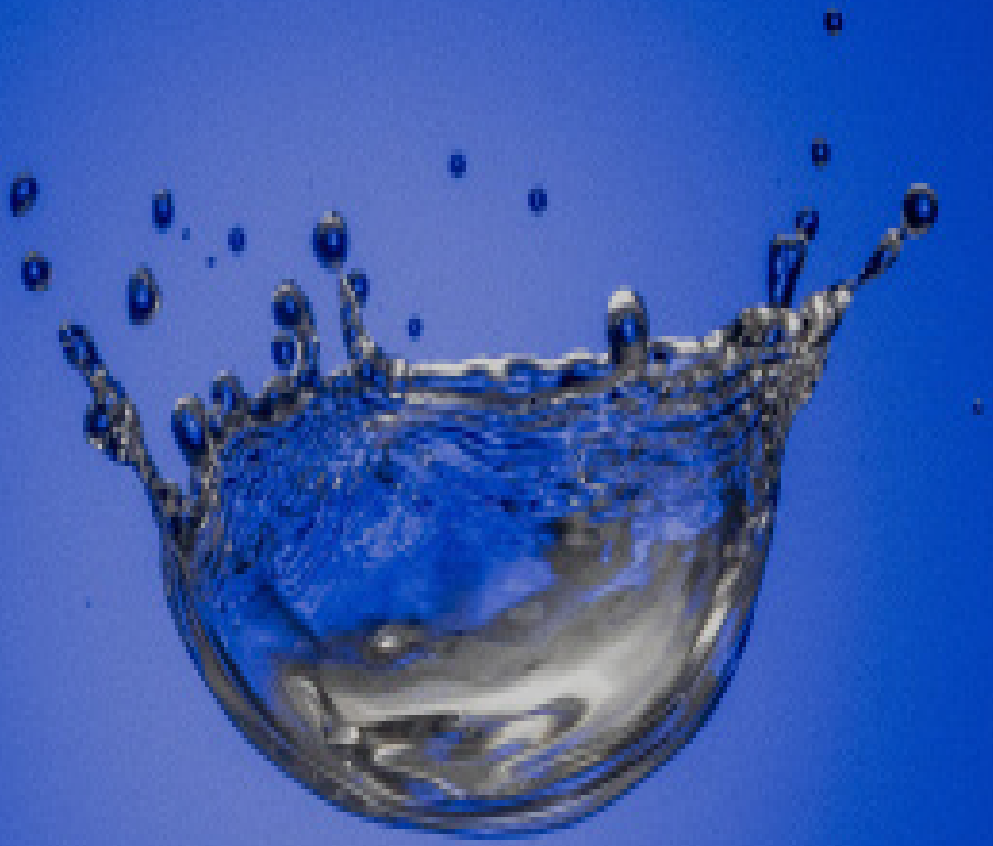
WATER SECURITY IN A POST-COVID-19 WORLD



Our Future Water

Water security in a post-COVID-19 world

The post-COVID-19 reconstruction phase should be centred around the green economy, the concept of which enables economic growth and investment while increasing environmental quality and social inclusiveness. A key aspect of the green economy is that it achieves water security.

The traditional economic model of employing various types of capital, including human, technological, and natural, to produce goods and services has brought about many benefits including higher living standards and improved human well-being. At the same time, economic growth has resulted in environmental degradation. In addition, the global economic model is confronted by a wide array of trends including rapid population growth, urbanisation, increasing poverty, and inequality as well as climate change resulting in resource scarcity and social challenges. In response, many multi-lateral organisations have called for the development of a green economy that improves human well-being and social equity and reduces environmental degradation.

The green economy

The green economy as one that results in 'improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest form, a green economy is low carbon, resource efficient, and socially inclusive. In this type of economy, growth in income and employment are driven by both public and private investments that reduce carbon emissions, enhance resource efficiency, and prevent the loss of biodiversity and ecosystem services. A key component of this economy is that economic development views natural capital as a key economic asset and as a source of public benefit. The overall aim of a transition towards a green economy is to enable economic growth and investment while increasing environmental quality and social inclusiveness.

