

# CReW's Lines

Newsletter of the Caribbean Regional Fund for Wastewater Management

Vol. 2, Issue 1

March 2013

*"Many regional governments have not highlighted wastewater as a priority in their national development plans."*

-Martin S. Baker, Environmental Lawyer and Wastewater and Revolving Fund Expert

## In this issue:

- Sustainable Funding of Infrastructure for the Wastewater Sector—a choice or an imperative pgs. 1,2,3)
- CReW visits the Centro del Agua (pg. 2)
- Wastewater Treatment—the Basics (Pg. 3,8)
- CReW Regional Baseline Assessment looks at Status of LBS Protocol in participating countries (Pg. 4)
- Regional Baseline Assessment identifies needs ...finds political will and stakeholder involvement are key to good wastewater management (Pg. 5)
- Operational Assessments (Pgs. 6, 7)
- Effective Utility Management – EUM (Pg. 7).
- World Water Day 2013 (Pg. 8)
- GEF CReW Project Background (Pg. 8)

## SUSTAINABLE FUNDING OF INFRASTRUCTURE FOR THE WASTEWATER SECTOR - A CHOICE OR AN IMPERATIVE?

Funding infrastructure is increasingly a challenge for many governments in developed and developing countries. In the Wider Caribbean Region (WCR) there is an urgent need for infrastructural investment in order to maintain and enhance the quality of life enjoyed by current and future generations through sustainable economic growth.

Within the region, there is often a tremendous challenge to allocate funding for the various sectors, for example education, health, supply of potable water and wastewater management. The figure below shows the region's infrastructure expenditure from 1990 to 2002.

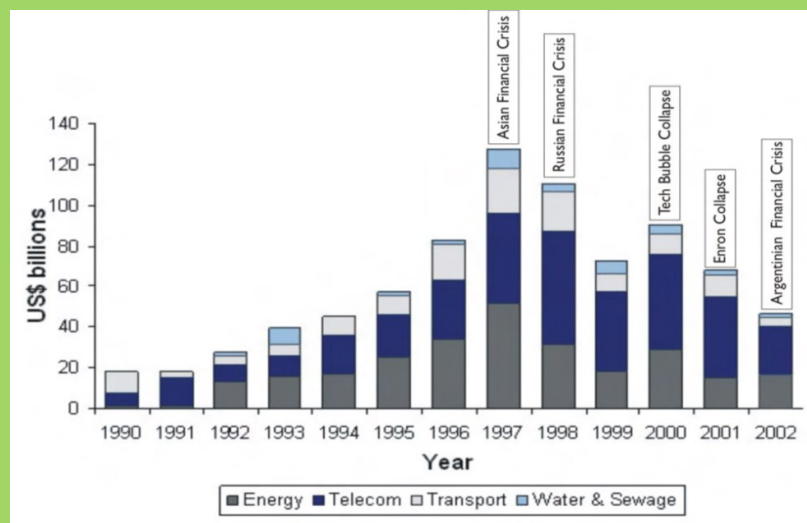


Figure 1: Capital Expenditure in Various Sectors 1990 to 2002

The data shows that in the decade of the 1990s, the water and sewage sectors consistently received the least investment when compared to the energy, telecom and transport sectors. Additionally, within allocations of funding for the water and sewage sectors, the majority of the capital went to investments in water. While that is understandable because water is essential for living, the provision of water to communities, industries and agriculture brings with it the generation of wastewater. Is it possible that the importance of investing in wastewater was overlooked? Or could the impact of untreated wastewater

(Continued on page 2)

(Continued from page 1)

on the region's natural resource base, biodiversity, fisheries and public health have been underestimated? Was the allocation of financing to the sewage and wastewater sector sufficient in the first place? An examination of the impact of untreated wastewater on our environment and economy provides some answers to these questions.

The region's report card shows that approximately 85% of wastewater entering the Caribbean Sea is currently untreated (UNEP CEP study, 1998). In addition, the Pan American Health Organization (PAHO) in 2001 reported that 51.5 % households in the Caribbean region lacked sewer connections of any kind and only 17 % of households are connected to functional collection and treatment systems. Less than 2 % of urban sewage in Small Island Developing States (SIDS) in the Caribbean is treated before disposal and the percentage is even lower in rural communities. In some countries there is no sewerage system and sewage is disposed of mainly through septic tanks and pit latrines.

