



CARIBBEAN WATER AND
WASTEWATER ASSOCIATION

Conference E-Magazine 2020



29TH

**ANNUAL
CONFERENCE
& EXHIBITION**

OCTOBER 19-23

2020

Water security and waste reduction:
Sustainability in an uncertain climate



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Message from President of CWWA - Mr. Mark Barnett

The 29th Annual Conference of the Caribbean Water and Wastewater Association (CWWA) is taking place against public health uncertainty, anxiety and deep concerns to the disruption to normal life activities. Almost on the heels of the culmination of the 28th CWWA conference and exhibition in St. Kitts and Nevis the world was facing a

new challenge. It has been seven months on since the region confirmed its first case of the Novel Corona Virus, COVID-19. According to the Caribbean Community (CARICOM Today) as at October 5th there were 36,788 confirmed cases of COVID-19 and 814 deaths from the disease.

As the premier water and wastewater association within the Caribbean region, we are very excited to continue to deliver on our mandate to be the voice on water, waste and environmental matters within the region despite the current challenges. In fact now is an opportune time than ever before to lobby our regional leaders to put water, waste and the environment at the top of their agendas.

Covid-19 has reminded us that our commitment as a region to achieving SDG-6 is more urgent now than ever. We must double our efforts to ensure sustainable investment to ensure our people have access to water and sanitation in an efficient and sustainable manner, The Caribbean region economies are extremely vulnerable, however notwithstanding the negative impact on our local economies, now is the time to act, and make water services 'right' for the people of the region.

In the context of a disruptive environment, the CWWA has to adopt a new normal approach in delivering knowledge, promoting technological advancement, share the experiences of water utilities and general progress in the sector, the Executive Council unanimously agreed to host the 29th CWWA Conference and Exhibition virtually. Keeping the water, waste and environmental agenda alive, as it may be sometime yet before this pandemic is fully contained.

This year's theme "water security and waste reduction; sustainability in an uncertain climate" is quite appropriate. Water security and waste reduction continue to threaten the lives and economies of the region. There is heightened uncertainty

brought on by climate variability/climate change. We have experienced in the last two years for example droughts or dry spells are lasting longer; rainfalls are less frequent or not during the usual biannual periods, most significantly we are now experiencing more tropical storms and hurricanes in the region. The CWWA Conference and Exhibition whether in person or virtual for this the 29th conference must recognised the sterling support of our regional and international partners who have continuously demonstrated their support in advancing the water, waste and environment regional agenda. The IDB, UNEP, IWECCO, CDB, etc. I want to say thank you for remaining committed to the CWWA and the Region.

Our exhibitors and sponsors, your investment in the region is testament to your commitment to improvement in public health, livelihoods and economies, we are very grateful for your commitment to the CWWA.

Finally, at the culmination of this years' virtual conference, the CWWA would have been under the leadership of Miss Sara-Jade Govia. The customary handing over ceremony will not be, but it is important to recognise and to express my appreciation of the support I received during the last two years for the Executive Council, and in the last year from the Secretariat. While the CWWA have advanced, there exist like all other organizations challenges, which this executive have time and time again demonstrated an affinity to agree and implement solutions..

As professionals and experts in water management the spotlight is on us, the CWWA must constantly advocate finding innovative ways to educate our people on water management and insist that the onset of a global pandemic is no excuse to wasting this precious commodity.

Inherent in any crisis are the seeds of opportunity which if properly cultivated can lead to growth and positive change. The Covid-19 pandemic has presented us with an opportunity to live up to our mission statement which is to bring together the water and sanitation community in the Caribbean towards the protection of public health and the promotion of sustainable development. Let us not miss this opportunity. We must boldly approach our Regional Governments to fund research; we must continue partner with all stakeholders to push our agenda of sustainable development and we must reach our citizens in communities at their level, bringing awareness that our agenda will benefit them in the medium and long terms.

I wish for us a successful and beneficial conference.

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About CARIBBEAN WATER AND WASTEWATER ASSOCIATION

The idea of a Caribbean Water and Wastewater Association (CWWA) was conceptualized during the late 1980's at an Annual conference of Caribbean Water Engineers. In 1991, the Association was registered as a Non-Governmental Organization (NGO) by an Act of Parliament (No. 8 of 1991) in the Republic of Trinidad & Tobago.

The CWWA is committed to the advancement of the science, practice, and management of water supply and waste disposal for the benefit of Caribbean people through the development of human resources, public education, professionalism, as well as promotion of appropriate technologies in the water, wastewater, and solid waste sector.

The Annual CWWA Conference and Exhibition is a major highlight of the organization's yearly calendar. Since 2004, a High Level Forum of regional Water Ministers has been held alongside the Annual Conference and Exhibition. More recently, a similar High Level Forum for regional Ministers with responsibility for Waste Management has also been held alongside the Conference and Exhibition.

The Conference involves hundreds of influential leaders in the water and waste sectors from the region and the world and will be the largest water and waste management Conference and Trade Show in the Caribbean. Participants include water and waste management utility companies, decision makers, professionals, experts, the corporate sector, students, development banks, the media and members of the public.

VISION

To be the pre-eminent Association of professionals and practitioners for water and waste sectors in the Caribbean.

MISSION

To advance the science and practice of water supply, wastewater disposal and solid waste management, and promote the efficient management of utilities for the sustainable development of Caribbean people.

AIMS AND OBJECTIVES

- To facilitate research and development and the use of appropriate technologies;
- To identify emerging needs and providing value-adding opportunities for our members;
- To promote the professional development of our members, by providing access to accredited education and certified training opportunities;
- To facilitate the sharing of members' knowledge and experiences by providing an efficient support network;
- To build alliances and partnerships to strengthen the development of our members and member institutions;
- To advocate on critical issues affecting the water, wastewater and solid waste industries and our membership.

MEMBERSHIP

The CWWA membership is open to individuals who work in the water, waste, solid waste, and environmental sectors. Companies and utilities that operate in those sectors are also eligible.

THE REPLAST-OECS PILOT PLASTIC RECYCLING PROJECT



Creating a Sustainable Model for the Management and Recycling of Plastic Waste in Saint Lucia

The Caribbean Region is extremely vulnerable to natural hazards, which, when coupled with anthropogenic activities result in disasters. Plastic pollution puts stress on the natural environment which is the bedrock of tourism – the mainstay of these economies. With no sustained programme in place for sorting and recycling of plastic waste, the high incidence of indiscriminate dumping and littering of plastics in the environment exacerbates the impacts of flooding, the health of the marine environment, and Public Health.

Saint Lucia is now at the half-way mark with the implementation of a pilot project that will provide Caribbean economies with a model for management and recycling of plastic waste. The RePLAST OECS Pilot Plastic Recycling Project is designed to create a sustainable solution to the issue of plastic disposal in the OECS Member States, in the first instance. Based on the circular economy model, and a public/private partnership ethos, RePLAST-OECS will create a system that moves plastic waste from collection to export. Polyethylene Terephthalate (PET) and High-Density Polyethylene (HDPE) plastic bottles will be removed from the environment while also creating new financial flows from the export of plastic to be recycled.

–RePLAST–OECS was launched on May, 2019, with an April 2021 completion timeline. It was developed and is being implemented by UNITE Caribbean Ltd. on behalf of the Government of Saint Lucia, with partnership support from the OECS Commission. –The Project is funded primarily by the Republic of France in partnership with the Government of Saint Lucia (GOSL), the Public and Private Sector and Civil Society.

The Project pursues three strategic outcomes: 1) An end-to-end flow for the collection and management of plastic waste, involving public, private and local stakeholders, set up and operational in Saint Lucia; 2) Used plastic bottles from Saint Lucia, exported to the Caribbean for recycling in a circular economy model; and 3) The Saint Lucian population aware of the ecological issues surrounding managing and selectively sorting recyclable waste. This this end, the pilot is being implemented in select communities, hotels and schools, to be replicated and upscaled in the rest of the island and the OECS.

Project implementation falls under four components. Component 1: Collection System and Incentive Scheme



THE REPLAST-OECS PILOT PLASTIC RECYCLING PROJECT

Creating a Sustainable Model for the Management and Recycling of Plastic Waste in Saint Lucia



has already achieved its key milestones, namely the (i) Development and Implementation of an Incentive Scheme and Collections System (ii) Development and Implementation of a Digital Platform to support the incentivized collection system and (iii) Development and Implementation of Rewards Programme for Incentive Scheme. Component 2: Export flow, Logistic and Supply Chain Economic Model is on track and has already (i) Developed and Implemented an Experimental Shipment Plan, (ii) Developed a Logistics Masterplan and Supply Chain Economic Model, and will shortly (iii) Supply and Install Equipment for Processing and Baling of Plastic and (iv) Develop and Implement a Commercial Shipment Plan. Under Component 3: Public Awareness and Replication the project Public Awareness and Environmental Education Plan is mere weeks away from rollout under the theme “Be A Hero: Reuse and Recycle Plastics”. Milestone ii: Development of Project Pilot Model for Replication in the OECS Countries is ongoing. Component 4: Project Management, Monitoring and Evaluation has facilitated the (i) Establishment of Project Management Structure including project governance and (ii) Appointment and Operation of a Project Steering Committee, Public Relations Sub-Committee, Technical Advisory Committee.

RePLAST-OECS is on track with all half-term milestones substantially met. Currently, there have been two experimental shipments of compressed PET exported from Saint Lucia to a recycling plant in Honduras at a combined weight of approximately 26,000 lbs. RePLAST Collection Points (RCPs) will begin operation in late October, supported by the Rewards Programme for Patrons. The processing and baling of material collected

will occur for a period of 6 months subsequently. It is projected that a total of 200 tons of plastic will be collected and exported by the end of the pilot project period.

Building upon the success of the Saint Lucia pilot, the intent is to mobilise new partners and resources to extend the project to other countries in the Caribbean Region, promoting a circular economy model for plastic waste management and recycling and regional cooperation.

Implementation agency Unite Caribbean Ltd is a Pan-Caribbean consulting firm that specializes in Caribbean development initiatives and regional cooperation projects with social and economic impact. As a sustainable development partner incorporated both in Saint Lucia and Guadeloupe, UNITE Caribbean fosters regional technical cooperation to solve complex Caribbean development issues and promotes Caribbean expertise across linguistic boundaries for the sustained environmental, economic and social development of the region.

