



## Urban Agenda Platform

*The global platform for sharing progress, action and knowledge on the implementation of the New Urban Agenda to achieve sustainable urban development.*

# Water WISE Buildings and Industries

Region	Asia and the Pacific
Award Scheme	Dubai International Award
Themes	Water & Sanitation
Sustainable Development Goals	Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable

## Summary

Water Smart Buildings and Industries is a technology-driven project developed by ECOSOFTT to drastically reduce freshwater consumption in commercial buildings, factories, homes and townships. It emphasises the integrated management and maximising the use of all water sources available, including rainwater, piped water, surface water and wastewater.

## Background and Objective

Water WISE Buildings and Industries is a set of solutions which enable water sustainability through total management of the water cycle for townships, homes, commercial buildings and industries. With the solution, buildings and industries can use every drop of water more than once, taking in less piped water and reducing wastewater discharge into the sewer network. As an example, recycling 50% of wastewater increases the supply of water by 100%. To quote the PUB, Singapore's National Water Agency: "Reuse is not unnatural - it's what nature does. Reuse is copying nature and using technology to make it happen faster." This approach greatly multiplies the water resources available for domestic and productive economic uses. With this solution, buildings and industries can become totally water-secure and reduce their water cost. The technology solution set includes Water Source Protection, Drinking Water Treatment, Water Conservation, Wastewater Recycling, Internet of Things, SMART Controls and Data Analytics which can be implemented in a modular manner that eliminates dependence on municipal systems. Whether in urban, rural or peri-urban settings, the platform has proven to be a viable and economic model by the following: • Recycle all wastewater streams present in buildings and industries using low energy and high water recovery technologies; • Embrace rainwater harvesting, a low-cost source of water from the natural water cycle; • Better optimise water from different sources and use non-potable water for non-potable purposes; • Deploy Smart Controls to monitor and manage water usage that can be integrated with Building Management Systems; • Engage users and sharing responsibilities in managing water from the source to source, at the source. As a result, Water WISE Buildings and Industries dramatically improve water security, improves the quality of life and alleviate the constraints to economic development, all critical in a water-scarce world.

## Actions and Implementation

In modern cities, water needs are mostly met by municipal potable water sources, used once mostly for non-potable applications (such as in toilet flushing, washing, and cooling towers) and discharged into the sewer systems where they exist. It should be noted that potable water has high embedded energy and high carbon consumption, especially in regions such as the Gulf where it is largely obtained through desalination. Using potable water for non-potable purposes means that we are incurring significant embedded financial and environmental costs, even if these costs are not fully reflected in water tariffs. Outside metropolitan city centres, access to clean water is often a challenge. The resulting wastewater is mostly discharged into open areas untreated or semi-treated. This causes pollution and wastage of a valuable resource – wastewater which can be reused. Instead of using potable water for non-potable needs, a switch towards using fit for purpose water for the majority of our water consumption can reap significant savings in terms of these "hidden" carbon footprints of water. Water recycled and kept within buildings and estates can be used efficiently for cooling, landscaping and urban farming. This will greatly reduce the heat effect in buildings and the energy to cool buildings. For example, a green roof or rooftop farm can reduce building temperature by 2 to 4 degrees Celsius and may offset up to 10% of food-related carbon emissions. Water WISE Buildings and Industries at appropriate scales lessen the load on the water networks where they exist. They can operate without the existence of a centralised municipal system with a water grid. This drastically reduces the wastages commonly seen in the conventional "once through, use and throw" water system. As a result, such an approach has the potential to be adopted on a massive level to bring reliable services to masses in water-scarce countries, conserve water resources and maintain an ecological balance.

