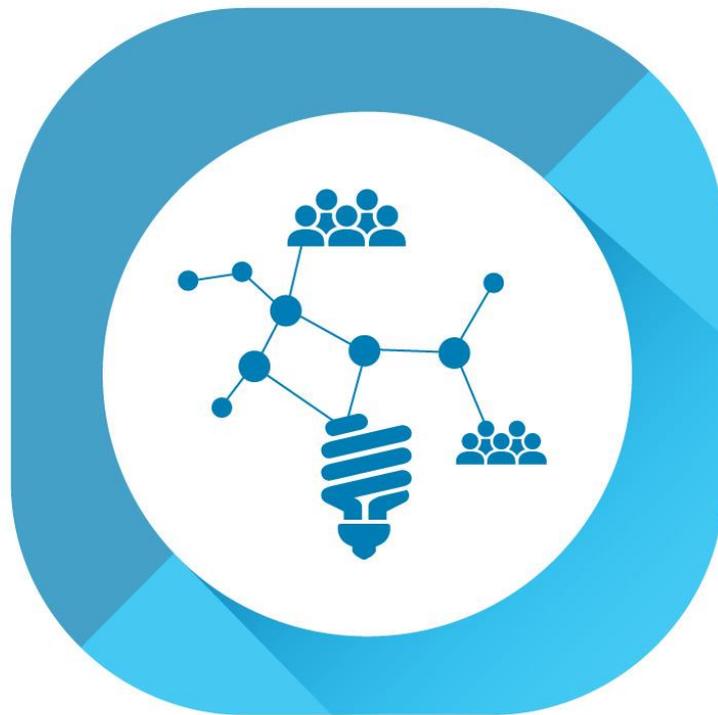


## Seminar: Innovation: Business as Unusual



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## ABSTRACT VOLUME

World Water Week, 25 - 30 August 2019

Water for society – Including all

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## Law for the last mile

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**Authors:** Ms. Alexandra Campbell-Ferrari, The Center for Water Security and Cooperation, United States

### Keywords

Law, accessibility, online, solutions

### Highlights

RENEWAL is the first pan-African water and sanitation law platform and will change how law is revised, amended, implemented and enforced by creating an accessible evidence-base for responsive and problem-focused law-making. We expect to have started a similar platform for The Americas, starting with South America.

### Introduction and objectives

Information about laws and policies is difficult to find and even harder to understand. This has allowed law and policy to become a political football, amended at changes in governing political parties rather than in response to periodic reviews that show weaknesses or failures in the law and policy. The objectives of RENEWAL are: 1. make information about governing laws publicly available, 2. to make information accessible and easier to understand so that all citizens can engage in law-making, and 3. set forth the evidence base that allows water to be understood and planned for across all sectors and jurisdictions.

### Methodology approach

RENEWAL examines (collects, catalogues, analyzes, and evaluates) water and sanitation laws across 10 different nexuses - 1. agriculture, 2. natural resources and services, 3. energy production and use, 4. natural and manmade disasters, 5. sanitation, drinking water, health and hygiene, 6. infrastructure, 7. peace and conflict, 8. national security, 9. the global economy, and 10. governance and institutions - and from the international to the local levels. Our work is being conducted first in 5 countries - Cote d'Ivoire, Kenya, Nigeria, South Africa, and Sudan - with in-country research partners (universities, nonprofits, and law firms).

### Analysis and results

The first stage was to collect and catalogue the laws governing across these 10 nexuses from the international to the local level. Based on the work completed, there is significant variation in the presence and robustness of laws governing certain nexuses from country-to-country. The different structures of governance also mean that the amount of law produced at the national level versus devolved to the local level differs from country-to-country. Researchers are currently completing the analysis stage whereby specific questions will be answered within and across each nexus. The analysis is an impartial discussion of how the law addresses the nexus and for the first time we will be able to compare and contrast how countries address the nexuses from a comprehensive source of evidence. Determinations of shortcomings, gaps, inconsistencies, unintended consequences and strengths are reserved for the evaluation stage where researchers are tasked with identifying opportunities for improvement as well as opportunities to share successes. This information will be published online in a free, accessible format for citizens, academics, governments, and other stakeholders.

### Conclusions and recommendation

The Platform is a powerful tool by which citizens and other stakeholders can determine whether proposed laws and revisions are responsive to actual shortcomings in the law or political antics. It will allow citizens and stakeholders to be proactive in the identification of opportunities, implementation and enforcement of the laws and policies. It will allow stakeholders across countries to collaborate in legal innovation, like

scientists have for millennia. RENEWAL changes the future of law by driving awareness, engagement and innovation in a way that has not been possible before.

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### Presenter biography



**Ms. Alexandra Campbell-Ferrari, The Center for Water Security and Cooperation, United States**

Alexandra Campbell-Ferrari is the Co-Founder and Executive Director of The Center for Water Security and Cooperation. Alexandra teaches Water Law at the University of Maryland Carey School of Law and American University Washington College of Law, and previously taught Legal Research and Writing at The George Washington University Law School. Alexandra is a member of the U.S. National Drinking Water Advisory Council and Co-Chair of the Water, Wastewater and Waste Pillar for Denton's Smart Cities and Communities Think Tank. Before co- founding the CWSC she was a Fulbright Scholar in Spain researching water law in Spain and the European Union.

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# Leaving None Behind: Innovative Approaches for Drinking-water, Sanitation and Hygiene

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**Authors:** Ms. Shubhangi Sharma, St Edmund College, Shillong , India

## **Keywords**

Leaving no one behind, Innovative approach, Youth groups, Drinking water and sanitation, Shillong city of India

## **Highlights**

A volunteer youth-groups approach was devised to make people aware of water-related issues of safe drinking water, water management, sanitation and hygiene. The groups consisted mainly of students who worked with people in their spare time. The approach has far-reaching impact and people have become more clean water conscious.

## **Introduction and objectives**

Shillong, located in the midst of Himalayan landscape, has a population of 500 thousand people. It carries all the features associated with mountain areas such as marginality, isolation, fragility, ethnic diversity and resource heterogeneity. Traditional approaches have failed to deliver drinking water, sanitation and water management. With increase in demographic pressure, these systems have almost collapsed and have lost their element of sustainability. Two options were; improve these systems scientifically with modern technologies or to go all-out for dynamic, eco-friendly and sustainable approach. We opted for the latter. Gender mainstreaming was one of the guiding principles for the study.

## **Methodology approach**

The water supply to Shillong city is untreated stored water collected from perennial mountain source. Water having bacteria and suspended matter, more severity during rainy season, make people suffer from water-borne diseases like cholera, typhoid, dysentery and diarrhoea. Different locality-wise youth-groups were formed to work with the people and make them aware of the importance of safe drinking water, hygiene and sanitation. Whole city has been divided 10 zones with five sub-zones in each zone. The zones have no strict boundaries. Ten major youth-groups have been formed, dividing each major group to five sub-groups and allocating them each sub-zone.

