Application of floating wetland islands for water and habitat promotion in two contexts: urban river and small fish farm

A.M. Antão-Geraldes[1]*, B. Nogueira[1], A. Teixeira, C.S.C. Calheiros[2]

[1] *Centro de Investigação de Montanha (CIMO). Instituto Politécnico de Bragança. Campus de Santa Apolónia.*

[2]*Interdisciplinary Centre of Marine and Environmental Research (CIIMAR/CIMAR). University of Porto. Portugal*

**geraldes@ipb.pt*

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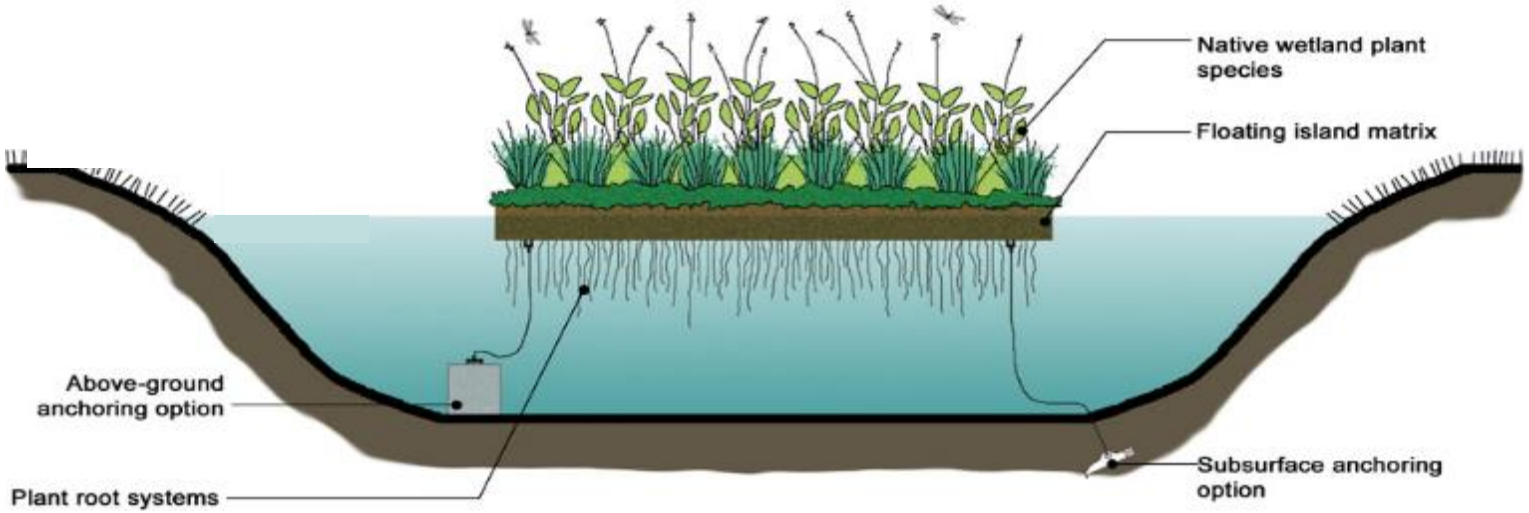
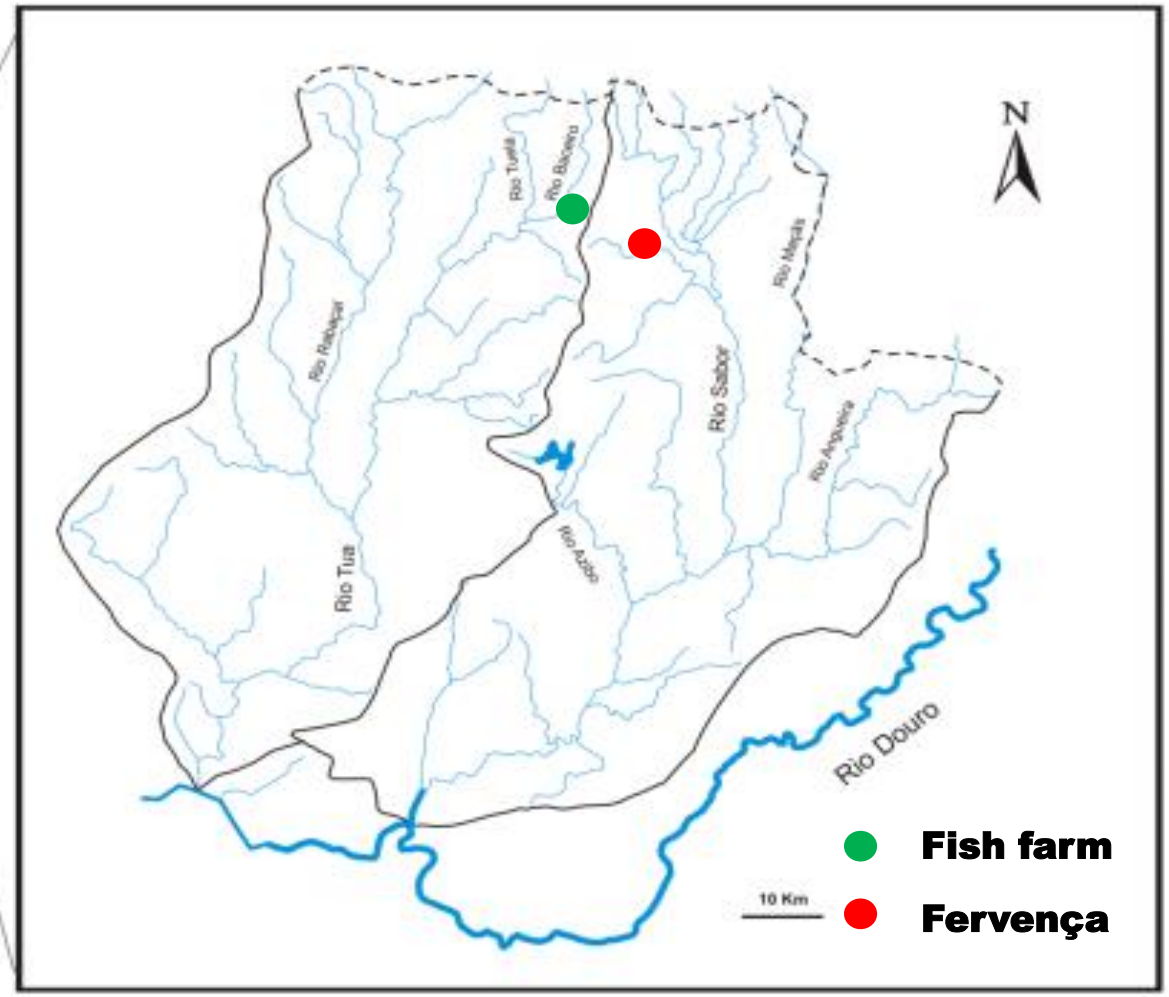
Floating wetland islands are man-made systems.

