Our Future Water

A Circular Water Economy

Managing the Human Water Cycle

BY: NINA F. AQUINO AND ROBERT C. BREARS

Introduction

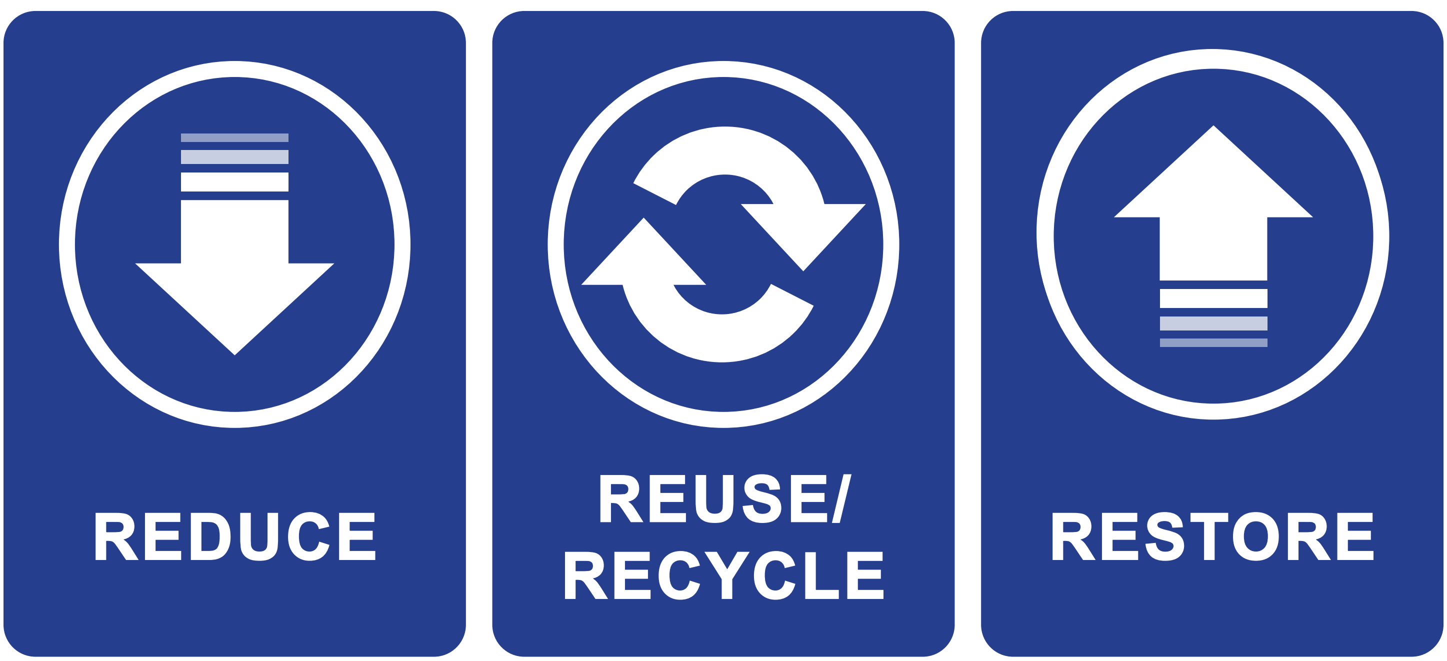
Water is a ***finite resource***. We cannot produce more water or use up the current supply. The totality of the Earth's water supply exists in three states: solid, liquid, or gas. However, most of the available water supply exists as oceanic salt water, is frozen, or trapped underground. In fact, only about 1% of the world's total water supply is usable as fresh, drinking water for human consumption. With the world's population continually growing, the quest for innovative sources of freshwater is quickly becoming our greatest challenge.

The current solution to the world's water supply dilemma is to tap into existing groundwater reserves. However, even the most robust groundwater sources are quickly dwindling. Furthermore, many of these groundwater and freshwater supplies have become increasingly contaminated by human activities.

While our communities continue to become technologically advanced, we must not forget the world that nourishes and sustains us. In fact, the answers to our global water crisis may be found in the beauty of the natural world. Without human intervention, the environment, through the hydrological cycle, is able to effectively clean water and restore fresh water supplies repeatedly.

In mimicking the natural water cycle, we can create a managed, circular human water cycle, ensuring our water for tomorrow.

This can be done through **3R concepts:**



Reduce

In the circular economy, the concept of reduce is achieved through two main concepts: Water Conservation and Water Efficiency

Water Conservation essentially means doing fewer things that use water, requiring us to make a change in our behavior. Water conservation is important when water supplies become unusually low, such as during severely dry summers or after natural events that disrupt water supplies.

Water Efficiency is when new hardware or management techniques are used to get the same level of benefits from using less water, often becoming financially rewarding in the long term.

