Carbon trading opportunities for waste-water treatment projects in the Caribbean

In the wider Caribbean region, only less than 10% of domestic waste-water from the wider public is treated in any centralized treatment plant. This situation is due to the lack of country's regulations that require the control of waste-water. Businesses and academic institutions account for the 10% of waste-water treated.

These institutions are driven by competitiveness in their business sector. However, the level of operations and maintenance to ensure a required quality effluent at these decentralized plants is questionable as there are seldom regulatory monitoring systems for effluent and penalties are inexistent.

Inadequate standards and a lack of monitoring and regulations have led to ineffective waste-water treatment throughout the Caribbean region. A significant number of hotels and resorts in the Caribbean have waste-water treatment plants that are not in good operating condition, resulting in the release of significant amounts of pollutants (including nutrients, pathogens and viruses) into water bodies. When the environment has polluted water and unsanitary conditions, tourists tend to stay away and local residents and tourism facilities lose an important source of income[1].

Reducing unregulated discharge of waste-water and securing safe water are among the most important interventions for improving global public health and achieving sustainable development. Smart and sustained investment in waste-water management will generate multiple dividends in society, the economy and the environment. It allows involving private and public sectors, fulfilling public needs and enhancing food security[2].

Waste-water treatment is a challenging situation in the region as requires the use of new regional technologies and investment. The carbon market, via the UNFCCC-Clean Development Mechanism[3] (CDM), can provide a source of revenue by trading emissions[4] reduced by implementing waste-water treatment projects. Under the CDM, there are about 240 waste-water treatment registered projects[5] in developing countries.

The following CDM project gives an overview of a waste-water treatment plant in a sewage facility in the island of Fiji.

Kinoya sewage treatment plant[6]

This *first-of-its-kind* project in Suva city, Kinoya (85,000 inhabitants), Fiji recovers and combust methane from anaerobic sludge treatment units; the methane is flare and the remains of solid sludge is used for composting. The sewage treatment plant

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[1] The Caribbean Regional Fund for Waste-water Management Project, 2011 (http://www.gefcrew.org/)

[2] Sick Water? The central role of waste-water management in sustainable development: A Rapid Response Assessment. 2010. United Nations Environment Programme, UN-HABITAT, GRID-Arendal

[3] The CDM allows emission reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tone of CO_2. These CERs can be traded and sold, and used by industrialized countries to meet part of their emission reduction targets under the Kyoto Protocol, an international legally binding agreement. *Currently, there are 192 Parties to the Kyoto Protocol to the UNFCCC*. CERs can also be used by individuals, companies, events and governments seeking to reach carbon neutrality or demonstrate environmental stewardship by offsetting some or all of their emissions. More information at: http://cdm.unfccc.int/

[4] Emissions reduced from waste-water treatment projects are methane (CH_4) gases which are least 20 times higher than carbon dioxide (CO_2) emissions. Source: http://unfccc.int/ghg_data/items/3825.php

[5] These projects apply small-scale methodology called "Methane recovery in waste-water treatment" (AMS-III.H). Source: http://cdm.unfccc.int/methodologies/DB/4ND00PCGC7WXR3L0LOJTS6SVZP4NSU

[6] CDM project 4552. Source: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1299488431.41/view

treats about 400m^3/day of wet sludge. In the case where the methane generation is sufficient electricity could also be generated[7].

Technology

The existing sewage treatment facility at Kinoya constructed during 1970's consists of both primary and secondary processes[8] with the final treated effluent being disposed to the sea. The CDM project introduced methane recovery and combustion system to the existing anaerobic sludge treatment units (anaerobic digesters).The sludge generated by the anaerobic digester is dried and used for compost and the biogas generated is flared in an enclosed flare system.

The existing treatment facility consists of grit traps, step screen, primary clarifiers, trickling filters, sequential batch reactors, anaerobic digester and sludge drying beds. After the sewage treatment process, the digested sludge is discharged to the sludge drying beds. The sludge is aged 15 days before being used for soil application.

The enclosed flare gas processing module consists of three systems; a gas scrubber, a refrigerated moisture remover and a gas compressor. Operational data for the systems is recorded in an electronic chart recorder. Flow meters measure the flow rates of the biogas produced and flared. The systems are automatic; the gas stream flare burner and the enclosure have monitoring devices. The system also monitors biogas pressure, UV flame sensor, temperature at appropriate locations, flame arrestor and flash back thermal sensors.

Carbon reduction and revenues

The CDM revenues were an important incentive to pursue the project. The annual emission reductions are of 22,471 tCO_2. The potential income from the sales of CERs during the 10 years crediting period of this project is around € 850,000 EUR[9].

[7] Such type of CDM project (located in Cali, Colombia) in a sewage facility can be found at: http://cdm.unfccc.int/Projects/DB/RINA1228922788.48/view

[8] Primary sludge originates as a result of capturing suspended solids and organics in the primary treatment process through gravitational sedimentation, typically by a clarifier. The secondary treatment process uses micro-organisms to consume the organic matter in the waste-water.

[9] The used reference price of CER is €4 EUR, taken from the Norwegian Carbon Procurement Facility call [http://www.nefco.org/sites/nefco.viestinta.org/files/NorCap_screen.pdf]. Transaction costs for validation and verification is assumed to be 40,000 EUR.