the same.

For advice and training on environment and climate change mainstreaming, contact:

INTPA and NEAR
Environment & Climate Change
Mainstreaming Facility

T: +32 229 622 83
E: INTPA-GREENING-FACILITY@ec.europa.eu
E: NEAR-GREENING-FACILITY@ec.europa.eu