Water Conservation and Water Efficiency are best promoted through **demand management.**

Demand Management

Demand Management promotes water conservation and water efficiency during both normal and abnormal conditions, through changes in practices, culture, and people’s attitudes towards water resources. Demand management seeks to reduce the loss and misuse of water, optimize the use of water, and facilitate major financial and infrastructural savings by minimizing the need to meet increasing demand with new water supplies.

Reduce

Demand Management (continued)

Case: Smart Meters in Singapore

Singapore's Public Utilities Board's (PUB) is trialling a smart water network that will collect detailed data on household water consumption to build customer consumption profiles and identify consumption patterns and trends. The data will then be analyzed and provided to customers enabling them to monitor their water usage patterns and better manage water consumption. PUB will also enable customers to set water-saving goals and track their performance. This is to see if game playing is more effective at engaging and motivating customers to conserve water rather than increasing water prices.

Case: Anglian Water using fibre optics to detect leaks

Anglian Water is trialling the use of fibre optic cables to detect leaks in their water pipe network. Working with partners, the trial is testing the endurance and capability of the fibre optics and allows the engineers to hone their skills in installing and removing the fibre optics from the pipeline. Once the fibre optic sensor cable is fed into water pipes, the technology can enable engineers to continually monitor the pipeline for leaks and other events in the network by creating thousands of virtual sensors along the sections of the pipeline being monitored. This information enables the utility to see in real-time where new leaks are.

Reuse and Recycling

In the Earth's natural water cycle, wastewater generated by the environment is rarely dumped after one use, but rather goes through various steps of reuse and recycling, eventually making its way back to the start as clean, fresh water. Unfortunately, human society does not currently mimic this process, and instead uses complicated and costly methods to treat wastewater for direct discharge to salty ocean water that is unsuitable to directly sustain human life.

The opportunities for water reuse and recycling are exceptionally large. According to a report done by the United States EPA, 32 billion gallons of municipal wastewater are produced daily in the US alone, but less than 10% of that is intentionally reused.

Wastewater Reuse can be classified into three types: ***Non-potable***, ***Indirect Potable***, and ***Direct Potable.***

Non-Potable

Non-Potable Reuse and Recycling represents the most promising way both commercial industry and domestic waste streams can most closely mimic the Earth's water cycle. Non-potable reuse and recycling of wastewater for landscaping and crop irrigation remains the most common method as the properties of wastewater are ideal for this application.

Case: Dual Rainwater/Greywater Harvesting in Chicago, Illinois

Mercy Housing Lakefront, a non-profit organization, is redefining affordable housing through its sustainable living solutions. Its development in the City of Chicago, the Margot and Harold Schiff Residences, uses a Wahaso dual rainwater and greywater harvesting system to drastically reduce freshwater use. Water from sinks, showers, and tubs is filtered, sterilized & stored in a 1,000 gallon basement unit. It is then reused to supply 100% of the building's 92 unit toilet flushing needs. Rainwater is channeled from the roof to a separate 500 gallon unit where water is reused for irrigation purposes.

Reuse and Recycling

Non-Potable (continued)

Case: Wastewater Recycling for Organic Farming at Narkoy Ecological Hotel

The case for recycling wastewater (greywater, blackwater or combined) for use in agricultural irrigation has been gaining steady traction over the past several years. The Narkoy Ecological Hotel in Turkey uses a biological on-site wastewater treatment system, Biopipe, to treat and recycle 100% of their sewage water for irrigation of their organic farm without the production of sewage sludge. The savings in recycled water allowed for a payback period of less than one year, creating savings for the future.

Indirect Potable

According to the Australian Guidelines for Water Recycling, indirect potable reuse is defined when municipal wastewater is highly treated and discharged directly into groundwater or surface water sources with the intent of augmenting drinking water supplies.

Case: Managed Aquifer Recharge in Orange County, California

Since 1976, the Orange County Water District (OCWD) has been mandated with managing the Orange County groundwater basin, an underwater water source that supplies approximately 2.4 million people. To maintain adequate levels of groundwater in the basin and prevent intrusion by sea water, the OCWD in partnership with the Orange County Sanitation District uses recycled treated wastewater from homes in the county to recharge the natural aquifer supply. The wastewater undergoes a three step process that results in drinking water quality supply.

Reuse and Recycling

Direct Potable

Treatment of wastewater to levels adequate for human consumption as drinking water have remained costly procedures often involving many different types of treatment technologies. This level of treatment for wastewater recycling is often used as the last resort if suitable fresh water drinking resources are not available.

Case: Toilet to Tap in Windhoek, Namibia

While direct Toilet to Tap still faces public aversion in most of the world, Windhoek, Namibia has been recycling their sewage water for direct supply to its citizens for over 50 years. Faced with the looming certainty of a disastrous drought, the city had to seek alternative sources of water. Built through a consortium involving both Veolia and VA Wabag, the Goreangab Wastewater Treatment Plant is an advanced sewage treatment system, but is actually based on nature. Biological bacterial organisms feed on the nutrients in the wastewater, eventually treating the sewage back to clean water, mimicking the processes found in nature.

