Effect of Environmental Changes on Greenhouse Gases from Water Bodies

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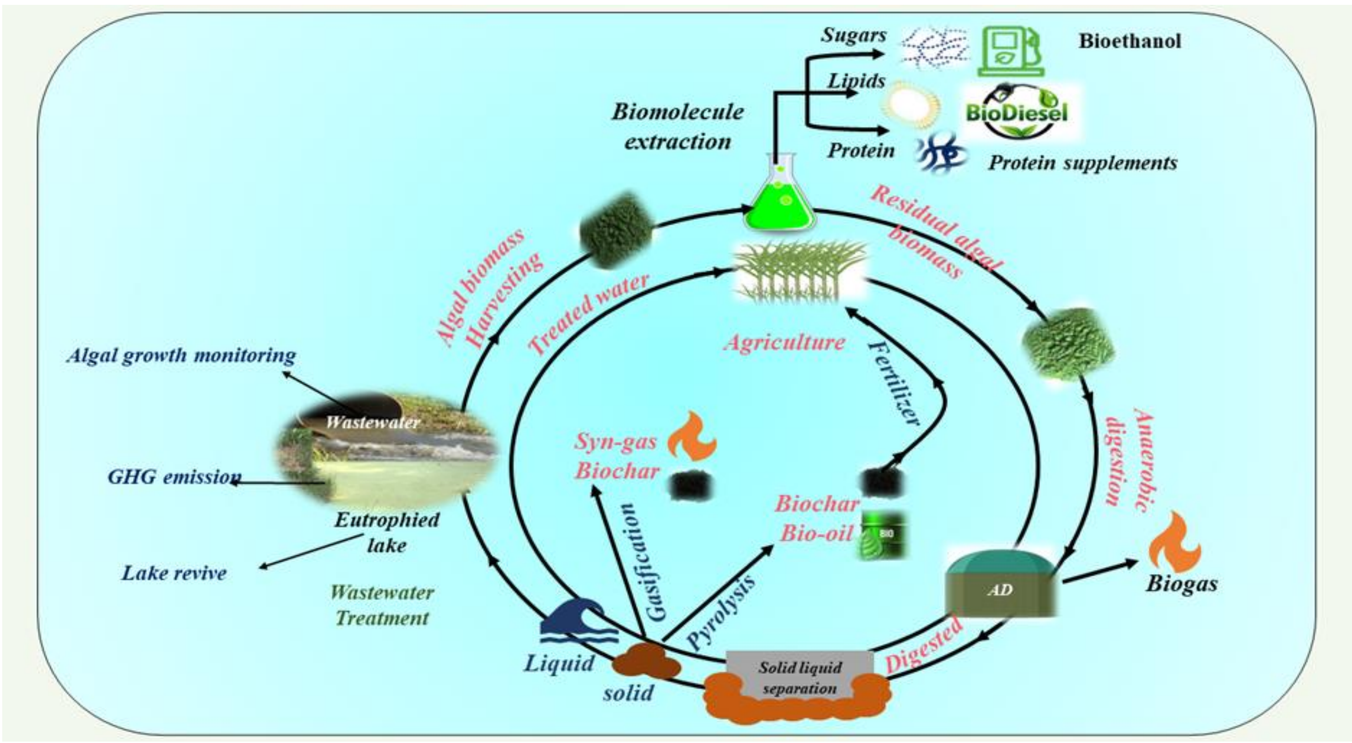
Introduction

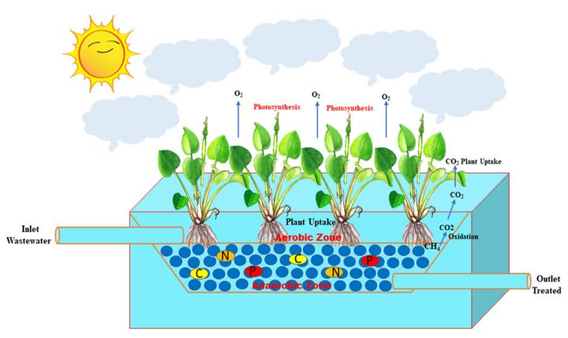
- Eutrophicated lakes are a considerable source of greenhouse gas (GHGs) emissions
- Algae-based treatment and regulation are suggested to combat eutrophication.
- Algae mediated treatment and harvesting as central dogma for circular bioeconomy.
- Anaerobic digestion facilitates energy and nutrient recovery from wastewater

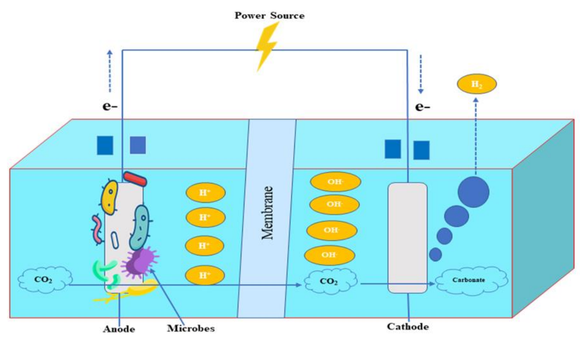


Wastewater treatment technologies: GHGs mitigation perspective

Wastewater treatment technologies: GHGs mitigation perspective:

