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ECLAC

ECLAC SUBREGIONAL HEADQUARTERS FOR THE CARIBBEAN

FOCUS

Magazine of the Caribbean Development and Cooperation Committee (CDCC)

WATER RESOURCE MANAGEMENT

CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT
IN THE CARIBBEAN



ISSUE 4 / OCTOBER - DECEMBER 2015

ABOUT ECLAC/CDCC

The Economic Commission for Latin America and the Caribbean (ECLAC) is one of five regional commissions of the United Nations Economic and Social Council (ECOSOC). It was established in 1948 to support Latin American governments in the economic and social development of that region. Subsequently, in 1966, the Commission (ECLA, at that time) established the subregional headquarters for the Caribbean in Port of Spain to serve all countries of the insular Caribbean, as well as Belize, Guyana and Suriname, making it the largest United Nations body in the subregion.

At its sixteenth session in 1975, the Commission agreed to create the Caribbean Development and Cooperation Committee (CDCC) as a permanent subsidiary body, which would function within the ECLA structure to promote development cooperation among Caribbean countries. Secretariat services to the CDCC would be provided by the subregional headquarters for the Caribbean. Nine years later, the Commission's widened role was officially acknowledged when the Economic Commission for Latin America (ECLA) modified its title to the Economic Commission for Latin America and the Caribbean (ECLAC).

Key Areas of Activity

The ECLAC subregional headquarters for the Caribbean (ECLAC/CDCC secretariat) functions as a subregional think-tank and facilitates increased contact and cooperation among its membership. Complementing the ECLAC/CDCC work programme framework, are the broader directives issued by the United Nations General Assembly when in session, which constitute the Organisation's mandate. At present, the overarching articulation of this mandate is the United Nations Sustainable Development Goals.

Towards meeting these objectives, the Secretariat conducts research; provides technical advice to governments upon request; organizes intergovernmental and expert group meetings; helps to formulate and articulate a regional perspective within global forums; and introduces global concerns at the regional and subregional levels.

Areas of specialization include trade, statistics, social development, science and technology, and sustainable development, while actual operational activities extend to economic and development planning, demography, economic surveys, assessment of the socio-economic impacts of natural disasters, climate change, data collection and analysis, training, and assistance with the management of national economies.

The ECLAC subregional headquarters for the Caribbean also functions as the Secretariat for coordinating the implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. The scope of ECLAC/CDCC activities is documented in the wide range of publications produced by the subregional headquarters in Port of Spain.

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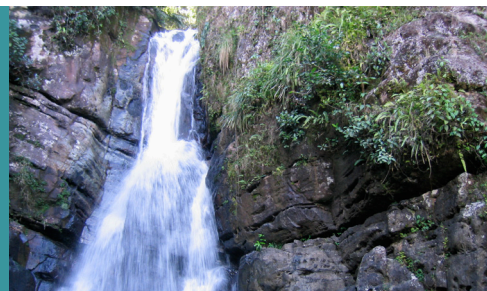
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WATER RESOURCE MANAGEMENT, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT IN THE CARIBBEAN



Over the past two decades, the issue of climate change has assumed increasing importance from the perspective of development thinkers, policy makers, investors, and civil society, as they have sought to design strategies to mitigate its anticipated impact. Stimulated by extensive global dialogue and relentless research of feasible solutions to this challenge, discussion on the need for adaptation and mitigation to address the increased frequency and intensity of natural events, and the importance of energy security and alternative energy solutions has become an essential element of the dialogue on sustainable development imperatives for the Caribbean.

Significantly however, the impact of climate change on water availability and management has generally never been featured in such discourse, or given the level of importance deserved. In this issue, we give focus to water and its role in our future development, with a particular emphasis on water as a development issue in Caribbean Small Island Developing States (SIDS).



Photo by Dale Alexander, ECLAC

Ms. Diane Quarless, Director, ECLAC subregional headquarters for the Caribbean

The UN's World Water Development Report 2015 puts water at the core of sustainable development, it being an essential element of services which support poverty reduction, economic growth and environmental sustainability. Water is of course pivotal to global food security, as an integral resource sustaining agriculture, and is critical to energy security and industrial development, since it is used for cooling power production and related industrial technologies. Water availability is also integral to improving social well-being and equity, and to fostering inclusive growth. Given its key role in the maintenance of environmental

health, this resource is central to the growth and well-being of societies.

Although water was not identified as a specific target of the Millennium Development Goals (MDGs), various achievements under the MDGs

have resulted in improved access to drinking water for approximately 2.5 billion persons. Notwithstanding this significant milestone, global water demand is projected to increase by 55 per cent by 2050, driven by increased population and urbanization, as well as the application of more water

intense food and energy security policies. The macro-economic growth of newly emerging countries through globalization is also expected to increase this demand, as changing diets and consumption patterns raise the levels of global per capita water use.

From a policy standpoint, water and sanitation comprise a number of critically interrelated components which impact overall development. These include elements such as water resources, water governance, water-related diseases, wastewater pollution and water quality, drinking water, and sanitation and hygiene.

It is all of these factors which led to a clear enunciation of water and sanitation as Goal 6 of the newly adopted Sustainable Development Goals (SDGs), the ultimate aim of which is to ensure availability and sustainable management of water and sanitation for all by the year 2030.

While for Caribbean SIDS, progress has already been

► (continued on page 19)

WATER FOR DEVELOPMENT



Access to clean water, sanitation and hygiene plays a central role in achieving development and, as such, is recognized as a human right that affects the lives and livelihoods of millions of persons.