They intend to mimic the processes that occur in natural wetland systems with the major difference of emergent vegetation being grown in hydroponic mode instead of being supported in a substrate.



Source: https://tcwp.tamu.edu/floating-wetland-islands/

Case studies location

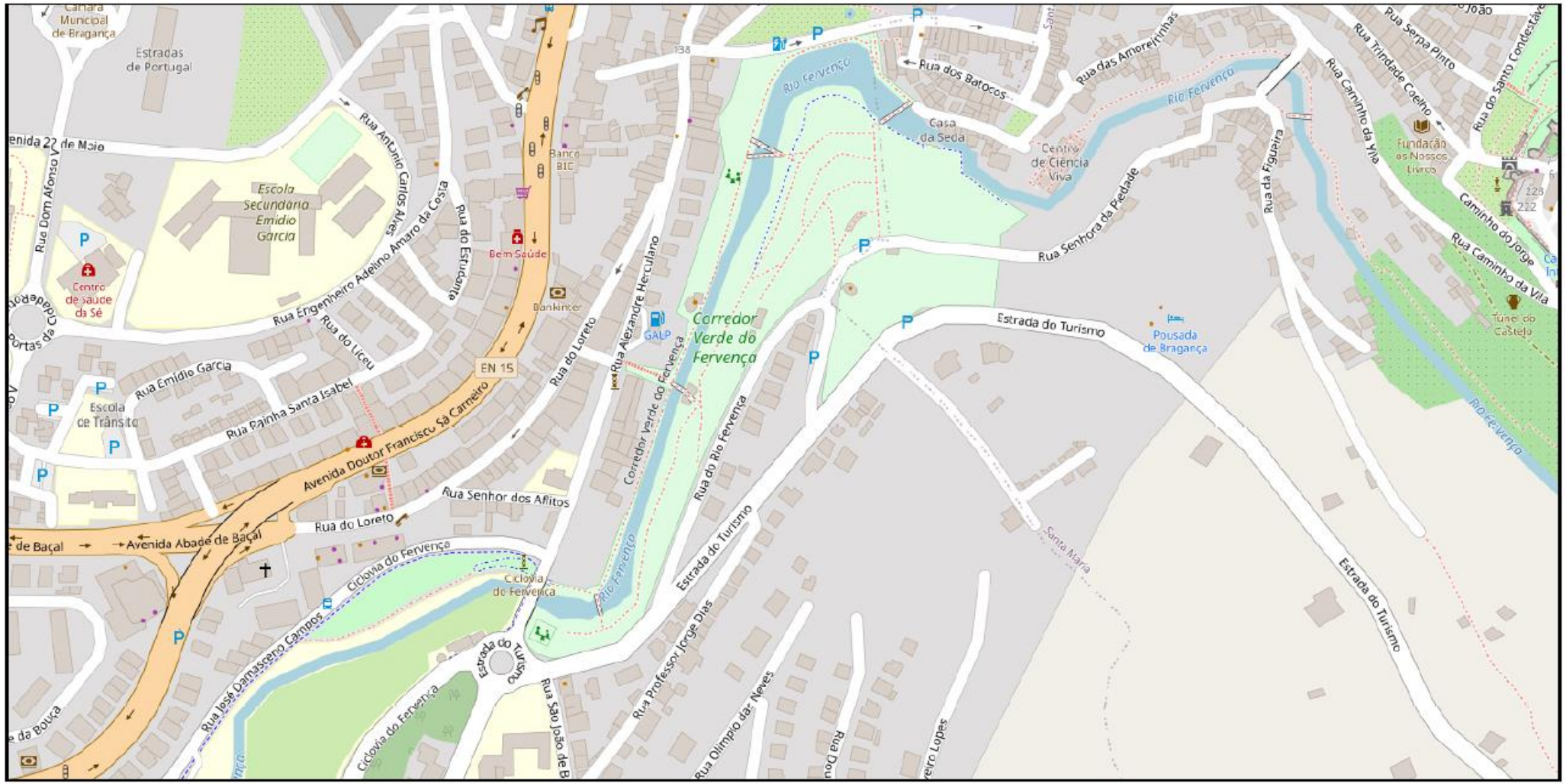


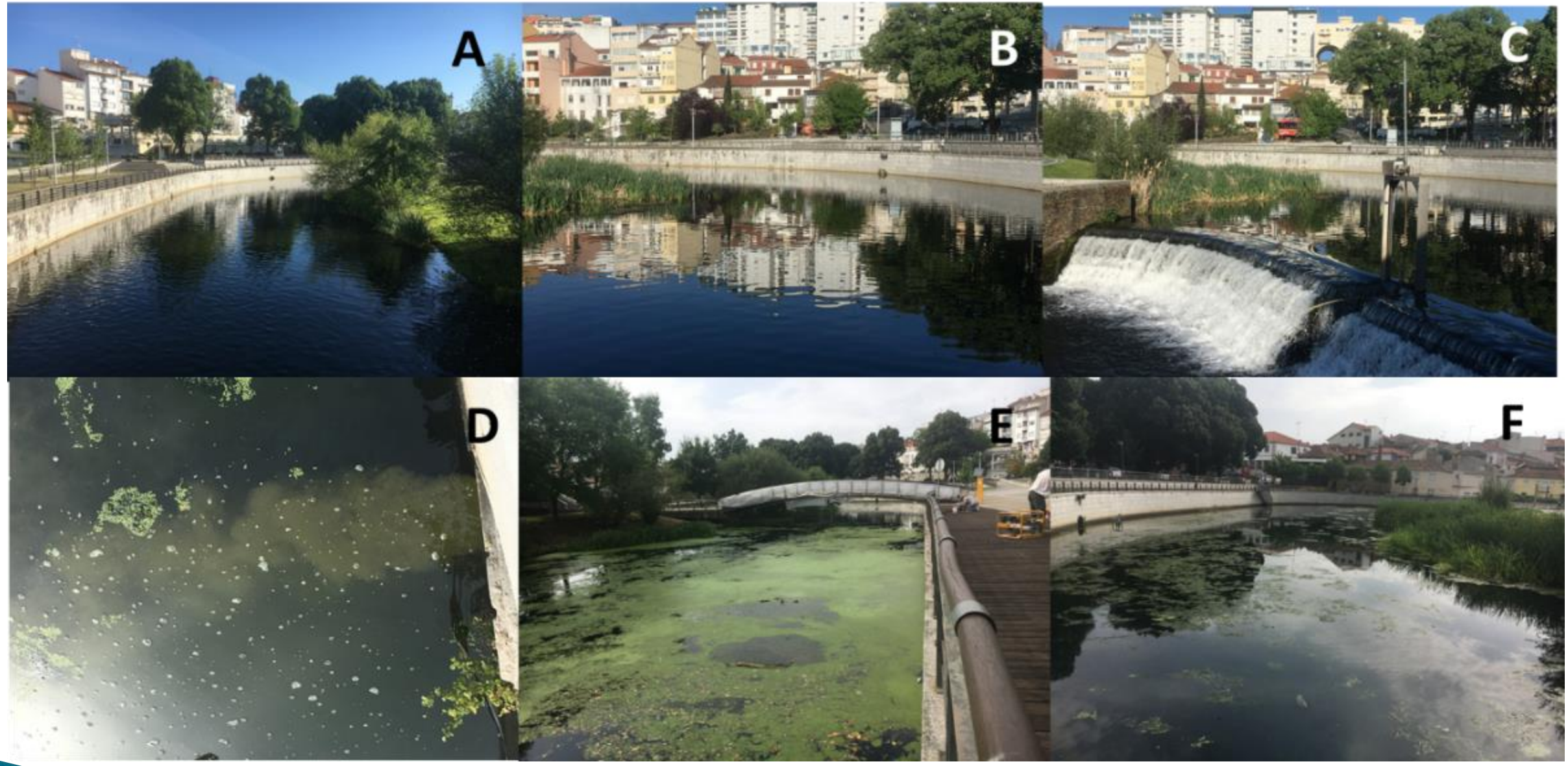
Adapted from Ascenção, 2011

Case 1: Fervença River (Diagnosis of the current environmental state)

- **Upstream urban area: Agriculture (nutrient runoff into Fervença);**
- **Urban area (stream regularisation; destruction of riparian vegetation);**
- **Downstream urban area (inefficient sewage water treatment).**

Case 1: Fervença River (Diagnosis of the current environmental state in the urban section)





Fervença river section located in the core urban area (A-C). Point source of pollution (D); algal summer blooms (E.F).

Case 1: Fervença River (Diagnosis of the current environmental state)

Nevertheless, this river section still supporting :

- ❖ **fish species, including endemic species;**
- ❖ **water birds and amphibians;**
- ❖ **And…. the otter (*Lutra lutra*) occasionally can be found.**

- ❖ **Recreate environments for species habitat;**
- ❖ **Assist pollution and algal blooms reduction;**
- ❖ **Promote recreational and educational activities in the area.**

Case 1: Fervença River (Presentation of a preliminary proposal and FWI installation simulation)

- FWI will be placed nearby the fully artificialized riverbank to increase habitat availability and to prevent the dragging by the high winter river flow;
- Preferential use of local ecotypes of macrophytes;
- The extent of coverage area, in a first approach, should be at least 10% of urban riverbed area;
- Vegetate the vertical concrete wall using vertical fencing structures;
- Periodical and long-term monitoring.