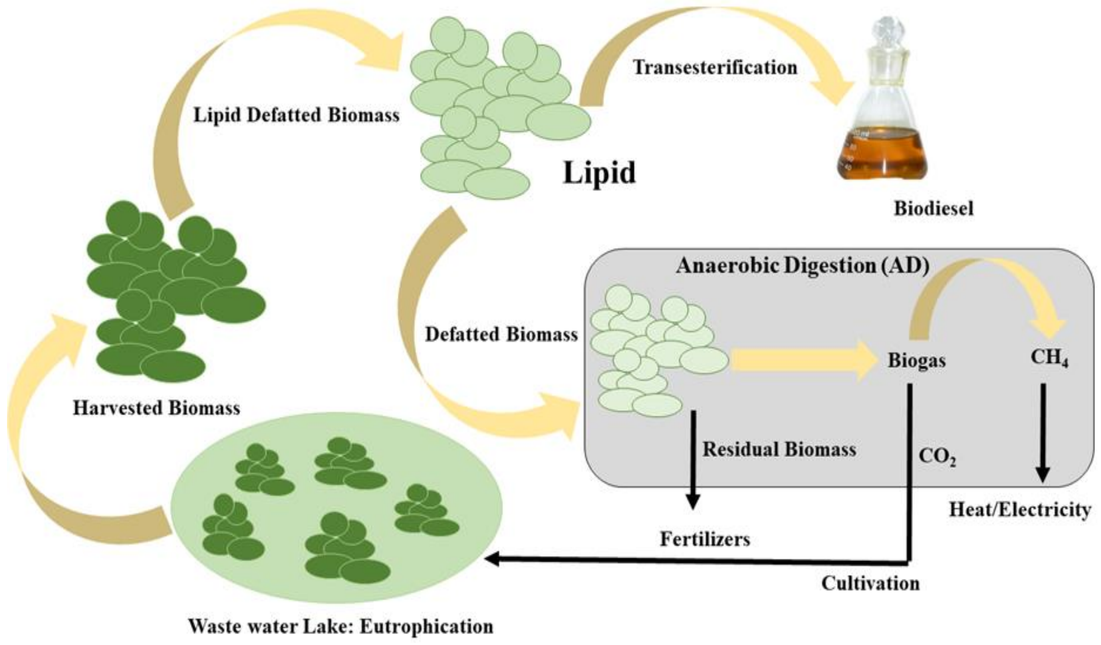
- Constructed wetlands
- Microbial bio-electrochemical systems
- Sewage biochar for carbon sequestration
- Microalgal technology for wastewater treatment



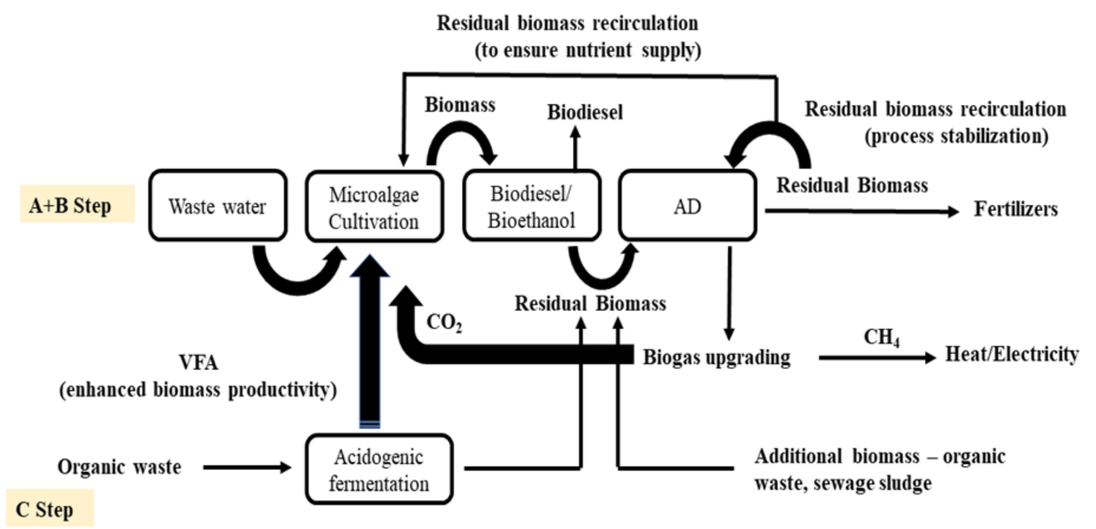


Wastewater treatment technologies for greenhouse gas mitigation (GHGs).