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EXAMINING THE NWC / MIYA METHODOLOGY FOR REDUCING NON- REVENUE WATER IN THE KINGSTON METROPOLITAN AREA - JAMAICA



Reducing Levels Of Non-Revenue Water

THIS PAPER SEEKS TO SHARE AND SUBSEQUENTLY MAKE CLEAR THE TECHNICAL GROUND WORK AND METHODICAL APPROACH UNDERTAKEN UNDER THE NWC/ MIYA CO-MANAGEMENT ARRANGEMENT TO MANIPULATE THE KINGSTON PIPE NETWORK AND LOWER NON-REVENUE WATER LEVELS.

CHADRON STERN

National Water Commission

9/28/2020

Purpose

Whilst discussions on Non-Revenue Water are abounding, re-occurring and potentially bordering on exhaustive, a fundamental gap exists between the general Non Revenue Water (NRW) reduction solutions and the tailored approach required by Water Practitioners in physically reducing NRW levels. As a result, this paper will seek to explore the pragmatic approach to reduce Non Revenue Water levels through the NWC/MIYA experience.

Problem

The Capital of Jamaica, unlike other parishes and town centres within the island, finds itself with a water demand, which exceeds its immediate available water supply. This poses a perennial problem for the National Water Commission (NWC) and its advancements in top tier service delivery. Whilst water imports from neighbouring parishes are able to support operations within Kingston during the rainy periods, seventy percent (70%) of the imported volumes into Kingston are from temperamental surface water sources. During low rainfall periods and the commensurate waning of surface water sources, the Kingston Metropolitan Area faces significant challenges, as the NWC is unable to meet the water demand of customers on a 24-hour basis. Figure below shares graphical details of the available water supply and the NWC's water demand per parish.

Secondly, in recognizing that the water demand exceeds the available water supply in Kingston, the need became apparent for a programme to better account for the water volumes entering the Kingston network. In doing so, a Non-Revenue Water reduction program was derived as a solution, which would reduce water loss thus increasing the propensity of the NWC to better meet the Kingston water demand. This strategy did not escape skepticism as the NWC was haunted by previous initiatives of similar constructs that were not adequately sustained for a protracted period beyond the post program completion. In addressing this, the anecdotal experiences which promulgated cynicism of not being sustained was looked at and a novel co-management approach was seen as the solution to hedge against post program related issues and to further support and promote capacity building.

29th CWAA Conference & Exhibition Conference Schedule

Time - UTC-4 (AST)

MONDAY, OCTOBER 19, 2020

9:00 - 10:00 10:00 - 11:00	Opening Plenary
11:00 - 12:00	
12:00 - 1:00	Pedro Moreo - GEF CReW+ Project: Toilets of the Caribbean
1:00 - 2:00	Ann Mariee Drakes - Reconstructing the way people view sewage and sewer workers in Guyana
2:00 - 3:00	
3:00 - 4:00	Kevin Carter - The One Water Academy for a One Water Resilient World
4:00 - 5:00	Jumal Duncan - Provision of Potable Water Utilizing Natural Flow to the Remote Indigenous Community of Chenapau in the Potaro/ Siparuni Region in Guyana.
5:00 - 6:00	Stephano Seecharan - Design of an environmentally friendly water treatment system to reduce high iron content in water supplied in Hinterland Communities
6:00 - 7:00	

TUESDAY, OCTOBER 20, 2020

9:00 - 10:00 10:00 - 11:00	Technical Seminar - NRW Apparent and Commercial Losses—A Caribbean Case Study—Stuart Hamilton
11:00 - 12:00.	
12:00 - 1:00	Cleon French - Water supply system enhancements and Climate Change Adaptation in Mabaruma in the Barima/ Waini region of Guyana.
1:00 - 2:00	Ayman Mendez - An Analysis & design of off-grid photovoltaic systems for Hinterland communities in Guyana.
2:00 - 3:00	
3:00 - 4:00	Angela L. Franklin - Using groundwater modelling to assess the impacts of Managed Aquifer Recharge (MAR) within the shallow coastal aquifers of Guyana
4:00 - 5:00	Nomalraj Bacchus-Misir - Design of a Photovoltaic Battery Power Supply System for a submersible pump using solely renewable energy in Aishalton, Region 9, Guyana

5:00 - 6:00.

Khemraj Persaud - Geophysical logging for Groundwater investigation in the Indigenous Hinterland Community of Toka, Region 9 to facilitate drilling of a potable water well

6:00 - 7:00

WEDNESDAY, OCTOBER 21, 2020

9:00 - 10:00
10:00 - 11:00

Technical Seminar Infrastructure and the pursuit of the Caribbean-NCB Capital

11:00 - 12:00

12:00 - 1:00

Juan Andrade - Trinidad and Tobago First Plastic Circular Economy

1:00 - 2:00

Bob Paul - Regulatory Pathway to Pollution-Free Water

2:00 - 3:00

3:00 - 4:00

Rensforde Joseph - Optimizing the Water and Waste Sectors to Secure the Needs of Women and the Vulnerable

4:00 - 5:00

Amanda Ramgobind - Wastewater Surveillance for COVID-19

5:00 - 6:00

6:00 - 7:00

CWWA's AGM

THURSDAY, OCTOBER 22, 2020

9:00 - 10:00
10:00 - 11:00

Technical Seminar - Waste Reduction and the Circular Economy: The Caribbean Approach - Christopher Corbin & Ronald Roach

11:00 - 12:00

12:00 - 1:00

Kalpna Solanki - Integrating Data Management for Water and Wastewater Classification and Certification

1:00 - 2:00

Adele Young - Crowdsourcing for improving pluvial flood forecast and decision making in the Caribbean

2:00 - 3:00

3:00 - 4:00

Anthony Farrar - Phasing a Non-Revenue Water Reduction Programme:
Realise the In-House Potential of your Utility

4:00 - 5:00

Ramchand Jailal - The impacts of climate change and the achievement of
SDG 6 in the Upper Takutu/ Upper Essequibo region in Guyana.

5:00 - 6:00

Ravendra Puran - The provision of potable water for small Indigenous
communities in Guyana to achieve Sustainable Development Goal 6, between
Matthews Ridge and Baramita, Barima - Waini Region.

6:00 - 7:00

FRIDAY, OCTOBER 23, 2020

9:00 - 10:00
10:00 - 11:00

Technical Seminar - Valerie Jenkinson - Preparing for and Dealing with Disasters

11:00 - 12:00

12:00 - 1:00

Fadilah Ali - Introducing the Caribbean Node of the Global Partnership on
Marine Litter (GPML-Caribe)

1:00 - 2:00

Sancha Foreman - Engagement and capacity building of local communities by
UNEP CEP : Trash Free Waters Initiative in Jamaica and Panama

2:00 - 3:00

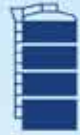
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NWC BUSINESS CONTINUITY STRATEGIES DURING COVID-19

Article Prepared by:
Kevin Kerr, B.ENG., IEAM, P.E.
Vice President Divisional Operations,
National Water Commission Jamaica.

Published in: CWWA Conference, E-Magazine
Articles October 2020

Business Continuity in a COVID-19 environment for Jamaica's National Water Commission

Background

Countries across the world have had to grapple with the coronavirus (COVID-19) pandemic (caused by the virus SARS-CoV-2), which has been called a 'public health emergency of international concern'. This pandemic brought many challenges and completely changed the face of business – including for water utilities, which have been forced to adopt new practices and adjust to new ways of doing business.

Following the first confirmed case of COVID-19 in Jamaica, the NWC immediately activated an emergency response plan by establishing a COVID-19 response committee to ensure business and operational continuity during the pandemic.

The announcement of Jamaica's first COVID-19 case resulted in an increased demand for potable water island-wide. To this end, the NWC took measures to minimise service interruptions by carrying out timely pipe and facilities repairs and maintained as best as possible, systems up time, as well as staff health and safety.

Challenges created by the pandemic

Some of the challenges being faced by the NWC are as follows:

1. Severe impact on cash flow due to the reduction in in-office bill payments;
2. Balancing the dry season's limited water resources versus the need to ensure sufficient supplies for hand washing and hygiene;
3. Heightened need to ensure there is sufficient redundancy in the electro-mechanical equipment at all pumping systems;
4. Increased monitoring of pipeline network to identify and repair leaks so as to minimize waste;
5. Increased demand for trucking of water.

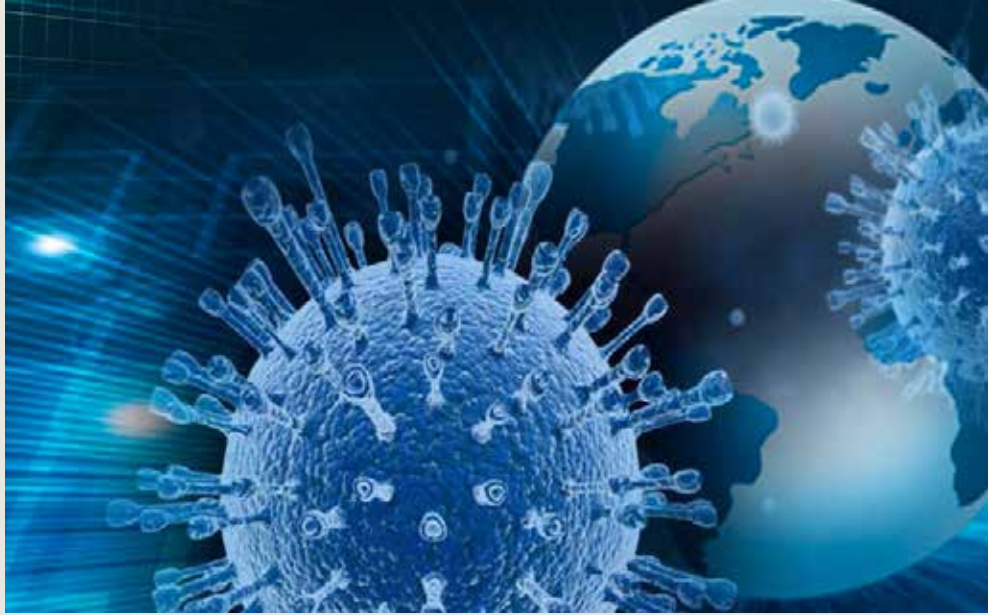


Action taken as a result of national restrictions and to protect employees and customers

Specific actions that Management implemented are listed below:

1. Closed all commercial offices to the general public;
2. Implemented 'Work From Home' policy, and provided ICT access to staff working remotely;
3. Provided Personal Protective Equipment (PPE) and sanitization products for increased hygiene activities;
4. Implemented non-contact temperature checks at the access point to our main and most popularly used locations;
5. Implemented transportation for staff who don't operate their own mode of transportation;
6. Implemented flexi-work hours for employees to limit the number of staff in the offices at any given time;
7. Standard Operating Procedures established to deal with suspected and confirmed cases of COVID-19 amongst employees;
8. Suspended non-essential projects;
9. Fully implemented online application for new supply connections;
10. Fully implemented webchat as an alternative to

NWC BUSINESS CONTINUITY STRATEGIES DURING COVID-19



email and telephone contact. This is in addition to using social media channels;

11. Greater promotion of bill payments through NWC iPay portal and third party facilities;
12. Significantly ramped up the trucking of water to both NWC utility areas, as well as other areas;.
13. The Commission took the decision not to disconnect the supply of customers who are in arrears and not to add the late fee to their water services account during the period.

