

Optimising Multi-Pollutant Phytoremediation Strategies to Sustainably Improve Water Quality

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1. Background

A major challenge to the provision of a safe and sustainable water supply is the **impact of multi-diffuse pollutants (Fig.1)** such as **phosphorus, nitrogen, heavy metals, pesticides and pharmaceuticals**.

Macrophytes (aquatic plants) have a demonstrable ability to sequester pollutants. However, **most studies focus on single plant species ignoring the benefit that a plant community could offer for remediating multi pollutant-impacted waters**.

Macrophytes can also be harvested to recycle or dispose of pollutants (Fig.2). **There is a need to integrate the remediation stage with sustainable pathways for re-use of plant biomass containing pollutants**. Therefore, a clear set of context-specific strategies requires development.

The potential of phytoremediation to enhance ecosystem services has largely been ignored, **therefore greater attention should be paid to this aspect in order to appreciate the multiple benefits that can be provided over and above remediation alone**.

1.2 Project aims

The overarching aim of this project is to optimise a series of strategies that can improve water quality by exploiting the ability of aquatic plants to assimilate waterborne pollutants. This will be achieved by:

- **Identifying aquatic plant combinations** that provide maximum sequestration potential for a range of diffuse pollutants.
- **Developing novel ecological engineering solutions**.
- **Carrying out field-scale experiments** to determine realistic extraction efficiency rates, and model potential for scaling up.
- **Calculating the economic practicality** of scaling up phytoremediation strategies in Scotland in both monetary and non-monetary terms.

3. Future impacts

This project will **develop efficient context specific phytoremediation strategies through plant community-based remediation** in order to protect and enhance Scotland's waters.

It will **optimise novel ecological engineering solutions** to maximise pollutant sequestration & harvest.

Pioneer an **ecosystem-based approach** to valuing phytoremediation strategies.

Contribute to **developing a national blueprint** for aquatic phytoremediation that can be exported to other countries (e.g. China).

