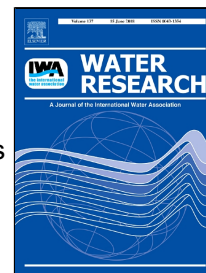


# Accepted Manuscript

Development of life cycle water footprints for the production of fuels and chemicals from algae biomass



Edson Nogueira Junior, Mayank Kumar, Stan Pankratz, Adetoyese Olajire Oyedun, Amit Kumar

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# 1 **Development of Life Cycle Water Footprints for the Production of Fuels** 2 **and Chemicals from Algae Biomass**

3 **Edson Nogueira Junior, Mayank Kumar, Stan Pankratz, Adetoyese**  
4 **Olajire Oyedun, Amit Kumar<sup>1</sup>**

5 Department of Mechanical Engineering, 10-203 Donadeo Innovation Centre for Engineering,  
6 9211 116 Street NW, Edmonton, Alberta, Canada T6G 1H9

## 7 **Abstract**

8 This study develops life cycle water footprints for the production of fuels and chemicals via  
9 thermochemical conversion of algae biomass. This study is based on two methods of feedstock  
10 production – ponds and photobioreactors (PBRs) – and four conversion pathways – fast pyrolysis,  
11 hydrothermal liquefaction (HTL), conventional gasification, and hydrothermal gasification  
12 (HTG). The results show the high fresh water requirement for algae production and the necessity  
13 to recycle harvested water or use alternative water sources. To produce 1 kg of algae through  
14 ponds, 1564 L of water are required. When PBRs are used, only 372 L water are required;  
15 however, the energy requirements for PBRs are about 30 times higher than for ponds. From a  
16 final product perspective, the pathway based on the gasification of algae biomass was the  
17 thermochemical conversion method that required the highest amount of water per MJ produced  
18 (mainly due to its low hydrogen yield), followed by fast pyrolysis and HTL. On the other hand,

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<sup>1</sup> Corresponding author. Tel.: +1-780-492-7797.

*E-mail address:* [Amit.Kumar@ualberta.ca](mailto:Amit.Kumar@ualberta.ca) (A. Kumar).

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