Business Continuity Planning and managing the radical change created by COVID-19

The far-reaching impact of the COVID-19 pandemic has thrust on to the NWC a need for organisational change, which in addition to the business' pre-COVID transformation plans, needed to be confronted and deliberately managed.

In May 2020, after the NWC's initial emergency response and prior to the easing of restrictions in Jamaica, NWC President, Mr. Mark Barnett made a proactive decision to assemble a New Normal Task Force which was solely responsible for planning business change and the re-imagining of the future of the NWC.

The Vice President of Divisional Operations (NWC) Mr. Kevin Kerr was selected to be the chairman for the New Normal Task Force. The mission of the task force was to discover and propose innovative ways to re-imagine the future of work for the NWC. The President's charge to the task force was to ensure the successful completion of the NWC Business Continuity Plan (BCP). The Task Force was supported by an outstanding change management strategist – Miss Zahra Orane who supported Task Force activities, including the development and execution of the BCP.

The task force was comprised of the NWC Executive Team, Corporate Public Relations Manager and a Legal Officer – each having specific roles and responsibilities.

Another critical component of the task force's functions was internal stakeholder relations, including communication to

employees on the activities of the task force, and COVID-19 updates, protocols and procedures.

Key achievements

The task force achieved the completion of protocols to govern operations at NWC offices, draft of a new work styles policy and the Business Continuity Plan (BCP), with associated sequencing of activities to guide key processes in the event of a pandemic or a disaster.

Lessons learned and the way forward

The NWC has had to rapidly adapt to the change created by the pandemic, and this has been an opportunity for the business to do things differently. The organisation is embracing new work styles and new technologies, including those such as Microsoft Teams, that facilitate the implementation of new work styles.

The organisation recognises change management as critical in supporting behavioural changes and adaptation to doing things differently in the context of this change. It also understands the need to support employees in this process by applying change management approaches, and providing training programmes to develop virtual working capabilities and behaviours.

These methods, combined with the results of a recent staff survey that show that NWC employees support the need for change in work styles and, demonstrate that the NWC is on the right path to transformation.

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CWWA Abstracts and Presenter Profiles

Name: Pedro Moreo
Country: Mexico
Profession: GEF CReW+ Regional Project Coordinator

Biography:

Pedro Moreo is Water and Sanitation Consultant at the IDB. He is based at the IDB office in Mexico, and responsible for the coordination of the regional project GEF CReW+, which encompass 18 countries in the Wider Caribbean region.



Pedro, a Spanish national, is an Industrial Engineer with more than 12 years of experience in project management and supervision in the construction, water and sanitation industries; working with public and private sectors and with international and multilateral organizations.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Christopher Corbin / Jamaica / 1 876 922 9267-69/ christopher.corbin@un.org / UNEP Programme Manager, Cartagena Convention Secretariat / Christopher Corbin is a Programme Officer with the Ecosystems Division of the United Nations Environment Programme (UNEP). He is based at the Secretariat for the Cartagena Convention in Kingston, Jamaica, which covers all the countries of the Wider Caribbean Region. Chris is responsible for the Secretariat's Marine Pollution and Communications Sub-Programmes. Chris, a Saint Lucian national, has over 30 years of programme and project management experience. He has been involved in the development and implementation of multi-country projects on wastewater management, solid waste management and integrated coastal zone and watershed management. Most recently he coordinated the development of the State of Convention Area Report on Marine Pollution in the Wider Caribbean Region

Conference Thematic Area

1. Water Security and Integrated Water Resources Management for the Development of Caribbean Nations

Paper Title

GEF CReW+ Project: Toilets of the Caribbean

Abstract

Approximately 85% of domestic wastewater that is discharged into the Caribbean Sea is partially treated or untreated. Increases in coastal population, expansion of the tourism sector, and coastal development continue to place heavy demands on wastewater treatment infrastructure (UNEP-CEP, 2019). It is estimated that in 2015, 12 billion m³ of domestic wastewater was generated in the region, however, only 40% reached treatment plants, while the remaining 60% of untreated wastewater was disposed of in coastal waters (CREW+, n.d.).

The GEF CReW+ project is a partnership project funded by the Global Environment Facility (GEF), co-implemented by the Inter-American Development Bank (IDB) and United Nations Environment Programme (UNEP) under the framework of the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention). It involves 18 countries of the Wider Caribbean Region (WCR): Barbados, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Grenada, Guatemala, Guyana, Honduras, Jamaica, Mexico, Panama, Saint Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago. The project is co-executed by the Deutsche Gesellschaft Internationale Zusammenarbeit (GIZ) GmbH, the Cartagena Convention Secretariat and The Organization of American States (OAS).

GEF CReW+ will implement innovative, sustainable and replicable solutions for improving water and wastewater management while reducing detrimental impacts on ecosystems and the peoples of the WCR. Focus will be on the strengthening of institutional and legislative frameworks, development of sustainable and innovative financing mechanisms and facilitating regional dialogue and exchange with countries and partners. In addition, the project will implement water use efficiency solutions in selected watersheds and freshwater basins. These

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interventions will promote a Source to Sea approach and increase the resilience of local communities to the impacts of droughts and, more generally, the impacts of climate change and climate variability in the water sector.

Name: Anthony Farrar
Country: United Kingdom
Profession: Chartered Civil Engineer

Biography

From experienced gained through over 50yrs within the water industry, Tony now acts as a free-lance consultant advising on operational and technical aspects of water and wastewater service provision.



Tony believes it is the institutional issues which lie behind poor performance that must be identified, analysed and addressed if short-term improvements are to be sustained. Tony endeavours to minimise his input on the why and the what of the issues factors that are frequently already known and understood by clients - instead focusing on the how, exploring the methodologies and modalities that are most suited to his client's needs and circumstances. A constant theme has been to ensure the long-term sustainability of funder investments through the development of local staff to be independent of external assistance and through helping managers to understand the business priorities, focusing on the solutions that provide the most value for money.

Recent roles have been as Team Leader in the Barbados Water Authority contract Cost of Service Study and Tariff Proposal; water operations expert for a study to assess and improve the performance, effectiveness, and accuracy of water metering and billing systems for the Saudi Arabian regulator, and, since 2011, providing a water sector consultancy service to the InterAmerican Development Bank throughout the Caribbean region specifically, but not exclusively, for non-revenue water projects.

Co-Author's Name / Country / Telephone / Email / Profession / Biography Conference Thematic Area

1. Water Security and Integrated Water Resources Management for the Development of Caribbean Nations

Paper Title

Phasing a Non-Revenue Water Reduction Programme: Realise the In-House Potential of your Utility

Abstract

The benefits of reducing NRW to address the security of public water supplies are well documented. Often, the question is not one of why or what, but how through a contract or by in-house teams?

Whilst utilities desire to use their own resources, lenders are wary of funding in-house reduction programmes because, unlike a performance-based contract, they do not provide the same assurance that the benefits will be delivered. Also, governments can be loath to commit to the required major investment without a utility track-record of project managing successful reduction programmes.

Moreover, though different skill-sets are required for reducing real and commercial losses, they are commonly linked together in a single contract. The reduction in leakage is essentially an on-site operational task, yet the reduction in commercial losses is predominantly office-based focused around the efficient management of the income and billing function for which the required organisational and financial skills are often available in-house.

Rather than enter immediately into a contract based NRW reduction programme, the Paper proposes a phased approach that provides the time and opportunity for the utility employees to demonstrate their capability to deliver an NRW reduction programme, and so reassure lenders and government.

CWWA Abstracts and Presenter Profiles

Within an initial phase, the organisational structure and skills to project manage a reduction programme are established; commercial losses are reduced by the utility employees, and in-house operational teams focus leak detection within shop window areas in order to showcase their competence.

Thereafter, depending upon the success in reducing NRW in the initial phase, the utility has the option to continue using its in-house resources, or to let a contract. Critically, the utility will have first shown confidence in its employees and provided them with the opportunity to demonstrate their competence and commitment.

Name: Valerie Jenkinson
Country: Canada
Profession: CEO WWWS Water and wastewater capacity building

Biography

Valerie Jenkinson is an expert in water and wastewater intuitional capacity building and has worked in sector in the Caribbean as well as Canada for the last decade. She has over 35 years' experience in developing and facilitating workshops and stakeholder engagement. She owned the largest training organization in the water and wastewater sector in Canada.



Ms. Jenkinson consults widely on a number of water related subjects including national water and wastewater policy, Emergency Response Plans, climate mitigation, rates and tariffs and she developed the Effective Utility Management Certificate Programme which underpins management strategy for water and wastewater utilities. She is also certified to assist in the reporting of SDG 6. Valerie is the Founder and Chair of Operators Without Borders and has worked with the organization on a number of disaster projects helping utilities rebuild after disasters as well as water utility capacity building initiatives and training

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Greg Solecki Canada, Disaster management?Canada/ gsolecki@shaw.ca/Disaster and RecoveryExpert Greg Solecki is one of Canada leading experts in disaster and crisis management. He is an internationally Certified Emergency Manager (CEM) and Business Continuity Professional (CBCP) who has been instrumental in the development of international crisis management standards (ISO 22301, ISO 24518, CSA1600), as well as contributing to the development of Canada Critical Infrastructure Pandemic Plan as the Water Sector Chair. He has been a guest lecturer at Harvard on crisis management. With practical experience during SARS, H1N1, H5N1 and President of the International Association of Emergency Managers (IAEM) Canada, he was sought out as a contributing member for the United Nations office of Disaster Risk Reduction (UNDRR) Global Education & Training Institute (GETI). Greg is also an experienced facilitator and Incident Command System (ICS) 400 instructor for both ICS Canada and the Federal Emergency Management Agency (FEMA) that has worked with every level of response managing Emergency Operation Centre during 6 States of Local Emergency, leading to his attendance at Harvard's National Preparedness Leadership Initiative (NPLI). Greg Solecki is one of Canada's leading experts in disaster and crisis management. He is an internationally Certified Emergency Manager (CEM) and Business Continuity Professional (CBCP) who has been instrumental in the development of international crisis management standards (ISO 22301, ISO 24518, CSA1600), as well as contributing to the development of Canada's Critical Infrastructure Pandemic Plan as the Water Sector Chair. He has been a guest lecturer at Harvard on crisis management. With practical experience during SARS, H1N1, H5N1 and President of the International Association of Emergency Managers (IAEM) Canada, he was sought out as a contributing member for the United Nations office of Disaster Risk Reduction (UNDRR) Global Education & Training Institute (GETI). Greg is also an experienced facilitator and Incident Command System (ICS) 400 instructor for both ICS Canada and the Federal Emergency Management Agency (FEMA) that has worked with every level of response managing Emergency Operation Centre's during 6 States of Local

CWWA Abstracts and Presenter Profiles

Emergency, leading to his attendance at Harvard's National Preparedness Leadership Initiative (NPLI).