In Latin America, in 2010 Panama reported at the Conferencia Latino Americana de Saneamiento (LatinoSan 2010) that 91.6 % of the sewage generated was collected. However, of that amount 29.6 % was treated in a centralised wastewater treatment facility and the remainder used septic tanks or pit latrines. Guatemala's 2002 census reported that of 2,200 households, 548, or 46.6 %, had adequate sewage treatment facilities. It was also reported that in Honduras in 2009, 78 % of sewage generated was collected, of which only 27 % was treated.

These figures would suggest a failing grade for the region and point to the need for a significant increase in funding for the wastewater sector. Without adequate levels of investment the consequence will be to continue to discharge untreated wastewater, which threatens the region's economic development and the quality of life of its people.

How then do governments and the private sector address the issue of adequately funding the sector? The Caribbean Regional Fund for Wastewater Management (CReW) is intended to provide, if not the only solution, one way of addressing the issue of insufficient funding for wastewater infrastructure. **The question is: Are our technocrats and policy makers recognising the strategic significance of the project as it relates to sustainable financing?** To continue on the current path is to risk the economic future of our region. Finding a way to fund the wastewater sector is not an option, it is an imperative! What then does CReW offer? What are the medium to long term benefits of the project?

The overarching objective of the CReW is to test pilot financial mechanisms that can be used to provide sustainable financing for environmentally sound and cost-effective wastewater management within an enabling policy and legal framework. Potentially

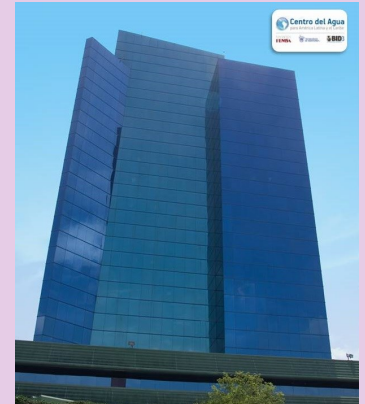
(Continued on page 3)

## CReW visits the ...



In 2012 the Water Center for Latin America and the Caribbean conducted wastewater technology training for the GEF CReW Project through two regional workshops (in English and Spanish (see earlier issues).

The Project Coordinator and Technical Specialist visited the Center, located in Monterrey, Mexico, in February to see first-hand their capabilities and to identify areas for further collaboration.



The Center's "Hall of Fame" was appreciated by the visitors upon entering the distinctive building.

Touring the facilities of the Virtual University.



Discussions with Humberto Covarrubias Gomez, Coordinator of Communications & Public Affairs, and Blanca Flores, Coordinator of Training Courses, Extension & Vinculation.

(Continued from page 2)



**Denise Forrest,**  
Project Coordinator

therefore, the project offers the opportunity to find ways of sustainably funding a sector which has been critically underfunded.

In the post-Global Financial Crisis environment, as countries focus on returning to, or remaining in, budgetary surplus, governments in the WCR increasingly face the challenge on how to find the capital needed to develop wastewater infrastructure.

Historically, when governments have contributed funds to infrastructure projects, it has most often been done so in the form of a grant. This is not repaid and earns no return. Less frequently, governments give equity injections to State-owned Corporations and while this approach can avoid an impact on the budget result, it is often followed by an impairment if the investment is not viable.

If governments are investing in financially viable infrastructure projects, then it should be possible for their capital to be returned and invested in new infrastructure projects, thereby maximising the impact of public sector money. More specifically, wherever possible, governments should be focussed on how to maximise the value derived from their investment in infrastructure, through leveraging government funds with private sector investment to enable capital to be recycled into future projects.

