



Caribbean Regional Fund for Wastewater Management



Gap Analysis and Regional Best Practices in Wastewater Management

CEP Technical Report 64



Draft Report

Gap Analysis and Regional Best Practices in Wastewater Management

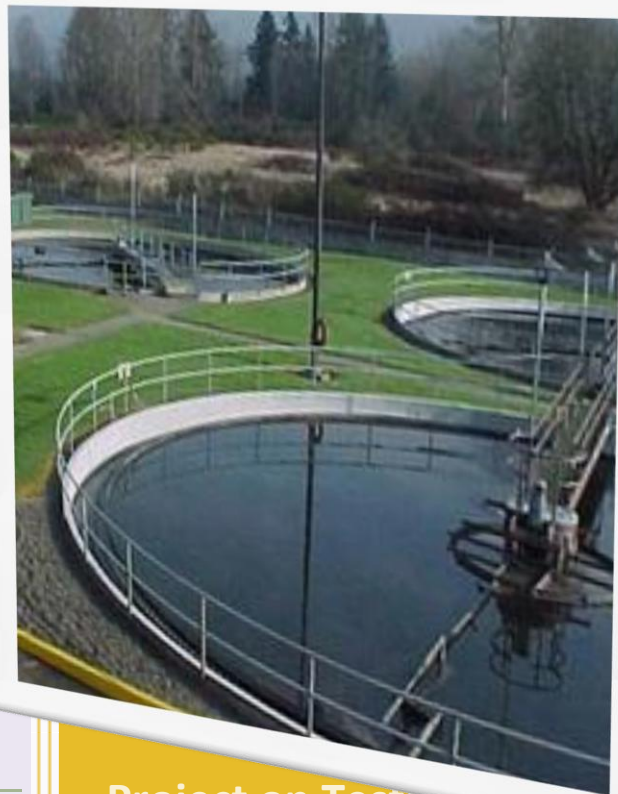
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Sustainability Managers

Promoting development with the environment in mind.....securing a sustainable future



Project on Testing a
Prototype Caribbean
Regional Fund for
Wastewater Management
(CreW)

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Background

The United Nations Environment Programme Caribbean Environment Programme has partnered with the Inter-American Development Bank (IADB) and the Global Environmental Facility (GEF) to develop a Prototype Regional Fund which will provide sustainable financing for environmentally sound and cost-effective wastewater management projects in the Wider Caribbean Region (WCR). Funding for this project is being jointly provided by the IADB and GEF.

The objectives of this project is to improve the capacity of States in the region to fulfil the obligations of the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (also known as the Cartagena Convention) and the Protocol on the Control of Pollution from Land-Based Sources and Activities (LBS Protocol), which are the only regional agreements governing the management and control of polluting substances in the waters of the Wider Caribbean.

The majority of States in the Wider Caribbean Region (WCR)¹ have ratified the Cartagena Convention and signed the LBS Protocol in recognition of the need for shared responses to the threats which land-based sources of pollution pose to population health, the marine environment and economic welfare.

The Cartagena Convention identifies domestic wastewater² as a priority pollutant and Annex III of the LBS Protocol sets out specific obligations of state parties to address the urgent and serious

During the 21st century, water and wastewater management is likely to be one of the most critical resource issues that the Latin American and the Caribbean countries will have to face. All the countries of the region are already facing serious problems in terms of how best to provide a reliable water supply for all uses, and then how to treat the resulting wastewaters adequately. With increasing population growth and accelerating human activities, the regions' water problems are likely to get worse, unless the existing water management processes are significantly improved within a short period of time.

¹ As defined in the Cartagena Convention, the Wider Caribbean Region comprises the marine environment of the Gulf of Mexico, the Caribbean Sea and the areas of the Atlantic Ocean adjacent thereto, south of 30 north latitude and within 200 nautical miles of the Atlantic Coasts of the United States. The countries of this Region (who are also members of the Caribbean Environment Programme) are: Antigua and Barbuda, Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Saint Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Venezuela.

² The LBS Protocol defines "Domestic Wastewater" as "all discharges from households, commercial facilities, hotels, septage and any other entity whose discharge includes the following:

- i. Toilet flushing (black water);
- ii. Discharges from showers, wash basins, kitchens and laundries (grey water); or
- iii. Discharges from small industries, provided their composition and quantity are compatible with treatment in a domestic wastewater system.

Small quantities of industrial waste or processed wastewater may also be found in domestic wastewater."

problem of inappropriate and ineffective wastewater treatment and management.

Numerous scientific studies, including UNEP/ Global Programme of Action's (GPA) 2006 report on the *State of the Marine Environment*, singled out untreated wastewater entering the world's oceans and seas as the most serious problem contributing to marine pollution. In the region, the recent *Caribbean Sea Ecosystem Assessment* (CARSEA) study similarly found that "sewage pollution from land-based sources and from ships has been the most pervasive form of contamination of the coastal environment".

UNEP/GPA estimates that as much as 85 percent of wastewater entering the Caribbean Sea is currently untreated. According to the Pan American Health Organization (PAHO) (2001), 51.5 percent of households in the Caribbean Region lack sewer connections of any kind and only 17 percent of households are connected to acceptable collection and treatment systems.

Within Caribbean SIDS, less than two percent of urban sewage is treated before disposal; this is even lower in rural communities. On some islands (e.g. Antigua and Barbuda, Dominica, Haiti) there is no sewerage system; sewage is disposed mainly through septic tanks and pit latrines, many of which do not comply with minimum technical specifications or are not adequately maintained.

...as a result of rapidly expanding populations, poorly planned development, and inadequate or poorly designed and malfunctioning sewage treatment facilities in most Caribbean countries, untreated sewage is often discharged into rivers and bays.

Indeed, as a result of rapidly expanding populations, poorly planned development, and inadequate or poorly designed and malfunctioning sewage treatment facilities in most Caribbean countries, untreated sewage is often discharged into rivers and bays. This practice has serious repercussions to human health, marine life and ecosystem services, and the already fragile economies. There is thus an urgent need to increase wastewater treatment in the Wider Caribbean, which is presently far below required levels.

