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Chapter 8 - Life cycle assessment of waste-to-bioenergy processes: a review

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Abstract

In the current global scenario, the problems of the depletion of fossil reserves, increasing waste generation, climate change, and the need for energy security are matters of prime concern. All these issues are inevitable in any economy today due to the absolute reliance on fossil fuels for fulfilling energy requirements. A global movement toward creating sustainable circular bioeconomies has taken shape over the past decade to address these problems. The valorization of waste through different technologies like incineration, pyrolysis, gasification, anaerobic digestion, and MFCs and MECs offers a scope of providing an alternative source of energy and other value-added products with an added advantage of solving the problem of waste management and reducing the problem of climate change. However, there may be an increase in other indirect environmental impacts due to the process of energy production from waste and these need to be quantified to understand the sustainability of the waste-derived bioenergy economy. A life cycle assessment (LCA) is a significant instrument used to measure and evaluate the ecological impact of a given bioenergy system. This chapter aims to address the importance of life cycle thinking to understand the sustainability of waste-derived energy systems along with the key challenges and recommendations for futur