## Outcomes and Impacts



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Water WISE Buildings and Industries are not dependent on any single technology. Instead, they offer a platform where technology innovators can collaborate to create integrated solutions. Nevertheless, the treatment technologies to be deployed need to meet a set of criteria to maximize user benefits and environmental impact. The positive impact on construction includes the following: 1. The small footprint of the system minimizes real estate costs 2. The blending of Green (landscape) and Blue (water) features into the building environment adds value to the property 3. Lower infrastructure costs to build water network/grid, which represents 70% of the cost of the water system which has to be paid upfront, This minimises financing and land access constraints 4. Low energy consumption and operating costs 5. Low use of chemicals through the stable biological process for safer handling 6. Facilitates closing of water, energy, material and nutrient resource loops at the local level 7. No odour, creating a pleasant environment 8. Reliable performance for ease of operations and maintenance, including It should be emphasized that the technologies selected are not static, but constantly evolving to incorporate viable and new technologies to meet changing user needs. As such, Water WISE Buildings and Industries can be seen as an “open-source” platform. The projects have proven building-level water management to be Technically Feasible, Socially Acceptable and Financially Viable. Depending on the water sources, tariffs structure and local costs, recycling may be viable at different scales. In many cases, managing recycling at an estate level could provide more flexibility in storage options and excess water from one building can be sent for use in another building that consumes more water. In such a framework, the end-users become active partners and collaborators with service providers and utilities in the management of water from the source to source, at the source.

## Sustainability and Scalability

Despite heavy investments, large “centralised” municipal water infrastructure solutions, where they exist are unable to cope with increasing demand. Over 5 billion people in the world still do not have access to adequate water supply and wastewater networks. Municipal water infrastructure has proven to be difficult to implement. Rapid and widespread urbanization makes it difficult to connect users. In some cases, it is not even technically and financially viable. Most municipals in developing countries cannot afford expensive, complex infrastructure investments. A World Bank report found that a whopping 89% of Low-Income countries have water tariffs that cannot cover even basic operations and maintenance (O&M) costs. The “decentralised” and “integrated” management of water and wastewater on the other hand has the following advantages: ? It eliminates the high capital and operating expenditure. ? It multiplies water resources through recycling, which is critical in water-scarce regions. ? It can be deployed by itself or in conjunction with existing centralised water or wastewater systems to enhance a community’s water resilience and security. ? It encourages active participation from consumers and empowers users to manage various water sources including recycled water to meet their water needs sustainably. Depending on the water needs and financial situation, users can choose to implement the parts of the paradigm that they most urgently require. The use of materials can be customised to maximise local purchases. Construction or installation can also be performed by local manpower. It is thus a viable and attractive alternative to provide adequate services to billions of people living in the least developed countries.

## Gender and Social Inclusivity

Climate change increases the challenge of water management. The frequency and severity of flooding and droughts will increase, exacerbating already significant water challenges. Water WISE Buildings and Industries increase climate resilience through an integrated water system to: ? diversify supply to increase security, ? reduce the impact of floods, ? safeguard scarce water resources and maximise availability, ? reduce the carbon footprint of water. The key aspects include the following: ? Capture every drop of rain on roofs and ground surfaces. ? Reuse water endlessly. Reuse is drought resistant by increasing water availability. At the same time, turning used water into clean water requires less energy than turning seawater into drinking water. This reduces the carbon footprint of water drastically. ? Combine the need for stormwater drainage with open space for recreation and wildlife habitat through rain gardens and man-made lakes. Other than preventing floods, this method mimics natural hydrological processes and brings the attractiveness of water to building users. Does this create Active Beautiful Clean (ABC) Waters? With abundant water available, it is possible to create greenery either on the ground or in the sky through high-rise gardens. This adds space for recreation and gathering. A layer of plants on a roof or wall can reduce the amount of heat that penetrates a building by 70%. This reduces the need for air-conditioning, which is one of the largest users of electricity in tropical regions and the Gulf. ? Excess water can also be used for farming whether in urban, peri-urban or rural areas. This mitigates the potential disruption of food supply due to climate change. Water WISE Buildings and Industries projects thus create communities of gardens and waters. Beyond monetary value, communities can now get much closer to water, appreciate its beauty and learn to treasure it more.