## **Analysis and results**

Recognizing the important role played by women in managing water, we designed a women empowerment component to trigger women's participation in decision making process and management of approach. Meetings held once a month helped to improve the capabilities of young-groups through a series of skill based discussions. Involving women as major stakeholders not only empowered them but also brought into the approach their knowledge and experience to ensure sustainability of water supply and sanitation interventions. The results of the approach undertaken showed that the access of people to safe drinking water, hand wash, sanitation and hygiene has increased and made the people, more so women, conscious of 'WASH'. This has been found to be linked with improved human rights too. Active participation of men and women in the decision making of the type of water and sanitation service installed, as also shared responsibility of managing the water and sanitation services, has improved environment. A focus on gender differences is of particular importance with regard to sanitation initiatives, and gender-balanced approaches have encouraged in plans and structures for implementation. Simple measures, such as providing schools with water and latrines, has helped girls in being healthy, especially after they reach puberty.

### **Conclusions and recommendation**

With the involvement of all the stakeholders in our approach, no one has been left behind in getting the benefits of our novel approach of making people aware through youth groups with regard to sanitation, hygiene, water management and access to safe drinking water. Volunteer youth groups were more acceptable to the people over the traditional government approaches and had better understanding with the women, who are the real decision makers as far as sanitation and water related issues are concerned. The changed behavioral attitude of the people towards sanitation and judicious water management is testimony to this.

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### **Presenter biography**



#### **Ms. Shubhangi Sharma, St Edmund College, Shillong, India**

Shubhangi Sharma holds a Bachelor's degree in Biochemistry. She's a 22 year old water activist from the Northeastern state of Meghalaya, India. Built a network of about 200 young water leaders who were mostly concerned college students, to address various issues of potable water availability, waste disposal, reducing the use of plastic bags, sanitation & menstrual hygiene. Over the last four years the group has conducted a number of campaigns promoting the use of safe drinking water and water harvesting among others, in slum areas, villages, schools and colleges in the state.

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## Water Diaries of the Poor

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**Authors:** Dr. Sonia Hoque, University of Oxford, Bangladesh

### Keywords

Affordability, diaries, culture, gender, poverty

### Highlights

Daily water diaries provide insights into the choices of poor people in water insecure environments in Bangladesh, Ethiopia and Kenya. Common assumptions which inform global monitoring of affordability, water quality and reliability are challenged. Gendered inequalities, cultural norms and climate risks identify issues and opportunities to leave no one behind.

### Introduction and objectives

Little is really known of the daily water choices of the poor. This matters for global monitoring, national planning and local service delivery to meet SDG6.1. Do people always use and prefer improved drinking water sources? Are they affordable all the time? Does water quality affect choices? Do cultural norms, gendered inequalities and rainfall variability influence choices? A water diary method is administered in Bangladesh, Ethiopia and Kenya to document the sources, volumes and cost of water collected with weekly expenditure data. Qualitative methods explore the choices made in each cohort to understand the reasons for behavioural change and policy responses.

### Methodology approach

We designed a water diary method to document the sources, volumes and cost of water collected by households every day, along with self-reported changes in sufficiency by consumptive, hygiene and productive uses. It also collates weekly household expenditure data to explore variation in payment behaviours across food, farming, health, education, transport, energy, water and other domains. This method is being implemented across four sites (two urban and two rural) in Ethiopia, Kenya and Bangladesh, with 100-120 households being studied for a one-year period in each site.

### Analysis and results

Limited public provision of safe and reliable water supplies cause resource-constrained households to experience trade-offs in quality, costs and collection distance. Findings reveal different payment behaviours with significant proportion of households in rural environments never using paid sources, while others shifting to free alternatives following rainfall events. In urban contexts, unreliable piped supplies lead to frequent purchase of water from neighbours or vendors, along with occasional use of surface or rainwater during the wet season. Analysis of diary data in combination with interdisciplinary evidence from infrastructure mapping, rain gauges, household surveys and qualitative interviews suggest multiple environmental, infrastructure and cultural drivers at play. Rainfall and seasonal variation in water levels, water point breakdowns, proximity to alternate sources, periodic income shortfalls and differential priorities for expenditures are among the underlying factors shaping trade-offs in decision making. While women are primarily responsible for water collection across all settings, gender inequalities are particularly stark in rural Kenya, where women and children carry heavy loads for long distances in arid conditions as men migrate to towns for work.

### Conclusions and recommendation

Diaries can complement existing national and global monitoring systems for SDG6.1. To leave no one behind it is necessary to understand and respond to the priorities of the poor. The choices of the poor are shaped by cultural, economic and environmental factors, not simply by differential access to water infrastructure.

Gendered inequalities remain pervasive and demand new thinking and investments in alternative institutional approaches rather than to keep building infrastructure. Understanding and addressing affordability by drinking service levels can better uncover the existing socio-spatial inequalities and guide innovative technological and financial mechanisms to reach those left behind.

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### Presenter biography



#### **Dr. Sonia Hoque, University of Oxford, Bangladesh**

Sonia Ferdous Hoque is an environmental social scientist, currently working as a Postdoctoral Researcher in water security and society for the REACH programme at the University of Oxford. Her research focuses on the environmental, financial and social risks to drinking water services in Bangladesh, Ethiopia and Kenya, with particular interests in exploring the socio-spatial inequalities in household water security and wellbeing.

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## Extending services to the poor: creating creditworthy utilities

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**Authors:** Ms. Lesley Pories, Water.org , United States

### Keywords

Utility finance, water service provider finance, Southeast Asia, assistance, utility strengthening

### Highlights

- Financial management and marketing support to rural and urban utilities in Southeast Asia has resulted in doubled monthly revenue and approval for government funds – a first step towards securing private investment
- Utilities assign highest value to the assistance with bookkeeping and business plan development
- Utility improvements are encouraging domestic replication

### Introduction and objectives

Water.org has been working with urban and rural utilities since 2014 in efforts to build their ability to access finance and thereby extend service coverage deeper into low-income populations. These efforts have evolved over time into distinct programs: 1) rural (CBOs) and 2) urban (PDAMs) in Indonesia, and 3) public rural and private urban in the Philippines. The scope is limited to existing partner utilities of Water.org, as it uses examples from all 4 programs to extract major takeaways of benefit to anyone working to increase the efficiency and service delivery of utilities in the region and possibly beyond.

### Methodology approach

The research questions focus on what types of assistance the partner utilities have found to be the most valuable to driving improvements that 1) advance them towards financial self-sufficiency as well as 2) position them more favorably when evaluated by potential investors. Semi-structured Interviews with utility managers, as well as the Water.org teams assisting them, form the core of the data, in addition to recorded revenue and documentation regarding successful or unsuccessful applications for finance.

### Analysis and results

A lot of discourse around making utilities credit-worthy focuses upon technical efficiency gains such as the reduction of Non-Revenue Water (NRW) – water lost via leakage or illegal siphoning. However, because investors are generally risk-averse, successful applications for investment hinge upon the demonstration of solid financial management and administration. Consequently, financial and administrative management assistance, including marketing, is where participating utilities found maximum benefit. Public rural utilities valued assistance in developing business plans that helped establish targets for client acquisition and monthly revenue goals. They also valued training in client acquisition outreach techniques - as a public utility, marketing their services to attract more clients was not in their strategy. Urban utilities similarly highlighted the assistance received in administrative activities such as the development of Standard Operating Procedures for financial service offerings, financial recordkeeping and reporting, and human resources recruitment – best practices that helped them appear more credible to financial investors – in addition to guidance developing internal payment facilities for customers. Private utilities valued assistance with concept design for developing digital payment and loan application platforms, the establishment of which would drive down personnel costs for loan collection and appraisal and facilitate extension into low-income communities.