CRew is testing two main funding mechanisms aimed at supporting those goals. These are revolving funds and credit enhancement funds. Both mechanisms can offer governments and the private sector in the region an opportunity to turn the page on their traditional approach to funding the wastewater sector. For a sustainable future, investing in the wastewater sector is not a choice it is an imperative. The region should find ways to strategically fund the wastewater sector; CRew offers some options. The real challenge is changing the current paradigm.

**Denise Forrest,**  
Project Coordinator

## Wastewater Treatment - the Basics

Treatment of sewage is essential to ensure that the receiving water into which the effluent is ultimately discharged is not significantly polluted. However, the degree of treatment required will vary according to the type of receiving water. Thus, a very high degree of treatment will be required if the effluent discharges to a fishery or upstream of an abstraction point for water supply. A lower level of treatment may be acceptable for discharges to coastal waters where there is rapid dilution and dispersion.

**Preliminary treatment:** removes large objects, coarse material and non-degradable materials that can be easily collected from the raw sewage or clog the pumps and sewage lines of primary treatment clarifiers. This can be a manual or mechanical system.

**Sewage treatment generally moves through three stages:**

**Primary treatment:** temporarily holding the sewage in a still basin where heavy, suspended solids can settle at the bottom while oil, grease and lighter solids float to the surface. The settling material (called sludge or bio-solids) and the floating material is removed and the remaining liquid is discharged or pumped onward for secondary treatment. *If discharged at this stage the wastewater will have undergone primary treatment only.*

Sludge from the primary sedimentation tank is pumped to the sludge thickener, where more settling occurs to concentrate the sludge prior to disposal. There are several methods of sludge disposal. E.g. it may undergo lime stabilization to kill potential pathogens.

Primary treatment removes floating and suspended solids which make up about 30 – 35 % Of pollutants that must be removed. While better than no treatment, effluent can still pose some risk to human health and the environment if released in local or near shore surface waters.

**Secondary treatment:** removes dissolved and suspended biological matter, further reducing suspended solids and the BOD of the wastewater. It is a biological process, typically performed by indigenous, water-borne bacteria and algae which metabolize the organic matter in the wastewater. Water may then flow to the final clarifiers (another set of primary sedimentation tanks) for further removal of sludge. It may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment. Depending on the method used, secondary treatment can also remove some of the nitrogen and phosphorus (nutrients) in the wastewater.

(Continued on page 8)



**Preliminary treatment:**  
bar screen.



**Primary treatment:**  
Clarifier

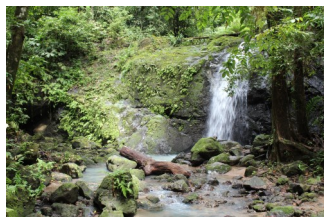


**Sludge digester**



**Secondary treatment:**  
Aeration chamber





## CRew Regional Baseline Assessment looks at the status of the LBS Protocol in Selected Countries

GEF CReW's Regional Baseline Assessment included an assessment of the status of the Protocol Concerning Pollution from Land-Based Sources and Activities (the LBS Protocol) in selected Caribbean countries - Antigua & Barbuda, Barbados, Guyana, Saint Lucia, Saint Vincent & the Grenadines, Suriname and Trinidad & Tobago. This aimed to provide a baseline for the design and implementation of future capacity building interventions.

Of the countries surveyed, Suriname is the only country that has not yet acceded to the Cartagena Convention, while Barbados and St. Vincent & the Grenadines have not ratified or acceded to the LBS Protocol. The other four countries - Antigua and Barbuda, Guyana, St. Lucia and Trinidad & Tobago have ratified or acceded to both the Convention and the Protocol.

The study confirmed that there is a great disparity between the countries with respect to their status in relation to the Protocol. While all of the countries have to some extent sought to prevent, reduce and control pollution of the marine environment from land-based sources and activities, some have made more progress than others. It also confirmed that even those countries that have not yet acceded to the Protocol are undertaking activities that fall within its purview.

The study found that these countries generally face the same challenges and constraints in their efforts to address Protocol related activities, to varying extents:

- Lack of financing.
- Inadequate (and sometimes uncoordinated) policy, legislative and institutional frameworks to facilitate the fulfilment of the countries' obligations under the Protocol.
- Lack of human, financial and technical resources.
- Old infrastructure.
- Lack of adequate maintenance and poor operational systems.
- A need for sustained water quality monitoring programmes as well as more comprehensive information management systems.
- A need for more focussed public awareness and environmental education programmes in respect of pollution of the marine environment.