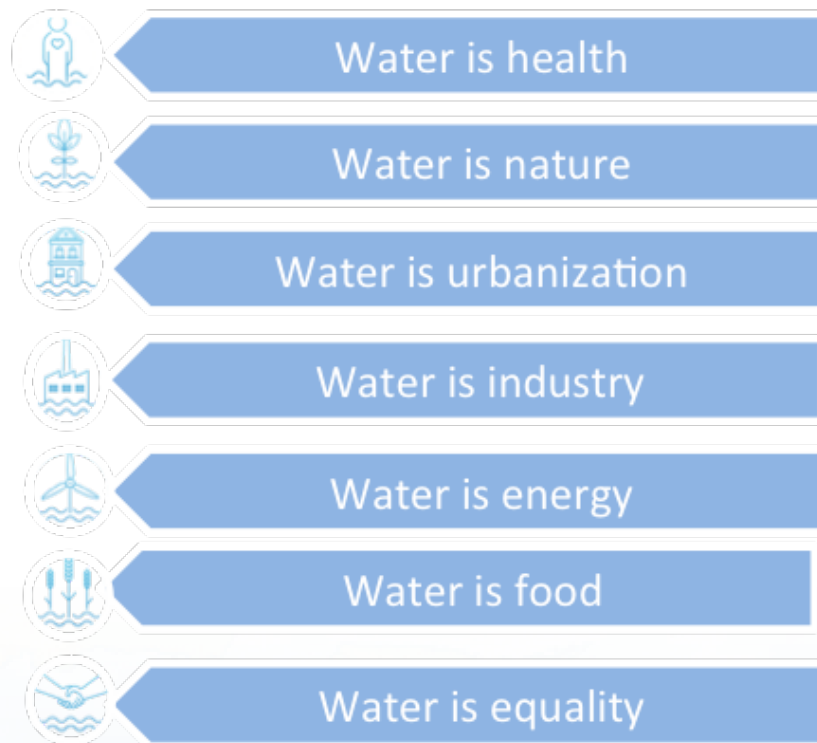
The World Health Organization (WHO, 2012) estimates that investment in water and sanitation services has the potential for substantial returns, in the order of US \$5 to US \$28 per dollar invested.

Conversely, a lack of access negatively affects health and well-being, which ultimately brings additional financial costs. In this regard, major global platforms including the Millennium Development Goals (MDGs), the Samoa Pathway and the Sustainable Development Goals (SDGs) have underscored the importance of water in alleviating poverty and in promoting sustainable development.¹

WATER REMAINS SCARCE RESOURCE

Access to water is fundamental to economic and social development. However, such developments in turn demand increased use of water and bring environmental impacts.

Climate change, population



<http://www.water.org/worldwaterday/learn/en/>

growth, degrading water quality and extreme hydrological events (e.g., floods and droughts) present serious challenges to national efforts to provide sustainable water services.

Even though the link between hydrologic extremes and economic losses has been confirmed by many researchers, efforts to implement programmes to address water-related disasters and water-related climate change

impacts are not as widespread as they should be.

Accelerated global development trends and population growth are exerting pressure on an already scarce resource. Population growth and development are accompanied by urbanization, food and energy security policies, and improved living standards that inevitably lead to sharp increases in water consumption and pollution of sources.

¹ According to the WHO and UNICEF (2014), 2.3 billion people have gained access to an improved drinking water source and 1.9 billion to an improved sanitation facility.

Competing demands combined with management challenges will certainly exacerbate water scarcity and increase the risk of localized conflicts.

WATER IS KEY TO SOCIAL DEVELOPMENT

A recorded 332.5 million cubic miles of water exist, but only 3 percent constitutes freshwater resources.

Much of this (approximately 68 percent) is trapped in glaciers, with a further 30 percent stored as underground resources. Readily accessible global freshwater resources therefore are estimated at about 22,300 cubic miles; approximately 1/150th of the one percent of total water resources. Even while discounting the pressure of climate change and development, water is scarce.

Nevertheless, freshwater resources are readily available in rivers and lakes, and are utilised by many sectors across society- including agriculture; energy production; recreation and manufacturing, with the unfortunate result of a virtual tug-o-war among its users. In this context, water can be classed as a resource and a sector. It is key to social development, environmental integrity and economic growth. As a sector, water requires infrastructure development and operational funds. As a resource it cuts across sectors, demanding

A drop of water is flexible
A drop of water is powerful
A drop of water is in demand!

Source: <http://www.unwater.org/worldwaterday/learn/en/>

a more integrated approach to management. Financing, monitoring and infrastructure have all been identified as high priority water management issues facing decision-makers.

CARIBBEAN PERSPECTIVE

Caribbean states face three major obstacles that hinder the optimal management of water.

These are: (i) governance, (ii) infrastructure and (iii) wastewater management. The water sector is seriously fragmented,² which results in inefficient use of scarce resources, both human and financial. Typically, a number of agencies are responsible for separate but complementary components of the sector (potable water, sewerage, disposal), creating silos and often contributing to a weak enforcement of the existing regulations, many of which are inadequate and seriously outdated (Cashman 2013).

In the case of infrastructure, priority has been given to increasing access to potable water, with a focus on network expansion rather than on

network upgrade, maintenance and/or rehabilitation. This has resulted in inattention to the need to upgrade infrastructure, resulting in significant levels of water leakage³ of between 50 and 70 per cent. This has been a major contributor to the waste of this vital resource and to the inefficiency of the sector.

Fragmented governance and outdated infrastructure also combine to exacerbate existing challenges. Due to its weight, water transmission and distribution consumes large amounts of energy, and in the Caribbean, inefficient energy consumption represents 30 per cent of the operational budgets of water suppliers. This is directly related to the lack of funds for investments since many suppliers show below-cost recovery revenues, which means that tariffs only cover operation and maintenance costs. Energy efficient transmission and distribution devices could create savings between 30 and 40 per cent (Cashman 2013); this is particularly relevant considering the subregion's high levels of indebtedness and dependence on imported fossil fuels.

► (continued on page 17)

² Cashman IDB 2013, CReW 2010, Riquelme IDB 2013, WB 2005

³ Unaccounted for water refers to leakage, theft and under-billing.

THE IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES



Climate change aside, the challenges affecting water availability and quality include population expansion, growing urbanization and increasing demand. Over the last 10 years, global groundwater resources have been falling largely because of the increased rate of abstraction. This is a logical progression in response to increasing population growth and related development activities.

Residential water demand has increased alongside growing population figures and ranks among the largest category of water users. Population and economic growth also translate into increased deforestation as forests are cleared for development, contributing to drought and flooding events. Growing populations also drive the need for irrigated agriculture, an activity responsible for more than 56 per cent of withdrawals from underground sources. This kind of agriculture is a major source of pollution for countries with mainly limestone topography like the Dominican Republic and Jamaica. It is increasingly evident that growing numbers of people in limited space without the adequate management practices can compromise water quality and quantity.