Conference Thematic Area

1. Water Security and Integrated Water Resources Management for the Development of Caribbean Nations

Paper Title

Preparing and Dealing With Disasters

Abstract

The proposal that was discussed with Wayne Williams is to provide a Panel Discussion on Disaster Management. There would be four presenters over a minimum 1 hour to 2 hour time period.

Panel members would be:

1. Greg Solecki Canada's top disaster expert and certified FEMA Incident Command System trainer and will speak on his prior experience with SARS and H1N1 and how it relates to dealing with the COVID pandemic as well as talking about the need and use of an Incident Command System;

2. Ian Mcilwham, who wrote many of the Canadian ISO water standards and who is leading the Region of Durham, Canada's COVID response team. Ian will speak about the challenges and solutions his region experienced dealing with COVID and the need for preparation for the next disaster

3. Bernard Ettinoffe, GM DOWASCO who led his utility through hurricane recovery in 2017 and is now dealing with COVID and will talk about their challenges and lessons learned

4. Valerie Jenkinson, Chair: Operators Without Borders who has led teams in disaster recovery. Valerie will talk on Rethinking Emergency Response Plans
Following presentations from each expert there will be a facilitated discussion with questions from participants

Additional bios.

Greg Solecki is one of Canada's leading experts in disaster and crisis management. He is an internationally Certified Emergency Manager (CEM) and Business Continuity Professional (CBCP) who has been instrumental in

the development of international crisis management standards (ISO 22301, ISO 24518, CSA1600), as well as contributing to the development of Canada's Critical Infrastructure Pandemic Plan as the Water Sector Chair. He has been a guest lecturer at Harvard on crisis management.

With practical experience during SARS, H1N1, H5N1 and President of the International Association of Emergency Managers (IAEM) Canada, he was sought out as a contributing member for the United Nations office of Disaster Risk Reduction (UNDRR) Global Education & Training Institute (GETI).

Greg is also an experienced facilitator and Incident Command System (ICS) 400 instructor for both ICS Canada and the Federal Emergency Management Agency (FEMA) that has worked with every level of response managing Emergency Operation Centre during 6 States of Local Emergency, leading to his attendance at Harvard's National Preparedness Leadership Initiative (NPLI).

Ian Mcilwham is the current Chair for Canada's National Critical Infrastructure Working Group and the Canadian Mirror Committee Chair for ISO TC 224, which developed the International Standard on Crisis Management of Water Utilities (ISO 24518).

Ian has been instrumental in developing Public Works emergency and continuity programs in his position as Manager, Compliance at the Regional Municipality of Durham. He is currently leading the response to COVID-19 for Durham Region water and wastewater since an Emergency declaration on March 17, 2020. He is the current chair of the Security and Emergency Management Committee for the Caribbean Water and Wastewater Association (CWWA) which cooperates with Public Safety Canada and other federal departments concerned with emergency preparedness and national security to actively contribute to the knowledge base and federal programs related to critical infrastructure.

Bernard Ettinoffe is well known throughout the Caribbean. Apart from leading the water utility DOWASCO for many years he is Past Chair of CAWASA and has served the water industry over many years.

CWWA Abstracts and Presenter Profiles

Name: Kalpna Solanki
Country: Canada
Profession: CEO and Engineer

Biography

Kalpna is passionate about water and making things better. She has a background in Environmental Health and business, and is a founding director of Operators Without Borders.



Jenni Green has a significant background in water and wastewater industry. She is a professional engineer and handles all aspects of facility related issues at the EOCP.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Jenni Green, Canada, Engineer, jgreen@eocp.ca

Conference Thematic Area

1. Water Security and Integrated Water Resources Management for the Development of Caribbean Nations

Paper Title

Integrating Data Management for Water and Wastewater Classification and Certification

Abstract

The EOCP underwent a massive Customer Relationship Manager (CRM) design and implementation. The new web-based information system provides improved overall business management support and functions for the EOCP and our stakeholders.

The new system collects and store Operator information (from initial contact through certification and professional development until retirement), facility, employer, owner, instructor, associate members, and training provider information, in an electronic format.

Several key features of the new EOCP CRM:

1. Storage of data electronically;
2. Track, manage and report on EOCP Operators

- throughout the full lifecycle of their interaction with the EOCP;
3. Collection and processing of Continuing Education Units;
4. Improving the interaction with Operators by using an up-to-date design and web interaction methods;
5. Provide workflow and status tracking;
6. Manage facilities, employers, and owners;
7. Collect Operator dues and facility fees;
8. Provide roll-up reporting and exception reporting to various levels;
9. Provide enhanced data security and data access "in the event of fire/flood/earthquake";
10. Provide support to integrate with the EOCP's accounting system.

The EOCP's CRM provides accurate and timely management of information for staff, Operators, employers, and government agencies, and contributes to the ongoing success of the EOCP as it continues its work to Certify Operators and Classify Facilities enabling the prudent management of water and wastewater in British Columbia and Yukon for 4.2 million people.

Name: Christopher Corbin
Country: Jamaica
Profession: Programme Manager, Pollution and Communications

Biography

Christopher Corbin is a Programme Officer with the Ecosystems Division of the United Nations Environment Programme (UNEP).

He is based at the Secretariat for the Cartagena Convention in Kingston, Jamaica, which covers all the countries of the Wider Caribbean Region. Chris is responsible for the Secretariat's Marine Pollution and Communications Sub-Programmes.



Chris, a Saint Lucian national, has over 30 years of programme and project management experience. He has been involved in the development and

CWAA Abstracts and Presenter Profiles

implementation of multi-country projects on wastewater management, solid waste management and integrated coastal zone and watershed management. Most recently he coordinated the development of the State of Convention Area Report on Marine Pollution in the Wider Caribbean Region.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

2. Waste Reduction and the Circular Economy: The Caribbean Approach

Paper Title

Solid Waste and Marine Litter Management Trends in the Wider Caribbean Region.

Abstract

Trash is now ubiquitous in the environment posing significant risk to public health and economic sectors such as tourism, fisheries, and shipping. With limited recycling and markets for solid waste, and space constraints in the small islands, countries in the Wider Caribbean Region (WCR) are struggling to deal with the vast quantities of waste produced. Infrastructure is lacking, and fees collected are inadequate to expand waste collection and disposal services. It was estimated that in Latin America and the Caribbean, 145,000 tons per day of waste are disposed in open dumpsites, including 17,000 tons per day of plastic (UNEP 2018). Solid waste generation is expected to increase in the region as human populations grow, in the absence of more sustainable production and consumption patterns and adequate solid waste management infrastructure. The WCR is among the world regions with the highest floating microplastic and macroplastic concentrations (UNEP CEP 2019). It has been estimated that in 2015 the resident population of the WCR generated 79 million tons of solid waste, which is projected to increase to 84 million in 2020. From this, 1.3 million tons of plastics were introduced to coastal waters of the WCR in 2015. First estimates of solid waste generated by the combined resident populations and by tourists in the Eastern Caribbean countries in 2015 amounted to 663,000 tons and 49,000 tons, respectively. (UNEP CEP 2019). While

bans of single-use plastic bags and polystyrene foam products have swept across the Caribbean, solid waste management improvements continue to be a major challenge. While addressing plastic pollution using the circular economy approach is gaining momentum, the by-products of plastic recycling can be just as or even more harmful than the uncycled plastic itself especially if policies, legislative and regulatory frameworks for dealing with these by-products are not in place.

Name: Christopher Corbin
Country: Jamaica
Profession: Programme Manager, Pollution and Communications

Biography

Christopher Corbin is a Programme Officer with the Ecosystems Division of the United Nations Environment Programme (UNEP).

He is based at the Secretariat for the Cartagena Convention in Kingston, Jamaica, which covers all the countries of the Wider Caribbean Region. Chris is responsible for the Secretariat's Marine Pollution and Communications Sub-Programmes.



Chris, a Saint Lucian national, has over 30 years of programme and project management experience. He has been involved in the development and implementation of multi-country projects on wastewater management, solid waste management and integrated coastal zone and watershed management. Most recently he coordinated the development of the State of Convention Area Report on Marine Pollution in the Wider Caribbean Region.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

2. Waste Reduction and the Circular Economy: The Caribbean Approach

CWWA Abstracts and Presenter Profiles

Paper Title

Waste Management and the Caribbean Blue Economy

Abstract

Coastal and marine ecosystems and water quality in the Wider Caribbean Region (WCR) are negatively impacted by increasing volumes of solid and liquid wastes. These can be in the forms of untreated wastewater, nutrients from agricultural runoff, or marine litter including plastics. The quantity of pollution entering the Caribbean Sea has been directly correlated with coastal population densities and extent of activities in watersheds draining into the oceans (World Bank, 2019). For Caribbean people, whose lives and livelihoods are heavily dependent on the Caribbean Sea, any efforts to develop new and innovative Blue Economy approaches must ensure long-term sustainability while reducing the negative impacts of pollution from land and marine-based sources and activities. Blue Economy is the sustainable use of ocean resources for economic growth. As marine, ocean-based or Blue economies are developed in the Caribbean, additional threats will grow for the environment from activities like maritime transportation, offshore mining and fossil fuels extraction. Not only must these future Blue Economy approaches encompass the preservation of the health of marine and coastal ecosystems, but pollution from poor solid and liquid waste management practices threaten development by negatively impacting blue economy sectors like tourism and fisheries, which foster economic growth, food security, and commercial opportunities in the region. In order to tackle the pollution threat and develop robust solid and liquid waste management responses, stakeholders in the Wider Caribbean must overcome challenges like inadequate institutional, policy, legislative and regulatory frameworks, the dilapidation of waste management infrastructure and sanitation systems, and the lack of human, technical and financial resources. On the contrary, a successful Caribbean Blue Economy will need to fully exploit the potential of circular economy approaches based on repurposing plastics, upcycling marine litter, producing energy from waste, recovering nutrients from wastewater, and shifting to more biodegradable materials.

