# Circular economy for climate change mitigation.

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## Introduction

The implementation of circular economy principles in urban solid waste management shows significant potential for reducing greenhouse gas emissions, thereby playing a direct role in climate change mitigation. Strategies such as waste reduction, reuse, and recycling are emphasized as superior to traditional linear approaches, fostering sustainable urban development and environmental protection[1].

Waste-to-energy technologies are increasingly recognized as essential components within a circular economy framework, offering effective solutions for climate change mitigation. A comprehensive review of these technologies reveals their diverse methods, environmental advantages, and the obstacles they face, underscoring their capacity to divert waste from landfills and generate renewable energy[2].

Advanced recycling technologies are critical for establishing a circular economy for plastics, contributing significantly to climate change mitigation. Innovations in plastic reprocessing are shown to reduce the demand for virgin materials, minimize waste generation, and decrease the greenhouse gas emissions associated with plastic production and disposal[3].

Managing electronic waste (e-waste) within a circular economy model presents both substantial challenges and considerable opportunities for climate change mitigation. Emphasis is placed on how efficient collection, refurbishment, and recycling of e-waste can decrease the need for raw materials, lower energy consumption in manufacturing, and prevent harmful emissions from improper disposal[4].

The governance landscape surrounding the circular economy transition for climate change mitigation reveals important challenges and promising opportunities. Effective acceleration necessitates integrated policy frameworks, robust multi-stakeholder collaboration, and responsive regulatory mechanisms to overcome existing barriers and encourage the widespread adoption of circular practices[5].

The valorization of biowaste within a circular economy framework is identified as a crucial pathway toward sustainable development and climate change mitigation. Various techniques for converting organic waste into valuable resources—such as biofuels, fertilizers, and biochemicals—are discussed, highlighting their role in reducing landfill burden and greenhouse gas emissions[6].

An assessment of the environmental impacts of diverse recycling methods across various waste streams underscores their importance in climate change mitigation. Effective recycling is quantified in terms of its ability to reduce greenhouse gas emissions, conserve natural resources, and minimize pollution, offering insights for optimizing waste management strategies for enhanced ecological benefits[7].

Advancements in textile recycling technologies are explored as vital for the fashion industry's transition to a circular economy, with significant potential for climate change mitigation. Mechanical and chemical recycling methods are discussed for their capacity to reduce the environmental footprint of textile production and consumption, promoting greater resource efficiency and waste reduction[8].

Consumer behavior plays a pivotal role in accelerating the circular economy transition and its subsequent implications for climate change mitigation. A systematic review identifies various behavioral interventions and consumption patterns that can effectively foster waste reduction, reuse, and recycling, stressing the critical need for public engagement in sustainable resource management[9].

Integrated waste management systems are evaluated using a multi-criteria decision analysis to determine their effectiveness in promoting a circular economy and contributing to climate change mitigation. This analysis provides a framework for selecting optimal waste management strategies that thoughtfully balance environmental, economic, and social factors for overall enhanced sustainability[10].

## Conclusion

Studies highlight that adopting circular economy principles in urban solid waste management drastically cuts greenhouse gas emissions, directly helping mitigate climate change. This involves prioritiz-

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ing waste reduction, reuse, and recycling over older, linear methods, leading to more sustainable urban environments and better environmental protection. Waste-to-energy technologies emerge as key players in the circular economy, effectively turning waste into renewable energy. These methods are vital for diverting materials from landfills and represent powerful tools in the fight against climate change. Advanced recycling technologies, particularly for plastics, are essential for creating a circular economy. They significantly cut down on the need for new materials, reduce overall waste, and lower the emissions linked to plastic manufacturing and disposal. Managing Electronic Waste (E-waste) efficiently within a circular economy presents both challenges and opportunities. By collecting, refurbishing, and recycling electronic waste, we can decrease demand for raw materials, reduce energy use in production, and prevent toxic emissions from improper disposal. The journey to a circular economy for climate change mitigation is shaped by effective governance. This calls for joined-up policies, collaboration across many groups, and strong regulations to overcome obstacles and encourage wider adoption of circular practices. Biowaste valorization stands out as a critical approach for sustainable development and climate change mitigation. It involves transforming organic waste into valuable products such as biofuels, fertilizers, and biochemicals, lessening the load on landfills and cutting greenhouse gas releases. Analyzing various recycling methods shows their significant environmental benefits, including reduced greenhouse gas emissions, conserved natural resources, and minimized pollution. This insight is key for crafting optimal waste management strategies that deliver greater ecological advantages. Innovations in textile recycling, covering both mechanical and chemical processes, are fundamental for moving the fashion industry towards a circular model. These advancements help shrink the environmental footprint of textile production and use, boosting resource efficiency and reducing waste. Consumer behavior is a driving force behind the circular economy transition. Encouraging behaviors like waste reduction, reuse, and recycling through public engagement is indispensable for achieving sustainable resource management and tackling climate change. Finally, evaluating integrated waste management systems using multi-criteria decision analysis helps identify the best strategies. These strategies balance environmental, economic, and social considerations to foster a circular economy and support climate change mitigation.

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