United Nations Climate Change
Clean Development Mechanism

Carbon trading opportunities for wastewater treatment

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Background

In the wider Caribbean region, less than 10% of domestic wastewater from the wider public is treated in centralized treatment plants. This situation is due to the lack of national regulations governing the control of wastewater. Businesses and academic institutions account for a significant share of wastewater treated.

These institutions are driven by competitiveness in their business sector. The level of operations and maintenance to ensure adequate quality of effluent at the decentralized plants is questionable as there are seldom regulatory monitoring systems for effluent and penalties are non-existent.

Consequences

Inadequate standards and a lack of monitoring and regulations have led to ineffective wastewater treatment throughout the Caribbean region. A significant number of hotels and resorts in the Caribbean have wastewater 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 the unregulated discharge of wastewater and securing safe water are among the most important interventions for improving global public health and achieving sustainable development.

Smart and sustained investment in wastewater 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]

Opportunities

Wastewater treatment is a challenging situation in the region and 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 wastewater treatment projects. Under the CDM, there are about 240 wastewater treatment registered projects[5] in developing countries.

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

[2] Sick Water? The central role of wastewater 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 tonne of carbon dioxide (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. 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 wastewater treatment projects are mainly methane (CH_4) gas. CH_4 has a global warming potential of at least 20 times greater than CO_2. Source: http://unfccc.int/ghg_data/items/3825.php

Samples from different treatment stages

[5]These projects apply a small-scale methodology called "Methane recovery in wastewater 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

[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 microorganisms to consume the organic matter in the wastewater.

[9]The used reference price of CER is €4, 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 are assumed to be €40,000.

Benefits

The following CDM project gives an overview of a wastewater treatment plant in a sewage facility on the island of Fiji

The Kinoya sewage treatment plant[6], a first-of-its-kind project in Suva city, Kinoya (85,000 inhabitants), Fiji, recovers and combusts methane from anaerobic sludge treatment units. The methane is flared and the remains of the solid sludge are used for composting. The sewage treatment plant treats about 400m^3 of wet sludge per day. In the case where the methane generation is sufficient, electricity could also be generated.[7]

Technology

The existing sewage treatment facility at Kinoya constructed in the 1970s consists of both primary and secondary processes,[8] with the final treated effluent being discharged into the sea. The CDM project introduced a 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 flashback thermal sensors.

Carbon reduction and revenues

The CDM revenues were an important incentive to pursue the project. The annual emission reductions are 22,471 tonnes of CO2. The potential income from the sale of CERs during the 10-year crediting period of this project is around €850,000 EUR[9]