Green growth

In the green economy, green growth is about fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. There are a variety of characteristics attributed to green growth including:

- more effective use of natural resources in economic growth
- valuing ecosystems
- inter-generational economic policies
- increased use of renewable sources of energy
- protection of vital assets from climate-related disasters, and
- reduced waste of resources

The main overall objectives of the green economy and green growth include:

- *Improving resource-use efficiency*: a green economy is one that is efficient in its use of energy, water, and other material inputs
- *Ensuring ecosystem resilience*: it also protects the natural environment, its ecosystems, and ecosystem flows
- *Enhancing social equity*: it promotes human well-being and equality

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Water's role in the green economy

Water, unlike any other natural resource, affects every aspect of society and the environment and is essential for human well-being. Specifically, water is embedded in all aspects of development including food security, health, and poverty reduction and in sustaining economic growth in agriculture, industry, and energy generation. As such, the transition towards the green economy requires not only the conservation of water resources but also the finding of new and innovative economic growth and social development opportunities that embrace the sustainable management of water resources. A key component of creating the green economy is ensuring water security for all users and uses, both human and natural, where water security is defined by the United Nations as "*the capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability*".

Overall, ensuring water security in the green economy can be achieved by:

- Creating policy instruments that promote complementary benefits
- Developing fiscal instruments that give a price to environmental goods
- Strengthening institutional arrangements that enable the management of water across sectoral silos and even political/administrative boundaries
- Developing financial instruments that share risks between governments and investors and make new water technology affordable
- Developing skills that support the sustainable management of water in the green economy
- Establishing information and monitoring systems that set targets, define trajectories, and monitor progress on water efficiencies
- Developing innovative plans that increase water productivity, protect groundwater and surface water resources, and ensure adequate levels of water quality

CASE: Green infrastructure turning stormwater into a resource

In the United States, the Water Infrastructure Improvement Act amends the Federal Water Pollution Control Act to provide for the use of green infrastructure to reduce stormwater flows. One city that is demonstrating how green infrastructure can turn stormwater into a resource is Santa Monica. The City of Santa Monica, in partnership with the Santa Monica Malibu Unified School District and the Metropolitan Water District of Southern California, has constructed the Los Amigos Park Storm Water Harvesting and Direct Use Demonstration Project. The project involves capturing stormwater runoff from a storm drain near the park, pre-treating flows with a hydrodynamic separator, storing flows in a subsurface storage system, and treating the water with ultraviolet light before use for indoor flushing and park irrigation, both of which currently use potable water. The project stores around 53,000 gallons of urban runoff and offsets up to 550,000 gallons of potable water per year, ensuring urban runoff can become a resource rather than a waste that carries pollution into Santa Monica Bay. In addition to reducing the amount of polluted runoff going into the ocean, the project demonstrates to the wider community the benefits of capturing and using urban runoff and stormwater for uses that do not require potable water. Overall, the project contributes towards the city's wider goal of reducing water use by 20% and being 100% water self-sufficient by 2020.

CASE: San Francisco's water-efficient equipment retrofit grant

As the San Francisco Public Utilities Commission (SFPUC) is a provider of water, wastewater, and energy services, one of its most important roles is to help customers use their energy as efficiently as possible. To decouple water consumption from energy usage, SFPUC offers a grant for non-residential customers to upgrade or replace their existing on-site indoor water-using equipment. Grants can be up to 50% of the project's equipment costs, with a maximum amount of $75,000 per project. The grants can be used for two types of retrofits:

1. Fixed water-saving retrofit projects: This is the use of standardised equipment that results in predictable water savings
2. Custom retrofit projects: This consists of unique or site-specific equipment retrofits that result in project-specific water savings

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CASE: A hybrid sewage power plant

