

# Intelligent reuse of wastewater

Safeguarding our coastal waters and marine life for future generations

**DAYS OF CONFERENCE:** November 18<sup>th</sup> and 19<sup>th</sup> 2016, **TIME:** 07:30-17:00 (day 1) and 08:30-13:00 (day 2)

**CONFERENCE VENUE:** Renaissance Curaçao Resort & Casino

**KEYNOTE SPEAKERS:** Mr. Chris Corbin (UNEP, Jamaica) and Mr. Mike Gosselin (City of Kelowna, Canada)

**PRE-CONFERENCE WORKSHOP/TRAINING SESSIONS (VENUE: UNIVERSITY OF CURAÇAO, UoC):**

- November 14<sup>th</sup> and 15<sup>th</sup> 2016, Waste water treatment best practices (by W/W/S-Canada)
- November 16<sup>th</sup> 2016, Desalination (by CaribDA)



Gobièrnu di Kòrsou



**REGISTER NOW:** [www.bpmcuracao.com](http://www.bpmcuracao.com)

## CONFERENCE ORGANIZATION

The Government of Curaçao and the Curaçao Business Council for Sustainable Development, with support of Fundashon TAS, the Faculty of Engineering (UoC) and CaribDA are working together in this conference to promote healthy oceans and a cleaner and greener island.

## COST OF PARTICIPATION

NAf 100 per person for 1.5 day conference, coffee, tea, lunches and a field trip on day 2.

## REGISTRATION AND PAYMENTS

Registration is possible on BPM's website: [www.bpmcuracao.com](http://www.bpmcuracao.com)

Please remit payment (NAf 100 per participant) to:

**Bedrijvenplatform Milieu**

P.O. Box 8246

MCB Account #: 20052102

In the name of: Treasurer BPM

Please specify: W/WC-16 and name of your organization

We also gladly accept payments at the door and we will provide you with a receipt.

## ADDITIONAL CONFERENCE INFORMATION

Wastewater recycling can ease water shortages and protect the health of our community, and protect marine life, fisheries and our tourism economy.

On many Caribbean islands wastewater is regarded as an undervalued and underexploited source of water, while if managed adequately it can actually be of benefit to a country and its population, nature and agriculture. Taking responsibility for wastewater is the sustainable way to go.

During this conference you will learn about the current risks (e.g. declining sea water quality), the condition of public sewerage and wastewater treatment systems, standalone systems (residential, hotels), recycled water for agricultural use and future regulations for businesses and industry.

**Come to this conferece and find out what you can do!**

## ADDITIONAL INFORMATION PRE-CONFERENCE WORKSHOP/TRAINING SESSIONS

**November 14<sup>th</sup> (08:30-16:00):** Introduction to wastewater treatment for operators: • Basic sewer system design • Primary, secondary and tertiary treatment • Lagoons • Treatment systems controls and equipment. This course is designed to raise the awareness and knowledge level of operators with limited exposure to different wastewater treatment systems.

**November 15<sup>th</sup> (08:30-12:15):** A facilitated discussion with professionals from industry and government to look at the challenges of wastewater in Curaçao and potential solutions.

**Participants will receive a certificate.** The instructors will be Mr. Mike Gosselin (City of Kelowna; Canada, Association of Boards of Certification) and Mrs. Valerie Jenkinson (W/W/S, Canada).

**November 16<sup>th</sup> (08:30-17:00):** Reverse Osmosis (RO) Basics. The basic course will be supplemented with: • Optimizing RO tips • General Presentation and • A site visit to a life RO-Plant.

**Participants will receive a certificate.** The instructors will be Mr. Jerry Matteo of Water Tech Sales and Consulting, Inc. and Mr. Manuel Pereira of Aquallectra.