While countries increasingly recognize the importance of improving wastewater management, obstacles exist to meeting the obligations of the LBS Protocol and taking such steps necessary to address the problems. UNEP/ GPA reported in the 2006 *State of the Marine Environment Report* that significant financial constraints exist and that there is a lack of adequate, affordable financing available for investments in wastewater management in the Wider Caribbean Region.

Smaller communities, in particular, often find it difficult to obtain affordable financing improving wastewater infrastructure.

In addition to financial constraints, other substantial barriers exist: inadequate national policies, laws and regulations; limited enforcement of existing laws and regulations; poor communication and collaboration between various sectors and agencies which contributes to a fragmented approach to wastewater management; and limited awareness, knowledge and understanding of appropriate, alternative and low cost wastewater treatment technologies. Other limitations in technical capacity (e.g. in developing project proposals, operating and maintaining treatment systems, and monitoring and analyzing wastewater discharges and impacts) constrain progress in effectively managing wastewater.

Furthermore, wastewater treatment is considered by many water utility managers and stakeholders as a low priority. In most cases, provision of a reliable and safe potable water supply ranks first, with the second priority being the collection of sewage by means of covered sewerage systems, and wastewater treatment being the least important.

Most countries in the region have failed to take a long-term, integrated approach to wastewater management and few have made adequate budgetary provisions for and investments in sewerage infrastructure, policy reform and public education. Thus, countries often engage in “opportunistic capital planning” based on the availability of funding from donors or governments, and not on best value and net economic benefit.

It is within this context that the development of innovative financial mechanisms and affordable financing to assist countries within the WCR constitutes a very high priority. This is critical to support, expand or establish domestic wastewater management programmes and policies; and to finance cost effective, sustainable and environmentally acceptable wastewater management facilities that meet the needs of communities and other stakeholders.

The Prototype Regional Fund is being piloted as a possible modality for providing sustainable financing for wastewater management projects in the region while also addressing key capacity constraints within existing legal, institutional, policy frameworks for wastewater management.

Purpose of Gap Analysis and Regional Best Practices Report

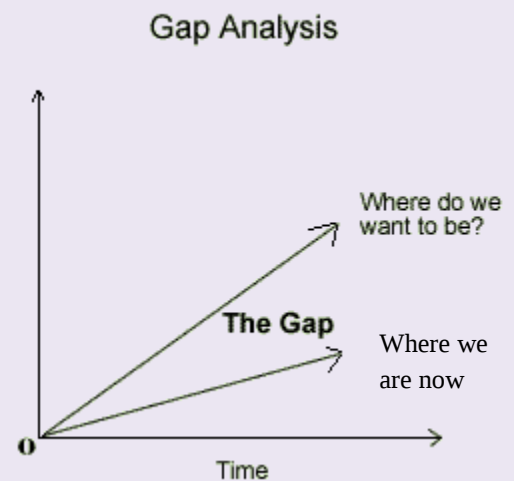
The Situational Analysis, SWOT Analysis and International Best Practices Study and the information contained therein is used to inform the gap analysis and identify the regional best practices in various aspects of wastewater management. This will help to reveal how strengths in some countries may be enhanced and used as models for others.

A matrix of the state of use of wastewater technologies and the policy and legislative framework for wastewater management in the Caribbean will be created; and from this matrix, the capacity needs by country will be able to be identified and grouped. These different/similar needs and circumstances will enable the development of specific TORs for building capacity to address the different wastewater management needs (technological and/or policy and legislative) that will be required in each country.

Defining Gap Analysis

A gap analysis is a technique for determining the steps to be taken in moving from a current state to a desired future state. It includes:

1. Listing of characteristic factors (attributes, competencies, performance levels etc.) of a present situation – “what is” scenario
2. Cross-listing factors required to achieve the future objectives – the “what should be” scenario or the international best practice
3. Highlights the gaps that exist and need to be filled



The Gap Analysis in a Nutshell

A = Where we are today, or the current situation

B = Why the heck aren't we there, or the challenge/frustration in not being in a better situation

C = What we need to get there, or the proposed action required to cross the gap

Proposed Approach and Methodology

Three steps will be undertaken to determine the gaps:

1. Defining the present situation, including regional best practices with respect to wastewater management in the WCR
2. Cross listing the current situation with international best practices in wastewater management
3. Identifying the current gaps with respect to wastewater management in the WCR

The first two steps will be captured in a matrix showing countries aligned to current wastewater management technologies, and their policy and legislative frameworks, the state of their natural environment aligned to the best practices contained in the study of international best practices.

The analysis which follows after the gaps have been identified include specific action steps that must be completed to close these gaps and achieve the proposed goals of proper wastewater management in the WCR. This is the conclusion to this report. The gap analysis will also provide information of the regional best practices in wastewater management.

Key Considerations for Gap Analysis – A Summary of the Current Situation in the WCR

The table below provides a snap shot of some issues related to wastewater management in selected WCR countries. The information contained herein is based on a survey instrument administered in November 2009 at a workshop in Cuba entitled, “Terminal Lessons Workshop for GEF Contaminated Bays and Regional Verification for GEF CReW Projects” at one administered at the “18th Caribbean Water and Wastewater Association Conference” held in St. Thomas in the USVI in October 2009.