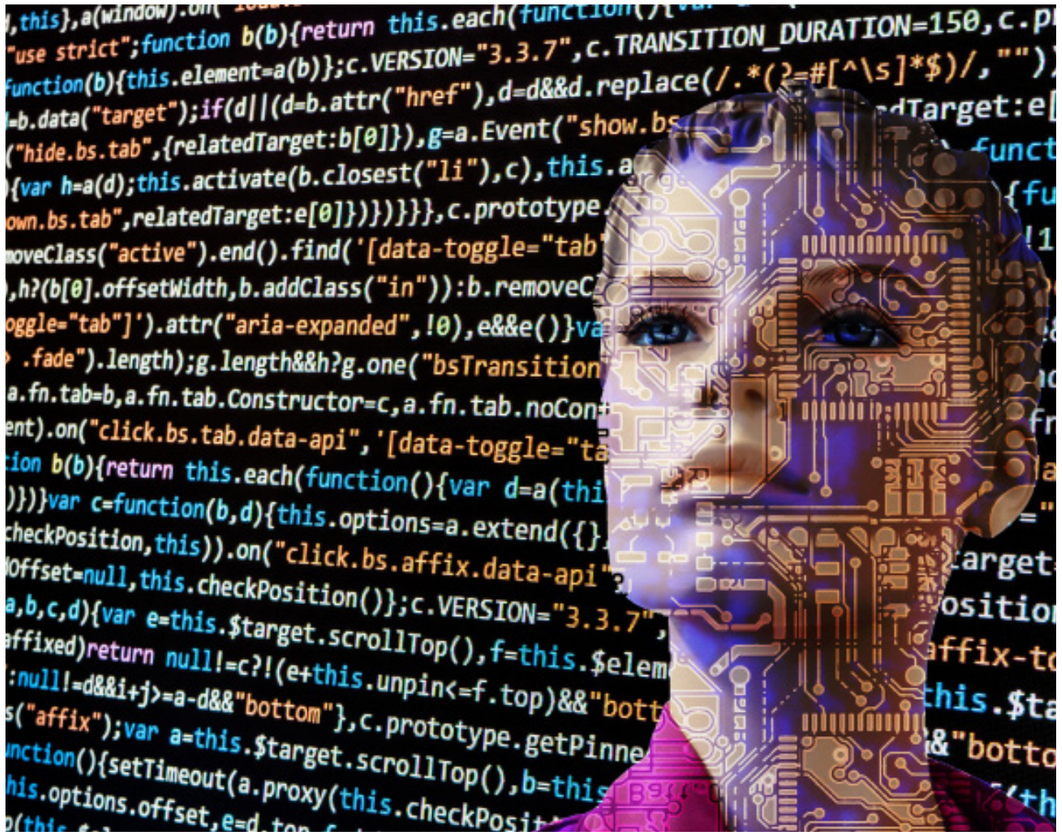
One of Germany's largest sewage treatment plants is aiming to become 100% energy self-sufficient through a range of decentralised renewable energy systems. The Bottrop sewage treatment plant serves a population of 1.34 million and currently self-generates 70–80% of its energy requirement. Through the project 'Vom Klärwerk zum Kraftwerk' ('From sewage treatment to power generation'), the plant's operators are aiming to self-generate 100% of the plant's total demand on-site (32 million kilowatt-hours of electrical energy per year). This will be met through individual, decentralised renewable energy systems. To date, the Bottrop sewage treatment plant generates 70–80% of its energy demand from a sewage gas CHP unit and a sludge incineration system. To increase this rate to 100%, the plant will install:

- A wind turbine (3.1 megawatts of power)
- Four new CHP modules (each with a capacity of around 1.2 megawatts)
- A solar photovoltaic system on a roof surface
- A hydrodynamic screw as part of the sewage treatment plant (around 80 kilowatts of power)
- A new steam turbine as part of the existing sludge incineration
- A thermo-sludge drying facility, which uses the sun's energy to extract the water from the excessively liquid sewage sludge so that it can be burned more easily, making the use of coal for sludge conditioning unnecessary.

In total, the plant will reduce its carbon emissions by 70,000 tonnes per year, serving as a blueprint for other sewage treatment plants across the country and internationally.