Case 2: Fish farm (Diagnosis of the current environmental state)

Fish farm outlet discharge showed slight increase on:

- ❖ **BOD;**
- ❖ **Ammonia;**
- ❖ **Total phosphorus;**
- ❖ **Chlorophyll *a*;**
- ❖ **Suspended solids.**

- ❖ **Summer water temperature increases fish mortality in outdoor tanks.**

Case 2: Fish farm (FWI installation assay)

February, 2021

June, 2021

Targets:

- ❖ **Create adequate refuge for fish;**
- ❖ **effectively remove the nutrient excess.**

Case 2: Fish farm (Future Research Suggestions)

It should be evaluated:

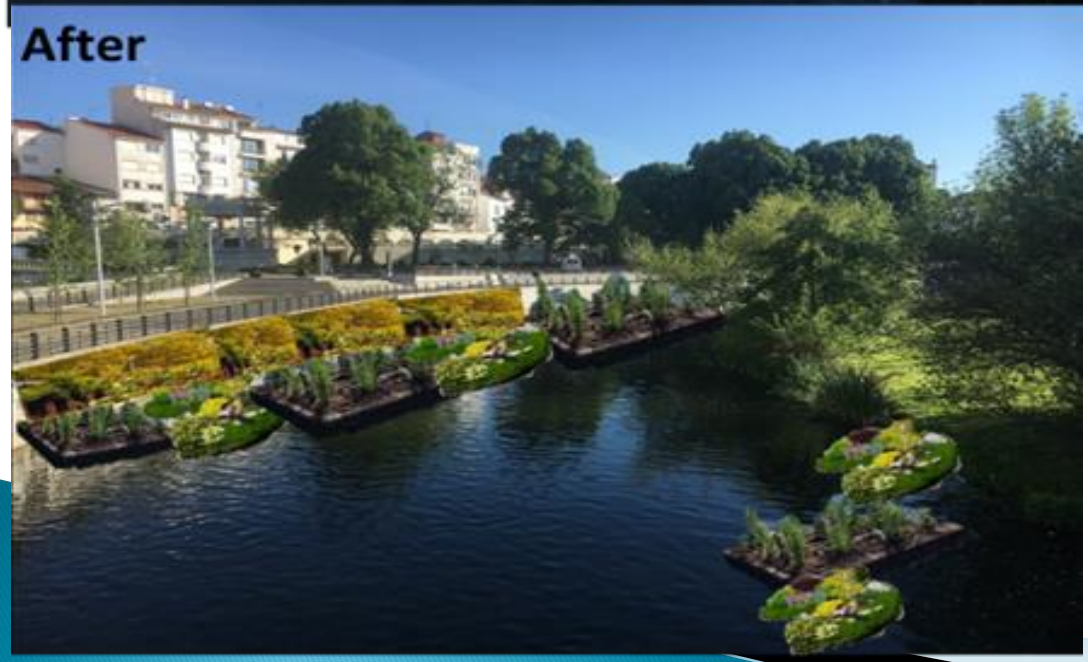
- **The adequate macrophyte coverage area to effectively remove nutrients considering food requirements, fish density and N and P excretion rates;**
- **The adequate macrophyte coverage area to effectively increase fish welfare;**
- **How fish can influence the growth of plant root associated biofilm;**
- **The efficiency of the combination of submerged and /or fluctuating plants with FWI.**

Final Remarks:

FWI are nature-based solutions that:

- **provide an array of ecosystem services;**
- **are characterized by being multifunctional technologies: as both case studies had shown it is possible to use FWI in different scenarios, being extremely flexible assisting to:**
  - **the sustainable water resource management;**
  - **uploading the depuration capacity;**
  - **improving water, habitat and landscape quality;**
  - **promoting biodiversity or, in case of fish farming, fish welfare.**

Nevertheless, the lack of knowledge concerning ecological fundamentals of aquatic ecosystems can limit the use and the efficiency of this technology if previous research and good monitoring design are absent.



Thank you!