Floating Islands

Modular plant platforms made from 100% recycled and recyclable materials clean the water in rivers, lakes, ponds and canals.

A Biomatrix floating island in Killingworth Lake, U.K. (Photo courtesy of Biomatrix Water)

The Impact

Artificial floating islands, also referred to as floating ecosystems or floating treatment wetlands (FTWs), are artificial plant platforms that clean water at the ecosystem level, removing as much as 98% of excess nutrients and harmful toxins by harnessing natural biological processes that keep water abundant and healthy. They have applications in habitat creation, urban waterscaping, water quality management, and wastewater treatment. Recently, they were adopted by the U.S. Environmental Protection Agency to reduce the negative effects of harmful algal blooms across the nation. They are made from 100% recycled and recyclable materials.

Description

Most water bodies are currently facing excessive nutrient loads due to both man-made and natural runoff from the land. This excessive richness of nutrients in water is known as eutrophication and leads to algal blooms (i.e., cyanobacteria) and low-oxygen (hypoxic) waters that can reduce water clarity and quality, taint drinking water supplies, degrade recreational opportunities, and create dead zones where no organisms are able to survive. Floating islands were developed as a cost-effective solution to eutrophication.

Rather than using chemical additives to remove potential toxins from the water, floating islands clean water by mimicking natural biological processes. Above the surface, the plants on the islands offer vital habitats for birds and pollinators and improve air quality. Below the water, there exists a

micro-wilderness of submerged roots where fish can thrive and communities of microorganisms break down harmful substances, effectively filtering pollution from the water like an artificial wetland does. Not only do floating islands help the ecosystem by engaging in both plant-based and microbe-based nutrient uptake, but they also nourish the ecosystem by producing food for fish and aquatic insects.

These islands have a variety of applications and benefits, including but not limited to water quality management, wastewater treatment, water restoration, fish/bird habitat creation, stormwater management, urban waterscaping, and shoreline protection. The applications and impacts of floating island technology have expanded in recent years as new forms of the technology, such as floating solar panels and floating farms, have been developed. The main benefits of floating islands include improving water quality, increasing plant biodiversity, increasing public amenities and recreational opportunities, providing a sheltered refuge for birds, improving fish stocks and promoting sustainability through the production of clean, renewable energy with floating solar panels.

Floating islands are also extremely versatile. The technology is immune to fluctuating water levels since the islands rise and fall with water level, allowing them to be applied to almost any water body. Additionally, floating islands are available in a variety of shapes, sizes and structures and can be planted with a myriad of plants, allowing for endless combinations and possibilities. Most companies that produce them offer a range of products, from mini islands for small ponds to large-scale floating islands built to suit whatever the need, as well as specialized products to treat wastewater or stormwater runoff.

Where It's Been Implemented

Floating islands have been successfully implemented worldwide by various local governments, businesses, individuals, communities and environmental and conservation groups. According to Floating Island International, a company that specializes in this technology, approximately 10,000 island systems have been launched worldwide.

Rochdale Canal, Manchester, England. In 2020, a series of floating island projects along the Rochdale Canal in Manchester, England, constructed by Biomatrix Water in collaboration with the Canal and River Trust, won a Green Flag award, an international accreditation for well-managed and accessible green spaces.

MetraPark, Billings, Mont. A BioHaven Floating Island installed in the City of Billings' MetraPark stormwater pond has effectively removed metals, nutrients and other contaminants, with removal percentages from 63% to 98%. The floating island's effectiveness substantially improved after its vegetation had matured for two growing seasons.

Faisalabad, Pakistan. Researchers installed full-scale floating treatment wetlands (FTWs) in stabilization ponds receiving sewage and industrial wastewater and evaluated their treatment performance over three years. The FTWs substantially improved all recorded water quality indicators and reduced heavy metal concentrations. The maximum removal capacities of the system were 79% of chemical oxygen demand, 88% of biochemical oxygen demand and 65% of total dissolved solids. During the second and third years of operation, about 60 million cubic meters per year of wastewater were treated at a cost of $0.26 per 1,000 cubic meters.

Bridgewater Basin, Manchester, England. Bridgewater Basin is a disused branch of the Rochdale Canal in the heart of central Manchester. It was devoid of healthy aquatic life and completely surrounded by vertical hard stone and concrete edging. The frequent fluctuations of water levels and the concrete edges limited the basin's water quality, aesthetics and natural waterscape appeal. To address these issues, Biomatrix Water worked with the Manchester City Council's green infrastructure

team and BDP Landscape Architects to install a series of floating waterscape gardens over two years that greatly increased the quality and functionality of the basin and provided a place for native plant species to re-establish themselves.

Oakland, Calif. Evidence of rising sea levels in San Francisco Bay has raised concerns over habitat loss for endangered species such as the California Clapper Rail, whose habitats are extremely vulnerable to rapid variations in water levels. FTWs were identified as a way to provide critical upland roost habitat for these birds during fluctuating tides and sea levels. Ten FTWs deployed in September 2010 were found to be extremely effective. The U.S. Geological Survey team reported that Clapper Rails at Arrowhead Marsh quickly adapted to the presence of FTWs, with all 10 islands receiving moderate-to-heavy use from a Clapper Rail population of 30 to 40 birds.

Key Drivers

Eutrophication is a growing issue in many water bodies throughout the world. Overgrowth of algae such as blue-green algae (i.e., cyanobacteria) and golden algae (i.e., prymnesium parvum) due to eutrophication results in the release of various toxins that deplete oxygen levels in the water, resulting in the deaths of fish and other oxygen-dependent organisms. It also creates a pungent odor that can disturb the surrounding landscape and community. Floating islands are a proven, cost-effective solution to combating eutrophication in water bodies.

Key Factors for Success

While floating islands can be installed by almost anyone, local governments and environmental/conservation groups most commonly contract with a floating island company to undertake a project. The key to successfully implementing a floating island project is convincing local policymakers, city councils and residents of the safety and efficacy of floating islands.

Key Obstacles

Maintenance could be considered an obstacle to implementation, with one specific concern being invasive species colonizing these floating islands. Additionally, there is also a risk of flooding if they become unmoored and disrupt water flow. However, the amount of maintenance required varies depending on the size and objective of the project. For relatively small and simple projects, very little maintenance is required. It typically involves weeding plants and checking the anchor connectors, cables and ropes and replacing them every once in a while. Another obstacle is the lack of widespread awareness and understanding of floating islands. For example, local officials may have concerns that the islands will create plastic waste even though the plastics used in the islands have protective coating and don't break down into microplastics. Without support and approval from local authorities and residents, floating islands cannot be implemented.

Timeline to Implementation

Depending on the size of the floating island project and the public sentiment surrounding biological remediation, floating island projects could take anywhere from two weeks, to three months, to several years to implement. Most projects can be successfully implemented within a year.

Return on Investment

Each floating island project is unique. Detailed financial calculations are necessary in the planning process. For reference, an average-sized project in Green Lake in Seattle, Wash., cost approximately $35 per square foot, including the floating island sections, underwater media columns, shipping, plants and anchoring system, according to Friends of Green Lake. Total costs vary with the

size and scale of the project, but are typically around $40,000. A detailed project plan and preliminary design are required in order to develop accurate and precise costs and feasibility studies.

References and Resources

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