### Conclusions and recommendation

Participating study utilities overwhelmingly value financial and administrative management assistance. It is easy to forget that utilities, when operated as a public service, do not think like companies that require

business plans, marketing and outreach strategies, or SOPs for recordkeeping, and these are the areas where a little investment goes a long way. Additionally, stakeholders should have realistic expectations and not expect all utilities to go directly from operating at a loss to securing private investment – successfully receiving grant funds from the local government, for example, can be a great indicator of progress.

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### Presenter biography



**Ms. Lesley Pories, Water.org**  
**Water.org, United States**

Lesley Pories is Manager of Sector Strategy at Water.org. Before joining the team that builds Water.org's strategic relationships with sector influencers on global stages as well as at country level, she managed part of Water.org's portfolio in India. Lesley's previous work experience includes the World Bank, World Resources Institute, UNDP and the Carter Center. She holds degrees in City and Regional Planning as well as International Environmental Resource Policy.

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## Agua del Sinai (Ecuador)

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**Authors:** Mr. Frederic CERTAIN, Interagua, Ecuador

### Keywords

Responsibility, Smart Technology, Efficiency, Solidarity, Fair pricewater supply

### Highlights

The Guayaquil water supply system does not cover the “Monte Sinai” informal settlements. In 2018, Interagua started the “Agua del Sinai” project, to organize the management of water tankers supplying water to the 120.000 inhabitants using smart technology, improving the customer service, and reducing the price charged to the households.

### Introduction and objectives

The project seeks to improve the efficiency of the water distribution through use of water tankers to the population in a modern, secure and friendly way, using intelligent routes of water distribution and GPS control that guarantees the coverage and timeliness for the inhabitants. Rates can be reduced by 25%, while expanding the service quality. The construction of a loading station within a reasonable distance from the community guarantees efficient service and improves the water tankers’ performance. The Guayaquil Municipality, Interagua-Veolia, the guild of water tankers transporters, neighborhood leaders and the community are strongly involved in the project.

### Methodology approach

A census is done in Monte Sinai in order to know the (a) number of inhabitants; (b) water consumption per family; (c) supplying frequency; (d) prices. This information is needed to optimize the routes of water distribution.

Water tanker operators are trained and their trucks duly identified. A subsidy to the water tankers is initially paid by Interagua to promote the operation.

Community leaders are informed about the regulation, new scheme, supply routes, schedules and the rate. The deployment starts, with the construction of the filling station and the positioning of each water tank using applications with Smartphones.

### Analysis and results

In two months of operation (the first 2 phases), 18,711 inhabitants have benefited from the 25% price reduction for their potable water, with an increase in quality and continuity of service. The new distribution scheme increases in efficiency by 75%, the daily trips per water tank from 4 to 7 trips, and having shorter routes, which allows a lower and more sustainable price with improved customer service.

In the zones already covered with the new system, 100% of vehicles that distribute potable water in the coverage area are duly controlled, ensuring the adherence to the assigned routes and the continuous coverage of the zone. The supervision is implemented using a handling and control room and a mobile phone application where each tanker describes and records each transaction.

Several communication channels have been established, in order to attend to the requirements of the Monte Sinai inhabitants, who have no direct relation with the company prior to the project.

### Conclusions and recommendation

With the municipal regularization program, the city aims at including communities which are currently in unfavorable economic situations and not covered with services and water networks. The “Agua del Sinai” project concretely embodies this aim by designing an alternative coverage for informal population settlements and professionalizing the distribution of potable water through use of water tankers, ensuring

continuity of service at a fair price. The authors want to highlight the collective, bottom-up, commitment of the Municipality, the operator staff, the community and the local providers, to design and implement this solution.

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### Presenter biography



#### **Mr. Frederic CERTAIN, Interagua, Ecuador**

Mr. Frédéric CERTAIN serves as CEO at Veolia-Ecuador since 2017. Previously, Frédéric held various managing position with Veolia Water in Spain and France. From 1985 to 1989, he was with Agronomic Research Institute IRSTEA (in France) developing hydraulics numerical application. He also worked at the Food and Agriculture Organisation (FAO) in Rome. Mr CERTAIN graduated from Agro-Paris Tech (Engineering school).

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## Defining the Last Mile – Piped Water to Every Home

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**Authors:** Ms. Marla Smith-Nilson, Water 1st International , United States

### Keywords

water supply, household taps, water use, health, gender equality

### Highlights

- People need 50 l/c/d to maintain a healthy environment
- There are clear patterns of water use associated with different service delivery approaches
- The only service delivery approach that comes remotely close to meeting the established health standard of 50 l/c/d is household level service provision

### Introduction and objectives

Water1st has funded different variations of piped water networks around the world for 12 years. In our follow-up monitoring, one pattern has been highly consistent across continents. When water supply is on-premises, consumption is 100+ liters of water per day per household. When water supply is derived from a shared water distribution point, use falls dramatically to 25 liters per day per household or less. The WHO recommends a service level of 50 l/c/d to ensure users have sufficient water for consumption and hygiene purposes. Our data suggests that household water supply is the only way to achieve this standard.

### Methodology approach

Water1st-funded projects are entirely household level service or a combination of household level service and shared distribution points. Shared distribution points are designed with multiple taps to reduce queuing time. The projects with the combination of service delivery approaches are particularly interesting from an evaluation perspective. With most operational variables held constant, one can more confidently draw conclusions about the relationship between on-premises water supply and water use. Using meter readings at the point of use, Water1st's monitoring protocol includes calculating volume of water used per person and compares it to established standards for protecting human health.

### Analysis and results

We analyzed meter readings from rural Ethiopian and Mozambican communities that have piped water service with a combination of household service and shared public taps.

- Households collecting water from shared distribution point use 25% of the volume compared to households with on-premise water service.
- Households with on-premise service use an average of 75 liters per day
- Households with on-premise water use share in the capital cost for connecting to the system and pay a monthly water bill based on volume of water used.

Our experience to date has led us to believe that we need to approach water systems in low-resources settings using the same best practices as the developed world with the goal of 24/7 water service on-premise. We believe progress in the WASH sector has been unequal and exclusive, not been because of lack of innovation, but because we are not giving users the opportunity to have the same service level that the developed world expects. Household level water service meets our public health goals and also eliminates the burden of water collection, which is primarily borne by women and girls.

### Conclusions and recommendation

Households need 150-300 liters of water per day to effectively practice the hygiene behaviors required to maintain good health. Based on the data collected from project participants in multiple countries, Water1st has concluded that there is only one approach that will reliably lead to that level of water use: household

level water service. We predict that any other approach will result in dramatically lower (25% of the goal) use, which will result in ongoing health challenges for the community and reduced productivity.