These competing pressures interact to create complex manifestations that exacerbate the threats facing water resources (Box 1). When climate change is added to this equation the impact can be significant, as it affects the cycle, availability, quantity

Box 1. Key water challenges

- Intensifying water inefficiencies in food production
- Failing access to water and sanitation
- Stressed aquatic ecosystems and biodiversity loss
- Increasing conflicts on water rights
- Degrading water quality
- Unsustainable groundwater abstraction
- Frequent hydrologic extreme events
- Lack of investments to provide adequate services
- Closing rivers and over exploited aquifer systems
- Unplanned urban growth threatening water balances
- Inadequate human and institutional capacities
- Sectorial water management leading to confused, conflicted and unintended policy outcomes

and quality of water resources, including the variability and frequency of precipitation.

WATER AVAILABILITY

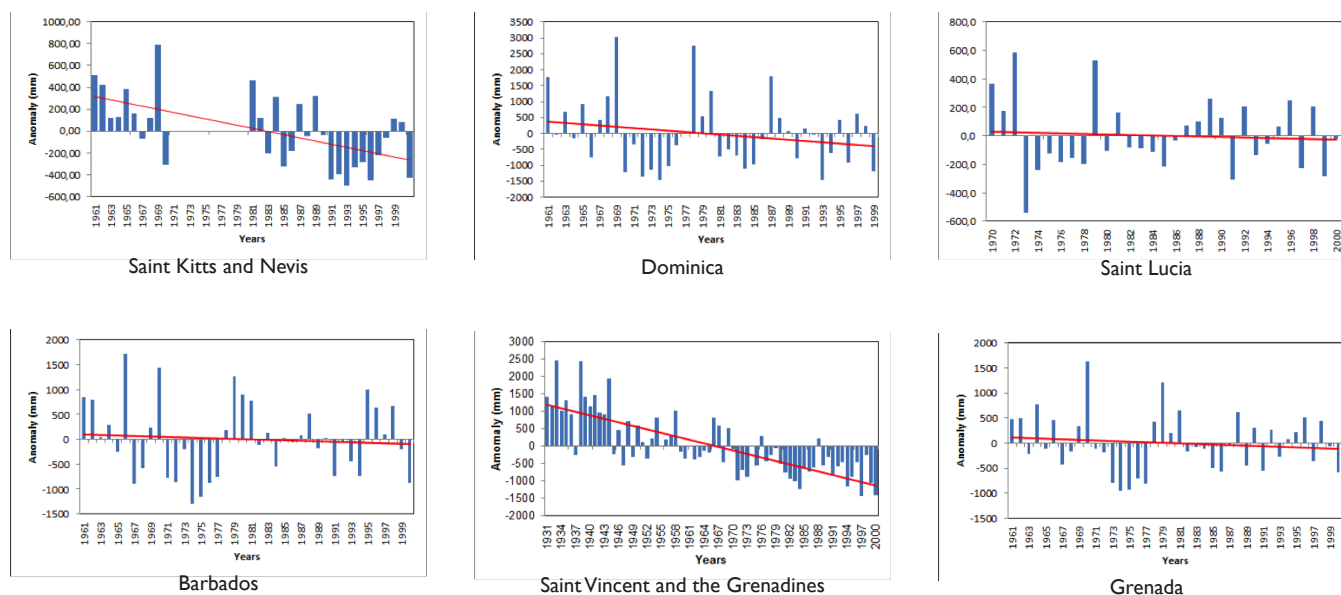
Evidence shows that climate change is heating the atmosphere and increasing overall evaporation rates.

This in turn increases the volume of water held in the air, causing

heavier rainfall in many areas and drought in others. By way of example, studies by ECLAC (2013), suggest that the Caribbean region has already begun to show significant hydrological variation, with an intensification of precipitation during the winter months (December to March), and a decrease during the rainy season. Measures of anomalies in annual precipitation, from the 1960's to 2000's show overall downward trends for Barbados, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia and Saint Vincent and the Grenadines (Figure 1).

High temperatures also cause an increase in water demand and a reduction in groundwater resources. The growing trend of reduced aquifer recharge shows the following scenarios. In the first instance, faster evaporation rates result in reduced water tables. Increased frequency and intensity of storms prevents proper soil infiltration and increases runoff. In coastal areas, rising sea levels raise water tables, but delay effective aquifer recharge. Elevated temperatures encourage faster surface drying, which reduces the existence of

FIGURE I: ANOMALY OF ANNUAL PRECIPITATION, SELECTED CARIBBEAN COUNTRIES, 1961 - 2000



Source: ECLAC (2013) "An assessment of the economic and social impacts of climate change on the water sector in the Caribbean"

water in the near-surface interface of soil, directly impacting agricultural production. When there is less downward movement of water through the soil, the opportunity for groundwater recharge severely diminishes. This worrying situation is not readily rectified by more rainfall, mainly because the infiltration process is hampered by the high temperatures. For low-lying coral based islands like Barbados, British Virgin Islands, Cayman Islands and the Dutch Caribbean reduced precipitation is already a reality.

Furthermore, there is another perspective that must be added to the discourse to appreciate the complexity of water availability. The water cycle distributes rainfall unevenly across space and time, contributing to the variability of global water storage. This may cause greater downpours and more flash floods leading to tremendous destruction of

infrastructure, environmental damage and loss of life. This variability in time and space is a factor that deserves great consideration when developing appropriate water management systems.

UNACCOUNTED WATER LOSS AND THE EFFECTS ON CLIMATE CHANGE

At a regional level, the implications of this variability determine water quality and quantity, which in turn hinge on size, geology, topography, climate and patterns of socio-economic development.

Many countries in the region have restricted water resources because of their geological and physical features. Depending on the financial situation of the country, rainwater harvesting and desalination may be the only possible solutions, especially in smaller and drier islands.

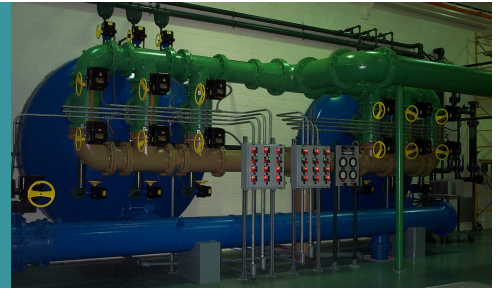
Limited water availability is an issue for Aruba, Barbados to a lesser extent, the British Virgin Islands, Cayman Islands and Curacao. For countries like Barbados, Antigua and Barbuda, and the Bahamas, their struggles are centred on addressing underground water resources that have been exhausted or contaminated from either pollutants or saltwater.