2.1 Project literature review (Year 1)



2.2 Project investigation

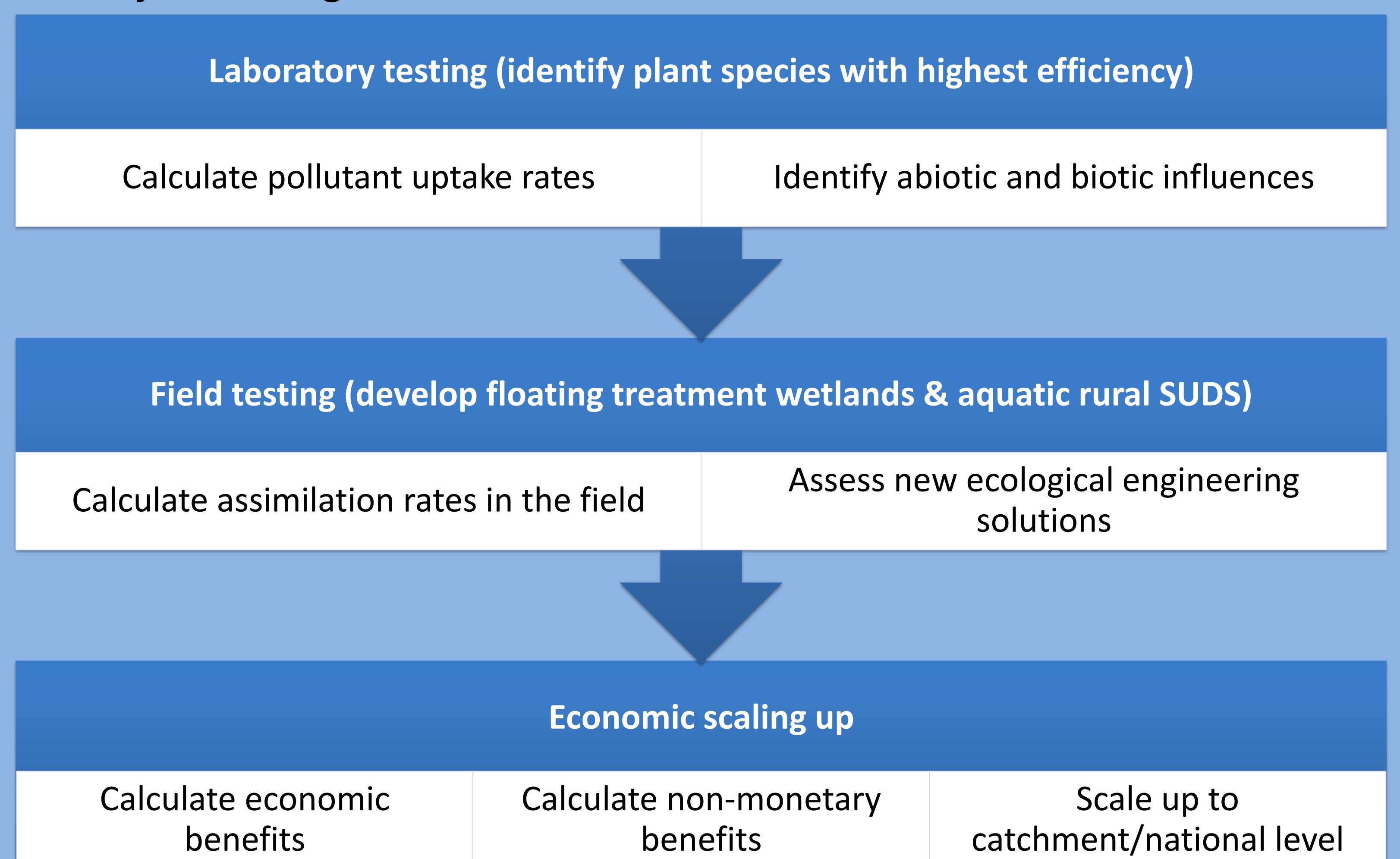


Fig 1. Eutrophic Lake (example target water type for phytoremediation)

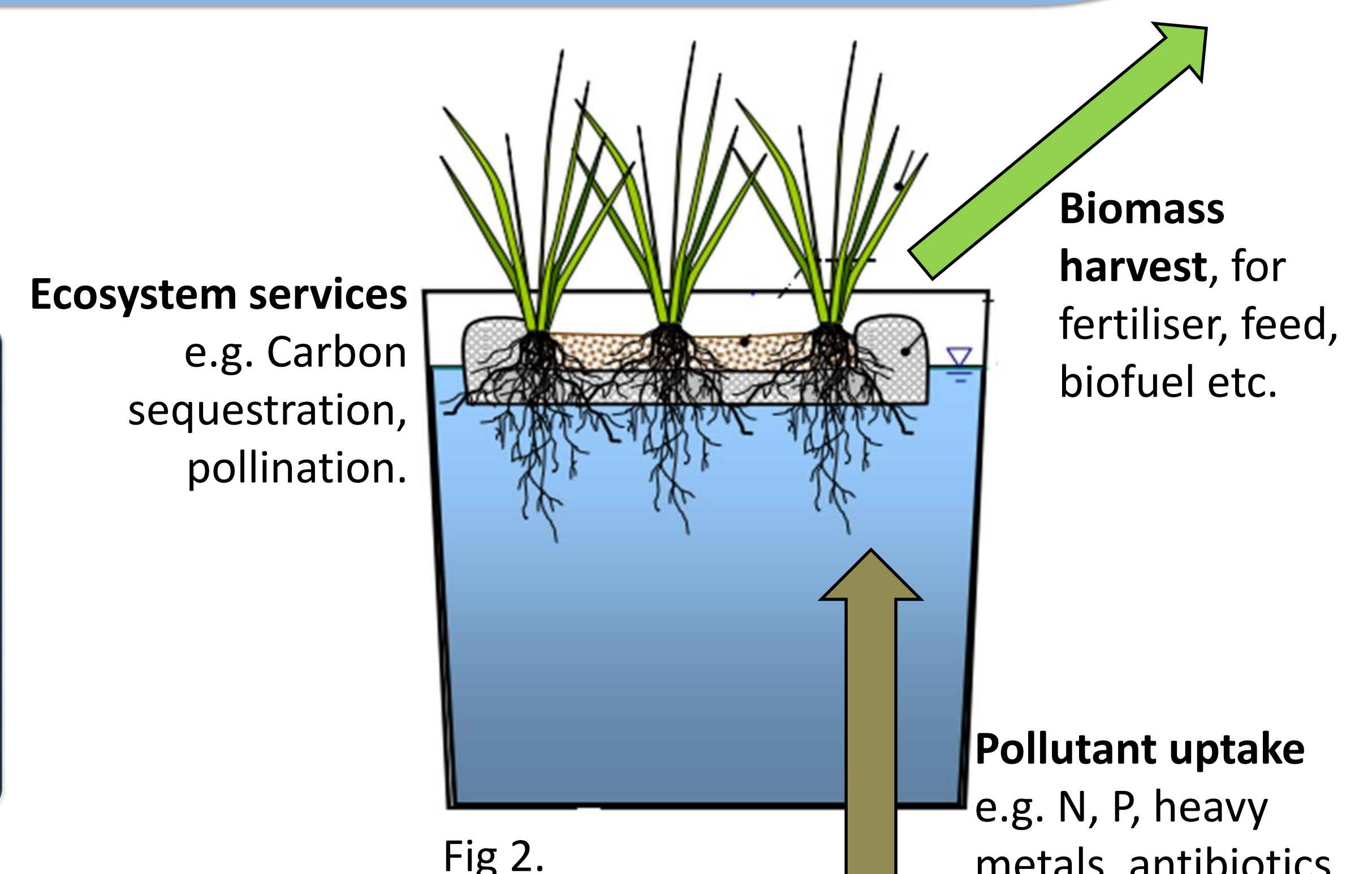


Fig 2. Phytoremediation concept



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