WCR Country	Key Wastewater Management Issues/Problems
Antigua and Barbuda	• Discharge of sewage effluent (untreated) from septic tanks and sewage treatment plants • No proper enforcement programme for wastewater discharge
Aruba	• Not all sewage systems are connected to the wastewater treatment facilities (most of them are) • Septic trucks discharge wastewater in illegal places (this is reducing due to new facility that has been constructed specifically for septic tanks) • The polluters are not paying • Lack of legislation and enforcement • Lack of awareness by the general public of wastewater management issues
Bahamas	• Need a comprehensive plan for wastewater • Old treatment plants (6 public plants and many private plants at hotels, businesses, condos – supposed to be monitored by Department of Environmental Health Services) • Wastewater is given low focus compared with water. The focus is on providing everyone with water then deal with sewage. • Septage and sludge facility has become a generic liquid waste facility – overwhelmed. • Rates for septage disposal are low - \$11 per truck – therefore no profit in managing septage leading to low focus • Sewer rates are artificially low and based on fixtures, not

WCR Country	Key Wastewater Management Issues/Problems
	flows (therefore not equitable or appropriate) • BWS is currently governed by Water and Sewage Act. There is a move to separate the regulatory function from the service provision/utility function.
Barbados	• Financing for maintenance of wastewater treatment systems • Human capacity (numbers and technical skills) for monitoring and maintenance • Inadequate treatment of domestic wastewater • Cost of installation of wastewater systems due to the spatial distribution of development
Belize	• Incomplete treatment of industrial effluent due to technology and capacity shortfalls • Booming tourism industry – more resorts being built in coastal and off-shore sites • Inadequate treatment of municipal wastewater
Colombia	• Wastewater treatment systems inadequate due to operation and maintenance (O&M) not being identified as an important factor • Weak compliance of wastewater treatment standards by industry and municipalities
Cuba	• Inadequate coverage of sewage and wastewater treatment • Defectiveness of some sewerage systems (leakage, tears, insufficient capacity of collectors, obstructions, illegal interconnections, stormwater runoff, operational problems of pumping stations among others) and its existence in part in many cases • Deterioration of processing systems due to lack of maintenance and rehabilitation • Insufficient implementation of a system of regular monitoring • Insufficient reuse of treated wastewater • Employment of obsolete technologies • Evidence of organizational and technological indiscipline

WCR Country	Key Wastewater Management Issues/Problems
	- in industry - Practices of cleaner production has been incorporated only partially
Dominican Republic	- Majority of the existing domestic water treatment plants not operating - Lack of drainage and sewers - Insufficient institutional capacity - Low awareness among industry and general public
Grenada	Inadequate infrastructure – no treatment plants
Guatemala	- Lack of compliance with regulations among government agencies - Weak data collection and monitoring
Guyana	- Untreated and poorly treated sewage - Lack of water treatment facilities - Discharge of waste from distilleries - Surface runoff (pesticides) - Operation and maintenance of sewer system
Haiti	- Industries/companies without wastewater treatment - Lack of drainage in “new” neighbourhoods without control or urban infrastructure - Lack of industrial and community wastewater treatment plants - Lack of application of existing legislature - Lack of awareness in the public and private sector
Jamaica	- Lack of adequate numbers of sewage treatment plants. - Majority of plants treat only to secondary level - Low or no maintenance of existing plants - Improper planning/development practices - Lack of adequate enforcement of existing legislation
Panama	- Treatment plants not fulfilling their objectives - Lack of awareness in regards to wastewater management in the industrial sector - Insufficient institutional capacity - Lack of compliance with existing regulations by wastewater treatment plant operators, construction

WCR Country	Key Wastewater Management Issues/Problems
	companies
St. Lucia	• An absence of wastewater management in most communities except for the main city • Absence of policies • Water and sewage company has the mandate but does not have the financial capacity • Lack of synergy among government institutions • Inability of government institutions to enforce laws and regulations
St. Vincent & the Grenadines	• Collection facility handling sewage from the capital city is in fair to poor condition and requires extensive refurbishment • ineffective sewage treatment systems used by hotels on the South Coast • Lack of comprehensive wastewater legislation
Suriname	• No wastewater treatment facilities in place • Lack of political will • Lack of institutional capacity • Lack of policies and laws in regard to wastewater • No effective monitoring • Lack of awareness and information sharing; no transparency
Trinidad and Tobago	• Release of untreated wastewater into receiving environment • Aging infrastructure that is below required capacity • Increase in number of private wastewater treatment plants that are not supervised by state agency; many dysfunctional • Increase of industrial wastewater production as new industries begin operation – industrial estates • Increase in thermal pollution in addition to nutrient pollution • Use of chemical pesticides in agricultural lands has increased • Increase in aggregate demand under 150 ha are not controlled by environmental law (no EIA required) • Increased hillside development has led to increased stormwater run-off and flash flooding in capital city

WCR Country	Key Wastewater Management Issues/Problems
Venezuela	• Low coverage in the country's interior • Lack of wastewater projects to implement plans • Lack of environmental education for the public • Lack of implementation of the existing laws, particularly in industry and private sector

The main wastewater management issues and problems (most pressing) highlighted in the table could be grouped according to similarity of issue among countries. The management issues/problems could be categorized into the following issues:

1. Poor attitudes and low levels of awareness of wastewater management issues
2. Poor practices
3. Low levels of enforcement
4. Need for improvements in legislative and policy frameworks
5. Low levels of capacity
6. Old/inadequate infrastructure and technologies

The table below shows each of the categories above aligned by country show similarity of issues faced by countries in wastewater management. The numbers 1 to 6 in the first row of the table correspond to the issues highlighted in the bulleted list above. The table below shows that participants felt that poor attitudes and low levels of awareness of wastewater management issues coupled with poor practices and old infrastructure and technologies were the most pressing concerns of countries. Low levels of capacity (technical) were cited as the least concern of participants. Much of the discussion defined here appears in the analysis in this gap analysis.

Country	1	2	3	4	5	6
Antigua and Barbuda						
Aruba						
Bahamas						
Barbados						
Belize						
Colombia						
Cuba						
Dominican Republic						
Grenada						
Guatemala						
Guyana						

Country	1	2	3	4	5	6
Haiti						
Jamaica						
Panama						
St. Lucia						
St. Vincent & the Grenadines						
Suriname						
Trinidad and Tobago						
Venezuela						



Guiding Principles for Wastewater Management

The following guiding principles provide a suitable basis for sound management of water pollution.