Name:

Fadilah Ali

Country:

Trinidad and Tobago

Profession

Consultant

Biography

Fadilah Ali is the Assistant Executive Director of the Gulf and Caribbean Fisheries Institute (GCFI). Originally from Trinidad and Tobago, she is an ecologist with a specialty in invasive species biology, control and management. She is currently the Project Manager for the Caribbean Node of the Global Partnership on Marine Litter which GCFI is a co-host of together with UN Environment. She previously conducted research on biological indicators for water quality as well as the distribution and impact of marine debris on British coastlines as well as research on the lionfish invasion within the Dutch Caribbean with a focus on their general and feeding ecology. She currently works as a consultant in the Caribbean, managing projects on marine litter and fisheries



Co-Author's Name / Country / Telephone / Email / Profession / Biography

Robert Glazer / United States / 305-289-2330 / bob.glazer@gcfi.org / Principal Investigator / Bob is the Principal Investigator for the Florida Fish and Wildlife Commissions Fish and Wildlife Research Institute's queen conch research and restoration program in Marathon. His research interests are in stock restoration, essential habitat, larval recruitment, endocrine disruption, marine fishery reserves, and stock structure. He has worked extensively on molluscan aquaculture for both commercial and restoration projects. Bob is also the Principal Investigator on a number of climate change adaptation projects. He developed the KeysMAP (Florida Keys Marine Adaptation Planning) program which uses scenarios to develop climate adaptation strategies, identifies triggerpoints for implementing the strategies, and develops monitoring program to identify when the triggerpoint is attained Christopher Corbin / Jamaica / +1 876 922 9267-69 / Christopher.Corbin@un.org / Programme Officer Christopher Corbin is a senior

CWWA Abstracts and Presenter Profiles

Programme Officer with the Ecosystems Division of the United Nations Environment Programme (UNEP). He is based at the Secretariat for the Cartagena Convention in Kingston, Jamaica, which covers all the countries of the Wider Caribbean Region. Chris is responsible for the Secretariat's Marine Pollution and Communications Sub-Programmes and oversees activities on marine litter management among others. Chris, a Saint Lucian national, has over 30 years of programme and project management experience. His technical training is in Environmental Monitoring and Assessment and he has been recently involved in the development and implementation of multi-country projects on wastewater management, solid waste management and integrated coastal zone and watershed management. He was responsible for the development of the Regional Action Plan for Marine Litter Management in the Caribbean and is currently leading the preparation of a Regional Caribbean Marine Litter Strategy.

Conference Thematic Area

2. Waste Reduction and the Circular Economy: The Caribbean Approach

Paper Title

Introducing the Caribbean Node of the Global Partnership on Marine Litter (GPML-Caribe)

Abstract

The Global Partnership on Marine Litter - Caribbean Node (GPML-Caribe) was formed in 2015 and represents a partnership among national and regional organisations, governments, research and technical agencies, and individuals, that work together to reduce the quantity and impact of marine litter in coastal zones of the Wider Caribbean Region (WCR). The Gulf and Caribbean Fisheries Institute (GCFI) and the Secretariat for the Cartagena Convention (UNEP-CEP) are the co-hosts of the GPML-Caribe. GPML-Caribe is focused on supporting national and regional marine litter projects whilst also promoting national policy and legal reforms. Through the support and development of marine litter related projects, a dedicated webpage (www.gpml-caribe.org), social media platforms, factsheets, an email distribution list, and sharing of information on new grant opportunities, GPML-Caribe strives to be the

coordinating force that unifies national and regional actions to achieve the overall goal of reducing and managing marine litter in the WCR. GPML-Caribe has enlisted marine litter experts to develop a marine litter-monitoring manual and to assist with the development of a Regional Marine Litter Management Strategy. This strategy will help to identify priority actions which could be used as the basis for developing new project proposals and assist in resource mobilisation efforts. It will further support the implementation of the Regional Action Plan for Marine Litter Management in the Wider Caribbean Region (RAPMaLi) and implementation of the Protocol on Land Based Sources of Pollution (LBS Protocol).

Name: Sancha Foreman
Country: Jamaica
Profession: S.Foreman-Programme Management Assistant, UNEP CEP

Biography

Sancha Foreman is the Programme Management Assistant for the Pollution Sub-programme of the United Nations Environment Programme, Cartagena Convention Secretariat based in Kingston, Jamaica. She has over 10 years of professional experience working with government, international and regional partners. Seasoned administrator with experience supporting projects from proposal, through implementation to completion and evaluation implementing complex projects and strategies.



Through the development of collaborative relationships with internal and external stakeholders, Sancha has facilitated the development and implementation of environmental programs and initiatives centred on the reduction of pollution and preservation of the marine environment in the Wider Caribbean Region among 33 states and territories.

CWVA Abstracts and Presenter Profiles

Ms. Foreman has a Master of Science degree in Governance and Public Policy from the University of the West Indies and a Bachelor of Science degree in International Relations along with additional qualification in Project Management and Spanish among others.

In her capacity as a current member of the National Steering Committee of the GEF Small Grants Programme, Sancha looks forward to empowerment of community-driven and civil society-led initiatives which contribute to sustainable development.

Committed to service whether locally or at a global level, Sancha is driven to improve the social, educational and economic outcomes of vulnerable and under-served communities as she continues to volunteer in a number of community service organizations.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Ankur Deb/Jamaica/India/+447549259075/deb.ankur586@gmail.com/Masters in Water and Coastal Management/Aspiring environmentalist with underlying interest in ocean and related biodiversity protection
Conference Thematic Area 2. Waste Reduction and the Circular Economy: The Caribbean Approach

Paper Title

Engagement and capacity building of local communities by UNEP CEP : Trash Free Waters Initiative in Jamaica and Panama

Abstract

A region connected by one single resource- the sea, the Caribbean is home to more than 700 islands and over 30 coastal countries and territories. Our Caribbean Sea forms the lifeblood of the region's tourism, maritime and fisheries industries. It has been estimated that the gross revenues generated by the Caribbean Sea alone is US\$407 billion. Marine Litter has been a persistent challenge for the Caribbean with inflows of land-based trash entering the waterways threatening the sustainability of our coastal and marine ecosystems. According to the Region's first State of Pollution Report, the Wider Caribbean region has among the highest floating micro-

plastic and macro-plastic concentrations in the world with estimates of about 82,000- and 5,000-pieces per km² respectively. The UN Environment Programme-Caribbean Environment Programme (UNEP CEP) has been active with projects and initiatives like the Trash Free Waters Initiative which address the marine litter problem. The Trash Free Waters (TFW) Initiative for the Caribbean is a partnership among local, regional and international partners involving community stakeholders to address the issue of trash entering the Caribbean Sea with pilot projects undertaken in Jamaica and Panama. In Jamaica, over 4,500 lbs. of plastic bottles and 2,500 lbs. of compost have been collected while 3,400 residents benefitted from outreach activities. Residents gained from livelihood training embracing the circular economy concept including jewellery making from items collected from sea & composting from livelihood workshops. In Panama, community-based activities were successful in educating 450 students and institutions on trash reduction and training of 10 volunteers to support waste reduction strategies. As the Caribbean's transition to a circular economy continues to evolve, lessons learned from these waste reduction projects can enable replication and upscaling in the region through frameworks like the Cartagena Convention, the only legally binding environmental agreement in the region.

Name: Juan Andrade
Country: Trinidad and Tobago
Profession: Aeronautical Engineer

Biography

Juan Andrade is an Aeronautical Engineer by profession and philanthropist by nature. Juan has worked as a Type Rated Engineer at Air Caribbean Trinidad & Tobago and Bristow Caribbean Helicopters. Locally and internationally, he also performed as an automation expert having assembled various manufacturing facilities including but not excluded to Blue Mountain Waters, Brava International, Eskimo Ice



CWAA Abstracts and Presenter Profiles

and Duc Juices. He also provided engineering solutions at Solo Beverage Company, Venco and Fine Choice Meats Limited, among others. Juan gained experience in the oil and gas industry when he served as Services and Supply Manager at Trinidad & Tobago's LNG Plant in Point Fortin during its critical construction stages. He is a certified Eastern Aero-Marine Inspector and certified Helicopter Underwater Escape Trainer (HUET). He is the Founding Director of Milagros Solutions Limited and the Founding Director of Extreme Advertising Limited. Juan is an honorary Rotary International member as well as a member of the International Animal Welfare (IFAW) and Zoological Society of Trinidad & Tobago, and volunteers avidly at the Manatee Conservation Trust and the Emperor Valley Zoo. He is the Founding Director of the T&T Paragliding Association. He is also a very active athlete who has represented Trinidad & Tobago in the most prominent competitions in paragliding such as the World Cup and Pan American Games; and he is also involved in motor-boating, motorcycling, bicycling and kite surfing as a sportsman. His great love and appreciation for the community and the environment provoked him to also start Flying Tree Environmental Management (FTEM) where he is currently Managing Director; also founding Un Cielo Para Todos, a non-profit organisation that operates in Colombia which engages in socio-environmental inclusion programmes through sports. As the Managing Director of FTEM, Juan provides management expertise along with networking and communications and is critical in the design and management of all FTEM's projects. His wealth of experience and technical training also makes him an expert in waste collection and beach clean-ups, recycling, upcycling and reforestation. He is a champion of the environment and a philanthropist at heart, having a deep understanding of the natural environment's role to provide all resources thereby requiring conservation and protection. He believes hands-on education is key to changing people's behaviour by empowering them with tangible experiences that impact their attitude individually which can lead to a ripple effect through their personal interactions, influencing their social circles and communities.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Dr. Sharda Mahabir, Trinidad and Tobago, 1868-307-9872, sharda.mahabir@undp.org, National Coordinator, GEF Small Grants Programme. Sharda has a PhD in Environmental Biology from the University of the West Indies, St. Augustine. She was part of a five-person team, which completed the first ecological assessment of rivers across Trinidad and Tobago. In 2015, she developed a programme called Adopt A River for the local water authority. This programme brought together corporate entities, community groups, educational institutes and government agencies to develop and implement projects to improve the poor status of rivers locally. Under her stewardship, the Programme completed 35 clean-up exercises; 40 recycling projects; 3 tree-planting exercises and developed 12 water supply projects. These activities resulted in a reach of 5000 person and over 200 community members were trained in just 2 years. Sharda represented the Programme and won two awards: Most Outstanding Project (2015) from AMCHAMTT and third place in the IDB President's Award for Excellence and Innovation in the Public Sector (2019). Sharda has also lectured part-time with the Department of Life Sciences, UWI, St. Augustine for both undergraduate and post-graduate programmes, sharing her knowledge on pollution monitoring and assessment with the next generation.