Another concern is the high level of unaccounted water loss. The region recorded a staggering 50-60 per cent loss. This is particularly noteworthy, considering that the Caribbean is the region with the lowest water availability per capita among all Small Island Developing States (SIDS).

► (continued on page 18)

¹ Source: World Resources, 1998 -1999: Environmental Change and Human Health

INTEGRATED WATER RESOURCE MANAGEMENT



The Global Water Partnership identifies Integrated Water Resources Management (IWRM) as “a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.”

There are four main principles that govern IWRM reform:

Principle 1:

Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.

Principle 2:

Water development and management should be based on a participatory approach involving users, planners and policy makers at all levels.

Principle 3:

Women play a central role in the provision, management and safeguarding of water.

Principle 4:

Water has an economic value in all its competing uses and should be recognised as an economic good as well as a social good.

With specific reference to Principle 3, it is clear that gender should be addressed comprehensively to ensure that the views and contributions from both men and women are treated equitably in shaping the development agenda.

IWRM underscores that access to clean water and sanitation is a basic right that should be afforded to all. IWRM changes the status quo, eschewing a disjointed approach to water resources management in favour of an

integrated one. Its foundation is based on the concept that water resources are essential to the well being of the ecosystem.

Given the threat which climate change poses to the long term water availability in SIDS countries, a broad based strategic framework for IWRM is necessary to ensure future water security.

Such a framework should include the following:

1- Implementation of the following adaptive strategies:

a. Infrastructural – build coastal and flood water guards to regulate sea-level rise and flooding, and devise techniques that increase water use efficiency (e.g. drip agriculture).

b. Behavioural – raise awareness in order to modify production and consumption behaviours (e.g. efficient irrigation potable water to be used as needed).

c. Managerial –change farm practices, for example by growing drought resistant crops that adapt to the changing weather, and demand management policies such as pricing, metering and classification of water use groups.

d. Government policy – adjust planning guidelines, building codes and utilization of renewable sources of energy (e.g. solar, wind, geothermal).

2. Modification of current water management strategies throughout the region through:

a. Improvement, rehabilitation and maintenance of infrastructure.

b. Desalination, especially in water scarce countries.

c. Rainwater harvesting.

d. Harnessing the potential benefits of greywater as an alternative to increase the availability of water and to address the global challenge of wastewater management.

3. Strengthening of water resource management through assessments of water resources, economic assessments of the sector, water forecasting and industrial reform, capacity building, and establishment of water monitoring networks.

4. Development, design and implementation of water policies, which include integrated water resource management (IWRM), national water information systems to increase availability and accessibility of sector information.

5. Elaboration of sustainable land management practices and mainstreaming of development planning. ■

CASE STUDY OF THE CARIBBEAN DROUGHT OF 2009 - 2010¹



Recent evidence provides a good indicator of the likely impact of prolonged water deficits in the Caribbean on the basis of the 2009/2010 Caribbean Drought experience.

Caribbean Drought of 2009 – 2010 – Key Characteristics:

- Began during the 2009 rainy season (in particular the month of October)
- Regional awareness through Caribbean Drought and Precipitation Monitoring Network (CDPMN); prior to this no official action
- In 2010, stations in Barbados, Dominica, Grenada, Jamaica, Saint Vincent, Saint Lucia and Trinidad, recorded their lowest ever February rainfall totals
- Stations in Anguilla, Dominica, Grenada Saint Vincent and Trinidad recorded their lowest ever 3 month (January to March, 2010) totals
- Stations recorded their lowest six month (October 2009 to March 2010) totals.
- These included stations in Barbados, Grenada, Guyana, Saint Vincent, Saint Lucia and Tobago
- Over 24 years of record at Point Saline Airport in Grenada; 2009 lowest annual total
- Drought subsided in April, 2010 in northeast Caribbean and in May, 2010 in the southeast

Impacts of the 2009 – 2010 Drought:

- Water rationing in some Caribbean States.
- Water courses greatly depleted.
- Major crop losses; 25 % loss in onion crop, 30 % loss in tomato crop in Antigua.
- Increases in food prices; prices of tomatoes rose from \$2.35/ pound in Feb 2010 to \$6.00/ pound in Mar 2010.
- Hydro power contribution in Saint Vincent dropped from 28.69% in Feb 2009 to 12.01% in Feb 2010
- In one of Guyana's Regions cost US \$16,000 per day to deliver water (pumping and creation of canals) to one of its 10 regions; pumping saline water to about 150 acres of rice lands.
- Record numbers of bush fires in all Caribbean; in Dominica, 160 fires (mainly bush fires) during the 1st quarter of 2010, the entire year 2009 realised 103 fires.
- Severe landslides when rains returned. ■

¹ Source: Trotman, Farrell and Cox, 2010 – Caribbean Environmental Health Institute and Caribbean Institute for Meteorology and Hydrology

EFFECTS OF URBANIZATION ON WATERSHEDS



According to the United Nations Department of Economic and Social Affairs (UNDESA), in 2014, 54 per cent of the global population lived in cities and it is expected that by 2050 this number will increase to two-thirds of the population.

Urbanization is a significant demographic trend in most countries, particularly in developing countries. By the year 2050, two-thirds of the world's population will be living in cities.

A growing, increasingly prosperous and rapidly urbanizing global population will demand more food, more energy and more water resources to meet its needs (Figure 1). These demands from industrial development and rapid population growth encourage investments in water and sanitation infrastructure.

Currently, an average person uses more than double the water than a hundred years before (UNESCO 2013), and urbanization is keeping domestic water use on an upward trend, accounting for 11 per cent of total water withdrawal worldwide. However, pollution and over exploitation are seriously affecting the natural hydrological processes, and the world is projected to face a 40 per cent water deficit by 2030 under the business-as-usual scenario.

THE IMPACT OF URBANIZATION ON THE HYDROLOGICAL CYCLE AND ECOSYSTEMS

The hydrological cycle is the

continuous exchange of water between the atmosphere, land and water bodies.