## Innovative Initiative

In human settlements, freshwater, materials and resources are almost entirely used once, contaminated and discarded. In some advanced cities, the resulting used water and materials are sent to centralised wastewater and incineration plants. However, many developing areas have either overloaded municipal water and waste infrastructure or have no municipal infrastructure altogether. In such cases, untreated used water and material are often discharged into open areas, polluting land and water sources. In either case, there is much room to reduce cost and improve sustainability by closing the resource loops at the point of use. A low cost, modular and replicable approach to close the water, carbon and nutrient loops is critical. Water WISE Buildings and Industries can be enhanced with additional modules to produce clean energy, recycle discarded materials and recover nutrients for food



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production. Does the platform encompass the following: Recover and reuse used water (up to 95% of freshwater intake) for indoor farming, toilet flushing, cooling and other non-potable applications? Convert biodegradable and non-biodegradable solid waste to generate energy, especially for cooling and heating. This is done through the form of a small scale Waste to Energy Plant on-site that meets environmental discharge (air emission) standards? Extract nutrients from used water and waste to grow food that enhances food security. This is done through Biological reactors such as the Aerobic Biofilter without Sludge, another innovation by ECOSOFTT? Integrate solar and other renewable energy to power the infrastructure The vision of the future of Buildings and Industries is one that is able to maintain a reliable water supply and a highly reduced level of waste at the lowest cost and environmental impact. The aim is Net Zero Water, Net Zero Carbon and Zero Waste through technology innovation and user involvement.

## Resources devoted to delivery

The issue with water equity or justice is “How do we make sure that all people have safe, affordable access to water? Water is shared by different users – rich and poor - within a catchment. It can be contaminated from a variety of sources, including industrial discharges, domestic wastewater, and polluted farm runoff. Attempts to get more than one’s fair share of this shared resource or avoid common costs will result in winners and losers. The burden of being the loser can impact negatively on people’s livelihoods and on ecosystem health, which can result in discontent, and potentially conflict. Often the losers are marginalised communities, disempowered individuals or groups, and the natural environment. Water WISE Buildings and Industries brings about greater water security for all users and stakeholders. This applies to those living in wealthier areas with the ability to pay for water, and those in poorer areas with less ability to pay. In the case of industries and wealthy urban communities, we improve water security and reduce the cost of water. In an example of a housing estate in North India with 5,000 residents, we implemented a system to enable 500,000 litres of sewage to be. This reduces the cost of water by 90%, prevents over-extraction of the catchment and eliminates pollution to nearby areas. Our social enterprise model channels capital and technology to serve poor communities to attain security and justice goals. We help such communities gain access to 24x7 clean water, and sanitation facilities and replenish water sources. With replication, the end result is harmonious co-existence and fairness.

## Conclusion

Water WISE Buildings lead to “Liveable Density”, which focuses on creating a high quality of life in urban settings. Water and wastewater treatment infrastructure need not be dull structures or ugly machines. We have integrated water management features into the built environment including: attractive rain gardens that prevent floods? water fountains using recycled water? wastewater biological reactors that become visitor attractions Innovative design can reduce that feeling of density by creating the illusion of space using green, blue (water) and eco-friendly elements. Liveable Density means that we prioritise these facilities for occupant and community recreation. At the same time, employing Water WISE solutions in rural areas at a significant scale contribute to lower urban density. In many developing countries, rural populations migrate to cities to seek better livelihoods. Many thus live in unorganised slums or unauthorised settlements with poor water and sanitary conditions. Inevitably, they lead to the overloading of urban infrastructure including water systems and increase the difficulty of infrastructure development. Providing access to water in conjunction with sanitation, health, education and livelihood opportunities in rural areas would lead to better lives for villagers. It would reduce the need for villagers to migrate to urban areas and reduce urban density.