1. Prevent pollution rather than treating symptoms of pollution

Past experience has shown that remedial actions to clean up polluted sites and water bodies are generally much more expensive than applying measures to prevent pollution from occurring. Although wastewater treatment facilities have been installed and improved over the years in many countries, water pollution remains a problem, including in industrialized countries. In some situations, the introduction of improved wastewater treatment has only led to increased pollution from other media, such as wastewater sludge. The most logical approach is to prevent the production of wastes that require treatment. Thus, approaches to water pollution control that focus on wastewater minimization, in-plant refinement of raw materials and production processes, recycling of waste products, etc., should be given priority over traditional end-of-pipe treatments. In many countries, however, an increasing proportion of water pollution originates from diffuse sources, such as agricultural use of fertilizers, which cannot be controlled by the approach mentioned above. Instead, the principle of "best environmental practice" should be applied to minimize non-point source pollution. As an example, codes of good agricultural practice that address the causes of water pollution from agriculture, such as type, amount and time of application of fertilizers, manure and pesticides, can give guidance to farmers on how to prevent or reduce pollution of water bodies. Good agricultural practice is recognized by the United Nations Economic Commission for Europe as a means of minimizing the risk of water pollution and of promoting the continuation of economic agricultural activity (UNECE, 1993).

2. Use the precautionary principle

There are many examples of the application and discharge of hazardous substances into the aquatic environment, even when such substances are suspected of having detrimental effects on the environment. Until now the use of any substance and its release to the environment has been widely accepted, unless scientific research has proved unambiguously a causal link between the substance and a well-defined environmental impact. However, in most cases it takes a very long time to establish such causal links, even where early investigations suggest clear indications of such links.

When, eventually, the necessary documentation is provided and action can be taken to abandon the use of the substance, substantial environmental damage may already have occurred. Examples of such situations include a number of pesticides which are now being abandoned because contamination of groundwater resources has been demonstrated. The examples clearly show that action to avoid potential environmental damage by hazardous substances should not be postponed on the grounds that scientific research has not proved fully a causal link between the substance and the potential damage (UNECE, 1994).

3. *Apply the polluter pays principle*

The polluter pays principle, where the costs of pollution prevention, control and reduction measures are borne by the polluter, is not a new concept but has not yet been fully implemented, despite the fact that it is widely recognized that the perception of water as a free commodity can no longer be maintained. The principle is an economic instrument that is aimed at affecting behaviour, i.e. by encouraging and inducing behaviour that puts less strain on the environment. Examples of attempts to apply this principle include financial charges for industrial waste-water discharges and special taxes on pesticides. The difficulty or reluctance encountered in implementing the polluter pays principle is probably due to its social and economic implications. Full application of the principle would upset existing subsidized programmes (implemented for social reasons) for supply of water and removal of wastewater in many developing countries. Nevertheless, even if the full implementation of the polluter pays principle is not feasible in all countries at present, it should be maintained as the ultimate goal.

4. *Apply realistic standards and regulations*

An important element in a water pollution control strategy is the formulation of realistic standards and regulations. However, the standards must be achievable and the regulations enforceable. Unrealistic standards and non-enforceable regulations may do more harm than having no standards and regulations, because they create an attitude of indifference towards rules and regulations in general, both among polluters and administrators. Standards and regulations should be tailored to match the level of economic and administrative capacity and capability. Standards should be gradually tightened as progress is achieved in general development and in the economic capability of the private sector. Thus, the setting of standards and regulations should be an iterative and on-going process.

5. *Balance economic and regulatory instruments*

Until now, regulatory management instruments have been heavily relied upon by governments in most countries for controlling water pollution. Economic instruments, typically in the form of wastewater discharge fees and fines, have been introduced to a lesser extent and mainly by industrialized countries. Compared with economic instruments, the advantages of the regulatory approach to water pollution control is that it offers a reasonable degree of predictability about the reduction of pollution, i.e. it offers control to authorities over what environmental goals can be achieved and when they can be achieved (Bartone et al., 1994). A major disadvantage of the regulatory approach is its economic inefficiency. Economic instruments have the advantages of providing incentives to polluters to modify their behaviour in support of pollution control and of providing revenue to finance pollution control activities. In addition, they are much better suited to combating nonpoint sources of pollution. The setting of prices and charges are crucial to the success of economic instruments. If charges are too low, polluters may opt to pollute and to pay, whereas if charges are too high they may inhibit economic development. Against this background it seems appropriate, therefore, for most countries to apply a mixture of regulatory and economic instruments for controlling water pollution. In developing countries, where financial resources and institutional capacity are very limited, the most important criteria for balancing economic and regulatory instruments should be cost-effectiveness (those that achieve the objectives at the least cost) and administrative feasibility.

6. *Apply water pollution control at the lowest appropriate level*

The appropriate level may be defined as the level at which significant impacts are experienced. If, for example, a specific water quality issue only has a possible impact within a local community, then the community level is the proper management level. If environmental impacts affect a neighbouring community, then the appropriate management level is one level higher than the community level, for example the river basin level. On a wider scale, the appropriate management level may be the national level for major water bodies where no significant water pollution impacts are anticipated for neighbouring states. Where significant impacts occur in several nations, the appropriate management level is international (e.g. an international river basin commission). The important point is that decisions or actions concerning water pollution control should be taken as close as possible to those affected, and that higher administrative levels should enable lower levels to carry out decentralised management. However, in considering whether a given administrative level is appropriate for certain water pollution control functions, the actual capacity to achieve these functions (or the possibility of building it) at that level should also be taken into account. Thus, this

guiding principle intends to initiate a process of decentralisation of water pollution control functions that is adapted to administrative and technical feasibility.