Conference Thematic Area

2. Waste Reduction and the Circular Economy: The Caribbean Approach

Paper Title

Trinidad and Tobago's First Plastic Circular Economy

Abstract

Linear industrial systems, which are characterised by unidirectional production and consumption, have been recognised to result in poor waste management globally. In Trinidad and Tobago, plastic production is linear, and is depended upon for cheap packaging, especially for beverages. This has come at a high cost to the environment, which includes unsightly dumping, flooding and microplastics in water and organisms.

CWWA Abstracts and Presenter Profiles

As yet, Trinidad and Tobago has not implemented strategies to realise sustainable solutions for our plastic waste problem. One such, world-recognised strategy for addressing plastic waste is via a circular economy, which is an economic system aimed at eliminating waste and the continual use of resources. This paper will detail the development of the country's first plastic circular economy, which has been in existence for the past thirteen years. It will describe the journey of how one company has been actively working towards changing the culture of plastics as well as actively engaging communities to re-engineer at least 100 tonnes of plastics to date. Based on their experiences of actively processing plastic waste, this paper will also make recommendations on how their work can be upscaled and replicated in other areas of the country.

Keywords: Circular economy, waste management, industry, culture, sustainable development.

Name: Ramchand Jailal
Country: Guyana
Profession: Engineer

Biography

Ramchand Jailal currently heads the Hinterland Services Department whose mandate is to conceptualize, design and implement water supply projects in Hinterland communities in Guyana. The department also manages the operations and maintenance of water systems in all the Hinterland communities.



Ramchand Jailal possesses a Bachelor's Degree in Civil Engineering and a Master's Degree in Construction Management from the University of West Indies and has over 15 years' experience in the Water utility sector.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

John Yow, Guyana, 5926849293, johny@gwi.gy, Engineer, John Yow possesses a Bachelor's Degree in Civil Engineering from the University of Guyana and has

over 4 years' experience in designing and implementing water supply projects for Hinterland locations.

Conference Thematic Area

3. Effective Financing, Governance and Leadership for Sustainable Water and Waste Sector Development

Paper Title

The impacts of climate change and the achievement of SDG 6 in the Upper Takutu/ Upper Essequibo region in Guyana.

Abstract

Guyana is called Land of many water and is the only English speaking country in South America, with neighbors Suriname to the East, Venezuela to the West, Brazil to the South, and the Atlantic Ocean to the North. This country has a total landmass of 83,000 square miles and a population of below one million persons. It is divided into ten Administrative Regions, of which four of these Regions have predominantly Indigenous people that makes up around ten percent of the total country's population. One of these Region, the Upper Takatu / Upper Essequibo with predominantly Indigenous persons, is the largest in landmass of of the ten Regions, with 22,300 square miles and comprised of a population of 24,212 persons. There are fifty seven (57) main Indigenous communities along with thirteen (13) satellite communities in this region. Potable water is currently being supplied to approximately fifty-five percent (55%) of the residents in this Region, and Sustainable Development Goal (SDG) No 6 targets the provision of potable water to everyone by the year 2030. This paper will identify the gaps and presents a strategy for the achievement of this goal (SDG 6) within the specified Region of Guyana before the deadline incorporating climate change mitigation and adaptation measures.

CWWA Abstracts and Presenter Profiles

Name: Ann Mariee Drakes
Country: Guyana
Profession: Admin Assistant



Biography

Ann Marie Drakes is an Administrative Assistant within the sanitation department of Guyana Water inc., where she provides administrative, clerical and analytical support.

She is a graduate from the University of Guyana who completed her bachelor's degree in Sociology. She is passionate about addressing social phenomenon s in society such as stigma, discrimination and classism.

She is a pinned Rotaractor from the Rotaract club of Georgetown Central and enjoys volunteer work, traveling, singing, cooking and have a soft spot for dogs.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

4. Optimizing the Water and Waste Sectors to Ensure the Needs of Women and the vulnerable
Paper Title Reconstructing the way people view sewage and sewer workers in Guyana

Abstract

There is a need to reconstruct the way people view sewage and sewer workers in Guyana. Waste, often times have produced negative connotations in the mindset of people, considering it to be something that is useless and unprofitable. Sewer workers also experience a fair share of stigmatization and can be considered vulnerable because of their close association to waste and the unique challenges they face with their high risk job.

The first phase of gathering data for this research entailed the use of purpose sampling method in interviewing nine (9) sewer workers. The intention was to determine the challenges that they face and their personal experiences when interacting with internal

and external customers. The second phase of data gathering entailed convenience sampling procedures interviewing nine (9) respondents from the general public to determine their perception of sewage and sewer workers.

Analysis of the data from sewer workers found that majority of the respondents indicated that the major challenge they face is being appropriately compensated for the high risk roles they perform. However, there were mixed reviews as it relates to how they are treated by the public as a result of their close association with sewage. As it relates to the respondents from the general public, most of them lacked knowledge on the potential of sewage shared positive perceptions of sewer workers.

The results indicated that most respondents lacked knowledge as it relates to sewage and it's potential. It can be contented that improved knowledge of sewage may encourage a positive view of sewage which may in turn positively affect how the general public view sewer workers. Until then perhaps, sewage will be seen generally, as something profitable and useful with the capacity to enrich lives in Guyana.

Name: Rensforde Joseph
Country: Guyana
Profession: Wastewater Engineer

Biography

Master's Degree in Business Administration - University of South Wales Graduate of the University of Guyana with a Graduate Diploma in Development Studies and a Bachelor's Degree in Electrical Engineering Professional training in Wastewater Management University of the West Indies/ UNESCO-IHE, DELFT, Water Centre for Latin America and the Caribbean, Project Management training "INDES." Twelve year experience in water and wastewater operations "Sanitation Manager- Guyana Water Incorporated and WASH Coordinator GWRF-CReW " Participated in a number or wastewater related projects in Guyana including the GEF



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CRew project, Georgetown Sanitation Rehabilitation Program and Most recently the EU/IDB Water and Sanitation Infrastructure Improvement Programme and the Venezuelan Migrant WASH program

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Anthony Thornhill

Conference Thematic Area

4. Optimizing the Water and Waste Sectors to Ensure the Needs of Women and the vulnerable

Paper Title

Optimizing the Water and Waste Sectors to Secure the Needs of Women and the Vulnerable

Abstract

Optimizing the Water and Waste Sectors to Secure the Needs of Women and the Vulnerable
The United Nation Sustainable Development Goal 5 “Achieve Gender Equality and Empowering all Women and Girls, calls on participating governments to develop and implement strategies, legislations, policies and enforcement programs and strategies aimed at achieve this development goal. Goal 6 of the organization’s development mantra aptly collaborates goal five, as it brings into focus governments needs to effectively institutionalize the provision of safe water and adequate sanitation to all of its citizens including women and girls. The government of Guyana through the Guyana Water Incorporated, GWI, has within its Strategic Business Plan 2017-2021 a projection to increase water coverage in the hinterland regions from 11% in some regions to 93%. According to the daily Stabroek Newspaper, the Company reported that as of December 31, 2019, access to potable water in the hinterland regions stood at 85%, a signification improvement from the 11% in 2017. The paper focused on the intertwining of the United Nation Sustainable Development Goals 5&6 and the GWIs Strategic Business Plan 2017-2021 with emphasis on hinterland development. The paper chronicles the metamorphosis of one of the Amerindian Villages, White Water, in the area of water and sanitation, over the period 2018-2020. The author, with the use of situation and gap analysis, accentuated the inadequacy of the existing water supply and sanitation facilities in

the village relating to the risks these inadequacies post to the villagers, particularly women and girls. The paper zeroed in on the struggles this vulnerable section of the population face and the exacerbating of the situation due at a large influx of Venezuelan migrants into the village seeking refuge. The paper demonstrates the effect of collaboration among local agencies- GWI, Regional Democratic Council, etc. and International Donor Agency, UNICEF in adeptly bringing to bear at transformation of this village, thus significantly reducing the health and socio-economic risk once faced by the village’s women and girls.

Name: Khemraj Persaud
Country: Guyana
Profession: Mechanical Engineer

Biography

Khemraj Persaud possesses a Bachelor’s Degree in Mechanical Engineering from the University of Guyana and has over 5 years experience in designing and implementing water supply projects for Hinterland locations.



Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

Geophysical logging for Groundwater investigation in the Indigenous Hinterland Community of Toka, Region 9 to facilitate drilling of a potable water well

Abstract

Guyana is the only English speaking country in South America and is bordered by Suriname, Venezuela and Brazil. Guyana has more than 200 Hinterland communities and the provision of adequate supply of potable water to these communities has been challenging due to difficulty with accessibility and communication which hinders data gathering for analysis and designs.

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The Indigenous community of Toka is located in the North Rupununi Region of Guyana. Toka has a population of 207 persons, most of whom belong to the Indigenous Macushi tribe.

Residents of the community face significant challenges with access to adequate and potable water for consumption and daily usage. This is due to the fact that the existing hand dug shallow well does not produce sufficient water to meet the demand of the entire community. As such, residents would have to walk long distances daily to a water hole spring source to fetch water in pails. However, the spring usually depletes in the dry season and also becomes contaminated and highly turbid in the rainy season.

To ensure compliance with the Sustainable Development Goals (SDGs) more specifically goal 6: Ensure availability and sustainable management of water and sanitation for all, The Guyana Water Incorporated Hinterland Services department is embarking on construction of a new water supply system utilizing ground water from a drilled well. The new scientific approach will entail execution of a geophysical survey of the community to determine a precise location to undertake drilling in order to infiltrate an identified aquifer, instead of drilling multiple pilot holes in a trial and error method which used to be both time and resource consuming.

The geophysical logging survey will be conducted throughout the community using the Super Sting R8 Resistivity logging equipment to gather subsurface data, which will then be analyzed to identify the most suitable location for drilling of a successful well.

Name: Kevin Carter
Country: United States of America
Profession: Water Sector Legislative and Intergovernmental Affairs

Biography

Kevin Carter is the Broward County Water and Wastewater Services Assistant to the Director where he focuses on legislative and intergovernmental affairs as well as special projects such as grants. Kevin is a Resilient Utility Coalition Board member



(based in South Florida, USA) and serves on the Florida Section of the American Water Works Association and Florida Water Environment Association Utility Councils. He is also a Broward College adjunct professor in the Environmental Sciences Department.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Not applicable

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

The One Water Academy for a One Water Resilient World

Abstract

The Florida water sector (along with other USA and global partners) recently developed a resilience collaboration and education platform The One Water Academy (OWA). The OWA's mission is to develop water professionals for a One Water Resilient World (<https://onewateracademy.org/purpose>). We seek to equip governments, utilities, industry, academia, nonprofits, and the community with the skills and knowledge needed to prepare, respond, and recover from shocks and stresses for One Water Resilience.