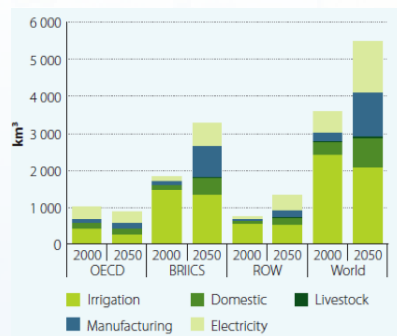
It consists of processes such as precipitation, evaporation, infiltration and condensation.

An urbanized area consists of large areas of impervious surfaces that disrupt the infiltration of water into the soil which results in the disruption of the recharge of groundwater, exacerbating flood risks.

discharge is greater, the rate of infiltration and recharge is reduced, the amount of water that can be stored is lowered, there are increased runoff volumes and peak flows in rivers, and surface runoff occurs more frequently. Urban development significantly increases the amount of storm water and the frequency of extreme hydrological events experienced by the city's catchments. The increased runoff causes more intense local flooding, while droughts during dry weather are more severe and longer.

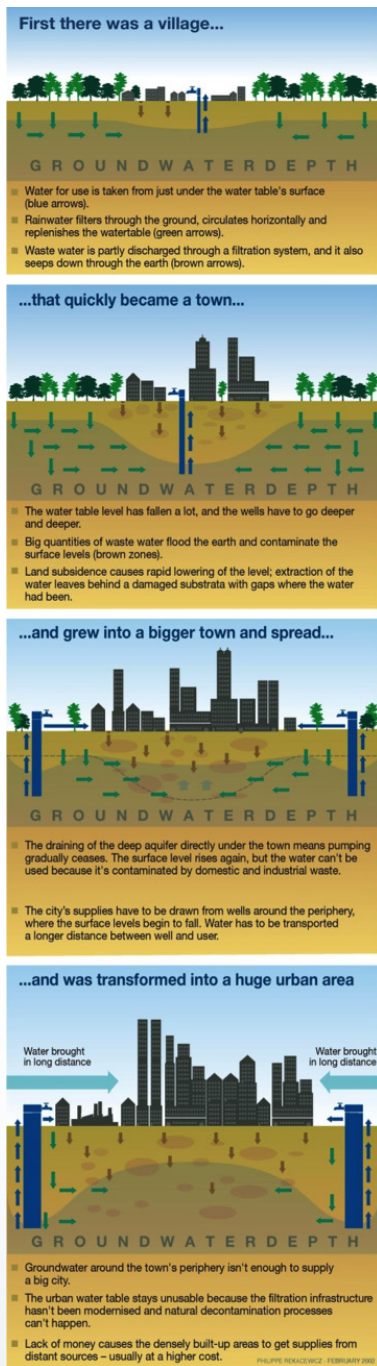
Aquatic habitats are also affected by urbanization. This may occur in the form of increased discharges that erode stream beds and banks, which may cause the straightening of a stream by the process of channelization. There is also the loss of stream bank tree cover, which may be lost during floods or due to human activity. Additionally, increased contaminants in water and increased fine sediment in stream bed can also take place. Furthermore, there is a growing concentration of pollution into the rivers due to the runoff from land which affects the quality of water available for use. When

FIGURE 1: GLOBAL WATER DEMAND IN 2000 AND 2050



Source: UN-Water 2015. World Water Development Report 2015.

In urban areas there is the occurrence of a number of scenarios that affect the hydrological cycle. For example, the interception of rainfall is reduced due to removal of trees, the rate of evapotranspiration is much lower, surface run-off



services. Ultimately, this results in overall degradation of the aquatic habitat.

WATER SUPPLY, QUALITY AND DEMAND

Since much of the water consumed by cities generally comes from outside its limits, and the pollution generated tends to flow downstream, the impact of cities on water resources goes beyond their boundaries.

Cities also import significant amounts of food, consumer goods and energy, which require large amounts of water at the point of production, transportation and sale. This virtual demand of cities greatly exceeds direct water use.

Rapid urbanization, increased industrialization, and improving living standards generally combine to increase the overall demand for water in cities. It is projected that by 2050 global water demand may increase by 55 per cent, largely because of the growing

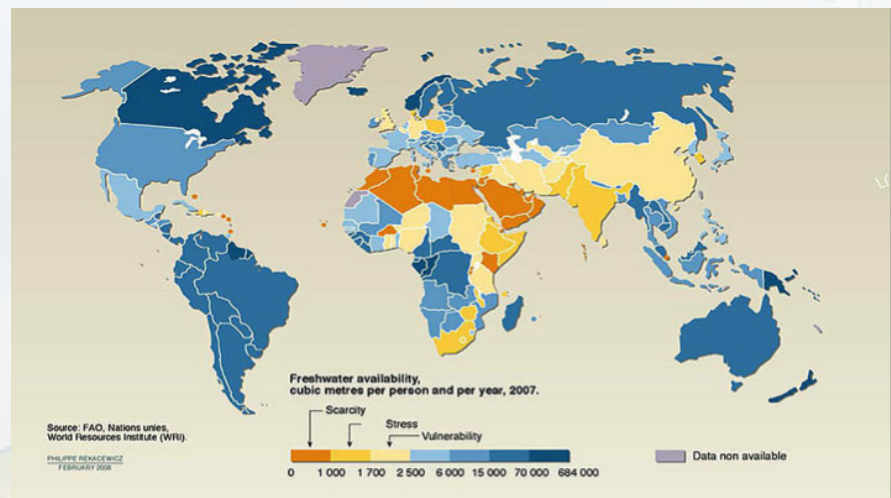
demand from manufacturing, thermal electricity generation and domestic use, all of which mainly result from growing urbanization in developing countries.

According to the U.N. Department of Economic and Social Affairs, around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical water scarcity, and another 1.6 billion face economic water shortage in countries that lack the necessary infrastructure to extract water from rivers and aquifers.

