EU4Algae Factsheet – WG2

Provide a circular economy perspective about the use of waste stream for microalgae cultivation to the industry.

Producing microalgae involves the use of commercial nutrients (N, P and C) which are costly and to a certain extent impacting in terms of environment. The use of existing local nutrient-rich waste streams, such as wastewater and fluegas, can provide an alternative and more sustainable solution. It is hence mandatory to completely change the mindset versus microalgae biomass:

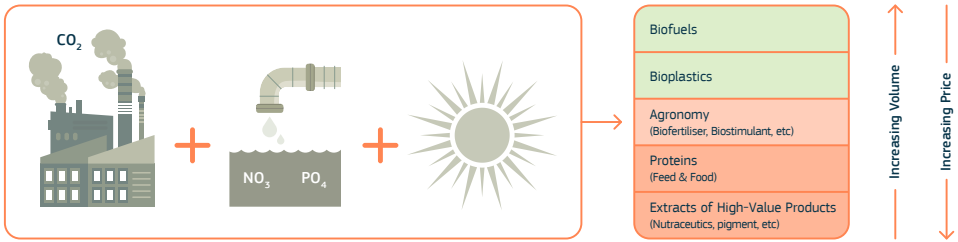
- Bioremediation of waste streams means Million tons and/or m^3 of exhausted flows to upcycle
- Mass markets are mandatory to absorb the so-produced microalgae biomass
- Feed, food and high-value products cannot be easily targeted due to regulations and market unacceptance for such products issued from secondary streams
- The produced biomass itself is the unavoidable power of microalgae bioremediation because it is a recoverable product, and could balance the upcycle treatment price where competing technologies represent only a cost.

Therefore even if the global value chain of microalgae for bioremediation is neither ready nor economically viable yet, their high potential in upcycling secondary industrial streams should not be prevented.

Want to contribute to improve ? Please complete the Form (below link)

https://forms.gle/ZpFAGSSegwnisAA18

Microalgae can grow as well with inorganic (autrophic) and organic (heterophic) effluents. Some species can even tolerate high levels of heavy metals, high temperatures and high pH. To remediate CO_2 gas streams, the use of closed high density photobioreactors should be favored in order to prevent CO_2 loss.



CO2 flue gas	Industrial / agro wastewater	Urban wastewater
Quality of flue gas strongly depends on the type of industry and the type of initial energy source	Characteristics of industrial wastewaters are highly variable, depending on the type of industry.	Urban wastewater final effluent (tertiary) is rich in inorganic compounds (N and P). This effluent can be stable in quality but highly contaminated
Contaminants are SOx, NOx, dust, heavy metals...	Contaminants are heavy metals, toxic compounds, pharmaceuticals,	Contaminants are bacteria, viruses, heavy metals, micro-contaminants (pharma-ceuticals, persistent chemicals such as PFAs.), microplastics....
Need to purify the flue gas to obtain a CO_2 <0,1% contaminants remaining	Need to focus on only certain agro wastes (orange peels, coffee wastes, brewery...)	Application sector : biofuels or biomaterials (with no contact with food/feed)

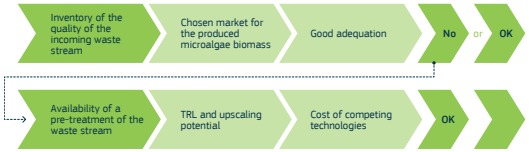
There is a need to target markets which are able to absorb the production volumes and associated logistics... and considering a premium price of the final product with regards to the "circular economy". The possible markets are:

- BioFuels and BioPlastics
- Biofertilizers
- Feed needs investigation and should be adapted according to the type of wastestream.

There is a need for each waste stream to comply with its own regulation (regional, national, european):

- In terms of quality criteria
- In terms of contaminant limits

Each waste stream candidate to implement bioremediation by using microalgae growth has its own quality specification. A good practice to assess the feasibility of microalgae bioremediation should follow the steps represented here below.



Blocking points for upscaling industrial facilities

Economics: need incentives to shift to circular economy for producing microalgae for Biofuels or Biopastics which are to date not economically viable (price premium, carbon credits...)
Regulation: Considerations under the Waste Framework Directive - European Commission (europa.eu).

#EU4Algae

These factsheets were produced based on the bottom-up discussions with stakeholders of the EU4Algae WG2, dedicated to microalgae, on key topics of interest for the sector. If you are willing to contribute to improvement, please complete this form.

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