The OWA is part of the South Florida Resilient Utility Coalition (RUC) next phase to connect globally. The RUC and the OWA are closely intertwined and RUC is providing financial, technical, and logistical support. Launched on Earth Day 2020, the OWA's content, successes, and lessons learned will be discussed during the presentation. In addition, the author seeks feedback from the Caribbean water sector on their perspectives and needs from an Internet-based platform. This feedback is critical to enhance the resilient water sector information exchanges usability and content. The dialogue is also important to build operational resiliency into water sector management.

As discussed by the author at the 2019 Caribbean Water and Wastewater Association Conference (Florida (USA) Water and Wastewater Resilience: Planning,

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Implementation, and Collaboration, Kevin Carter), the close geographic proximity coupled with social, cultural, and economic connectivity provide an optimal nexus for information exchange between the Florida and Caribbean water sectors. In person meetings and trainings are often a preferred approach to exchange information and to educate people. However, the recent COVID-19 pandemic ushered in an immediate need to virtually communicate. The OWA provides an excellent opportunity to continue sharing information and experiences between the Florida and Caribbean water sectors. Post COVID-19 pandemic in person activities (e.g., utility twinings) should benefit greatly from communication and coordination on the OWA platform during the crisis and beyond.

Name: Nomalraj Bacchus-Misir
Country: Guyana
Profession: Engineer

Biography

Nomalraj Bacchus-Misir possesses a Bachelor's Degree in Electrical Engineering from the University of Guyana and has over 3 years' experience in designing and implementing water supply projects for Hinterland locations.



Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

Design of a Photovoltaic Battery Power Supply System for a submersible pump using solely renewable energy in Aishalton, Region 9, Guyana

Abstract

Stand-alone Photovoltaic battery systems operate reliably and are one of the best option to power pumps

for water supply systems in remote areas around the world. This technology generates clean renewable energy sourced from sunlight which has zero carbon emissions. It is a sustainable energy source that is reliable for the long-term. In Guyana, remote areas are mainly in the hinterland regions where fuel prices are very high thus making PV systems the source of power for pumps. In some cases as in Region 9, wells have to be drilled deeply and require a very high head solar pump in order to pump water to the surface into overhead tanks. Due to pump designs, this means that the pump will have a low flow of water. The Guyana Water Incorporated better known as G.W.I, is working towards attaining Sustainable Development Goal 6 Ensure availability and sustainable management of water and sanitation for all country wide. Most communities mainly depend on rain water harvesting in supplemental with the existing water infrastructure and face harsh conditions during the dry seasons. In order to meet the water supply demands of hinterland communities, PV systems need to be supplemented with batteries. This project aims at designing a Photovoltaic Battery System to meet the water demand of an Indigenous community in Deep South, Region 9, Guyana by the name of Aishalton. It also aims at providing twenty hours of water service to the entire community. The design, project implementation, operational and maintenance cost of this system will be compared to that of a Diesel Powered System over a 20 years cycle. Aishalton has approximately fourteen hundred persons. The village currently has no Power Supply System and only a few residents have small scale photovoltaic and generator systems.

Name: Ravendra Puran
Country: Guyana
Profession: Technician Engineer, Guyana Water

Biography

Ravendra Puran possesses a Diploma in Project Management and is pursuing a degree at the University of Guyana at the moment. He has fourteen years' experience supervising projects, which includes three years working in the Hinterland areas.

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Co-Author's Name / Country / Telephone / Email / Profession / Biography

Ramchand Jailal of Guyana (ramchandj@gwi.gy) currently heads the Hinterland Services Department of Guyana Water and possesses a Bachelor's Degree in Civil Engineering and a Master's Degree in Construction Management from the University of West Indies and has over 15 years' experience in the Water utility sector.

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

The provision of potable water for small Indigenous communities in Guyana to achieve Sustainable Development Goal 6, between Matthews Ridge and Baramita, Barima - Waini Region.

Abstract

Guyana is bordered by the Atlantic Ocean to the North, Brazil to the South and South West, Venezuela to the West and Suriname to the East. With 215,000 square kilometers (83,000 square miles), Guyana is the third-smallest sovereign state on mainland South America after Uruguay and Suriname and it is the only English speaking country in this continent. Guyana has ten Administrative regions of which Regions 1, 7, 8 and 9 has 159 communities, which is more than eighty (80) percent of the total Indigenous communities throughout the country.

The provision of adequate supply of potable water to some of these small communities can be very challenging, especially when the population is small. In addition, there is a big gap in access to potable water coverage as most capital investment works are being done in areas with larger population first. This paper focuses on the provision of potable water to five small communities between Matthew's Ridge to Baramita, in the Barima/ Waini region, with a total population of seven hundred and twenty four (724) persons. Residents usually find it very challenging to access potable water, as a result would have to walk far distances using buckets to fetch water to meet their daily needs.

To ensure compliance with Sustainable Development Goal 6 – Ensure availability and sustainable management of water and sanitation for all. This approach will be to examine the current situation with the objective to propose a most suitable solution to provide potable water so as to achieve Sustainable Development Goal (SDG) 6.

Name: Stephano Seecharan
Country: Guyana
Profession: Hinterland Engineer

Biography

Stephano Seecharan possesses a Bachelor's Degree in Civil with Environmental Engineering from the University of Guyana and has one and a half year experience in designing and implementing water supply projects for Hinterland locations.



Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

Design of an environmentally friendly water treatment system to reduce high iron content in water supplied in Hinterland Communities

Abstract

In keeping with Sustainable Development Goal 6 (SDG6), access to potable water is essential for all. In Guyana, there are more than 200 hinterland communities spread across the country. There are many challenges in these hinterland communities to access potable water as compared to the coast. In this paper the challenge that is being focused on is High Iron content present in water supplied to Hinterland communities. Iron

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possess a significant challenge in water supply since it blocks up distribution systems, causes encrustation and damage aesthetics. It usually affects the quality of water and causes discoloration of clothing, utensils and other household materials. Although GWI has been monitoring the quality of water frequently, treatment systems for Iron in hinterland communities is nonexistent. Conventional treatment systems on Guyana's coast require high capital investment for chemicals for operation and maintenance. This paper presents an innovative system to remove iron in a small scale water supply system that is suitable for Hinterland communities at a low cost that can help improve service to residents.

Name: Ayman Mendez
Country: Guyana
Profession: Engineer

Biography

Ayman Mendez an electrical engineer currently attached to the Hinterland department of the Guyana water Inc. Ayman Mendez possesses a Bachelor's Degree in Electrical Engineering from the University of Guyana and has over 3 years' experience in designing and implementing water supply projects for Hinterland locations.



Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

An Analysis & design of off-grid photovoltaic systems for Hinterland communities in Guyana.

Abstract

Guyana consists of more than two hundred (200) Amerindian communities in our Hinterland, where the production of potable water solely depends on fossil

fuel and renewable energy.

The Guyana Water Incorporated (G.W.I) manages the operations in the Hinterland as well as coastal areas of Guyana. Planning, analysis and monitoring are constant parts of management in order to improve water supply so that residents in Hinterland communities can have the same level and quality of service as offered on the Coastal areas of Guyana, this will making it easier for a comfortable lifestyle for all citizens and inline to achieve sustainable development goal six (SDG6) and attain the level of service required, also in keeping with the mission which is to deliver safe, adequate and affordable water and ensure safe sewerage systems for improved public health and sustainable economic development. This design was undertaken with the above goals and mission in mind.

As our planet temperature continues to rise there is an even more urgent need to generate clean electricity and to reduce the use of fossil fuel to generate our electricity needs. In this paper solar photovoltaic panels were analyzed and a photovoltaic power supply system will be designed to power the pumps in these communities. The system forms an alternative power source to the government own utility power supply in Guyana and will be design with the maximum efficiency in consideration.

Name: Cleon French
Country: Guyana
Profession: Civil Engineer

Biography

A bachelors in Civil Engineering from the University of Guyana with over 7 years of water related projects in the Hinterland.



Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

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Paper Title

Water supply system enhancements and Climate Change Adaptation in Mabaruma in the Barima/ Waini region of Guyana.

Abstract

The town of Mabaruma, the administrative center of Region 1, Barima Waini, is located approximately 237 km north-west of the capital city, Georgetown and accessible by air and river transport. There is an airport, hospital, nursery school, primary schools, secondary school, student dorm, catering for over 700 secondary school children, police station, guest house, nurse hostel, agricultural center, and town center in Mabaruma.

Labarum - 575 homes (170 properties receiving low to no water) Due to the climate change and ever growing population, the residents of Labarum now get 2-3 hours of water supply two times weekly as compared to 7 hours three times weekly. This poses a serious problem as it relates to the supply gap in the water supply.

Over time we have been monitoring the spring's flow which has showed some reduction from 45 gallons per minute to 25 gallons per minute, with the implementation of an efficient hydraulic pumping schedule there can be sustained water delivery pumping times from 3 hours to 12 hours per day minimum. The use of alternative energy to power the new system from fossil fuel to solar powered system with a battery bank will contribute to lower carbon emissions.

Thus an enhanced water delivery system through alternative energy and efficient hydraulics to deliver the Sustainable Development Goal No. 6 and No. 7.

Name: Angela L. Franklin
Country: Guyana
Profession: Hydrologist

Biography

Angela is currently a Hydrologist at the Guyana Water Incorporated (GWI) with a primary focus on groundwater modelling and water resource management. Her primary tasks are the construction of a model of the coastal aquifers



of Guyana followed by the development of groundwater management plan. Prior to joining GWI she was the Senior Environmental Officer for the Water Quality Unit of the Environmental Protection Agency in Guyana.

With a BSc in Environmental Studies, from the University of Guyana and MSc in Hydrogeology and Surface Water Management from the University of Newcastle, UK, she looks at the management of water resources through a multidisciplinary lens. She is extremely passionate about water resources from research to management at the policy level.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

5. Next Generation Climate Change Adaptation and Resilience for the Water and Waste Sectors

Paper Title

Using groundwater modelling to assess the impacts of Managed Aquifer Recharge (MAR) within the shallow coastal aquifers of Guyana

Abstract

Climate change projections for Guyana include increased temperatures between 1Â°C - 4Â°C, a rise in sea level by 0.3 m - 0.9 m, and a change in precipitation comprising more intense rainfall periods and longer dry periods. The low coastal plain, which is 2 m below sea level, comprises 10% of Guyana's landmass but is home to 90% of its population. The primary source of water for the population here is the coastal aquifers.