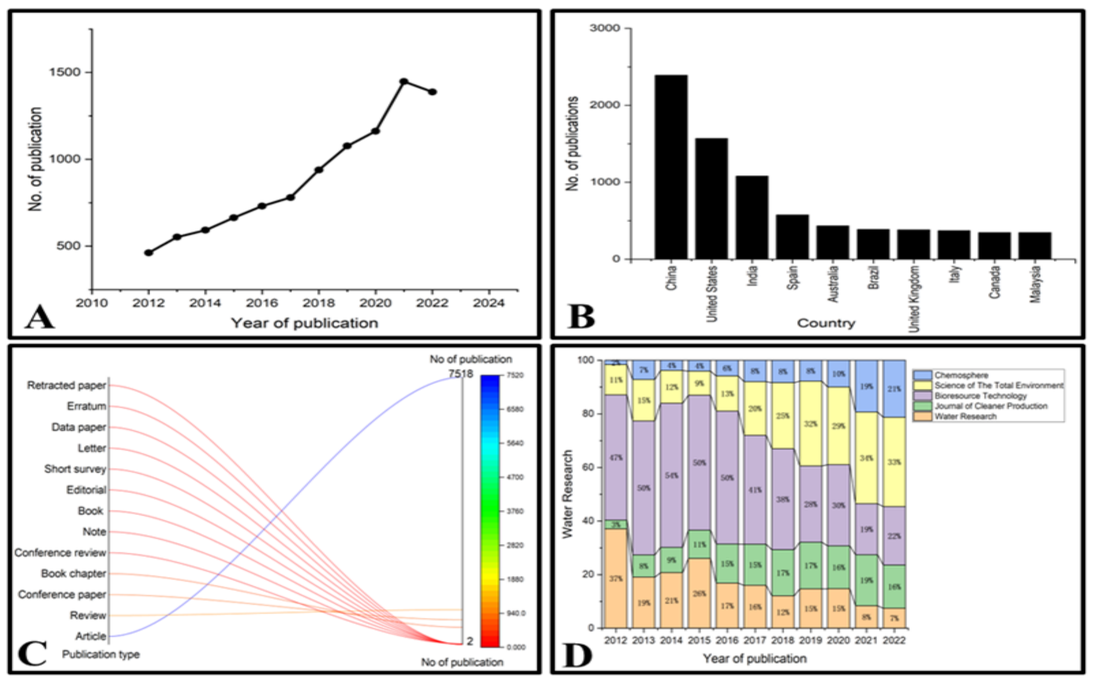
Technology	Purpose	Advantages	Disadvantages
Constructed wetlands (CW)	A system that employs plants to enhance water quality and collect GHGs in an integrated manner.	Economical, Easy to operate and maintain, Environmentally friendly, Incorporate wetlands into landscape for organisms,	Low productivity, Sensitive to toxic chemicals, Large land required, Uneven treatment
Microbial electrosynthesis (MES)	Electricity generation and chemical manufacturing from chemical energy stored in biodegradable materials.	Self-sustaining technology; a low sludge output; and integration with renewable energy systems are some of the advantages of this technology.	Low production rate, Low selectivity
Microbial electrolysis cells (MECs)	Purify waste water by dissolving base minerals, while also capturing and transforming CO_2 and producing H_2.	Sludge generation is minimised because to the following features: Efficient CO_2 collection and utilisation	Uneconomical, Low productivity, Partial nutrient removal efficiency
Microbial carbon capture (MCC)	A system that cleanses wastewater while simultaneously reducing CO_2 emissions and generating electricity	Effectual CO_2 sequester and utilization, Variable product can be obtained Resource recovery	High-cost operating system, Tough to separate biomass, Sensitive to toxic elements
Biochar	Sludge and other biomass are pyrolyzed to produce a carbon-rich product with superior environmental specifications.	Economical, High reusability, Highly stable, Sustainability	Drying, Pre-treatment required
Microalgae cultivation	Use as a treatment for wastewater, a means of capturing greenhouse gases, and an energy source.	Faster growth than plants, effective nutrient removal, efficient reduction of GHG emissions, a source of energy and other useful things	Sensitive to contamination and other variances in the system, Need for a large amount of land; Costly culture system, Biomass collection may be necessary;



Sustainable and economical approach for effective utilization



Meta Analysis



Meta analysis plot number of publications A (year), B (Country), C (Publication type) and D (articles wise)

Conclusions

- Wastewater is a silent source of GHGs emission.
- Eutrophicated lakes release CH_4, while freshwater waters release CO2.
- N_2O emission is not studied widely.
- Algae growth and harvesting if regulated can facilitate nutrient recovery and wastewater treatment.
- Utilization of harvested algal biomass for production of bio-products such as, biofuel, biofertilizer advocates to circular bioeconomy.

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