Environmental Sustainability of Biofuels

Prospects and Challenges

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Chapter 10 - Biofuel consumption and global climate change: Solutions and challenges

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Abstract

The issue of climate change is a continuous topic of debate. The emission of greenhouse gasses is the reason for climate change. These gasses include CO_2, CH_4, O_3, NO, and NO_2 and small amount of a water vapor. The greenhouse gas effect is a warming effect responsible to rise in atmospheric average temperature. To achieve desired level of emission reduction, all of the transport modes will need to reduce their emissions in every region of the world. The potential for expansion in the use of biomass-based fuels will depend on biofuel production potential and its sustainability. In this work, I discuss a few of these critical issues. Biomass has the property to transform into a different range of fuels including solid, liquid and gaseous forms. Liquid biomass fuels are also known as biofuels are the most studied option for their possible use in the transport sector. The bioethanol is considered as the most accepted fuel for the transport use. Bioethanol can easily be integrated with current engine technology and can stop atmospheric pumping of new carbon. The study reinforces that biofuel is one of the important tools to mitigate transport-based greenhouse gas emissions but also has quantity and sustainability-based limitations. The holistic consideration of (3E), i.e., Efficiency, Environment and Economy are needed to incorporate in all the approaches of biofuel production and consumption. The decarbonized of supply chain is achieved by considering direct and indirect land use change and feedstock production with BECCS hence, could mitigate the climate change.

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Multi-objective optimization design of sustainable biofuel network with integrated fuzzy analytic hierarchy process

2024, Expert Systems with Applications

> *Citation Excerpt :*
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> …Besides, some challenges for the use of biofuel are also mentioned in the literature inclusive of land use, crop usage, energy efficiency, and costs. Additionally, weak supply chains are also considered one of the most dominant barriers for the biofuel sector from unstable feedstock supply, lack of qualified workers, and sustainability risks (Hiloidhari et al., 2023, Usmani, 2023, Wei et al., 2023). The structure of the biofuel network involves various decision makers from the upstream to the downstream process of the chain, which includes farms growing biomass, consolidating facilities, biogas or bio-refinery facilities, blending facilities, and consumer nodes.…

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> …Biodiesel feedstock mainly includes various oil crops, waste cooking oil, algae, and other new feedstock generation (Bashir et al., 2022; Lin and Lu, 2021; Nayab et al., 2022; Singh et al., 2021; Singh et al., 2020; Ziolkowska, 2020). The feedstock using by different countries or regions differs according to agricultural land use change, climate, environment, and oil consumption, etc (Bashir et al., 2022; Lin and Lu, 2021; Nayab et al., 2022; Singh et al., 2021; Singh et al., 2020; Usmani, 2023; Ziolkowska, 2020). Europe produces rapeseed oil and sunflower seed oil-based biodiesels, while Asia centers on palm oil, coconut oil, and jatropha oil-based biodiesels.…

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2023, Sustainable Chemistry for the Environment

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> …Due to dependence on conventional energy supplies, the energy crisis has become a serious global problem in recent years [9]. The search for alternative energy sources that can replace coal, petroleum, and natural gas from the current energy system has been triggered by concerns about the depletion of fossil fuel reserves, energy security issues, as well as the effects of global warming caused by rising CO2 levels in the atmosphere [7,32]. As a direct consequence of this, there is an ever-increasing level of interest in renewable forms of energy.…

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