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### Presenter biography



#### **Ms. Marla Smith-Nilson, Water 1st International, United States**

Marla is the founder and Executive Director of Water1st International based in Seattle, USA. A respected leader in the water sector, Marla is a civil engineer who brings more than 25 years of hands-on field experience with water supply and sanitation projects in developing countries. She is an expert in identifying and partnering with on-the-ground implementing organizations. Throughout her career, Marla has remained steadfast to her mission to advocate for and support effective international development—supporting local, long-lasting solutions to the water and sanitation crisis.

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## Community-Governance action partnerships to attain SDG 6: A Lagos Slum

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**Authors:** Ms. Belynda Petrie, OneWorld Sustainable Investments, South Africa

### Keywords

Urban supply, quality, women & children, health, Africa's megacities

### Highlights

- Youth-centric inclusive approaches are integral to increasing awareness of the water-health nexus crisis in Africa's mega cities
- Polluted water in dense urban spaces affects the hygiene of women and girls the most
- The most highly affected must own the clean and safe water agenda – this is central to achieving

### Introduction and objectives

Africa's rapidly-growing mega cities such as Lagos (pop. ~21 million) are enormously challenged to scale up their almost universally inadequate water infrastructure to ensure that clean and safe water is accessible to all. Women and children (especially girls) are the most adversely impacted, with many dropping out of school once they begin menstruating, due to poor sanitation. Lack of awareness around hygiene/sanitation means that people often use water sources, used for fishing, as defecation sites. The project attempts to use arts education to engage and educate school-children around water and sanitation issues, in a project to 'tell their water stories'.

### Methodology approach

An inclusive partnership between a slum community and Nigeria's Ministry of Health, sees 500 school children each illustrating a donated jerry can with their daily water issues/requirements. A multidisciplinary expert team (e.g. water, health) analyses the emergent patterns of inequality, loss of education and governance. These are communicated with the children. The same children illustrate a further 500 cans with their respective visions of a different water future for themselves/their communities, highlighting the positive impacts of improved water quality, hygiene and education and the pathways for attaining these. Expert analysis reflects a Lagosian community in an SDG6-positive world.

### Analysis and results

Current behaviour and governance patterns have severe impacts on health (e.g. gastroenteritis), education (e.g. school drop-outs) and family welfare (reduced incomes). However, many of these impacts are self-inflicted. Children living in the Makoko slum, built over water, prefer to use the jetty to defecate rather than available toilets as it is easier to do so. Exploring their water stories through art enables the children to engage with issues of contaminated water and the cause and effect pathways. In turn, this helps them to envision a different water future and understand how changing their own behaviour can empower them to influence change and accelerate its pace. Their enhanced insights into the links between clean water, improved hygiene and enhanced education opportunities promotes behaviour change, greater gender equality and a better way of

Through individually painting jerry cans and collectively illustrating boats, children learn that a different future is possible, partly enabled by alternative behaviours. They are encouraged to engage in community work to filter the lagoon water and are taught techniques for cleaning the water (e.g. alum, charcoal etc.). Although infrastructure remains inadequate, empowered communities, who own the safe water agenda through decentralised solutions, promote SDG 6.

### Conclusions and recommendation

Arts education is an inclusive means of translating water and health issues into tangible messages, stimulating behaviour change and raising awareness of solutions. Youth and households that understand the impacts of their choices are empowered to adopt healthier practices. This is the highest possible resolution of decentralised water resource management and is key to joint action in community partnerships with Lagos' governance and institutions for promoting SDG 6 – neither party

Educators and curricula incorporating the outcomes promotes sustainability; comprehension of cause and effect pathways – and how to change them through healthier practices is thus institutionalised.

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### Presenter biography



#### **Ms. Belynda Petrie, OneWorld Sustainable Investments, South Africa**

Belynda Petrie is an expert and leading figure in climate change and water resource development. She has pioneered a systems analysis approach to water, energy, climate change and food nexus issues in the developing world. Her strength lies in pulling together multidisciplinary teams to deliver large, or complex projects. Belynda is an author of numerous research paper policy briefs, strategies, books and peer reviewed articles in the fields of water, energy and climate change/finance and is a frequently invited speaker at international conferences. She currently leads a sustainable development consultancy based in South Africa.

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## Microsoft's Pathway to Off-Grid Water: Majik Water

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**Authors:** Dr. Priscilla Johnson, Microsoft, United States

### Keywords

Cape Town, Water Crisis, Air-to-Water Generation, Entrepreneurship, Off-grid solution

### Highlights

Cape Town's Water Crisis prompted Microsoft to deliver an innovative strategy to provide water for its operations that would not impact the region's drinking water

### Introduction and objectives

In January 2018, Cape Town declared a state of emergency that began a countdown to Day Zero, the day the taps would be shut off. In 2018, Microsoft committed to delivering cloud services through its Africa Hyperscale launch. We had to find an alternative solution to potable water usage. During SWWW 2018, Young Water Solutions introduced Microsoft to Majik Water, an Imagine H2O Urban Drinking Water Challenge winner. Microsoft engaged them to conduct what has now become a successful off-grid solution in Cape Town.

### Methodology approach

Microsoft engaged Majik Water by conducting a Technology Readiness Level (TRL) review of their atmospheric water generation (AWG) approach. This methodology allowed us to decide whether or not the AWG was a good fit from a capacity and engineering level for our site.

### Analysis and results

As of January 2019, Majik Water has installed and commissioned a successful off-grid solution in Cape Town.

### Conclusions and recommendation

Feeder organizations such as Young Water Solutions and Imagine H2O do important work to highlight entrepreneurs with creative approaches. The platform that SWWW provides is excellent to connect entrepreneurs to corporations like Microsoft that can catapult them to the global stage and amplify the good work that smaller businesses are attempting to solve in their local areas.

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## Presenter biography



### Dr. Priscilla Johnson, Microsoft, United States

Priscilla Johnson, Ph.D., LEED AP O+M, is Director of Microsoft's Datacenter Water Strategy. With an enduring passion for the environment, she enables organizations to achieve sustainable growth. As an inventor, she launched a line of eco-friendly, plant-based cleaning products in 2009 to help protect consumers and aquatic life from harsh cleaning chemicals.

Dr. Johnson holds degrees from NYU (B.S.) and Purdue (M.S., Ph.D.) in Civil and Environmental Engineering and is a LEED AP.. Her experience spans environmental remediation to promoting energy efficiency at a major US utility. She believes that cloud services can be provided without depleting our natural resources.

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# Enabling the Digital Transformation of Water Management through Data Science

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**Authors:** Mr. Paul Fleming, Microsoft, United States

## **Keywords**

Digital transformation, artificial intelligence, data

## **Highlights**

This session will highlight Microsoft's AI for Earth program and describe how the program is enabling organizations to use artificial intelligence to address challenges in four areas, including water.

## **Introduction and objectives**

Highlight how data science techniques can be and are being utilized to generate new insights, inform decision making, and improve sustainable management of water resources. We will also explore what situations particularly lend themselves to a data science approach and what are key building blocks for successfully deploying data science, which seminar attendees can use to assess potential data science applications in their own work.

## **Methodology approach**

Microsoft established the AI for Earth Program to put the Microsoft cloud and AI tools in the hands of those working to solve global environmental challenges related to biodiversity, agriculture, climate change and water. The 5 year, \$50 million Program builds on Microsoft's mission to empower every person and every organization on the planet to achieve more and aligns with our strategy to partner and enable. As such, this session will focus on how Program grantees have enhanced their capacity to use data science to address water challenges and opportunities.