Case: City of Wichita Falls' Direct Potable Reuse Project

The City of Wichita Falls' direct potable reuse project went online in 2014 and involves a seven-step process for treating the water. After being processed through the wastewater treatment plant, the treated reuse water is disinfected and pumped into the River Road Resource Recovery Facility to the Cypress Water Treatment Plant. From there the water is treated in the Microfiltration Reverse Osmosis Plant. After which, the reuse water is treated through reverse osmosis. The water is then released into a holding lagoon. The reuse water is then blended with raw lake water on a 50-50 basis. The blended water from the City's water sources lakes, Lake Arrowhead and Lake Kickapoo, is treated through an extensive series of steps to produce safe, clean drinking water ready for distribution.

Restore

The circular economy aims to maximize environmental flows by reducing consumptive and non-consumptive uses of water, preserve and enhance natural capital, improve the quality of effluent, and ensure minimum disruption to natural water systems from human interaction and use. One of the main strategies for managing water resources while restoring the natural environment is the implementation of **green infrastructure** solutions.

Green Infrastructure

This is defined as a strategically planned network of natural and semi-natural areas, ranging in size from rain gardens in housing developments right up to green streets and green public spaces, that are designed to manage water quantity and water quality while delivering a wide range of environmental, economic, and social co-benefits. A key aspect of green infrastructure is its multi functionality, specifically, its ability to perform several functions and provide several benefits within the same spatial area. For example, green infrastructure can reduce flooding while improving water quality, reducing infrastructure costs, and providing a space for communities and wildlife

Case: A Waterwise Perth by 2030

The Waterwise Perth Action Plan sets out the direction for transitioning Perth to a leading Waterwise city by 2030. The Plan's Waterwise Greening Scheme provides Waterwise Councils with funding to support a variety of Waterwise greening initiatives that improve water quality, improve community health and well-being, increase biodiversity, and cool local communities. Waterwise Councils can apply for up to $10,000 of dollar-for-dollar funding per annum to fund GI initiatives such as tree planting, garden competitions, garden workshops, and the development of Waterwise demonstration gardens.

Restore

Green Infrastructure (continued)

Case: Hamburg's Green Roofs

Hamburg's green roof strategy aims to have 100 hectares of green roofs across the city to manage heavy rain events that will likely increase with climate change. The Authority for the Environment, Climate, Energy and Agriculture is supporting this strategy by providing funding of €3 million for green roofs until 2024. The funding supports voluntary intensive or extensive green roofing measures in residential and non-residential buildings in Hamburg with eligible applicants receiving a one-time grant up to a maximum of €100,000.

Conclusion

The water crisis is not a country problem, but a human problem. The actions of every single human on the planet has direct consequences for everyone and eventually for oneself. Innovative technologies and solutions are essential to smart water management. It's up to us to learn how to effectively manage the human water cycle, creating our own circular economy. The 3Rs of reduce, reuse and recycling, and restore are vital components to solving and managing the world's water crisis before it is too late.

Meet the Authors

Robert C. Brears

Founder of Our Future Water

Our Future Water has been created to ensure water security for today's and future generations. This is achieved by bridging communities – water specialists, points of view, and generations; generating and disseminating knowledge through fact-based analysis; and advocating for water education at all levels to build a community of water leaders who can see and solve water challenges from various vantage points. To date, Our Future Water has conducted a range of activities to enhance awareness and understanding of how to achieve water security including hosting events, workshops, and panels; sharing best practices across social media; and supporting partner organizations.

OUR FUTURE WATER
Website: https://ourfuturewater.com
Email: robert@ourfuturewater.com
LinkedIn: Our Future Water
Twitter: @ourfuturewater

Our Future Water

Nina F. Aquino

Chief Marketing Officer, Biopipe Global Corp.

Biopipe Global Corp. is a water treatment company focused on providing innovative solutions to ensure the world's supply of water for tomorrow. Biopipe, the company's flagship product, is a revolutionary no sludge domestic sewage treatment plant (STP) and water recycling system. No Sludge, No Odor, No Noise, No Chemicals. Biopipe was invented in 2012 in Turkey by founder, Enes Kutluca, as a solution to the many pitfalls of current sewage treatment technologies and their infrastructure that are decades old, hard to maintain, and hard to scale. Biopipe remains dedicated to promoting awareness about how we can better manage our human water cycle.

BIOPIPE GLOBAL CORP.
Website: https://www.biopipe.co
Email: nina@biopipe.co
Linkedin: Biopipe
Facebook: @biopipeglobal
YouTube: Biopipe Global

biop!pe