7. Establish mechanisms for cross-sectoral integration

In order to ensure the coordination of water pollution control efforts within water-related sectors, such as health and agriculture, formal mechanisms and means of cooperation and information exchange need to be established. Such mechanisms should:

- Allow decision makers from different sectors to influence water pollution policy
- Urge them to put forward ideas and plans from their own sector with impacts on water quality
- Allow them to comment on ideas and plans put forward by other sectors. For example, a permanent committee with representatives from the involved sectors could be established. The functions and responsibilities of the cross-sectoral body would typically include at least the following:
 - i. Coordination of policy formulation on water pollution control
 - ii. Setting of national water quality criteria and standards, and their supporting regulations
 - iii. Review and coordination of development plans that affect water quality
 - iv. Resolution of conflicts between government bodies regarding water pollution issues that cannot be resolved at a lower level

8. Encourage participatory approach with involvement of all relevant stakeholders

The participatory approach involves raising awareness of the importance of water pollution control among policy-makers and the general public. Decisions should be taken with full public consultation and with the involvement of groups affected by the planning and implementation of water pollution control activities. This means, for example, that the public should be kept continuously informed, be given opportunities to express their views, knowledge and priorities, and it should be apparent that their views have been taken into account. Various methods exist to implement public participation, such as interviews, public information sessions and hearings, expert panel hearings and site visits. The most appropriate method for each situation should take account of local social, political, historical, cultural and other factors. In many countries in transition, for example, only professional and scientific experts usually participate and other groups have mostly been excluded from the process. Public participation may take time but it increases public support for the final decision or result and, ideally,

contributes to the convergence of the views of the public, governmental authorities and industry on environmental priorities and on water pollution control measures.

9. *Give open access to information on water pollution*

This principle is directly related to the principle of involvement of the general public in the decision-making process, because a precondition for participation is free access to information held by public authorities. Open access to information helps to stimulate understanding, discussions and suggestions for solutions of water quality problems. In many countries, notably the countries in economic transition and the developing countries, there is no tradition of open access to environmental information.

Unfortunately, this attitude may seriously jeopardize the outcome of any international cooperation that is required.

10. *Promote international cooperation on water pollution control*

Trans-boundary water pollution, typically encountered in large rivers, requires international cooperation and coordination of efforts in order to be effective. Lack of recognition of this fact may lead to wasteful investments in pollution load reductions in one country if, due to lack of cooperation, measures are introduced upstream that have counteractive effects. In a number of cases (e.g. the Danube, Zambezi and Mekong rivers), permanent international bodies with representatives from riparian states have been successfully established, with the objective of strengthening international cooperation on the pollution control of the shared water resources.

Undertaking the Gap Analysis

The main gaps in wastewater management in the WCR are presented in the matrix below. The gaps are essentially derived from subtracting the current state prevailing in the WCR countries from the goal state or the international best practice. The first column lists the area/aspect of wastewater management being examined and they are as follows:

1. Policy Framework for Wastewater Management
2. Wastewater Management Technologies
3. Legislative Framework and Supporting Regulations for wastewater management
4. Institutional Arrangements for Wastewater Management
5. Education and Training in Wastewater Management
6. Public Awareness in the Wastewater Management Sector
7. Financial Sustainability of the Wastewater Management Sector

This simple exercise also enables a pull-out of the best practices in the WCR countries.

The current state column defines the prevailing state in the WCR countries. The current state is not disaggregated by country but simply provides the general state in the Caribbean. It is for this reason that the column highlighting WCR Country Best Practice becomes important because the best practice country in any particular aspect would essentially be different to the current state of the other countries.

The goal state includes examples of best practices in wastewater management and demonstrates:

- Initiatives which integrate water resource management, coastal zone management, environmental management, waste management and human health issues
- Stakeholder participation in the development of policy and practice
- High levels of public education and awareness in wastewater management and general environmental management and/or sanitation and hygiene
- Innovative technologies used in treatment plants
- Culturally acceptable technologies and practices for wastewater management in households and industry
- Widespread use of clean technologies in industry
- High levels of capacity of institutions that deal with wastewater
- Cohesive institutional framework for delegating responsibilities and management

- Innovative and sufficient financing for wastewater management
- Holistic approaches to training and development of human resource capacities

The WCR best practice country can be defined as one in which its current state is close to or surpasses the criteria in the best practice case.

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
Policy Framework for Wastewater Management	38% of the countries in the WCR can be considered to have a weak policy and legislative framework, translating into poor practices; while 23% (countries such as Colombia, Cuba, and the Dominican Republic) have made considerable progress and provide a comprehensive framework for wastewater management in their country. Some countries have integrated water and wastewater management plans. There are only a few countries that made the link between clean, safe potable water and good sanitation have a national water policy which addresses not just issues related to drinking water, but also to the issue of wastewater management as well, including sewage treatment and disposal.	Wastewater management within a country is guided by a national policy on sanitation which can promote the importance of sanitation, and set priorities and mobilize resources for addressing sanitation needs at different levels within the country. A sanitation policy exists that addresses the costs associated with implementing it: capital costs required for sanitation infrastructure and facilities; recurrent costs required to operate and maintain the facilities and; programme costs for such aspects as training, institutional development, community organization and hygiene improvement There is a strong focus on wastewater management in national development plans.	Jamaica has a draft national sanitation policy. Guatemala also has developed a National Plan of the Public Services of Potable Water and Sanitation for Human Development 2008-2011. The Jamaica Water Sector Policy (1999) and the Draft National Water Policy for St. Lucia are examples of policies that have integrated waste and wastewater management	Lack of national policy on sanitation in most WCR countries – more than 38% of the countries in the region do not have national sanitation policies. Lack of infusion of wastewater management issues in national water policies Low levels of infusion of wastewater management issues in overall national development planning

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	Many of the countries in the WCR have environmental policies which highlight sewage pollution as a major national concern and identify wastewater management and pollution control as a priority.	Political will exists to fully implement policies	There is growing recognition among governments in the region of the importance of holistic national sustainable development planning and some countries in the region have national development plans all of which include environmental protection with wastewater management included as a sub-component. Noted examples of this are in: • Barbados • Trinidad and Tobago • Guatemala	

