BBCircle – LIFE CYCLE ASSESSMENT FOR INNOVATIVE BIOREFINERY PROCESS EVALUATION

Lidia Lombardi, Niccolò Cusano University, Italy
lidia.lombardi@unicusano.it
Giulia Costa, University of Rome Tor Vergata , Italy
G. Farabegoli, F. Minniti, F. Tatti, ISPRA, Italy
A. Polettini, R. Pomi, A. Rossi, T. Zonfa, University of Rome "La Sapienza", Italy

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The BBCircle project[1], funded by the Lazio Region (IT), is aimed at integrating different processes to produce biomaterials, biofuels, capturing CO_2 and promote circularity, in reference to the suitable and available substrates in the regional territory.

The project is still in its infancy, but the final aim is to evaluate the environmental sustainability – by Life Cycle Assessment (LCA)of the biorefinery process depicted in Figure 1. The organic waste (sludge, organic fraction of the municipal solid waste or cheese whey) – eventually after necessary pre-treatments - is fed to a first step of dark fermentation, to produce a biogas mainly composed by H_2 and CO_2. Here the interest is for the H_2, which can be separated from the CO_2, for further uses. CO_2 in turn, can be captured directly during biogas up-grading – using methods based direct contact with alkaline industrial residues - on or indirectly, by contacting the separated CO_2 stream with alkaline industrial residues in a following step, in both the cases allowing for the environmental behaviour improvement and further reuse of the alkaline industrial residues. The other output stream from the dark fermentation step – the fermentate – is still rich in organic content and can be further exploited by other steps. In this case electrochemical treatment is proposed, to produce additional H_2/CO_2 biogas and electricity. The exiting fermentate stream is here assumed to feed a thermochemical treatment – namely hydrothermal carbonization – for producing hydrochar for further use. The preliminary framework for LCA will be presented and key elements discussed.

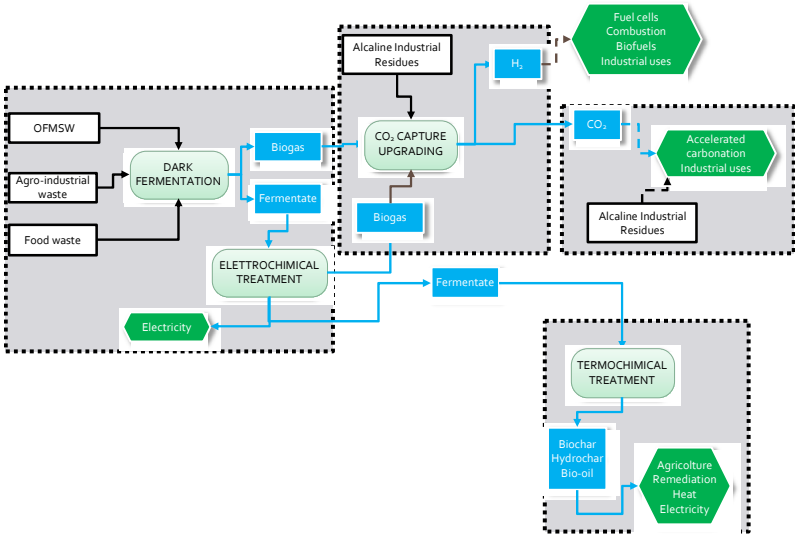

Figure 1. Schematic concept of the proposed biorefinery process.

[1] BBCircle - Biomateriali, Biocombustibili, Sequestro della CO2 e Circolarità. Studio sull'implementabilità di Bioraffinerie nella Regione Lazio

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