

CRew: Introducing treated water reuse in two Caribbean Small Island Developing States (SIDS) – Lessons Learnt



Abstract:

In Central America and the Caribbean, the potential for reuse of treated wastewater has generally been overlooked and the resource wasted. The effective management of wastewater is further hindered by the strong cultural barrier to discussing wastewater management openly and to identifying opportunities for reuse of treated wastewater. The GEF CRew Project provided support for two pilot projects, one in Antigua and Barbuda (A&B) and the other in Saint Vincent and the Grenadines (SVG) in the period 2015 - 2016. There is undoubtedly significant interest in these countries in the reuse of treated wastewater due to increasing interest in water use efficiency, especially as concerns over climate change and its impact grow. Although implementation of both these treated water reuse projects experienced many challenges, there were many lessons learnt and there is significant potential for treated wastewater reuse in the

future. The experience and lessons learned in attempting to implement these two short pilot projects are described.

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PROJECT DESCRIPTION

The Global Environment Facility (GEF) funded “*Testing a Prototype Caribbean Regional Fund for Wastewater Management (CReW)*” project was a four year project which used an integrated and innovative approach to reduce the negative environmental and human health impacts from untreated wastewater discharges.

It began in 2011 and completed activities in 2017. CReW was implemented by the Inter-American Development Bank (IDB) and United Nations Environment Programme (UN Environment) with the lead regional executing agency for the project being UN Environment Caribbean Regional Coordinating Unit and Secretariat to the Cartagena Convention.

CReW's objectives were to:

- Provide sustainable financing for the wastewater sector,
- Support policy and legislative reforms, and

- Foster regional dialogue and knowledge exchange amongst key stakeholders in the WCR.

There were thirteen participating countries: Antigua & Barbuda, Barbados, Belize, Costa Rica, Jamaica, Guatemala, Guyana, Honduras, Panama, Saint Lucia, Saint Vincent & the Grenadines, Suriname, and Trinidad & Tobago.

ISSUE AND CHALLENGE

CReW actively promoted “treated water reuse” (the preferred term due to the negative public reaction to the term “wastewater recycling”, and necessary to emphasize that wastewater must be treated for purpose). In Central America and the Caribbean, the potential for reuse of treated wastewater has generally been overlooked and the resource wasted. The effective management of wastewater is further hindered by the strong cultural barrier to discuss wastewater management openly and to identify opportunities for re-use of treated wastewater.

Treated wastewater reuse has the potential to alleviate and mitigate periods of drought in Central America and the Caribbean. Cultural norms and public perception makes wastewater and sewage a taboo subject for most Caribbean people. As a result, much of the treated and untreated wastewater often ends up in the oceans as well as in underground aquifers. It should be taken into account that treated wastewater, in addition to irrigation, can be used to recharge aquifers and, with an adequate level of treatment, can even be made safe for human consumption. In addition, sludge from the treatment process can be used as fertilizer for its rich nutrient content as well as for manufacturing building materials. The bio-solids and biogas produced contain ten times the energy needed to operate the wastewater treatment plant itself (Water Environment Research Foundation).

GEF CReW Project promoted an integrated approach to water and wastewater management, including treated water reuse. Two pilot projects, one in Antigua and Barbuda (A&B) and the other in Saint Vincent and the Grenadines (SVG) were attempted in the period 2015 - 2016.

EXPERIENCE

In Antigua and Barbuda (A&B), groundwater sources are declining due to frequent droughts, desalinated water is very expensive and there is little rain to be captured using rainwater harvesting, so they are looking for alternative methods to obtain water for irrigation, agriculture and domestic use. There is interest from the prison authorities (recycled water to irrigate crops grown by prisoners as part of a rehabilitation scheme), small farmers and hotels (recycling of treated water to irrigate their landscaping and non-food crops).

The pilot project in Antigua and Barbuda (A&B) aimed to put in place a management structure for the McKinnon's wastewater treatment plant, an MBR (Membrane

Bioreactor), built with GEF IWCAM project funding in 2011, which would facilitate the reuse of the effluent for landscaping, sustainable livelihoods (non-plant food items), agricultural products (chicken and pigs) and other economic activity. The GEF CReW project, in addition to supporting the commissioning and start-up of the plant, supported the establishment of the enabling environment i.e. necessary legislation, regulations, policies and standards, for the reuse of treated wastewater. It also supported training for the operators of the facility as well as the development and implementation of activities to raise public awareness.

In Saint Vincent and the Grenadines (SVG), the Prison Commission is interested in improving the wastewater management system at Belle Isles Correctional Facility. The prison established a garden as part of its efforts to reduce costs and provide healthy, nutritious food for its inmates. The garden also forms part of the prisoners' rehabilitation programme – providing skills training in agricultural production techniques. It was therefore, proposed to establish a water reuse and recycling demonstration at the prison to provide water for the prison garden.

In SVG the pilot project aimed to improve the wastewater treatment system at the Belle Isle prison so that the effluent would comply with the water reuse regulations. This treated wastewater would then be used for crop irrigation inside the prison; crops which are cultivated by the prisoners themselves. Once the project was completed, in addition to being an example of reuse of the treated wastewater, it would help to raise awareness of the value of recycling water in this way. There would also be the significant added value of skills training and rehabilitation of prisoners who would be involved in the project.

The Project Coordination Group visited SVG in March 2015 to meet with various stakeholders and quickly realized that inter-

sectoral coordination would be essential for successful implementation. Several agencies including the Ministry of Health, Wellness and Environment, the Public Information Agency, Belle Isle Prison, the Central Authority for Water and Sanitation and the Bureau of Standards would have to endorse the project and commit to specific activities. Additional information would be needed to complete the design as well as consultation with various stakeholders to ensure that roles and responsibilities are agreed and accepted.