## CONFERENCE PROGRAM

### PROGRAM: FRIDAY NOVEMBER 18<sup>TH</sup> 2016 (Day 1 of Conference) Renaissance Curaçao Resort & Casino

|                    |   |  |
|--------------------|---|--|
| <b>07:30-08:00</b> | Registration  |  |
| <b>08:15-08:20</b> | Chairman BPM, Mr. John Amarica  | Opening  |
| <b>08:20-08:30</b> | Minister of Traffic, Transport and Urban Planning, Mrs. S.F.C. (Suzy) Camelia-Römer | Opening speech   |
| <b>08:30-09:10</b> | Mr. Chris Corbin, UNEP, Jamaica   | Improving Wastewater Management in the Caribbean: Financial Burden or Economic Opportunity   |
| <b>09:10-09:40</b> | Mr. Mike Gosselin, City of Kelowna, Canada, Association of Boards of Certification  | Utilizing Effective Utility Management to run wastewater operations - How wastewater can be used to benefit Curaçao  |
| <b>09:40-10:10</b> | Mr. Ursel Cordilia, Public Works Curaçao  | Recent developments in Wastewater Management on Curaçao  |
| <b>10:10-10:40</b> | Break   |  |
| <b>10:40-11:20</b> | Mrs. Marta Beltran, UNOPS, St. Lucia  | Industrial Wastewater Treatment in Curaçao; Challenges and Opportunities   |
| <b>11:20-11:40</b> | Mr. Filomeno Marchena, Chair Sustainable Water Technology and Management            | Zero liquid discharge desalination and treated water reuse: the path forward to sustainable environments   |
| <b>11:40-12:15</b> | Q&A   |  |
| <b>12:15-13:30</b> | Lunch Break   |  |
| <b>13:30-13:45</b> | Mr. Darrell Fecteau, Windjammer Landing Villa Beach Resort, St. Lucia               | Skype presentation on wastewater management at resort  |
| <b>13:45-14:05</b> | Mrs. Gisette Seferina, Blue Halo Initiative Curaçao                                 | Highlights of Blue Halo Initiative Curaçao Policy Recommendations: a case for better management of waste water in Curaçao's coastal areas  |
| <b>14:05-14:30</b> | Mr. Mark Vermeij, Carmabi   | The rise of microbes on coral reefs: implications for humans and marine life   |
| <b>14:30-14:45</b> | Q&A and tea break   |  |
| <b>14:45-16:30</b> | Workshop in group sessions on 4 themes  | <ul style="list-style-type: none"> <li>• Sustainable financing</li> <li>• Recycled water for agriculture</li> <li>• Nutrient removal in coastal areas</li> <li>• Waste water in smart communities</li> </ul> |
| <b>16:45</b>       | Presentation of draft resolution and closing of day 1                               |  |

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**PROGRAM:** SATURDAY, NOVEMBER 19<sup>TH</sup> 2016 (Day 2 of Conference) WORLD SANITATION DAY  
Renaissance Curaçao Resort & Casino

|                    |   |   |
|--------------------|---|---|
| <b>08:30-09:00</b> | Mr. Francisco Beltrán Rodríguez<br>Suez, Panama   | <ul style="list-style-type: none"><li>• Importance of treating waste water through the example of Bilbao's Ría recovery</li><li>• Public Private Partnership model for an economically sustainable treatment of waste water</li></ul> |
| <b>09:00-09:30</b> | Mr. Timo Brouwer,<br>Curaçao Business Council for<br>Sustainable Development (BPM)  | Constructed wetlands on Curaçao.<br>Proposal by BPM for waste water treatment<br>and biodiversity enhancement on Curaçao  |
| <b>09:30-10:00</b> | Panel discussion with Mr. Gosselin, Mr. Beltrán Rodríguez, Mr. Brouwer  |   |
| <b>10:00-13:00</b> | Excursions to (1) restored mangrove area (former sewerage discharge point),<br>(2) sewage treatment plant "Klein Hofje" and (3) Shoot (facility for trucks) |   |

# Intelligent reuse of wastewater

MR. CHRIS CORBIN



Programme Manager for the Pollution sub-programme of UNEP's Caribbean Environment Programme.

## Improving Wastewater Management in the Caribbean: Financial Burden or Economic Opportunity?

Throughout the Caribbean, wastewater treatment is viewed as a lower priority to drinking water treatment, as evidenced by the level of investments in these sectors. Polluted beaches and waters and declining coral reef quality keep tourists away, resulting in a loss of income for Caribbean nations.

In 1986, several Caribbean countries signed the Cartagena Convention for the Protection and Development of the Marine Environment

of the Wider Caribbean Region, followed by the Land-Based Sources of Marine Pollution Protocol in 1999, aimed at improving wastewater management coverage and treatment in the region.

Although financing for wastewater infrastructure is available, countries often lack the organizational capacity to take advantage of opportunities or are excluded based on legal and institutional prerequisites required.

Other Caribbean countries have begun to put in place policy and institutional frameworks to improve wastewater management, including strengthening the financial sustainability of water and wastewater management utilities and exploring opportunities for wastewater reuse.

MR. MIKE GOSSELIN



Chair Association of Boards of Certification and Wastewater Manager, Kelowna, Canada

## Utilizing Effective Utility Management to run wastewater operations – How wastewater can be used to benefit Curaçao

The City of Kelowna is based in the Okanagan Valley in British Columbia, Canada. Although based in Canada many people are surprised to learn that the Okanagan is semi-arid with temperatures reaching 35-40 degrees C for many weeks during the summer months.