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
			Barbados' Five-year National Development Plan includes a focus on wastewater management Guatemala has a comprehensive National Plan of the Public Services of Potable Water and Sanitation for Human Development 2008-2011	
Wastewater Management Technologies	There are numerous technologies to deal with the disposal of wastewater throughout the world. Many of these technologies have been used in the Caribbean but, for many reasons have failed including: inappropriate technology, insufficient operation and maintenance practices, lack of funding and lack of skilled personnel,	Wastewater is considered a potential resource in a country's water management system. There is a shift in thinking – from seeing waste as a drain on resources to seeing it as an economic and environmental opportunity. Sewage, household grey water and wastewater for example, contain potential sources of fertilizer and energy. Treated effluent will replenish	Aruba has adequate sanitation infrastructure for its citizens. Trinidad & Tobago: Water Reuse Project to Boost Supply to Domestic Customers – this wastewater	Old technologies and infrastructure Lack of infrastructure coverage Insufficient number of treatment plants Low levels of skilled

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	The majority of countries in the WCR, approximately 81% have poor practices with regard to sanitation and wastewater infrastructure. In many countries, this is due to the use of old technologies and infrastructure. For example, in Grenada the system was constructed in the 1920s for lower volume and can no longer handle the country's current needs. Throughout the region, there are insufficient numbers of treatment plants and those that do exist do not function adequately, largely due to improper operation and maintenance. There are signs of pending improvement: Trinidad and Tobago's Water and Sewage Authority is committed to an infrastructure upgrade. Some countries in the WCR still dispose untreated sewage into marine areas. The effectiveness of existing sewage collection and treatment facilities in	water courses or be reused directly for many purposes. Better management of wastewater contributing to a solution to water scarcity as well as water pollution. Key characteristics of technology for wastewater management should be: • Efficient to carry out the function and perform at optimum levels • Reliable - the system must accommodate the normal inflow variations, as well as infrequent, yet expected, more extreme conditions. • Be accompanied by institutional manageability - to plan, design, • construct, operate and maintain treatment plants require appropriate technical and managerial expertise; these include a substantial number of engineers with postgraduate education in wastewater engineering, access to a local network of research for scientific support and problem solving, access to good quality laboratories, and experience in management and cost recovery	Reuse project earmarked for the new Beetham Wastewater Treatment Plant will provide some 20 million gallons per day of high-quality industrial water for use by the Point Lisas Industrial Estate In Jamaica, developers are now asked to be responsible for the construction and maintenance of sewage treatment plants for new residential developments.	personnel in the wastewater management sector including weak operational skills and process understanding Low levels of maintenance of sewage treatment plants and absence of preventative maintenance Lack of training in operation and maintenance of current and imported technologies Financial constraints to implementing new technologies Reliance on imported technologies that are sometimes difficult to

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	the region is usually constrained by limited capacity, poor maintenance, process malfunction, poor maintenance practices, and lack of experienced or properly trained staff. Most collection and treatment facilities dispose of their effluent and wastes directly into the marine environment, resulting in high coliform concentrations and low dissolved oxygen levels in coastal waters. In rural areas of the WCR, collection systems are rarely used, and pit privies, latrines, or septic tanks are the most common waste disposal systems. These processes can be effective, provided they are designed, installed, maintained, and used properly. Of 138 plants in the region or 46% of all plants in 1992, only 25 % were operating effectively, 36 % were operating moderately, 22 % were operating poorly and 13 % were not	- Financially sustainable - Can be applied in reuse schemes related to for example - agricultural irrigation, aqua- and pisciculture, industrial cooling and process water re-use Use of environmentally sustainable technologies (ESTs) in the wastewater management sector which encompass technologies that have the potential for significantly improving environmental performance relative to other technologies. Broadly speaking, these technologies: - protect the environment - are less polluting - use resources in a sustainable manner - recycle more of their wastes and products - handle all residual wastes in a more environmentally acceptable way than the technologies for which there are substitutes Furthermore, as presented in Chapter 34		maintain Lack of adequate regulations and approval procedures; Limited inspection procedures and programmes Poor financial resources allocations in the sector Absence of operation and maintenance manuals Limited operational support and service contracts Inadequate process monitoring and inadequate laboratory facilities Inappropriate selection

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	operational Most wastewater operators have no formal training (72%), but possess knowledge of wastewater treatment through on the job training, private studies and experience. Good and moderately plants have higher percentages of certified operators.	of Agenda 21, Environmentally Sound Technologies are not just “individual technologies, but total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures.” This requires both the human resource development (including gender relevant issues) and local capacity building aspects of technology choices. There is also the need to ensure that ESTs are compatible with nationally determined socio-economic, cultural and environmental priorities and development goals.		of technologies Unavailability of spare parts
Legislative Framework and Supporting Regulations for wastewater management	No one country in the WCR has all the legislation listed in the goal state. For example, only three countries in the WCR have legislation for urban waste management and few countries have national sewage effluent standards. Jamaica is one of the few countries in the WCR to develop draft sewage sludge regulations.	Have existing legislation and the supporting regulations for: - management of urban waste (especially important for the expanding urban areas in the Caribbean) - protection of waters against nutrient pollution caused by agricultural sources - defining good agricultural practices - governing the use of pesticides in	Colombia, Dominican Republic and Mexico have the majority of the legislation and supporting regulations highlighted in the best practice. Colombia has 67% with about 2	General lack of standards, regulations and guidelines for effective wastewater management vis-à-vis the goal state. Outdated pieces of legislation. Lack of a

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	There is fragmentation of legislative instruments for wastewater management. In some cases, where there is legislation it is outdated does the reflect modern realities. In some countries pieces of legislation and/or regulations for wastewater management date back to the 1960's In most countries, there are various different legislative instruments, governing from protection of public health to conservation of ground and surface freshwater resources, which may or may not be leading to the desired outcome of better management of wastewater. There is inadequate capacity to enforce wastewater laws as well as surveillance and monitoring laws. There also exist low levels of compliance with standards in some of the countries.	agriculture • determining various levels of treatment standards e.g. primary or secondary treatment • marine areas especially waters containing fish • reducing contamination by specific pollutants • the inclusion of public education in the promotion of sound wastewater management practices • integrated water resources management • addressing industry by type • handling stormwater runoff • creation of marine protected areas and prohibition of discharges to these areas or the use of greater restrictions for discharges to these areas Standards and emission limits for: • sewage treatment plants that discharge pollutants into fresh and marine waters • municipal wastewater • construction and operation of	additional pieces in draft stage; while Dominican Republic and Mexico has 72% of the legislation mentioned in the goal state. Jamaica can be defined as a best practice as it relates to its sewage sludge regulations.	comprehensive legislative framework for wastewater management. Need for a comprehensive review of the existing legislative framework in WCR countries In most countries, full enactment of obligations of Annex III of the LBS Protocol into national law has not yet been achieved in most countries. Low levels of enforcement of wastewater management laws due primarily financial and human resource capacity constraints. Need for development of comprehensive