In many urbanized areas the availability of surface water and groundwater sources has been reduced (Figure 2). Therefore, cities have to go farther or dig deeper to access water. In some cases they will have to depend on innovative solutions or more advanced technologies, such as reverse osmosis for desalination, or reclaimed water, to meet their water demands. ■

urban development occurs, protection of biodiversity and the conservation and restoration of ecosystem services tend to not be the main priorities; therefore organisms in ecosystems are affected due to the destabilization of ecological processes between the food chains of different organisms which can restrict the provision of ecosystem

FIGURE 2: FRESHWATER AVAILABILITY



Source: UNEP 2008

WATER QUALITY AND WASTEWATER



The United Nations Environment Programme and Human Settlements Programme (UNEP/ UN-Habitat, 2010) define wastewater as a combination of one or more of: domestic effluent consisting of blackwater (excreta, urine and faecal sludge) and greywater (kitchen and bathing wastewater); water from commercial establishments and institutions, including hospitals; industrial effluent, stormwater and other urban run-off; agricultural, horticultural and aquaculture effluent, either dissolved or as suspended matter.

This variety of contaminants and pollutants is produced primarily by the domestic/urban, industrial and agricultural sectors, with the latter accounting for 70 per cent of total fresh water consumption. Extraction of water for food production and its resulting diffuse water pollution are likely to be exacerbated by population growth, considering that by 2050 the agriculture sector will need to produce 60 per cent more food globally, and 100 per cent more in developing countries.

Inadequate treatment of wastewater can have detrimental effects on water quality. Most impacts are caused by (i) chemical contamination and (ii) microbial pollution. Chemical contamination is caused by excess nutrients (nitrates and phosphates), which can stimulate eutrophication and result in algal blooms, dissolved oxygen depletion, biodiversity loss, increased turbidity, invasion of alien and competitive species, and an overall reduction in water quality. Furthermore, “the deterioration in water quality resulting from eutrophication is estimated to have already reduced biodiversity in rivers, lakes and wetlands by about one-third globally” (UN- Water, 2015).

Microbial pollution is associated with high concentrations of excreted pathogens. As a result, it is estimated that 1.45 million people a year die due to diarrhoeal illness, of which 58 per cent is caused by inadequate water, sanitation and hygiene. It is critical to note that 43 per cent of the deaths occur in children aged five and under (UN- Water, 2015).

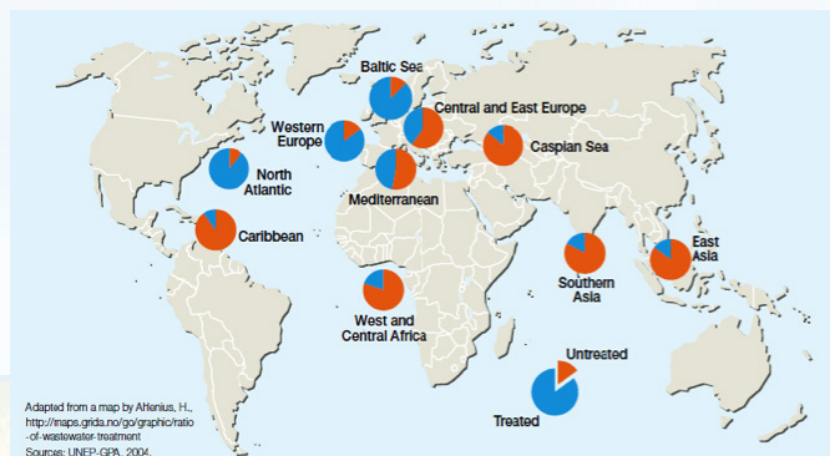
The broad definition of wastewater, which includes domestic, commercial, industrial and agricultural end products, highlights the complex and multisectoral nature of the challenge. It also recognizes the importance of coordinated and integral approaches to address a complex issue within a sector with multiple and competing uses and users.

WASTEWATER AS A RESOURCE

As cities and populations have grown, countries and international organizations have strived to devote resources to guaranteeing access to water and sanitation to citizens worldwide.

However, most efforts have been dedicated to granting access to safe drinking water and appropriate sanitation systems, without complementary actions to manage the end products of water and sanitation provision. “... MDG targets on improved sanitation have focused resources on increasing service coverage in terms of access to improved toilet facilities, but with far less attention paid towards ensuring

FIGURE 1: RATIO OF WASTEWATER TREATMENT



Source: UNEP/UN-Habitat. 2010. Sick Water? The central role of wastewater management in sustainable development

that waste streams are adequately collected and treated prior to discharge into the environment. As a result, the majority of waste waters, septage and faecal sludges are discharged without any form of treatment into the environment...” (World Water Council, 2012). This problem is particularly serious in developing countries, where UN-Water (2015) estimates that only eight per cent of wastewater is

treated. The treatment capacity of developing countries is below the global average of 20 per cent, and considerably lower than the capacity of high-income countries, set at 70 per cent, reflecting disparities among and within countries (Figure 1).

Additionally, the World Water Council (2012) expects urban populations to almost double in

the next 40 years, rising from 3.4 billion to over six billion people. Furthermore, most of this growth and the rapid changes that it entails are already taking place in developing countries, which have limited capacity to address these issues, with many cities currently lacking adequate wastewater management.

► (continued on page 16)

FIGURE 1: WASTEWATER PRODUCTION BY SECTOR

| Scores | Domestic/Urban | Industrial | Agricultural |
|-----------------------------|--|---|---|
| Contaminants and pollutants | <ul style="list-style-type: none"> - Blackwater - Greywater - Surface water run-off - Stormwater | <ul style="list-style-type: none"> - Diffuse industrial pollutants - End-of-pipe point discharges and illegal dischargers | Non-point or diffuse water pollution: <ul style="list-style-type: none"> - Sediment runoff - Nutrient runoff - Microbial runoff - Chemical runoff |
| Current situation | <ul style="list-style-type: none"> 💧 1.8 per cent annual population growth in urban areas 💧 By 2030, 60 per cent of the world’s population will be urban dwellers 💧 2.6 billion people lack access to basic sanitation 💧 Over 70 per cent of water has been used in other productive activities before entering urban areas 💧 80-90 per cent of all wastewater generated in developing countries is discharged directly into surface water bodies | <ul style="list-style-type: none"> 💧 5-20 per cent of total water is used by the sector 💧 70 per cent of industrial discharges in developing countries is dumped untreated 💧 Global water demand for manufacturing will increase by 400 per cent from 2000 to 2050 | <ul style="list-style-type: none"> 💧 Largest user of water, 70 per cent of total global fresh water 💧 By 2050, agriculture will need to produce 60 per cent more food globally 💧 Inefficient use of water for crop production depletes aquifers, reduces river flows, degrades wildlife habitats, and has caused salinization of 20 per cent of the global irrigated land area |

Source: author’s compilation based on information from UNEP, UN-Habitat and UN-Water.