The main economic drivers are agriculture - traditionally fruit but now a thriving wine industry and, like Curaçao, a heavy dependency on

tourism. Mike Gosselin is the manager of the award winning, innovative wastewater treatment plant in Kelowna. Mike will share his experience and wastewater practices at the City of Kelowna as well as his international experience. His talk will cover:

- Utilizing the principles of Effective Utility Management to operate the wastewater treatment and collection systems
- Biological Nutrient Removal and other wastewater treatment methods
- Composting of bio-solids
- Energy recapture Operator and Management training

# Intelligent reuse of wastewater

**MR. URSEL CORDILIA**



Project Leader Public Works Curaçao

## Recent developments in Wastewater Management on Curaçao

In his presentation Mr. Cordilia will point out the current system of collection, transport and treatment of sewage water in Curaçao and the distribution of treated waste water to the end users (e.g. hotels, golf course and agriculture). A link will be made to the sea water quality monitoring results over a 10 year period.

Mr. Cordilia will present the objectives of Government for the next 5-10 years, especially with respect to the upgrading of the sewage treatment plant "Klein Hofje". In addition, he will give information on the situation at privately owned treatment plants (hotels, industry) and the way to go forward with waste water in these sectors.

**MRS. MARTA BELTRAN**



Project manager, UNOPS

## Industrial Wastewater Treatment in Curaçao; Challenges and Opportunities

The industrial production processes often generate large amounts of wastewater effluents that must be disposed of or treated in the least costly and safest way. There is little doubt that in the Caribbean, industrial wastewater treatment has lagged far behind the water production component. Implementing tighter regulations and control of wastewater discharges to protect life and the environment would force the industrial activities to consider the reduction of the discharges and also the installation of effective wastewater treatment systems for the residual effluents.

The characteristics of these effluents are very variable in terms of types of pollutions and concentrations, and can be treated by a wide range of technologies. Concentrating in the representative industrial activities of Curacao, this presentation will provide a review of applicable processes and technologies for the wastewater treatment, including the challenges and opportunities that can be derived.

# Intelligent reuse of wastewater

MR. FILOMENO A. (BOEY) MARCHENA



Chair Sustainable Water Technology and Management, University of Curaçao

## Zero liquid discharge desalination and treated water reuse: the path forward to sustainable environments

Small Island Developing States (SIDS) in arid or semi-arid areas as the Dutch Caribbean Islands, have limited natural fresh water resources. Due to relatively small land areas, surface water storage capacity is very limited and available groundwater is usually brackish due to seawater infiltration. Furthermore, SIDS are susceptible to climate change with both droughts and extreme rain fall causing water shortages and floodings, respectively, land erosion and deterioration of coastal seawater quality.

Many SIDS depend on seawater desalination for their drinking water supply. The highly saline brine may cause harm to the marine ecosystem.

Integrated Water Resources Management is considered the path forward toward water sustainability in SIDS. This presentation will elaborate on the concept of ZLD-Desalination (zero liquid discharge) and the importance of treated wastewater reuse and constructed wetlands to improve water and environmental sustainability.

MRS. GINETTE STEFERINA



Site manager of the Blue Halo Initiative Curaçao

## Highlights of Blue Halo Initiative Curaçao Policy Recommendations: a case for better management of waste water in Curaçao's coastal areas.

The Blue Halo Initiative is an initiative of the Waitt Institute and the Curaçao Government. By means of a science based, community driven approach the Blue Halo initiative supports the Government with policy recommendations about how their management objectives may be realized. During the years 2015 and 2016 an extensive research has been carried out with respect to coral cover, water quality (nutrients in seawater) and marine littering.

Mrs. Seferina will share the results from this research and - based on this - discuss the policy recommendations by the Waitt Institute, with a focus on waste water management.

# Intelligent reuse of wastewater

MR. MARK VERMEIJ



Science Director Carmabi Foundation

## The rise of microbes on coral reefs: implications for humans and marine life

Anthropogenic impacts on coastal ecosystems are often classified into two big categories: the dumping of unwanted compounds (e.g., sediments, nutrients) and the overharvesting of marine life (e.g., overfishing). Besides their direct impacts, these activities have far reaching indirect consequences for the functioning of reef ecosystems. These indirect effects often

comprise a complete alteration of the microbial community in coastal waters with negative consequences for human health, algal growth, coral- and fish-diseases and coral recruitment. Based on findings from Curaçao, an overview of these underappreciated indirect effects will be presented.