This study focuses on the shallow portions of the coastal aquifer system within the Pomeroon-Supenaam Region. This Region is home to over 10,000 residents and is served by six pump stations and one water treatment plant. The recharge area of this portion of the aquifer has not been adequately delineated but is expected to exceed 200 km² with a maximum depth of the aquifer is 150 m. The aquifer comprises a series of unconsolidated sand and clay lenses. It is overlain by the Demerara Clays within the discharge area and the White Sand Series within the recharge area.

Very few studies have been completed within the coastal system including this shallow section. As such, there is limited data available for the area, however, discharge

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head levels over the past five years reflect a decline in the groundwater levels. This raises concern for the sustainability of this resource. In addition to this, lower groundwater levels increase the cost of production as well as increases the risk of saline intrusion of the coastal aquifers. This study aims to determine whether managed aquifer recharge, by transferring water from nearby surface water sources within this section of the aquifer, would increase the groundwater levels within this portion of the aquifer. This would ensure the sustainability of this resource, aid in reducing the cost of production, and abate the risk of saline intrusion.

A combination of unconventional data is used to ensure sufficient data to facilitate this study. A combination of historical descriptions and recent gamma log data has been used to create boreholes. Historical rainfall and estimated recharge rates have been used along with hydraulic conductivity within the study area to define the model and discharge head levels have been used to substitute for groundwater levels. Abstraction will be maintained, as such it is expected that with the injection of recharge this impact will be reduced and the groundwater levels allowed to increase.

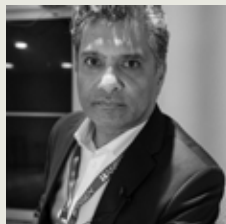
This study is expected to be completed within two months of submitting this abstract. The ability to apply MAR within this Region would prove most beneficial in reducing the abstraction cost and impact on this shallow coastal aquifer system. While this paper does not address directly the impacts of saline intrusion, the application of MAR would inevitably protect the system from potential saline intrusion and ensuring a sustainable source of water for the population within this Region.

Keywords: groundwater modelling; managed aquifer recharge; Guyana; abstraction

Name: Bob Paul
Country: Canada
Profession: Advisory Consulting

Biography

Bob Paul is a waste and recycling circular economy policy and program expert living in Victoria, British Columbia. He has over 23 years of experience in the waste management sector particularly in extended producer responsibility



(EPR) regulation and program development. He helped in the development of the BC Recycling Regulation which today has helped to create 22 producer-led programs. Currently, he is leading EPR Compliance for the ministry. He is an advocate for integrated systems thinking and design of smart policy to tackle complicated environmental problems. He believes that COVID-19 has challenged government budgets around the world and the environment should not come last while economic recovery takes place. Bob is a graduate of the University of Victoria with a Bachelor of Science in Geography. He presented last year at the conference in St. Kitts and Nevis with his presentation on "Extended Producer Responsibility An Effective Policy for Encouraging a Circular Economy". He currently works for the Ministry of Environment and Climate Change Strategy and President, E5 Solutions a consultancy created last year to help companies, governments, and not-for-profits in developing programs and projects related to the circular economy.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

6. Exploring the Nexus between Water, Waste and Other Key Sectors

Paper Title

Regulatory Pathway to Pollution-Free Water

Abstract

Globally, freshwater faces challenges from climate change and human activity. In the Caribbean region, hazardous waste management is a priority. Hazardous chemicals can leach into groundwater and surface water systems creating contamination. Water supports living systems, particularly to sustain good health and hygiene, and support economic development. The need to protect freshwater systems has become an urgency with the discovery of the COVID-19 virus.

At the high-level meeting in 2019, Caribbean country ministers responsible for waste identified end-of-life vehicles, oil, tires, and electronics waste as some of the priorities requiring policy action due to a high risk to the environment. Governments need to consider different policy solutions for hazardous pollution and help protect all water systems.

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Extended producer responsibility (EPR) policy might be one solution for Caribbean governments to consider to help protect water. EPR helps to shift the financial and ownership of waste management from governments to the producers of products. British Columbia, a global leader in EPR, has successfully implemented 22 EPR programs under its Recycling Regulation. It is a policy tool used around the world saving governments money in waste management. Under an EPR scheme, producers are regulated to plan and implement a recycling program for a regulated product. This year's presentation at the Caribbean Water and Wastewater Conference will highlight important elements to consider in creating EPR programs, including a deep dive into each of the respective programs for end-of-life vehicles, oil, tires, and electronic waste. EPR policy can help create a regulatory pathway to pollution-free water, create jobs in a circular economy, and help achieve the Sustainable Development Goals.

Contact:

Bob Paul, Principal

E5 Solutions

Advancing the Circular Economy

Email: e5solutions@outlook.com or bp7784@gmail.com

Home Office: 778 747-3316

WhatsApp or Viber: 250 893-0505

Skype: bob.paul30

Name: Amanda Ramgobind

Country: Guyana

Profession: Engineer

Biography

Amanda Ramgobind is a Civil Engineer. She holds a Master of Science in Water and Wastewater Engineering from Cranfield University UK, 2020 and a Bachelor Degree in Civil Engineering from the University of Guyana, 2014. Amanda Ramgobind has been working with the Guyana Water



Inc. for over ten years (2008 to date). She worked in the Operations Department (2008-2009), Sanitation Unit (2009-2016) and Project Implementation and Partnership Building (2016-2017). The projects involved in includes operation and maintenance of the collection and discharge of wastewater systems and infrastructure upgrades for production and distribution of water supply systems in both rural and urban areas. Presently Amanda Ramgobind is attached to the Design of Infrastructure Department with the responsibility for the design of infrastructure using innovative technology for sustainable wastewater treatment and reuse in Guyana.

Co-Author's Name / Country / Telephone / Email / Profession / Biography amandar@gwi.gy

Conference Thematic Area

6. Exploring the Nexus between Water, Waste and Other Key Sectors

Paper Title

Wastewater Surveillance for COVID-19

Abstract

Wastewater Surveillance for COVID- 19

The outbreak of the novel coronavirus 2019 (COVID-19) caused by SARS-CoV-2 infection is spreading rapidly around the globe. There is a great need to intensify the testing for COVID-19 to control and prevent the spread of the deadly disease. Since the current methods used by the Health Care System are not rigorous enough, scientists have developed techniques to test wastewater for the virus. Testing wastewater for COVID - 19 is a non-invasive method and it provides data of persons who are asymptomatic. It provides real time data depending on the size of network since the sewers constantly collects feces and urine. It also shows the scale of outbreak where higher concentrations of virus in the wastewater corresponds to higher numbers of infected people who contribute to the sewer system. The Guyana Water Inc. (GWI) operates and maintains the Georgetown and Tucville Sewer System which collects wastewater from 260,000 persons. The system is designed with wet wells that collects sewage from a specific area. This scenario makes it an ideal system

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to test for COVID-19 which will be representative of specific areas. Testing samples obtained from external drains and septic tanks from infectious disease centers can also ascertain whether the virus is prevalent in the surrounding. A mapping tool using GIS created to show the results, will highlight areas where wastewater was tested positive for COVID-19 but has no reported confirmed cases.

The test results will provide health officials with additional information about existing and potential hot spots for persons to be tested immediately and isolated before it can spread further. It will also provide decision makers with information for returning economic and social activities in some areas. The wastewater Surveillance for COVID-19 allows for continuous monitoring to ensure complete eradication of the virus and acts as an early warning-system for a potential second or third waves of the virus.

Name: Adele Young
Country: Trinidad and Tobago
Profession: PhD researcher

Biography

Adele Young is from the twin island of Trinidad and Tobago. She is a fulltime PhD fellow in the Netherlands at IHE Delft in the Coastal and Urban Risk Resilience Group, (CURR) and at the Delft Technical University (TUDelft) in the Civil Engineering and Geosciences faculty. Her research is being carried out jointly with the Hydroinformatics group focusing on the influence of spatiotemporal uncertainties on flood forecast decision making in data-scarce regions. Adele has over eight years of experience as a Civil and Hydraulic Engineer on several flood hydrological studies and drainage infrastructure design and construction management projects in Trinidad and Tobago. Her past work experience combined with her current research has made her interested in finding innovative solutions to



address data limitations in flood risk management.

Co-Author's Name / Country / Telephone / Email / Profession / Biography

Conference Thematic Area

Young, Adele*.a, b , Bhattacharya, Biswa.a, Chris Zevenbergen, C. a, b

a IHE Delft , Department of Coastal and Urban Risk Resilience, P.O.Box 3015, 2601 DA , Delft, The Netherlands

b Delft University of Technology, Faculty of Civil Engineering and Geosciences, 2628 CN Delft, The Netherlands *corresponding author:a.young@un-ihe.org

Paper Title

Crowdsourcing for improving pluvial flood forecast and decision making in the Caribbean.

Abstract

The risk of pluvial flooding is on the rise around the world and in the Caribbean as more cities are challenged by a changing climate and local drivers: increased urbanisation and inadequate drainage capacity. Flood forecasting and early warning systems have been proposed as a "low regret" measure to reduce flood risk and increase preparedness. Its success is dependent on the ability of agencies to not only accurately forecast hazards but also their impacts. Nevertheless, many countries and cities lack the capabilities, mostly due to data scarcity, to build hydrodynamic models produce flood forecast (flood level and extent). As a result, there is a cascading effect on the ability to provide actionable forecast and decisions. Through crowdsourcing, interested citizens can gather data, which can be used in modelling, real time crisis-mapping and data visualization through web-based technologies to raise alarm and situational awareness during a flood. It also allows citizens to reduce community risk by becoming involved in the monitoring process. This research proposes to examine how Caribbean cities can benefit from crowdsourced data for improved flood forecasting and decision making. Crowdsourcing for flood forecasting requires cooperation and collaboration of several actors and supports a multi and interdisciplinary approach by

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combining local and technical knowledge and ICT (Information, Communication Technology) tools. These are all integral for reducing the impacts of floods and increasing resilience of cities and communities.

Keywords: Crowdsourcing, Data-scarce, Pluvial Flood Forecasting, Decision Support



Caribbean Water and Wastewater Association
c/o Water and Sewerage Authority of Trinidad and Tobago
Bldg. HO12, Farm Road, St. Joseph
Trinidad & Tobago
Tel: 868-645-8681
Email : cwwattsecretariat@gmail.com