## **Analysis and results**

Nearly 200 grants in 50 countries have been awarded since the AI4E Program was announced just over a year ago; approximately 40 of those grants have been for water projects. The level of interest in the Program is one indication of the appetite that exists to explore how data science can be brought to bear to advance solutions to some of the world's most pressing environmental challenges. At the same time, the Program is still in its infancy and there exists significant potential to deploy data science to truly transform the sustainable management of water resources.

## **Conclusions and recommendation**

The proliferation of data provides an opportunity, if not the imperative, to determine how and when to deploy data science techniques that can best leverage the increasing deluge of water and related data; generate new insights, products and services; and help transform water resources management in order to achieve SDG6.

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## Presenter biography



### **Mr. Paul Fleming, Microsoft, United States**

Paul is the Corporate Water Program Manager for Microsoft where he is responsible for developing and implementing the company's water stewardship strategy. Previous to joining Microsoft, had extensive experience working on strategic, policy and technical issues in the water utility sector. Paul worked for the Seattle Public Utilities where he directed the climate resiliency group, focusing on building partnerships between research groups and utilities to build capacity to assess and prepare for the impacts of climate change.

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# Decentralized water purification using membrane filtration to improve community health

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**Authors:** Dr. Jochen Raimann, Easy Water for Everyone, United States

## **Keywords**

Membrane filtration, health outcomes, diarrhea, acute kidney injury, developing countries

## **Highlights**

Provision of a membrane filtration device has the potential to significantly improve health outcomes within rural communities drinking contaminated water.

## **Introduction and objectives**

In rural communities in regions with limited resources the provision of clean water remains difficult. Fecal contamination of water is very common and results in a high incidence of diarrhea, subsequent acute kidney injury and mortality particularly in the very young and old. Membrane filtration is a practical solution to this problem and a recent innovation allows membrane filtration using recycled hemodialyzers. We, Easy Water for Everyone ([www.easywaterforeveryone.org](http://www.easywaterforeveryone.org)), have attempted to quantify the systematic effect on health outcomes of providing clean water.

## **Methodology approach**

Between 06/2015 and 12/2018, 17 communities in rural Ghana (Ashanti-Ghana and Greater-Accra region; village size ranging in size from 5 to 591 people) were provided with high-volume membrane filtration devices (NUF 500; NuFiltration using recycled dialyzers). Health data from household surveys and chart review in local healthcare facilities were collected with approval from Ghana Health Services. Specifically, data was collected on gastrointestinal disease, acute kidney injury and therapeutic interventions. Incidence rates for 12 months periods before and after implementation of the device were calculated.

## **Analysis and results**

Data from 3611 villagers from the 17 studied communities in rural Ghana (around 13% 5 years or younger and 6% older than 65 years) were included in this analysis. The overall incidence rate of diarrhea showed a declining trend following the implementation of the filtration device in the village structure and was reduced from 1.5 to 0.8 cases per 1000 person days from the before to the after period. Further analyses of rate reduction and multi-level time-series analyses are currently underway.

## **Conclusions and recommendation**

Provision of a membrane filtration device has the potential of significant improvements of health outcomes within rural communities. While our data requires a larger sample size and further statistical analyses accounting for village characteristics, seasonality and subject demographics, the obvious decline in incidence rates supports widespread use of membrane filtration devices, particularly in rural regions. Multi-level longitudinal analyses will even further increase our understanding in terms of risk and preventive factors.

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## Presenter biography



### **Dr. Jochen Raimann, Easy Water for Everyone, United States**

Dr. Raimann holds a medical degree from the Medical University Graz, a PhD from Maastricht University, and a Master in Public Health from the City University of New York School of Public Health. As the Senior Manager of Clinical Data Analytics at the Renal Research Institute Dr. Raimann conducts and directs epidemiological research in dialysis and currently also teaches biostatistics at Yeshiva University. Dr. Raimann joined the foundation of the non-profit organization “Easy Water for Everyone” ([www.easywaterforeveryone.org](http://www.easywaterforeveryone.org)) which provides clean water to communities in need and supports the organization’s research efforts together with a diverse team of researchers, epidemiologists and statisticians.

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## Water Wide Web 3.1: Circulating Urban Water System for Renewable

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**Authors:** Mr. Odwa Ntsika Mtembu, Department of Water and Sanitation South Africa, International Water Association, United Nations Office for Disaster Risk Reduction , Water Youth Network World Merit South Africa, South Africa

### Keywords

Decentralised, energy, water, cities

### Highlights

It is important to have other sources of energy; both wind and solar energy have consistency limitations and therefore we need the above effective storage and distribution system coupled with heat recovery and energy generation from water as it flows from the source, to households and back to the source.

### Introduction and objectives

Optimisation of energy circulation from utilised urban water sources to develop self-supportive cities and islands on decentralised water and energy systems.

Problem statement: Lack of other sustainable energy sources to be used in the near future to develop self-supportive cities and islands on water and energy with a 100% reliable sustainable energy supply.

Research questions:

- How can we realize this 'Water Wide Web' considering the fact that the infrastructure in Amsterdam is very dense, but centrally organized?
- What are the first steps according to you to store energy on different levels and how can we decentralize our energy supply?

### Methodology approach

Storage:

At household level we use the Blue Battery to store energy generated by Solar panels and other renewable resources. The blue battery is more efficient storage system which is 100% sustainable. It consists of water and table salt and it provides an eco-friendly system of storing energy.

On new development areas or cities with less intense infrastructure underground, Ecovat systems can be used as thermal reservoir for underground storage.

Reuse and Recycling:

Waste water from the households contains a lot of wasted heat. Heat from wastewater can be reused by using a SHARC-System which is a heat exchanger on a larger scale.

### Analysis and results

Designed circulated Energy System

Production and distribution:

In the SWWTP the solids and the waste water are collected to generate energy on a smaller scale than a normal WWTP. This energy will be stored in a so-called Molten Salt battery and can be distributed wherever there is demand for energy. Molten Salt battery (tanks) are ideal both for new development areas and can easily be connected to existing infrastructure.

Energy Security: Energy productions for Buiksloterham - 10 TJ/year for 2000 households with 4 TJ retrieved from WWTP , 5 TJ from Heat Recovery system and 1 TJ from other sources.

Energy Equity: Flexible storage capacity, decentralised and centralised energy storage and distribution scales.

Environmental sustainability: High quality renewable energy, reuse and recycling waster networks, easily disposable batteries

### **Conclusions and recommendation**

For 2040, cities like Amsterdam has the ambition that all the energy used in the city comes from renewable resources. The energy demand is growing and water companies like Waternet has developed the sustainable development plans to increase the pace of improving sustainability in Amsterdam, which has the 2020 goal to be climate neutral concerning with CO<sub>2</sub>. This includes seeking ways to decentralise energy from water sources but the lack of other sustainable energy sources to be used in the near future to develop self-supportive cities and islands on water and energy with a 100% reliable sustainable energy supply.