POST- 2015 AGENDA ON REALISING THE FUTURE WE WANT FOR ALL



The Millennium Development Goals proved that access to water and wastewater management are multisectoral issues that pose cross-cutting challenges due to the variety of stakeholders and institutions involved. The Post-2015 Development Agenda aims at solving the most pressing issues of our time: poverty eradication; safe and sufficient food; sustainable energy; population growth; urbanization; and adequate management of water and environmental resources.

Building on lessons learned and understanding that water plays a fundamental role in almost all the global challenges we face, UN-Water identified five inter-linked areas that must be addressed in an integral manner to achieve sustainable access and management (Figure 1).

Science, technology and innovation will play a key role in moving towards green economies, as they help to understand the complexities of sustainable use of water. Adaptive measures to improve water and wastewater management are crucial to use water efficiently and to provide access to all. There is also a need for new technologies for using different sources of water, such as rainwater and fog harvesting, grey water reuse and untreated river water.

However, water is not distributed equally among societal sectors and across geographical boundaries. Additionally, water culture,

and economic, legislative and environmental aspects vary within and among countries. Therefore, water management should be locally appropriate and new approaches and technologies must consider existing socio-cultural settings.

ACHIEVING ADEQUATE WATER MANAGEMENT

The ecosystem-based approach should be complemented with a rights-based approach to promote participation from all agents, prioritize non-discriminatory access to water and ensure accountability.

In order to achieve adequate water management, it is also necessary to address key issues such as sectoral governance, access to financial resources, coherent regulatory and monitoring frameworks, and improvement of data quality. Data and innovative monitoring techniques are crucial to understand the state of water resources and design cohesive policies.

Equitable, participatory and accountable approaches should be accompanied by appropriate policy and legal frameworks, and institutional and human capacities and structures.

In this context, the Sustainable Development Goals (SDGs) and the Samoa Pathway have incorporated water management as a fundamental component of sustainable development. Both instruments focus on critical areas such as: (i) integrated management, (ii) sustainable management, (iii) water efficiency, (iv) wastewater management, and (v) institutional and human capacities. Ultimately, these measures will contribute to accomplishing SDG 6 “ensure availability and sustainable management of water and sanitation for all.” SDG 6 expands the MDG focus on drinking water and basic sanitation to now cover the entire water cycle, including the management of water, wastewater and ecosystem resources.

FIGURE 1: COMPONENTS OF THE PROPOSED GLOBAL GOAL FOR WATER



Source: UN-Water 2014

SDG 6 contains six targets on outcomes across the entire water cycle, and two targets on the means of implementing the outcome targets:

- Targets 6.1 and 6.2 build on the MDG targets on drinking water and basic sanitation, providing continuity while expanding their scope and refining definitions.
- Targets 6.3 to 6.6 address the broader water context that was not explicitly included in the MDG framework, but whose

importance was acknowledged at the Rio+20 Conference, such as water quality and wastewater management, water scarcity and use efficiency, integrated water resources management, and the protection and restoration of water-related ecosystems.

- Targets 6.a and 6.b acknowledge the importance of an enabling environment, addressing the means of implementation and aiming for international cooperation, capacity-building and the participation of local

communities in water and sanitation management.

With water at the very core of sustainable development of Small Island Developing States (SIDS), and specifically Caribbean SIDS, SDG 6 does not only have strong linkages to all of the other SDGs, but also the ability to underpin them: realising SDG 6 would in fact go a long way towards achieving much of the 2030 Agenda. ■

WATER QUALITY AND WASTEWATER

CURRENT SITUATION IN THE CARIBBEAN

According to UNEP/UN-Habitat, the world is facing a water crisis (quality and quantity) due to continuous population growth, which intensifies industrialization and food production, increases living standards and consumption, and tends to result in poor water use strategies, socioeconomic conflicts and unplanned urbanization.

Intensive use is often accompanied by pollution which undermines the ecosystems' ability to regulate and restore themselves, in addition to their capacity to provide water-related services. The Caribbean is not exempt from these challenges, and countries have long recognized that pollution from diverse productive activities has negative impacts on marine ecosystems, which are one of the subregion's most valuable resources for economic and social development.

The degradation of the marine ecosystems in the Caribbean is primarily driven by the discharge of untreated wastewater and is a consequence of rapidly expanding urban populations, suboptimal urban planning, and inadequate or absent sewage treatment facilities (CRew, UNEP, CWWA). According to GEF-CRew and

UNEP, 85 per cent of wastewater entering the Caribbean Sea remains untreated and 51.5 per cent of households lack sewer connections. In contrast, only 17 per cent of households are connected to acceptable collection and treatment systems.

Wastewater discharge has been a large contributor to the loss of over 80 per cent of living coral in the Caribbean in the past 20 years. Additionally, UNEP (2004) has shown that pollution by sewage has caused some serious problems in the subregion, such as: (i) increased fish mortality; (ii) eutrophication; (iii) threats to corals, swamp ecosystems and seagrass beds; (iv) biological diversity loss; (v) red tides; and (vi) threats to human health that affect local populations and touristic activity.

Several regional and international organizations agree that there are three main challenges that have led to ineffective wastewater treatment and its associated problems:

- a. Inadequate policy and legal frameworks, including enforcement and monitoring.
- b. Insufficient funding.
- c. Low priority given to the development of the wastewater sector.

In this context, and considering that the millennium Ecosystem

Assessment (2005) reported that 60 per cent of global ecosystem services are being degraded or used unsustainably, an ecosystem-based approach to wastewater management should consider the full wastewater cycle, from source to final disposal, and include both freshwater and marine waters.

WASTEWATER MANAGEMENT

In light of the complexities surrounding wastewater management and considering the incessantly growing demand of water for various uses and users, it is possible to understand the enormous pressure on the resource.

Currently, management in most countries does not consider all the elements of the wastewater cycle. Technologies are often developed without taking national infrastructure fully into account, and supporting data is not always adequate or available, resulting in sewers and treatment plants being under- or over-utilized, and wastewater streams being combined. In terms of impacts on the ecosystems, poor management has resulted in overloaded natural processes, affecting water purification and maintenance of soil structure.