The assessment covered: the status of river and coastal water quality; status of implementation of Protocol related activities; areas relating to the Protocol that are of greatest concern to the countries; challenges

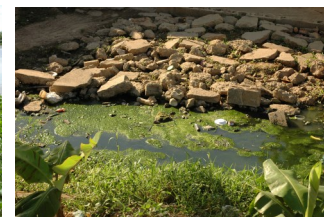
faced in the implementation of the Protocol; and areas where CReW can assist in addressing the challenges faced.

In countries which have not already acceded to the LBS Protocol it also included: areas relating to the Protocol that are of greatest concern; the main stumbling blocks to ratification; a list of areas where CReW can assist in moving the accession process forward; and recommended steps to be taken to accede to the Protocol.

Areas where assistance is needed included the following, most of which were identified by all or most of the countries:

- funding for the development of laboratory capacity in support of monitoring programmes;
- the formulation and implementation of relevant policies;
- enhancing institutional capacity through training and the provision of technical and other assistance;
- the review of the legislative and regulatory framework and drafting of legislation to address the weaknesses and gaps identified;
- the design and implementation of public awareness and environmental educational programmes;
- accessing and adopting more appropriate technology;
- establishing data management systems both for national analytical purposes and for facilitating the exchange of information;
- valuation of the economic impacts of pollution resulting from nutrients and wastewater;
- the provision of "easy" financial arrangements to assist industries in upgrading their treatment;
- developing public awareness programmes;
- guidance on the development of a wastewater permitting systems.

The assessment concluded that all of the countries, whether or not they have acceded to the Protocol, face some challenges in respect of addressing Protocol related activities. Through Component 2: Reforms for Wastewater Management, CReW is working with these countries to prioritize and deliver activities which address some of these needs. It is however up to the countries themselves to commit to the implementation of the Protocol related activities and to integrating them into national agendas and the work programmes of implementing agencies.



## Regional Baseline Assessment Study identifies needs

**...finds political will and stakeholder involvement are key to good wastewater management**

GEF CReW's Regional Baseline Assessment on Wastewater Management, conducted in the latter half of 2012, was meant to inform UNEP CAR/RCU in the design and implementation of capacity building activities under Component 2 of the project. One of CReW's objectives is to provide sustainable financing for the wastewater sector, support policy and legislative reform and foster regional dialogue and knowledge exchange amongst key stakeholders in the Wider Caribbean Region. In addition the assessment will be the foundation of information for a broad group of stakeholders to understand the general and the specific needs that should be considered in the development of National Domestic Wastewater Management Plan (DWMP). This can help WCR governments to meet the requirements of Annex III of the Protocol concerning the control of pollution from land based sources and activities (LBS Protocol, as well as, governments working towards protecting and preserving the marine environment by addressing domestic wastewater management needs.

The Regional Baseline Assessment is currently being prepared from information collected from National Baseline Assessments conducted via questionnaires and interviews. This was preceded by a review of documents produced in the development phase of the project, which helped to identify key areas for inclusion in the assessment: (See Box A).

The Caribbean Water and Sewerage Association (CAWASA) lead this survey. (See Box B.) The Baseline Assessment Questionnaire was developed by Dr. Homero Silva, who gathered and compiled the information for Belize, Costa Rica, Guatemala, Honduras, Jamaica and Panama. World Water and Wastewater Solutions (WWWS) worked with: Antigua & Barbuda, Barbados, Guyana, Saint Lucia, Saint Vincent & the Grenadines, Suriname and Trinidad & Tobago.

Preliminary results of the study were presented by Dr. Homero Silva, Consultant, at the GEF CReW Project's Second Steering Committee Meeting which took place in November 2012 in Costa Rica, and further examined and qualified by Valerie Jenkinson, Consultant working on behalf of CAWASA at the Project's Operational Assessment Training which took place in December 2012 in St. Lucia. Dr. Silva had conducted the review for Belize, Costa Rica, Guatemala, Honduras, Based upon further input from countries the regional baseline assessment report is currently being finalized.