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
		wastewater treatment plants Guidelines and codes of practice for: • use of recycled water • management of septic tanks • management of public toilets • environmental management systems in industries		compliance and enforcement plans and programmes for managing the environment as a whole
Institutional Arrangements for Wastewater Management	Most countries have a designated national provider of water and wastewater services. However, many of these organizations suffer from low levels of technical capacity. Notwithstanding this, responsibility for aspects of wastewater management resides with several separate government institutions. The sanitation services that these institutions provide are often deficient. The sector is typically under-funded, and the financial situation of water and wastewater authorities has been deteriorating over many years (largely attributable to a low level of cost recovery in the	The existence of a national water apex body” which formulates and coordinates policies, programmes and standards relating to the water and wastewater sector; and regulates and monitors water/wastewater utilities. Because water issues cut across a number of departments/ministries, the apex body has representations from the highest levels of government is multi-sectoral in nature. “Apex bodies” are generally policy making and coordinating bodies but they also define specific and time-bound targets in water resources management, and ensure that these targets are	Bahamas can be designated a best practice as it has in place a quasi government body (organization) responsible for wastewater management whose mandate includes the development and implementation of a National Water and Wastewater Plan that reinforces Integrated Water Resource Management (IWRM) to enable good	National water apex body are not commonplace in WCR countries. Need for clearly defined capacity assessment studies for wastewater management within all entities dealing with aspects of wastewater management towards providing concrete recommendations for improved structures that will result in improved

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	sector). This has led to insufficient investment in the sector and poor maintenance of wastewater management infrastructure and equipment.	enforced and attained. Apex body policies are translated into action at all levels. The Apex body has the participation of the entire water sector, including water users, to facilitate the implementation and coordination of policies.	quality and expanded services, operation and maintenance of all facilities for the collection, treatment and disposal of wastewater, including opportunities for wastewater reuse, and to achieve the transfer of appropriate technology. In Colombia, a new institutional framework is being developed with clear roles of the water sector entities. There is strong momentum from the central level with financial support and for the creation of sanitation projects.	environmental conditions. No clear or weak legislative direction for agencies [involved in wastewater management] with respect to wastewater management Overlap of responsibility among various agencies and fragmented approach in the institutional framework with respect to wastewater management Low levels of technical capacity in areas such as: operations and maintenance; Low numbers of technical staff for

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
				wastewater management in some WCR countries Low levels of financial resources in the sector – resources often provided for access to water as opposed to wastewater management services
Education and Training in Wastewater Management	It has been found that most operators have had no formal training, but gain knowledge of wastewater treatment through on the job training, private studies and experience. A recent “market place” exercise for water utilities in the region revealed that their greatest training need was in operations and maintenance knowledge and skill development and in setting tariffs and fees. To assess the level of knowledge among government leaders and	USA: National Menu of Best Management Practices (BMPs) for Stormwater – this is an example of a best practice The US EPA maintains a National Menu of Best Management Practices (BMPs) for Stormwater Phase II that provides BMP information for all aspects of the Stormwater Phase II Rule (public education, public involvement, illicit discharge detection & elimination, construction, post-construction, pollution prevention/good housekeeping) (USEPA n.d.). For each	Some regional utilities some levels of expertise and are willing to provide training as follows: Some regional utilities some levels of expertise and are willing to provide training as follows: CORAAPPLATA (Dominican Republic) - Community participation and training	Training programmes are not systemic, but include more ad hoc workshops Insufficient funding allocated to long-term training programmes Need specific programmes for decision makers to increase appreciation of importance of the sector

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	decision makers, the perceived level of “political will” was examined, as well as actions taken by these leaders with respect to wastewater management and sanitation. It can be deduced that in 62% of the countries, the key decision makers do not have adequate knowledge of wastewater management issues; while only about 38% having a moderate level of knowledge.	aspect, the website provides background information, fact sheets, guidelines, legal requirements, and resources. For example, the BMP page for public education includes guidelines for conducting an outreach strategy, classroom education, interacting with the media; information for homeowners and businesses on how to reduce pollution of water emitted by their establishments; case studies of public education programmes; and communication resources such as videos, flyers, fact sheets and other outreach materials. A collaborating mechanism among water operators, recognizing that the greatest capacity to improve the delivery of water and sanitation services is found in the operators themselves. Partnerships between operators present a way to improve and extend basic water and sanitation services to all consumers. A Water Operators Partnership (WOP) is defined as any form of simple or	Guyana Water Inc. - strategic planning Barbados Water Authority - energy efficiency (in ww sector) CWWA has periodic training sessions in various aspects of wastewater management New CARIWOPS network being formed for sharing data and expertise among regional water/wastewater operators	

