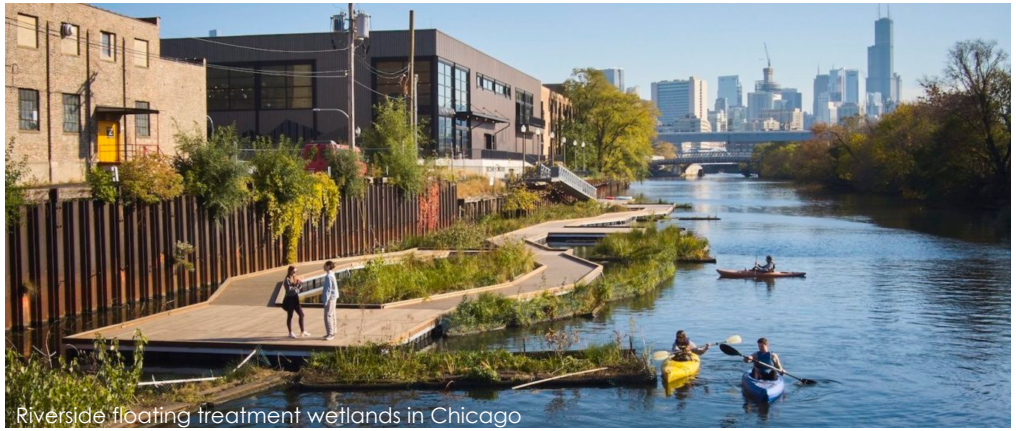
NbS-51: FLOATING TREATMENT WETLANDS (FTW) & PHYTOFILTRATION

Rotorua large-scale Floating Treatment Wetland, New Zealand


Riverside floating treatment wetlands in Chicago

Floating Treatment Wetlands (FTWs) are a versatile NbS that excels in phytofiltration, providing effective water depollution, wastewater treatment, and ecosystem regeneration. These systems feature buoyant platforms that support aquatic plants like reeds and vetiver grass, whose roots extend into the water to perform phytoremediation by absorbing excess nutrients, heavy metals, and organic pollutants.

In addition to their phytofiltration capabilities, FTWs enhance water quality by promoting biofilm activity, which breaks down contaminants, and by physically filtering suspended solids, improving water clarity. Their application is particularly effective in post-mining landscapes, where they treat metal-laden wastewater and stabilize degraded aquatic ecosystems. FTWs also address agricultural runoff, mitigate eutrophication in urban waterways, and support regenerative aquaculture practices.

Beyond water treatment, FTWs contribute to the regeneration of soil and water systems, foster biodiversity, and provide sustainable uses for waste biomass in bioenergy or compost, promoting a circular economy. Their low cost, adaptability to various environments, and potential for community participation make FTWs an attractive solution for restoring ecological balance, enhancing aesthetic value, and supporting livelihoods. This holistic approach underscores their value as a Nature-based Solution for addressing Southeast Asia's environmental and socio-economic challenges.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

PHYTOREMEDIATION & ECOSYSTEM RESTORATION | WATER QUALITY MANAGEMENT | NUTRIENT CYCLING | SEDIMENTATION MANAGEMENT | INTEGRATED WASTEWATER TREATMENT

MAIN PROBLEMS ADDRESSED

SOIL EROSION | BIODIVERSITY LOSS | FLOOD CONTROL | DISASTER RISK REDUCTION | CARBON SEQUESTRATION | FOOD SECURITY

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- **Enhance biodiversity** by creating habitats for aquatic species, birds, and beneficial insects.
- **Support nutrient cycling** through biofilm activity and plant-microbe interactions.

REGULATING

- **Improve water quality** by removing nutrients (nitrogen, phosphorus), heavy metals, and pollutants through phytoremediation.
- **Reduce turbidity and sedimentation** by trapping suspended solids and particulate matter in dense root networks.

PROVISIONING

- **Provide harvested biomass for use in bioenergy**, compost, or sustainable agricultural practices.
- Offer cleaner water for downstream agricultural, aquacultural, and industrial applications.

SOCIAL BENEFITS

- **Enhance landscape aesthetics**, contributing to urban and rural beautification and increased recreational value.
- **Promote community involvement** in water quality management and ecosystem restoration, fostering environmental stewardship.