For each country it includes: the national context; an overview of wastewater treatment management; pollution problems and their costs; national policy, legislative and institutional capacity; surveillance and enforcement capacity; manpower capacity; financing; best practices and innovative technological treatment systems; current knowledge, attitudes, behaviours and practices; information collection and sharing; climate change impacts and current issues and challenges.

*(Continued on page 6)*

### BOX A:

#### Areas included in the baseline assessment:

- Wastewater Treatment Management
- Pollution Problems and Their Cost
- National Capacity (policy framework, legislative and institutional framework)
- Surveillance and Enforcement capacity
- Manpower Capacity
- Financing
- Best practices and Innovative technological treatment solutions.
- Current knowledge, attitudes, behaviours and practices
- Information Collection and Sharing
- Water and Sanitation Diaspora Organizations
- Climate change impacts

### BOX B:

Questionnaires administered to government officials at national level asked respondents to provide information on extent of coverage with regard to:

- Sanitation Coverage
- Disposal of treated/untreated wastewater
- Wastewater Reuse
- Type of Reuse
- Quality of Effluent
- Industrial Waste Management
- Tourism/ Hotel Wastewater management
- Institutional Effluent Discharges
- Amount of water Discharged
- Quality of discharge
- Septage/Biosolids Management
- Infrastructure Condition
- Pollution Problems and Their Cost
- Policy framework
- Legislative framework
- Institutional framework
- Surveillance and Enforcement Capacity
- Availability of Staff for Wastewater Management
- National/Regional Training Needs for Wastewater Management
- National/Regional Training Opportunities for Wastewater Management
- National/Regional Training Areas for Wastewater
- Financial Issues
- Best Practices and Innovative technological Treatment solutions
- Current knowledge, attitudes, behaviours and practices
- Information Collection and Sharing
- Organizations support for wastewater management
- Climate Change Impact

(Continued from page 5)

### Summary of findings and recommendations:

**Political will** is necessary to ensure that the policy, regulations and guidelines needed to establish needed national wastewater management plans are put in place. It is also needed for enforcement of regulations and to ensure that the necessary resources – training, incentives and penalties are made available. While the specific needs of countries vary, much can be learned from Industry Best Practices and national planning is essential.

**Stakeholder involvement** / consultation, as well as collective review of legislation and regulations makes good sense given the similar challenges faced by the countries. WWWS recommends that International Best Practices be used as guidelines and that a start could be made, either through the OECS, or by a network of Environmental Ministries and utilities forming a sub-committee to draft policy and legislation that could be adapted to the needs of individual countries.

**Identifying human capacity needs and priority training needs** is also recommended. While comprehensive operational assessments would assess these in detail, in the absence of such, a training needs assessment could be conducted in each country. WWWS suggests the creation of a central regional repository of training opportunities.

In addition, they stress the importance of training in 'soft skills':

*"It is necessary to look beyond technical skills training for wastewater managers. Today's utility has to deal with such aspects as stakeholder engagement, demand side management, sustainability and leadership skills to name a few. Very few engineers or financial managers in wastewater facilities have had training in the 'soft skills'."*

Another survey finding was that there are inadequate levels of awareness about wastewater management concepts, issues and technologies by the general public or government. A deep understanding of technologies is not needed but people need to be aware and have some understanding of wastewater issues, especially as they relate to both public health and the environment.

The **development of a proactive Communication Plan and Outreach Programme for each country** would increase awareness and understanding of the issues and could result in more buy-in to the need of the Government and utility to create sufficient funding to deliver required services. Such plans should have a public health message as their bases.

Insufficient data to run operations with maximum efficiency was a consistent finding of the survey. The recommendation is that **data requirements be documented and a plan put together as to how to collect the data**, beginning with what data is most urgently needed.