Wastewater management refers to systems that "work with rather than against natural

ecosystem processes” (UN-Water 2015). The ultimate goal of wastewater management is to reduce the level of pollutants before reusing or disposing the wastewater into the environment. In order to accomplish this, countries must put in place administrative structures responsible for the design and operation of wastewater management systems. It is necessary to understand the situation and role of both the receiving environment and the production and consumption processes before designing sustainable infrastructure and systems that respond to a particular societal organization. While there are different types of wastewater management approaches, their suitability will vary and depend on certain characteristics, such as

population size and density, institutional and technical capacity, carrying capacity of the ecosystem, and level of development, among others.

Complementarily, there is a new paradigm which emphasizes the usefulness of wastewater as a resource, shifting away from framing it merely as a problem. If adequate standards are put in place, wastewater can complement water supply in environmental applications, urban reuse and industry, but the agriculture sector is the main user of reclaimed water. Wastewater can be harnessed as a drought resistant source of water in agriculture, as well as in non-agricultural lands (parks, golf courses), as a source of nutrients, reducing the use of chemical fertilizers; and as a source of energy, since

the bacterial decomposition process produces biogas.

Regardless of the selected approach, there are two critical elements that authorities should consider. First, management must be continued, as systems have to be periodically maintained to avoid failures. This includes appropriately trained staff, allocation of resources, and adequate regulatory frameworks that include incentives, sanctions, and monitoring and inspections. On the other hand, systems should be locally appropriate and reflect the local environment, culture and resources. ■

► (continued from page 5)

WATER FOR DEVELOPMENT

THE ROLE OF GOVERNMENTS

Governance and infrastructure also affect the unsustainable levels of extraction in a subregion where water is naturally scarce.

Even though water availability is limited and many countries already face deficits, the supply-demand gap is not necessarily due to insufficient resources, but weak infrastructure and institutional frameworks.

Finally, growing populations, weak urban planning and inadequate sectoral governance combine to exacerbate the problems associated with wastewater disposal. It is estimated that 85 per cent of wastewater enters the Caribbean sea untreated, becoming the primary driver of marine degradation in the subregion (CReW 2010).

It is evident that, in spite of climate change, water is under

tremendous stress. Access to water and wastewater management are thus increasingly becoming global challenges that could result in serious environmental problems, posing grave threats to human health and well-being, and negatively impacting sustainable development. ■

THE IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES

WATER QUALITY

With the onset of glacier melt, sea level rise is already clearly evident, as oceans accommodate the increased volume of water. Salt water intrusion in near coastal freshwater resources turns these reserves brackish.

This occurs often in drought conditions, when groundwater resources are very low, drawing in saltwater to replace depleted reserves. Countries like Cuba, Hispaniola island, Jamaica, and Trinidad and Tobago, have experienced some level of saltwater intrusion along their coastlines.

Flooding events caused by both climatic and non-climatic conditions have varying levels

of impact and the potential flood damage depends on rainfall intensity, frequency and volume of water. The pathogens and impurities from ruptured sewer mains also represent a major source of contamination for freshwater reserves. Additionally, heavy torrential rains bring garbage, silt, pollutants, animal waste and other impurities, increasing the microbial load of the water supply. A high microbial load in the waterways encourages algae blooms, which deplete oxygen levels, thereby disrupting aquatic ecosystems and eventually affecting human health. Such events retard the natural purification process of oceans and rivers, and contribute to overall water quality degradation.

The tourism based economies in the Caribbean place tremendous value on ensuring the adequate supply of potable water. Managing high water consumption levels and significant wastewater volumes is critical to the maintenance of a viable tourism sector. A telling example of water consumption by the tourism industry that is not sustainable can be found in the Bahamas, where daily consumption levels are estimated at between 400 to 1,000 litres per capita, almost three times the residential demand. In Saint Vincent and the Grenadines, water demand in the tourism industry is four times that of domestic household consumption. ■

UPCOMING EVENTS 4TH QUARTER 2015

30 November - 1 December

Caribbean conference on ageing, elder abuse and the rights of older persons. Roseau, Dominica

23 November

Expert group meeting on dissemination of Caribbean census microdata to researchers (Webex). Port of Spain, Trinidad and Tobago

LIST of Recent ECLAC Documents and Publications

Listed by Symbol Number, Date and Title

No. L.4098

November 2015

The Caribbean and the post-2015 development agenda.

THE IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES

achieved with respect to some of these elements, there are still development challenges to be overcome in order to guarantee the sustainable development future of the subregion. These challenges are likely to be further exacerbated by the concomitant effects of climate change. Consider for example, climate projections for the Caribbean which suggest the likelihood of more intense rainfall over shorter time periods, resulting in periods of both excessive rainfall and drought. This phenomenon has implications for the subregion's ability to implement both flood management infrastructure as well as drought mitigation systems, in order to shore up the public water supply, and to provide water for economic sectors such as tourism and agriculture. Such challenges influenced by climate change directly impact the availability of natural water resources of Caribbean SIDS.

As noted by the Caribbean Institute of Meteorology and Hydrology, climate change

is anticipated to have major impacts on the islands' two main water sources - ground water and surface water. In the case of ground water, changing rainfall intensity due to climate change could reduce ground water recharge during periods of extremely heavy rainfall, since much of this water dissipates through run-off. At the same time, drought conditions could also result in extreme water extraction from aquifers both through use and surface evaporation, ultimately affecting both water availability and ground water quality. In the case of surface water, climate change can induce high levels of evaporation from surface reservoirs, rapid run-off during heavy rainfall and filtration to ground water sources.

The Caribbean is also facing challenges related to wastewater management and growing intersectoral water competition, as it struggles to provide improved housing and other public infrastructure while sustaining economic

growth. With respect to public infrastructure, improved water distribution systems will be necessary to reduce the high level of water lost through leakage. The management of wastewater as a water recycling strategy is also critical in this regard. Water use efficiency in the tourism sector will also require attention, given the implications for both financial and environmental sustainability for the region's most dynamic economic sector. It is my hope that the articles presented in this issue will provide the necessary food for thought to stimulate an awakening to the very real, urgent water challenges confronting us in the context of the broader development aspirations of the subregion.

Yours in Focus,

Diane Quarless



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