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### **Presenter biography**



**Mr. Odwa Ntsika Mtembu, Department of Water and Sanitation South Africa  
International Water Association, United Nations Office for Disaster Risk  
Reduction, Water Youth Network, World Merit South Africa, South Africa**

Mr Mtembu is the co-founder and President of World Merit South Africa and Southern African representative for the African World Merit Network. His alma mater is the University of Cape Town where he majored in Geology, and Environmental and Geographical Sciences. He is currently a Master of Science candidate at the University of The Witwatersrand, Republic of South Africa, where he is conducting research focused on issues relating to geomorphological disasters by integrating water, climate change, land use and cover change, and geomorphological issues especially in areas with intense agricultural activities.

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## VeriSan: Accelerating sanitation scaling through mobile IT

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**Authors:** Ms. Mary Roach, Container Based Sanitation Alliance, Loowatt, United Kingdom

### Keywords

Reporting, capacity, inclusive, affordable, IT

### Highlights

The Container Based Sanitation Alliance is developing a mobile application and web-based platform to support the efficient delivery of household sanitation across multiple countries and to enable the growth and replication of affordable and safely managed CBS services for all.

### Introduction and objectives

The Container Based Sanitation Alliance is developing a mobile application and web-based platform to support the efficient delivery of inclusive sanitation across multiple countries and to enable the growth and replication of CBS services. The platform will address customer relationship management, billing and mobile payments, and tracks the safe disposal of waste from household to treatment. It is creating scalable management, operational and reporting capacity through the provision of IT systems to CBS providers and government counterparts. We will share practical lessons learned (from Antananarivo, Cap Haitien, Naivasha and Lima) while developing the platform and invite peer inputs from audience members.

### Methodology approach

Container-based sanitation (CBS) consists of an integrated, end-to-end service that collects waste hygienically from waterless toilets built around sealable, removable containers, and transports the waste for safe disposal or treatment and transformation into valuable end-products. Building off the experience of its members, the CBSA is developing a mobile application and web-based platform (called VeriSan) to consolidate existing technology and develop a platform and application that is modular yet customisable. The development and trial of the system is funded by the latest GSMA M4D. System development has been led by a Ghanaian IT company.

### Analysis and results

The phases of the development process include:

- Discovery phase – data collection to assess current IT system functionality (i.e. strengths and weaknesses), essential required features, and to understand the status and potential for mobile payments (May-June 2018)
- Consolidation and technical specification – Identifying various modules to be integrated, or agreeing a build-from-scratch approach, using group knowledge. Technical specification / platform architecture development (June-July 2018)
- Software development and testing – Agile development with modules released for user acceptance testing on an on-going basis. Trials with CBS providers in Madagascar, Kenya, Peru, and Haiti (August 2018-January 2019)
- Full trial and roll-out – Incorporation of feedback and peer inputs (February-September 2019)
- Lessons gathering – parallel activity running throughout. This proposed presentation will share lessons learned to date and elicit inputs from other FSM/CBS providers. The project will impact all the low-income customers of the four partner organisations. In December 2017, an estimated 2,120 households were being serviced by the pilot partners and this is estimated to grow to 6,400 by early 2019.

### Conclusions and recommendation

CBSA organisations have experimented with off-the-shelf or custom-built applications; however, each has identified challenges with their existing systems - they require extensive customization and are prohibitively expensive. The VeriSan platform will help accelerate the adoption of operational best practices across CBS providers and support the uptake of services by others. The platform will be used to provide stakeholders (government, donors, mobile industry) real-time information on financial sustainability and service quality (e.g. collection efficiency and waste removed). This information can inform future policies, target investment to reach the poorest, or develop financial products (e.g. results-based financing) to facilitate service scaling.

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### Presenter biography



**Ms. Mary Roach, Container Based Sanitation Alliance Loowatt, United Kingdom**

Mary Roach is the Chief Operating Officer at Loowatt, a waterless toilet company based in the UK. Previously, Mary worked for: Ceniarth, a single-family office, where she was responsible for their energy access portfolio; GSMA's M4D Utilities Innovation Fund supporting organizations leveraging mobile technology to improve access to energy, water and sanitation; M-KOPA to create a pay-as-you-go product; GE Power Generation; and a decade of involvement with Engineers without Borders Canada at home and abroad. She holds an MBA from Oxford University and a Bachelors in Chemical Engineering from McGill University.

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# The Implications of a Sustainable Source of Potable Water

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**Authors:** Mr. Joseph D'Alba, Sun Fresh Water, LLC , United States

## **Keywords**

Innovative, sustainable, water purification, system

## **Highlights**

A discussion of the implications of a sustainable source of potable water for health, immigration, and global warming.

## **Introduction and objectives**

Sun Fresh Water, LLC, in partnership with the City University of New York, has developed a system that replicates the Earth's natural process of fresh water production. Within the framework of a clear acrylic tube water containing saline, and/or other contaminants is introduced and the Earth's vaporization/condensation process utilizing solar energy is duplicated, similarly producing potable water. The inexpensive, portable, and scalable characteristics of the system make it ideal for use by the people in greatest need for potable water – those disenfranchised, geographically isolated, economically marginalized, and the least vocal members of the human community.

## **Methodology approach**

As mankind advances into the 21st Century we are faced with unprecedented opportunities as well as challenges. While these opportunities provide the promise of great advances, the challenges, resulting from the consequences of a rapidly increasing population within a finite ecosystem, threaten our social fabric, civility and the prospect for the health, vitality, and continuity of the human race. This article will explore the implications of a sustainable source of potable water for three of the greatest challenges facing us today – health, migration, and global warming.

## **Analysis and results**

The genesis of the article is found in the development of the solar powered water desalinization and purification system under development by the City University of New York and Sun Fresh Water, LLC of Ormond By-the-Sea, Florida. See [www.SunFreshWater.com](http://www.SunFreshWater.com). This system is a portable, inexpensive, scalable and easy to use and maintain water purification system. Recently this system has been awarded Patent Protection by the United States Patent Office at numbers 10150049 and 10150050.

The simplicity of this system is found in its replication of the earth's natural system of potable water production via vaporization and condensation within the framework of a clear acrylic tube wherein the Earth's vaporization/condensation process utilizing solar energy is duplicated producing potable water .

Water is the necessary for human existence along with food and air. Little water is left on Earth that is safe to drink without purification. Only 1% of Earth's water is in a fresh, liquid state, and nearly all of this is polluted by diseases and/or toxic chemicals. For this reason, purification of water supplies is extremely important.

The inexpensive, portable, and scalable characteristics of the system make it ideal for use by the disenfranchised people in greatest need for potable water.

## **Conclusions and recommendation**

The implications of a sustainable source of potable water on the issues of health, immigration, and global warming are profound. This article seeks to call attention to the importance of a sustainable source of potable water to address these issues and to initiate a dialogue about this often-ignored potential solution. This article will introduce utilizing a sustainable source of potable water to address these issues, the challenges involved with implementing this solution, and it hopes to serve as a starting point for discussions

regarding enhancing the health, civility, and perpetuation of humanity through a sustainable source of potable water.

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### Presenter biography



**Mr. Joseph D'Alba, Sun Fresh Water, LLC, United States**

Joseph D'Alba is the President of Sun Fresh Water, LLC. In partnership with the Center for Advanced Engineering Design and Development of The City University of New York, they have developed a proprietary solar powered desalinisation system that is inexpensive, sustainable, scalable, easy to use and maintain, and of high production. They are now developing a system to convert deserts to agricultural production.