MR. FRANCISCO BELTRÁN RODRÍGUEZ



Suez, CEO of the Caribbean and Central America's division

## (1) Importance of treating waste water through the example of Bilbao's Ría recovery (2) Public Private Partnership model for an economically sustainable treatment of waste water

Through the example of the evolution of the Bilbao Ría water streams over the course of the 20th century it will be demonstrated how the impact of the industrialization has been reverted through the implementation of integrated waste water management.

The case study of San Luis de Potosi (Mexico) PPP exposes the mechanisms through which the city of SLP could recycle 91,000 m<sup>3</sup>/day of wastewater for industrial and agricultural purposes. The water reuse technologies and financial model used enables the city of San Luis Potosi to conserve its water resources while meeting the industrial and agricultural needs of a dry area where groundwater quality is seriously deteriorated.

# Intelligent reuse of wastewater



MR. TIMO BROUWER

Environmental activist

## **Constructed wetlands on Curaçao. Proposal by BPM for waste water treatment and biodiversity enhancement on Curaçao**

Constructed wetlands are a low cost and eco-friendly alternative to conventional waste water treatment schemes and coastal protection measures. This presentation describes the potential for developing a constructed wetland in an area of the Schottegat bay known as the Asphalt Lake. The Asphalt Lake is a region of the Schottegat Bay used for asphalt dumping during the Second World War. The asphalt contained in

this 52 hectare bay is currently being removed and utilized for production of fuels.

Join us in the process where we go from a heavily polluted area, lost for decades, to a useful constructed wetland in the city center, able to improve the end-quality of treated wastewater and to provide a green area for the population of Curaçao.

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### MR. CHRIS CORBIN

**Christopher Corbin** – United Nations Environment Programme (UNEP) is a senior Programme Officer with the Division of Environmental Policy Implementation (DEPI) based at UNEP's Caribbean Environment Programme (CEP) in Jamaica.

He is responsible for the sub-programme for the Assessment and Management of Environmental Pollution (AMEP) and coordinates the development and implementation of national and regional projects for two agreements on Oil Spills and Land-Based Sources of Marine Pollution. These agreements form part of the only regional legally binding agreement for the Protection of the Caribbean Sea – the Cartagena Convention for which the Jamaica-based office is also the Secretariat.

Mr. Corbin has been employed with UNEP and based in Jamaica for the last 12 years. He has worked on several national and regional projects dealing with wastewater including the GEF funded Caribbean Regional Fund for Wastewater Management (CRéW).

### MR. MIKE GOSSELIN

**Mike Gosselin** is the manager of the Wastewater Treatment Division for the City of Kelowna, managing multiple wastewater treatment facilities, mechanical and electrical-instrumentation support for Kelowna's landfill gas systems and bio-solids composting. The Kelowna wastewater treatment plant was the first Biological Nutrient Removal facility in North America and following its recent upgrade one of the most current facilities of its kind. Mike also represents the Utilities Departments for Asset Management and Energy Committees.

Mike is currently the Chair for the Associated Boards of Certification (ABC) which is the certification body for all water and wastewater operators in North America, most of the Caribbean as well as other parts of the world. He is also the current Past Chair for the Environmental Operators Certification Program (EOCP) for the Province of British Columbia and the Yukon Territories which oversees the certification of operators. He is a current member of the Public Advisory Committee for the Okanagan College for the Water Engineering Technology Programme, one of Canada's leading wastewater operator trainers and an active instructor for World Water and Wastewater Solutions utility courses in Canada and internationally.

### MR. URSEL CORDILIA

In 1993 he finished his study Chemical Engineering at the University of Eindhoven. In the period from March 1994 until February 1995 he worked with the American company Ewmanco International Ltd., which is mainly engaged in water treatment. As district representative he was responsible for commercial and service aspects of the "Accounts" at the Isla refinery and Aquallectra.

From 1995 to 1996 he worked at Antillanos Alimentos SA, where he was responsible for the refining of vegetarian cooking oil.

From January 1997 to 2007 he worked at the Environmental Service of Curaçao, and was responsible for the coordination of issuing Nuisance Permits and performing inspections at the large and complex companies, including the Isla Refinery.

Since 2007 he has been working at the Department of Public Works Curaçao in the Wastewater Management section where he is responsible for the Management and Operation of treatment plants and pumping stations of the West District of Curaçao.

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### MRS. MARTA BELTRAN, MSC.