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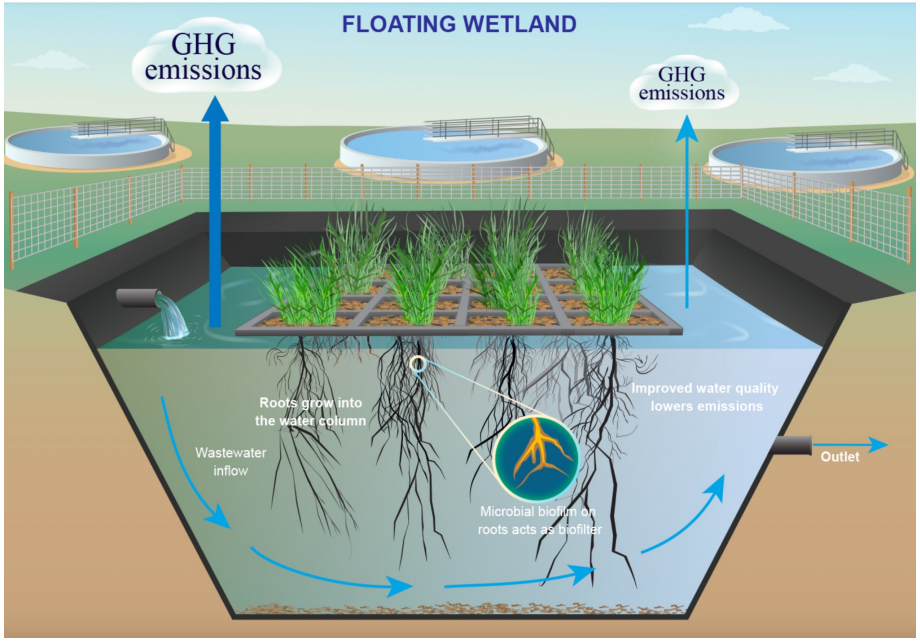
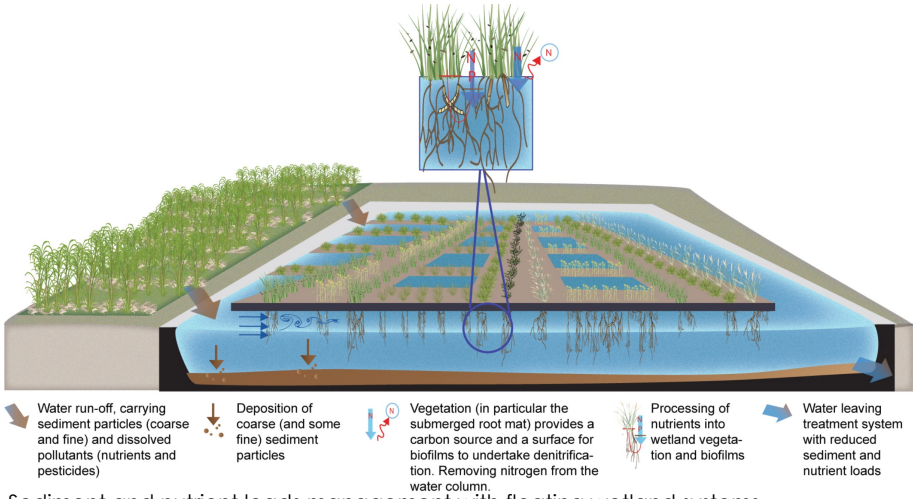


Floating wetland technical section. *Source: Blue Carbon Lab*



Sediment and nutrient loads management with floating wetland systems

PROJECT'S CHALLENGES & RISKS

- **Climate Vulnerability**: Extreme weather events such as typhoons and heavy rains can damage floating platforms and disrupt their functionality.
- **Heavy Metal Accumulation**: Harvested biomass from phytoremediation may contain concentrated toxins, requiring careful disposal or reuse strategies to avoid secondary contamination.
- **Maintenance and Monitoring**: Ensuring long-term performance requires consistent maintenance, monitoring, and community engagement, which may be resource-intensive in some regions.
- **Site Suitability**: Inappropriate site selection, such as areas with strong currents or unstable water levels, can limit the effectiveness and stability of FTWs.

NbS co-BENEFITS AND THEIR INDICATORS

- **Biodiversity Enhancement**
  Increased species richness and abundance of aquatic organisms, birds, and insects in areas with FTWs.
- **Water Quality Improvement**
  Reduction in nutrient concentrations (e.g., nitrogen and phosphorus) and suspended solids in treated water.
- **Climate Resilience**
  Improved water quality and ecosystem stability during extreme weather events like floods and droughts.
- **Waste Recovery & Circular Economy**
  Amount of biomass harvested from FTWs repurposed for compost, bioenergy, or sustainable agriculture.
- **Aesthetic & Recreational Value**
  Increased community use and positive perceptions of water bodies enhanced with FTWs.
- **Community Engagement and Awareness**
  Number of local stakeholders participating in FTW installation, maintenance, or environmental education programs.

COST ANALYSIS

- **Direct Costs**
  Typically ranges from $40 to $100/m2, depending on materials, plant species, and site conditions.
- **Indirect Costs**
  Maintenance and monitoring costs can add $10 to $20/m2/year, including labor, biomass harvesting, and periodic repairs.
- **Time Horizon**
  FTWs could have a lifespan of 10–15 years with a typical discount rate of 5–10%
- **Direct Benefits**
  Water treatment cost savings can be valuable, especially in areas with high nutrient loads.
- **Indirect Benefits**
  Enhanced ecosystem services and biodiversity can lead to economic gains through tourism, fisheries, and improved agricultural productivity.
- **Risk Assessment**
  Possible damage from extreme weather events.

REFERENCES:

FTWs in Bishan-Ang Mo Kio Park, **Singapore**
Pond Restoration in Kunshan, **China**
Large-scale FTWs deployed to mitigate eutrophication, effectively reducing nutrient loads, Lake Rotorua, **New Zealand**

IMPLEMENTATION OPPORTUNITIES:

Citarum River, **Indonesia** (highly polluted river system)
Tonle Sap Lake, **Cambodia**: FTWs can address water quality degradation caused by agricultural runoff.
Mekong Delta, **Vietnam**: FTWs can improve water quality in aquaculture ponds and mitigate pollution from agricultural activities.