CASE: Testing smart water tech Down Under

The New South Wales Smart Sensing Network (NSSN) was established in 2016 with funding from the NSW State Government to position the state as a leader in sensing technology. As part of the initiative, a $3 million project, funded by Sydney Water, along with other water utilities: Hunter Water, SA Water, Melbourne Water, Intelligent Water Networks (Victoria), Queensland Urban Utilities, and the NSW state government, was launched in 2019 to solve the global challenge of water leakage and supply disruption. One of the initiatives of the project is an acoustic sensing pilot in Sydney. NSSN, Sydney Water, SA Water, and UTS are collaborating on an acoustic sensing pilot in Sydney that aims to proactively reduce leaks and breaks in the water network using cutting-edge acoustic technology. As part of the project, SA Water has deployed its state-of-the-art acoustic sensors within Sydney Water's CBD water main network. Since their installation in 2017, SA Water's acoustic sensors have helped detect around half of all water main leaks and breaks in Adelaide's CBD, enabling them to be proactively repaired. This minimizes the interruption to customers and commuters while reducing operational costs. In Sydney, these sensors monitor a total of 13 kilometres of pipes across the CBD with the aim of predicting leaks and being able to do preventative maintenance: important as in Sydney's current drought the dry soil is exacerbating water main breaks. In return for contributing to leak detection in Sydney, SA Water will be able to increase the range of data it has to baseline acoustic patterns against and further fine-tune their algorithms used to monitor leakage in Adelaide's CBD network. Overall, Sydney Water estimates that in three years, this new technology will help reduce major breaks by 50% in the CBD.



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CASE: Singapore Blue-Greening its Grey Infrastructure

Singapore's Public Utilities Board (PUB) is integrating Blue-Green Infrastructure (BGI) features into existing grey infrastructure to not only manage extreme weather but also bring people closer to water. With climate change projected to increase the intensity of rainfall events and overwhelm the city's drainage system leading to flash floods, PUB's Active, Beautiful, Clean (ABC) Waters program is implementing a range of BGI initiatives across the city-state to help slow down run-off and prevent localised flooding. In addition to creating new BGI features, the ABC Waters programme is also integrating BGI into existing grey infrastructure. Further to enhancing resilience to extreme weather events, the ABC Waters programme aims to open up water bodies for community and recreational use, provide more engaging and experiential ways for the public to learn about water, and encourage the public to become guardians of Singapore's water resources. In 2009, a heavy downpour caused a diversion canal from the main Bukit Timah canal to burst its banks, with floodwater partially submerging the ground floor of buildings and cars. To prevent further localised flooding, PUB has, over the past two years, undertaken improvement work on the 3.2 kilometres-long Bukit Timah First Diversion Canal. This work has also included a $3.9 million ABC Waters project. The ABC Waters project is along an 800 metre-long stretch of the canal with BGI features including three rain gardens, designed to improve the quality of the water flowing into the canal, as well as new shelters, benches, fitness equipment, a wetland, and paths for jogging and cycling. Rock walls and creeper plants will also line the canal banks.

Conclusion

The post-COVID-19 reconstruction phase should be centred around the green economy, the concept of which enables economic growth and investment while increasing environmental quality and social inclusiveness. Specifically, the main objectives of the green economy include improving resource-use efficiency, ensuring ecosystem resilience, and enhancing social equity. A key aspect of the green economy is that it achieves water security for all users and uses, both human and natural. Overall, ensuring water security can be realised by:

1. Capturing and reusing stormwater for non-potable uses
2. Providing financial incentives to install water-efficient equipment that conserves both water and energy
3. Retrofitting wastewater treatment plants so they become mini-power stations essentially
4. Collaborating with like-minded partners to test cutting edge technologies that detect leakage in the water distribution system
5. Mitigating flood risks using natural solutions that simultaneously provide health and well-being and community benefits

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Robert is the author of Urban Water Security, The Green Economy and the Water-Energy-Food Nexus, Blue and Green Cities: The Role of Blue-Green Infrastructure in Managing Urban Water Resources, Natural Resource Management and the Circular Economy, Climate Resilient Water Resources Management, Developing the Circular Water Economy, and Nature-Based Solutions to 21st Century Challenges. He is the editor of the Climate Resilient Societies book series with Palgrave Macmillan. Robert is a contributing author for the World Bank's Water Blog, Asian Development Bank's Blog, United Nations Industrial Development Organization's Making It Magazine, and Green Growth Knowledge Platform. He has published widely on water security, water resources management, and related issues, and has conducted field research around the world, including Antarctica. He is Founder of Our Future Water, Mitidaption, and Mark and Focus.

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