Successful and sustainable treated wastewater reuse depends upon good monitoring and quality control, on education of the different operators and users, and good communication as well as public education regarding the benefits of treated water reuse.

The GEF CReW Project learned several lessons as it explored the feasibility of introducing treated wastewater reuse in these two islands and these will be useful during the implementation of any reuse initiatives in the follow-on project (CReW+) which is being proposed.

Positives:

- There is good support for communications to promote the benefits and safety of water reuse, and to address the negative perceptions and human health and environmental risk concerns associated with the reuse of treated wastewater: In SVG, the Agency for Public Information is generally interested in educational and public awareness resources regarding sanitation, wastewater management, treated water reuse and related topics and the Environmental Health Department wants to promote water reuse. In A&B, the Environment Division committed to developing a communications strategy to promote safe water reuse.

- There is increasing interest in water use efficiency and climate smart agriculture to increase the resilience of the small farmers to the impacts of climate change, particularly as periods of drought increase. This is especially so in the more arid islands such as A&B where the benefits of water reuse are being recognized more.

Challenges:

- The absence of existing national policy and guidelines, legislation and regulations to guide and regulate water reuse: in SVG they expressed willingness to work according to whatever guidelines are being used; the World Health Organization's guidelines would not be an issue. In A&B, a draft Wastewater Policy is in place, part of the newly passed Environmental Protection and Management Act, but regulations are still being drafted. These regulations need to further identify criteria and conditions for water reuse for specific purposes.
- There is a need for education/sensitization of decision-makers regarding the benefits of water reuse and how to mitigate any potential risks. All benefits need to be documented – environmental, social (health) and economic.
- There must be education of potential users and the wider public regarding the benefits of water reuse and how to mitigate any potential risks. All benefits need to be documented – environmental, social (health) and economic.
- Someone, or some entity, must take ownership of the project/initiative: in the case of SVG, the Environmental Health Department stressed the need for the Prison Commissioner to

understand the responsibilities, their role, and, the costs involved in sustaining the system. While they stated their willingness to provide needed manpower for construction, they must also accept responsibility and commit to the proper operating of the system in the long-term. This would include responsibility for operations and maintenance in the long-term.

- Training and capacity building is needed (e.g. operators, laboratory technicians): in SVG the suggestion was made that this be done via attachments and/or exchanges.
- Monitoring and evaluation is essential: Following World Health Organization (WHO) standards requires that laboratory tests be conducted on an ongoing basis; this must be planned and budgeted for. The question of who would be responsible for monitoring water quality was a significant one in SVG where the Environmental Management Department stated that it could do the field monitoring – BOD, fecal coliform and residual chlorine tests, but not others. The Central Water and Sewage Authority (CWSA) laboratory currently does not test wastewater and while it could do some testing in the future, they would need a directive from the relevant Ministry. On-site testing might be best for remote facilities, due to the logistics of transporting samples on a daily basis.
- Procurement issues must be considered: e.g. in SVG, the use of chlorine gas instead of chlorine tablets was discussed as a preferred option due to the difficulty of procuring chlorine tablets on a sustained basis.
- Innovative methods should be considered: e.g. In SVG, the possibility of using constructed wetlands and sending the wastewater to a settling tank before it goes to the wetland was also discussed by the Environmental Health Department.
- The cost of electricity to operate the system.
- Pesticide content in wastewater may be an issue.
- Difficulty obtaining data and information needed for design of appropriate wastewater treatment systems that also allow for water reuse.
- Early and continuous consultation with stakeholders is needed to ensure understanding of the project and its benefits, to consider their concerns, and to clarify roles and responsibilities. Negotiation of agreements with partners may be needed, e.g. ensuring adequate wastewater is supplied to the plant recycling water, in the case of Antigua, depended upon the receipt of sewage from one test hotel but the hotel decided after the project had begun that it would not hook up to the plant unless it could buy back the water for the purpose of landscaping.
- Information on the cost of water reuse, existing and possible tariff structures, and existing drivers and incentives for water reuse projects is needed. This includes proper costing of all requirements to make a water reuse project successful. E.g. in A&B, the cost of piping and distribution of the treated wastewater was grossly underestimated.

REPLICATION

Although implementation of both these treated water reuse projects experienced many challenges, and in the case of SVG barely got off the ground, there is undoubtedly significant interest in these countries in the reuse of treated wastewater. Inter-sectoral and inter-institutional coordination are challenges to be addressed in early planning stages and communication at all levels to promote the benefits and safety of water reuse, and to address the negative perceptions and human health and environmental risk concerns associated with the reuse of treated wastewater is a prerequisite. The importance of ongoing monitoring of the effluent cannot be underestimated and must be guaranteed, coordinated and transparent.

Indeed, wastewater reuse is complex, and the technical work must be accompanied with institutional work; this will vary in complexity depending upon the particular country.

SUSTAINABILITY

There are still many challenges to be addressed in order to achieve the objective of reuse of treated wastewater, especially as an important element of the integrated management of water resources. Successful introduction will depend, above all, upon introduction of the necessary policies, regulations, standards and legislation to guide and regulate water reuse, as well as coordination amongst the various institutions involved. Finally, the cost of wastewater reuse, the existing or possible tariff structures, and incentives for reuse projects must be considered and dealt with if there is to be sustainability.

REFERENCES

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- ◆ Treated water reuse

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