The topic that he will be addressing is 'The Implications of a Sustainable Source of Source of Potable Water'. These implications include addressing the global challenges of health, hunger, migration, water wars, and climate change.

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## Increasing Access to POU Water Disinfection with UVC LEDs

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**Authors:** James Peterson, Crystal IS, United States

### Keywords

UVC LED, water disinfection, Legionella, point-of-use, consumer safety

### Highlights

New research from the University of Colorado Boulder and Crystal IS found that when applied to water flowing at a rate of over two liters per minute, UVC LEDs reduced key pathogenic organisms like *E. coli*, *Pseudomonas*, and *Legionella* levels by over 99.99 percent.

### Introduction and objectives

An October 2018 vote on proposed water guidelines in Europe ruled in favor of more stringent quality standards for consumer drinking water, expanding monitoring and limits on certain pollutants, including *Legionella* in buildings and *Pseudomonas* in bottled water. These organisms, along with *E. coli* contamination, are critical target organisms for benchmarking technologies to assure safe dispensed or bottled water access across the globe. Crystal IS in conjunction with the University of Colorado conducted independent testing of the Klaran AKR, an on-demand UVC LED-based water disinfection reactor intended for long service lifetime consumer and commercial water purification.

### Methodology approach

Utilizing a novel reactor chamber and product design suitable for low power, intermittent use, and long service life UV treatment of water at the Point of Use, the Klaran AKR with UVC LEDs was evaluated against three challenge organisms, *E. coli*, *Legionella pneumophila*, and *Pseudomonas aeruginosa* in dechlorinated tap water. Performance was evaluated by flowing the challenge solution through the AKR at flow rates between 0.5-3 Liters per minute to replicate consumer dispensing flow rate needs. Cultured plate counts of treated solutions are collected and summarized as results.

### Analysis and results

UVC LEDs applied to water treatment through the use of the AKR reactor design were able to demonstrate greater than 4 Log Reduction Value of all target organisms at flow rates sufficient to provide water service to individuals and households. This performance enables UVC LED based water treatment to reduce waterborne pathogen risks while increasing access to treated water by requiring less power, low maintenance, and a lower cost of treatment overall than comparable POU UV lamp or cartridge systems. The target organisms selected reflect a range of leading water safety needs in both the developed and developing world, which experience challenges providing treatment directly before consumer consumption. *E. coli* serves as a primary indicator of microbial contamination from waste water in distribution systems. *Pseudomonas* serves to monitor the safety of bottled and stored water. *Legionella* currently leads to the highest health burden of any waterborne pathogen in the EU.

### Conclusions and recommendation

UVC LEDs can serve as an effective treatment method at point of use flow rates against pathogenic organisms. The technology additionally supports novel and cost effective approaches to distributed treatment methods for municipal supplies, off-grid, and water challenged regions to improve consumer access to safe drinking water. The long service life and lowered capital costs of low flow solutions provide reliable, low power treatment for years upon implementation, which holds potential to greatly lengthen the timespan of impact of humanitarian efforts to improve water safety across the globe.

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## Presenter biography



### **James Peterson, Crystal IS, United States**

James is responsible for the strategic direction of Crystal IS' products focused on water disinfection. He develops business models for UVC emitters and solutions and ensures product lines meet specific customer needs. Prior to Crystal IS, he co-founded Vital Vio, a company that designs, engineers and manufactures LED lighting systems that reduce bacteria and other organisms from at-risk environmental surfaces. James holds several patents in using light for disinfection and was named to the 2016 Forbes 30 under 30 list. He has a BS in Mechanical Engineering from Rensselaer Polytechnic Institute, New York.

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# Innovation in Low-Cost Water Treatment using Conventional and Nanotechnologies

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**Authors:** Mr. Yolwin Jed Perales, Water Youth Network, Mindanao Mineral Processing and Refining Corporation, Philippines

## Keywords

Water Treatment, Low-cost, Wastewater, Contaminated Water, Zeolite

## Highlights

- In the Philippines, more than 20 million Filipinos rely on unsafe improvised water treatments for drinking water.
- Diarrheas and typhoid fevers are prevalent in the Philippines primarily due to unsafe drinking water.
- The potential of nanotechnology applied to zeolite is promising in designing an effective low-cost water treatment.

## Introduction and objectives

Philippines is facing a water crisis, Water.org estimates that nine million Filipinos lack access to safe water and over 19 million lack access to improved sanitation. Moreover, it is estimated that 58% of the country's groundwater intended for drinking is contaminated with coliform bacteria. Safe drinking water had been a luxury for most Filipinos due to expensive fees for water purification, which are often unavailable most especially to rural areas. This project aims to design a cheap and simple yet effective water treatment equipment made out of local materials that could be easily maintained at low cost.

## Methodology approach

The water treatment equipment was made of three removable layers out of used plastic water bottles with cheese clothes in between. These three layers consist of 1) sand and pebbles 2) activated charcoal and 3) silver nanoparticle activated zeolite in particular order. Water samples from rain, pump, spring and faucet from one barangay were tested for pH, total dissolved solids, conductivity and presence of coliform before and after running it to the equipment. Desorption and cleaning was done by continuously passing hot water to the equipment. The ease of use and interest with the equipment were also rated by respondents.

## Analysis and results

Results show that all samples were semi-acidic with rainwater having the lowest pH of 5.8. Total suspended solids (TDS) were relatively high but acceptable with spring water having the highest average of 784 mg/L. Conductivity shows that pump and faucet samples were highly contaminated with ions and are unacceptable for drinking with average of 88 uS/m and 64 uS/m. Additionally, coliform tested positive in most samples. Elemental testing also revealed the presence of iron and traces of lead in water samples from pump and faucet. After running the water samples through the equipment, pH was neutralised, TDS was <300 mg/L, conductivity were lowered to <20 uS/m, trace elements were lowered to acceptable concentrations and coliform was undetectable. Cheesecloth served as initial filter for particles >0.1 mm, sand and pebbles removed small particles and trap bacteria, activated charcoal adsorbed ions while Ag-zeolite served as pH neutraliser and final filter for remaining bacteria and ions, with Ag having excellent antibacterial properties. The total cost for one equipment was estimated to be 10 USD/200L. Desorption was successful in bringing back the efficiency of the equipment to 80%. Moreover, 100% of the respondents approved the ease of construction, cost and effectiveness of the equipment.

### Conclusions and recommendation

Cost and effectiveness had been the two most critical issues in designing water treatments. Conventional techniques had been proven to be insufficient most especially with emerging pollutants while modern techniques are usually expensive and inaccessible. The results of this pilot study suggest the big potential of combining conventional and nanotechnologies applied to zeolite in overcoming the challenges we continuously face in providing sustainable access to safe drinking water most especially to the marginalised. It is recommended to try the equipment to more polluted waters and create a more comprehensive logistical and business model for the product.

