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How far can circular economy practices contribute to a carbon-neutral Europe? The case of flat glass production in the construction sector

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Abstract:

The construction sector heavily relies on non-renewable resources for energy and materials. Addressing this, Circular Economy (CE) is frequently suggested as a means to foster sustainable growth while reducing global emissions. Yet, the actual impact of CE in the long term is still uncertain due to limited empirical evidence and various factors that may hinder its widespread adoption. Indeed, the transition to CE might necessitate a substantial transformation in production capabilities, supply chain modifications, the phasing out of existing capital, and investment in new technologies and facilities. This study introduces for the first time a JRC-TIMES-based methodology to assess the significance of feedback loops in construction, focusing specifically on flat glass production, a notably carbon-intensive component of the industry. JRC-TIMES model is an optimization model that integrates the processes of energy consumption and production for European countries to suggest the most cost-efficient options for mitigation of greenhouse gases emission. We have enhanced the model by incorporating conventional flat glass processes and have specifically designed closed-loop value chains to evaluate the impact of circular economy practices on the business-as-usual scenario. Through this approach, we can assess the contributions of each circular economy practice in various CE implementation scenarios, focusing on energy, emissions, and material savings. Results can provide a more precise measurement of the circular economy's role in climate mitigation and offer Policymakers quantitative insights into the effectiveness of circular economy strategies to overcome market and technical challenges.