## Operational Assessments

### – Making Water and Wastewater Utilities more Efficient

The GEF CReW Project, as part of its capacity building strategy, has to date funded two Operational Assessments in Barbados and in Antigua & Barbuda. These have been conducted by World Water & Wastewater Solutions (WWWS) in partnership with the Caribbean Water and Sewerage Association (CAWASA).

Operational assessments can identify significant areas for improvement. They focus upon making recommendations that can lead to changes in operations making the utility more effective and efficient and, sometimes result in large capital cost savings. (See Box C, page 7, EUM)

The assessments conducted by WWWS focused on the operational level. They provided concrete, achievable recommendations, including an energy audit designed to identify energy cost reduction strategies and savings.

### What is an Operational Assessment?

An operational assessment looks at the day-to-day activities of a utility, the equipment used and includes such aspects of the operation as:

- Energy audit
- Daily water and wastewater operator system checks
- Water system leakage and losses
- Review of routine equipment maintenance checks and approaches to repairs
- Simple recommendations for predictive and preventive maintenance programmes to reduce down time and costs
- Improvements for water and wastewater quality sampling and testing practices
- Identification of efficiencies that can be gained through the use of SCADA
- System security
- Identifying the benefits of critical equipment redundancy
- Data capture for Benchmarking initiatives
- Customer relations
- Clearly defining customer rate classes
- Opportunities to defer capital expenditures through effective conservation
- Financial and budgetary processes
- Power use and related cost reductions
- Human capital planning related to personnel development for Effective Utility Management – ties back to Centre of Excellence with training plan

(Continued on page 7)



(Continued from page 6)

## The Benefits to the Utility

Benefits derived from an Operational Assessment can include:

- Reduced equipment downtime
- Significant deferral of capital investment for upgrading water distribution system through conservation initiatives
- Increased customer satisfaction
- Better equity as a result of rates and tariff reviews
- SCADA upgrades improving response times for emergencies and failures
- Significant improvements to equipment tracking, performance reporting and record keeping
- Improved water quality monitoring and reporting programmes

The WWWS assessment team worked directly with operations and management staff to make practical “on the ground” recommendations for improvement to gain efficiencies in daily operator routines and equipment maintenance and selection. The recommendations provided include detailed information on the latest in industry equipment that is practical, low cost and best suited to the challenges of the site.

## The Assessment Process

Operational assessments are completed using a peer-to-peer review process.

*“This process brings WWWS operations staff that has extensive operational experience together with local utility staff to discuss and review day-to-day operational practices. Operators in the field speak the same “language” and understand each other’s work environment and challenges.”*

- Valerie Jenkinson, WWWS

Information is shared and strengths as well as opportunities for improvement are identified and discussed in all operating areas. Recommendations that include training plans are also provided. All recommendations utilize industry best practices applied based on-site specific operational needs. Simple low cost, yet effective items, are identified and recommendations provided. The length of time an assessment takes depends on the complexity of the operation and the provision of utility documents such as routine check sheets, water and wastewater quality reporting and customer consumption records prior to site work.

OA reports consist of two parts: observations and recommendations. They can include working examples of how operational improvements can be implemented and lists of simple, clearly defined recommendations that serve as a template that can be referred to.

Ref. “Operational Assessment Workbook” developed by World Water and Wastewater Solutions (WWWS) for the GEF CREW Project, Oct –Dec 2012

## BOX C:

### Effective Water Utility Management- EUM

*“for utility managers by utility managers.”*

Utility managers face the common challenge of having to deal with one urgent priority after another. Effective Utility Management (EUM) considers all significant aspects of management in order to help them address a full range of challenges and move toward sustainable operations and infrastructure.

The United States Environmental Protection Agency in 2007 began working collaboratively with six national organizations that support drinking water and wastewater utilities to promote effective utility management based on series of **Ten Attributes of Effective Utilities:**

- Product Quality
- Employee and Leadership Development
- Financial Viability
- Community Sustainability
- Stakeholder Understanding and Support
- Customer Satisfaction
- Operational Optimization
- Operational Resiliency
- Infrastructure Stability
- Water Resource Adequacy

The Attributes can be viewed as a set of building blocks for management improvement opportunities. They provide useful, concise reference points for utility managers seeking to improve organization-wide performance. They describe desired outcomes that are applicable to all water and wastewater utilities. Water and wastewater utilities can use the Attributes to select priorities and measurable objectives for improving their performance based on each organization's strategic objectives and the needs of the community it serves.