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### Presenter biography



#### **Mr. Yolwin Jed Perales, Water Youth Network, Mindanao Mineral Processing and Refining Corporation, Philippines**

I am a metallurgical engineer based in the Philippines and a member of the Water Youth Network. My research interests include hydrometallurgy, wastewater treatment, sustainable engineering solutions, water policy formulation, and WASH. My projects held range from risk assessment of water bodies such as rivers and seas, designing and creating low-cost water treatment, innovations in alleviating challenges in sanitation and clean drinking water, and nature-based solutions for industrial wastewater discharges. I had been awarded the World Water Week 2017 Poster Prize and the UNLEASH Innovation Lab 2018 Silver Award for SDG 6.

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# Building consumer-focused household sanitation solutions in Haiti

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**Authors:** Ms. Leah Page Jean, SOIL, United States

## **Keywords**

Urban, sanitation, container-based sanitation, social business, innovation

## **Highlights**

SOIL is building a customer-focused household toilet service in urban Haiti designed to increase access to equitable, affordable sanitation and waste treatment services. By taking an innovative, circular economy approach and working in partnership with key stakeholders, SOIL believes this service can cost-effectively reach those left behind by traditional technologies.

## **Introduction and objectives**

SOIL's EkoLakay service successfully provides cost-effective, dependable, and environmentally-sound household sanitation in informal urban settlements (where over 3 billion people are expected to reside by 2050), and this work represents an elegant public health and environmental intervention for a vulnerable base of the pyramid population. Given the sheer number of people requiring access to these services, there is significant demand to drive large-scale replication globally. This talk will discuss SOIL's consumer-focused approach, the need for new financial mechanisms, and how we can leverage new collaborations and public sector support to sustainably scale similar innovations in different contexts.

## **Methodology approach**

SOIL seeks to address the sanitation challenge in vulnerable urban communities through a technology called Container-based Sanitation (CBS). CBS is a system where toilets collect human excreta in sealable, removable containers that are transported to treatment facilities when full. SOIL is taking a consumer-focused approach to sustainable sanitation that combines an innovative service delivery model and new technology with a strategic, catalytic approach to financial sustainability. This talk will explore how to most effectively mobilize value-adding and sustainable revenue streams that can finance scale up, further incentivize innovation, and create a market for new entrepreneurs to enter the

## **Analysis and results**

To move beyond traditional sanitation technologies that have been expensive, resource-dependent and prone to perpetuating significant inequalities in access, cost and service quality, practitioners need to be open to exploring financial mechanisms that can bring more entrepreneurs to the sanitation sector and create a bridge to future public financing to increase access where ability to pay is low. SOIL is currently in dialogue with the Inter-American Development Bank and the government of Haiti to set up a results-based financing (RBF) mechanism to scale the provision of container-based sanitation services in Cap-Haitien, Haiti. This partnership will be an important test of how innovative financing can encourage the scale up of non-sewered sanitation solutions in an equitable way in vulnerable communities.

## **Conclusions and recommendation**

SOIL and other CBS innovators have made significant progress in building local-optimal, cost effective services, but further support is needed for them to continue to improve efficiency, reduce costs, achieve scale, and secure public sector support.

RBF with funds provided by large donors or development finance institutions can play an important role in covering unmet losses from sanitation service delivery to historically difficult-to-reach populations, improving equity and sanitation access.

Collaborations like the Container Based Sanitation Alliance can help practitioners develop standardized metrics and share best practices, speeding up the rate innovation and supporting new entrepreneurs entering the sector.

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## Presenter biography



### **Ms. Leah Page Jean, SOIL, United States**

Leah has been working with SOIL since 2007 where she has helped develop and refine SOIL's approach to sustainably providing sanitation services in rapidly expanding urban communities. Before joining SOIL, she worked for a range of international organizations in positions focused on helping create more impactful and sustainable responses to global challenges. She has a bachelor's degree from Reed College in Portland, Oregon.

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# Providing Sanitation to Off-grid Areas: a Successful Story from Cambodia

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**Authors:** Mr. Michael White, Asian Development Bank, Philippines

## **Keywords**

Off-grid sanitation solutions, solar septic tanks, innovation, Asian Development Bank

## **Highlights**

Solar septic tank installation in remote, off-grid areas, which are not reached by traditional infrastructure; Innovative technology application in remote communities to address sanitation issues in areas with vulnerable women and children.

Use of complete sanitation value chain approach amidst geographical and spatial limitations.

## **Introduction and objectives**

Communities living nearby the Ton Le Sap Lake in Cambodia are vulnerable to water-borne diseases, frequent flooding and improper sanitation conditions. Hence, there is an urgent need to develop cost-effective, non-invasive fecal sludge containment solutions which can be replicated in the whole catchment area surrounding the lake. It is equally important to ensure proper treatment of collected fecal sludge and disposal of any emergent effluent. This can positively contribute to enhance community living conditions while protecting the lake water quality.

## **Methodology approach**

During the pilot study phase, five innovative proven on-site sanitation technologies have been installed around the Ton Le Sap Lake. These require zero electricity, low water consumption and minimal civil works. Solar septic tanks use solar energy to increase their internal temperature. They rely on elevated temperatures to inactivate pathogens and convert organic waste into biogas. Such technologies eliminate the logistical and environmental problems associated with fecal sludge transport in conventional septic tanks while providing high-level effluent treatment. This contributes to improved effluent discharge and lake water pollution reduction.

## **Analysis and results**

Site analysis is critical to ensure that the technology being tested is suitable for various conditions and user profiles. In this regard, solar septic tanks should be placed only where enough solar heat can be harvested. The location should also consider the security of the unit. The selected sites at Ton Le Sap Lake include dry, flood prone and inundated areas. The number of users ranges from 20-2000 people, including women and children. Firstly, stakeholder engagement was critical to inform the community about proper usage and septic tanks care. Consultations with the community included government officials, teachers, health center officials, community leaders, user and non-users in the community. These provided an opportunity to inform the public about the solar septic tanks as well as to obtain real-time feedback and improvement suggestions. Most importantly, stakeholder perception was taken into consideration to ensure the sustainability of solar septic tanks. Secondly, regular water quality and temperature log monitoring were critical to ensure that units were performing as designed, and operations adjusted as necessary. The positive results proved that this innovation can be replicated in the other areas around the Ton Le Sap lake.

## **Conclusions and recommendation**

This study showed that it is possible to provide complete sanitation services to all areas reaching the 'last mile'. Difficult site conditions can be hurdled by appropriate technologies and methodologies, combined with proper coordination with local communities and government support. Innovative technologies can be

encouraged for mainstreamed use after they have demonstrated their effectiveness. Piloting innovative technologies is an effective way to test the suitability of new systems. In addition, training local operators and the larger community on technology operation and maintenance is paramount.

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## Presenter biography



### **Mr. Michael White, Asian Development Bank, Philippines**

Michel White is a Senior Urban Development Specialist (Water Supply and Sanitation), Southeast Asia Regional Department, Asia Development Bank (ADB). Mr. White is a civil / environmental engineer holding an honours degree in civil engineering from Liverpool John Moore's University, UK, and a master's degree in water and waste engineering from Loughborough University, UK. Before joining ADB in July 2009, he gained 22 years of professional experience in the water and urban

Christian Walder is an Urban Development Specialist – Water Supply and Sanitation Sector Advisory Service Division Sustainable Development and Climate Change Department, Asian Development Bank (ADB).

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