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
		structured partnership aimed at capacity building on a not-for-profit basis		
Public Awareness in the Wastewater Management Sector	There is a general acceptance within the region that the level of awareness about environmental issues in general is low, and that there is wide-spread need for more public education. It can be assumed that knowledge about wastewater management and sanitation issues is no higher than about general environmental issues and in many cases is lower, since many persons are more aware of issues related to solid waste management and deforestation. Most environmental management agencies in the region have public environmental education as part of their mandate and most, if not all, environmental education programmes will include sanitation and wastewater issues. However, targeted interventions focusing on	Public education/communication programmes include public awareness campaigns and educational programmes designed to raise awareness about water and sanitation issues and to implement good water conservation and protection practices. A combination of mass-media campaigns (using electronic more than print media) and more focused small group interactions – including in the formal education system – is required to increase awareness and understanding and to change attitudes among the general public. Good relationships should be established between communities and government officials and other “knowledgeable persons” in order to create trust that “those people know what they are talking about.”	Cuba has a number of environmental education initiatives focused on particular bays and watersheds which have been effective in educating local communities who have a stake in that particular watershed. In Jamaica, environmental issues, including sanitation, are integrated into the formal school curricula, beginning in primary schools. In Jamaica, environmental	Lack of a structured public awareness campaign focussing on wastewater management issues – but taking into account the different cultures and needs of each of the countries – in essence an umbrella campaign but customized for each WCR country

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	specific sanitation issues are necessary, especially in some communities.		issues, including sanitation, is integrated into the formal school curricula, beginning in primary schools and this could be used as a model to include wastewater management issues in WCR countries.	
Financial Sustainability of the Wastewater Management Sector	A few countries have dedicated funds for wastewater, for example, Belize which has an effluent licence fee of BZ\$ 300 per annum for industries, but they are woefully inadequate. Wastewater management is low priority in most countries, when compared with water supply. In Trinidad & Tobago, only 6% of the budget for wastewater and water production allocated specifically for wastewater treatment. This is true in Panama as well.	Involving communities in the provision of sanitation services to ensure that any service that is provided is what the community wants. A community may be able to provide in-kind contribution such as labour towards the construction of a wastewater collection system. With a simple on-site wastewater system, the community may be able to do most of its construction. Knowledge of technology options is therefore essential to a community to decide which one to choose, because in the end they have to pay for both the investment and operating costs if the service is to be	Jamaica's "k factor" – a charge applied to water bills that is to be applied soon in water treatment projects	Low levels of financing and investments in the wastewater management sector Wastewater management a low priority in most islands – resulting in minimal allocations in the national budgets No sewer tariffs or low tariffs resulting in low levels of resources

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	The sustainability of financing is a major limiting factor in WCR countries. The broad conclusion of the Assessment of Operational Status of Wastewater Treatment Plants in the Caribbean (CEHI, 1992) study was that the performance of the treatment plants was generally poor, and this was accounted for as a result of poor maintenance and management owing to poor financial resources for these activities. In the Caribbean, the primary source of funding for wastewater management initiatives is annual grants to utilities from the central government. Some countries engage in borrowing arrangements, and in a one case (Grenada), financing comes from the national social security fund. The countries of Central America typically fund projects through grants and loans from central government to local water providers.	sustainable in the long term.		accrued to the sector Weak regulations Poor condition and insufficient knowledge of networks and customer bases Currency mismatch between revenues and financing sources Local governments and utilities lack the financial capacity or regulatory framework and governance to act as credible financial partners

Wastewater Management Target Areas for Consideration	Current State	Goal State (International Best Practice)	WCR Country Best Practice	Main Gaps
	Within the Wider Caribbean Region, some of the main challenges to private sector financing of wastewater projects include: Difficult sector for attracting private capital, operational skills, and management expertise High capital intensity Political pressure on tariffs and conviction of water and wastewater services as a “free” good; Lack of sub-sovereigns access to financing Low level of risk mitigation instruments			

Closing the Gaps –Examples of Key Initiatives and Potential Sub-Projects

The identified in the matrix above, provide the basis for identifying key needs or early projects to address some of the main issues in wastewater management in the WCR. These needs and potential sub-projects are categorized under the following headings:

- Institutional
- Legislative
- Policy Framework
- Technology
- Education and Awareness

This is by no means an exhaustive list, but can form part of the needs assessment report and well as in the development of the overall project proposal.

Institutional Sub-Projects

- Conduct capacity assessment studies of institutions in the regions to determine levels of capacity for wastewater management and the required interventions to improve efficiency and effectiveness
- Develop capacity development plans for wastewater management based on the findings of the capacity assessment studies
- Develop business models for Institutions responsible for wastewater management in the WCR in order to increase their efficiency as well as their effectiveness towards creating improvements in operations and management
- Undertake studies to determine the feasibility of wastewater collection and treatment becoming the responsibility of municipalities as well as for the management (operation, maintenance and cost recovery) to be delegated to private enterprises.
- Strengthen administrative arrangements for planning the delivery of water services at national and local levels
- Develop mechanisms to enable better management of data – from collection through to management and use

Legislative Sub-Projects

- Conduct a robust review of legislative frameworks across WCR countries to determine best drafted legislation, most innovative etc and provide the basis for these to be used to develop appropriate template for legislation development across the WCR
- Develop a series of templates for drafting instructions on the ideal suite of legislation to be adopted/adapted by WCR country

Policy Sub-Projects

- Develop a framework template for the development of sanitation policies in all WCR countries taking into account the key issues/differences of these countries
- Prepare guidelines for enabling policy makers and analysts to infuse wastewater management issues into development plans, regional or spatial planning guidelines, housing strategies etc.
- Develop programmes that will build capacity in WCR countries to integrate water and wastewater planning and management more effectively

Technology Sub-Projects

- Prepare concept paper that explores prospects for sustainable private investment and financing through PPPs in WCR countries
- Develop comprehensive training programme (aligned to the universities in the region as well as the technical and vocational institutions) for wastewater management and operations – including issues such as preventative maintenance, operations management, new and emerging technologies in wastewater management etc.
- Conduct a regional study on tariffs to determine appropriate levels to form a basis for financing

Education and Awareness Sub-Projects

- Develop guidelines for public involvement in the development, implementation, and review of a wastewater management systems and programmes
- Develop education and awareness raising activities (for example, public education campaigns) to increase understanding, knowledge, attitudes and opinions on waste disposal technologies and increase cultural acceptability
- Create a/strengthen existing regional clearing house mechanism to facilitate the sharing of information and best practices in wastewater management

- Develop a comprehensive training programme with key courses (online to facilitate information sharing across territories and face-to-face) to build capacity in wastewater management



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