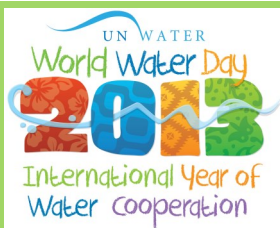
In addition to the Attributes, EUM identifies **five Keys to Management Success:**

- Leadership
- Strategic Business Planning
- Organizational Approaches
- Measurement
- Continual Improvement Management Framework

### Key Resource:

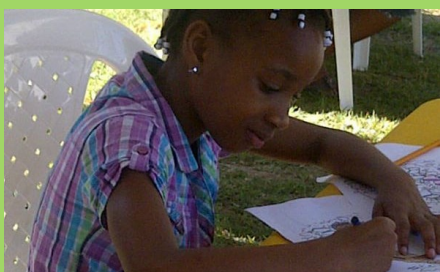
“Effective Utility Management – A Primer for Water and Wastewater Utilities.”

See [www.watereum.org](http://www.watereum.org)



GEF CReW supported UNEP CEP's exhibit in commemoration of World Water Day and

World Meteorological Day, March 22 and 23 in Kingston, Jamaica. 2013 is the International Year of Water Cooperation! This is of fundamental importance to implementation of the CReW. The project planned training in Facilitation for key project partners in March. This was postponed till May 2013 due to circumstances beyond the project's control and will be covered in our next issue.



*The WWD exhibit was popular with the many children at Devon House, Kingston.*

(Continued from page 3)

### Wastewater Treatment—the Basics cont'd:

Secondary treatment uses biological methods such as digestion. It reduces suspended solids and biochemical Oxygen Demand (B.O.D.). After Secondary treatment, effluent can be returned to local and near shore waters posing significantly less risk to human health and the environment than if it only received Primary sewage treatment.

**Tertiary treatment:** anything more than primary and secondary in order to allow release into a sensitive or fragile ecosystem. E.g. treated water may be disinfected chemically or physically (e.g. by lagoons and microfiltration) prior to discharge into a stream, river, bay, lagoon or wetland, or can be used for the irrigation of a golf course or park, or for groundwater recharge, if clean enough.

Tertiary, or advanced, treatment removes all but a negligible portion of bacterial and organic matter. Inorganic pollutants such as nitrogen and phosphorus remaining after Secondary treatment can cause eutrophication of surface water causing blooms of algae. Tertiary treatment provides additional protection of wildlife after discharge into nearby rivers and the sea. It is also necessary if the wastewater is to be reused for recreational purposes, or for drinking water.



*Clarifier, missing sludge pump and chlorination*



*Poorly maintained facultative pond*



## GEF CReW Project Background:

The CReW is a four-year project, funded by the Global Environment Facility (GEF) and implemented by the Inter-American Development Bank (IDB) and United Nations Environment Programme (UNEP). It was established in 2011 and will end in July 2015.

It aims:

- To provide sustainable financing for the wastewater sector
- To support policy and legislative reforms, and
- To foster regional dialogue and knowledge exchange amongst key stakeholders in the WCR.

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

The Project Coordination Group (PCG) is based in Jamaica, at the offices of the IDB and at UNEP's Caribbean Regional Coordinating Unit which is Secretariat to the Cartagena Convention (UNEP CAR/RCU).

Contact Donna Sue Spencer at: [ds@cep.unep.org](mailto:ds@cep.unep.org) for more information or to contribute articles.

### For more information contact:

Caribbean Regional Fund for Wastewater Management Project Coordination Group  
6th Floor, Dyoll Building, Inter-American Development Bank

40—46 Knutsford Boulevard

Kingston 5, Jamaica, W.I.

Phone: (876) - 764—0815

E-mail: [crew@iadb.org](mailto:crew@iadb.org) or [ds@cep.unep.org](mailto:ds@cep.unep.org)