**Marta Beltran Perez** – United Nations Office for Project Services (UNOPS) is a Project Manager - Water Specialist based at UNOPS Projects Centre in Saint Lucia, West Indies.

She is in charge of the implementation of the Dennery North Water Supply Project in Saint Lucia since March 2016. Previously, she has worked for more than 10 years with private environmental services providers as a Process Engineer in charge of design and construction of water and wastewater treatment systems, mainly for the industrial sector (energy, mining, food and beverage, oil & gas, etc.) and comprising a wide range of technologies and processes, from membrane filtration and ion exchange to physico-chemical and biological treatment.

### PROF. DR. IR. FILOMENO A. (BOEY) MARCHENA

**Filomeno A. (Boey) Marchena** is professor of the new chair Sustainable Water Technology and Management at the University of Curaçao, advisor Sustainable Water Technology and Innovation at WEB Aruba NV, UNESCO Focal Point of Aruba for the International Hydrological Program for Latin America and the Caribbean (UNESCO IHP LAC) and the president of the Education Foundation FESTAS. He has more than 25 years of practical experience in seawater desalination and drinking water treatment. His desalination efficiency improvement research at WEB Aruba NV has been granted with four prestigious awards by GE Water and Process Technologies and three patents. He has a PhD degree from the University of Twente and a MSc degree from the Delft University of Technology of the Netherlands.

### MRS. GISETTE STEFERINA, MSC.

In July of 2015 Mrs. Seferina accepted a position as site manager of the Blue Halo Initiative Curaçao, which is a collaboration between the Government of Curaçao and the Waitt Institute of San Diego, California. The Waitt Institute endeavors to ensure ecologically, economically, and culturally sustainable use of ocean resources. The Institute partners with governments committed to developing and implementing comprehensive, science-based, community-driven solutions for sustainable ocean management.

A medical entomologist by training and a communicator by vocation, she has had a unique opportunity to champion the task of raising awareness on the subject of insects both in the professional and lay circles in Curaçao.

Similarly, she hopes to use the experience gained to help raise awareness and build stewardship about the ocean, showcase its cultural and economic value as a broker of prosperity for the inhabitants of the precious island of Curaçao.

As the site manager of the Oura Blou Kòrsou it is her aim, together with her colleagues from the Waitt Institute, the key stakeholders and all who value this resource, to persuade the masses to use the ocean in a sustainable manner: "usa laman sin kaba kun'é."

# Intelligent reuse of wastewater

## DR. MARK VERMEIJ

**Dr. Mark J.A. Vermeij** is the scientific director of the CARMABI research station on Curaçao. His research interests include evolutionary and ecological dynamics of benthic marine organisms, with particular emphasis on corals, algae and, more recently, microbes. Currently, his work focuses foremost on the earliest life stages of corals and the processes that operate during these earliest life stages. The results of all scientific work conducted at Carmabi are disseminated through the organization's local network (i.e., parks, museums, educational programs) to stakeholder groups that are directly or indirectly involved with coral reef management and conservation. In addition, he works as an associate professor for the Institute of Biodiversity and Ecosystem Dynamics (IBED) at the University of Amsterdam and is an editor for the journal Coral Reefs.

## MR. FRANCISCO BELTRÁN RODRÍGUEZ, MSC.

**Francisco** is an Industrial Engineer graduated in the Technical school of Bilbao. Francisco started his career with Suez in 1986 in Argentina and was 21 years in Spain as Contract Engineer, O&M director, Engineering and Construction Director, Deputy General Manager and finally General Manager. In 2011 Francisco joined the Latam division as Deputy General Manager and is now CEO of the Caribbean and Central America's division, based in Panama.

Francisco has more than 33 years of experience in the field for water treatment in general and more than 20 years in desalination of seawater in particular.

## MR. TIMO BROUWER

**Timo Brouwer** is an environmental entrepreneur dedicated to saving the planet through education and recycling. Born on Curaçao, with Dutch roots and grown up in South America, this environmentalist dedicates his daily life to teach about sustainability and recycling and works in his own created from scratch recycling facility, Green Force. Came back from Europe to Curaçao in 2007, is now one of the most well-known proactive recyclers. Started with only 60 kilograms of waste recycling per month back in 2010, now with more than 36.000 Kilograms of waste being recycled per month in 2016, Green Force is one of the fastest growing recycling companies of Curaçao.

Timo Brouwer is board member of the Curaçao Business Council for Sustainable Development on Curaçao and board member of the CHATA Sustainability Task Force, where he contributes to solving sustainability issues on the island.

