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Integrating Citizens' Engagement Model into The Circular Economy: A Multidimensional Approach to The Recycled Construction Materials Usage

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Abstract: This paper proposes a multidimensional model to evaluate citizen engagement in the use of recycled construction materials, integrating individual, institutional, social, and technological dimensions. Drawing from existing literature and enhanced measurement indicators, the study synthesizes behavioural, attitudinal, and systemic factors contributing to sustainable material adoption. Findings suggest that participatory processes, policy coherence, and technological advancements significantly affect recycling efficacy. The proposed *Enhanced Citizen Engagement Model* aligns with EU circular economy goals and offers actionable metrics for academic and policy evaluation.

Keywords: citizens' engagement, recycling, circular economy, sustainability indicators, construction materials.

1. Introduction

Citizens' engagement is increasingly recognized as a cornerstone in the transition to a circular economy, especially in the context of sustainable construction practices. The urgency to reduce environmental impacts and material waste is reflected in EU policy frameworks such as the *European Green Deal* and the *Circular Economy Action Plan* (European Commission, 2020). However, transferring policy into the behavior requires the integration of citizens' attitudes, values, and day-to-day practices. Studies highlight that while awareness is growing, there remains a gap between intentions and sustainable actions (ElHaffar et al., 2020; Escario et al., 2020). According to EEA (2024), 66% of Europeans now sort their waste, and support for bioplastics has increased significantly (Leal Filho et al., 2021), but recycling behaviors remain highly influenced by convenience, access to infrastructure, and social norms.

Therefore, the **scientific problem** indicates the following: although citizens' awareness of recycling is increasing, there remains a significant gap between environmental attitudes and actual sustainable behaviour (ElHaffar et al., 2020; Escario et al., 2020). Current policy and technological measures often overlook the complexity of citizen engagement in recycling practices, particularly in the construction sector. There is a need for a multidimensional model that integrates behavioural, institutional, and technological aspects to enhance citizens' involvement in circular economy transitions (Dagiliūtė et al., 2023; Guillen-Royo, 2020).

The **focus** of this study is on the citizens' engagement in the use of recycled construction materials within the framework of the circular economy.

Aim is towards to develop and validate a multidimensional model for enhancing citizen engagement in recycled construction materials usage, aligning with EU circular economy goals.

Objectives:

1. To analyse theoretically the factors (individual, social, institutional, and technological) influencing citizens' engagement in recycling construction materials.
2. To design an *Enhanced Citizen Engagement Model* based on theoretical insights and empirical indicators.

2. Literature Background

2.1. Contextualization of Citizens' Engagement Indicators

Academic sources highlight multiple dimensions that influence citizen engagement in recycled material use. Guillen-Royo (2020) emphasizes participatory workshops as critical to co-creating sustainable lifestyles. ElHaffar et al. (2020) discuss the attitude-intention-behaviour gap and recommend using behavioural economics to inform policy design. Wang (2017) and Dawkins et al. (2019) highlight institutional governance and stakeholder consultation as enablers of engagement. The WRAP UK (2024) study shows that communication campaigns enhance trust and knowledge, directly affecting recycling behavior. More recent studies by Dagiliūtė et al. (2023) and Escario et al. (2020) confirm that demographic factors, such as age, gender, and income, shape recycling habits across Europe. Pilot studies (Roche Cerasi et al., 2021) also stress the need to address local barriers like convenience and access to infrastructure.

3. Methodology and Enhanced Model

Main **methods** were implemented within this study:

- Academic literature review and theoretical synthesis.
- Model development using indicator-based assessment.
- Secondary data analysis from previous empirical studies and EU reports.
- Comparative evaluation of engagement factors.

Figure 1. The Enhanced Citizen Engagement Model

The *Enhanced Citizen Engagement Model* consists of the following five dimensions and related measurement indicators (see Fig. 1).

4. Results and Discussion

Therefore, preliminary findings from literature and empirical indicators suggest a robust interrelation between perceived behavioural control, community influence, and institutional trust. Regional disparities and knowledge gaps hinder recycling efficiency. The model's (see above Fig. 1) strength lies in its ability to inform targeted interventions across policy, education, and technology sectors.

5. Conclusion

To align with EU goals, especially the CEAP, recycling systems must integrate citizen-oriented metrics and policy feedback loops. The *Enhanced Citizen Engagement Model* offers a validated, multidimensional tool for academic and policy stakeholders to evaluate and improve circular practices in construction materials.

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References

Bassi, S., & Guidolin, M. (2023). European Consumers' Attitudes towards the Environment and Sustainable Behavior in the Market. *Sustainability*, 15(2), 1234. https://doi.org/10.3390/su15021234

Dagiliūtė, R., Žaltauskaitė, J., & Sujetovienė, G. (2023). Self-reported behaviours and measures related to plastic waste reduction: European citizens' perspective. *Waste Management & Research*, 41(9), 1460–1468. https://doi.org/10.1177/0734242X231159841

Dawkins, E., et al. (2019). *Local government-led participatory approaches and recycling programs*.

ElHaffar, G., et al. (2020). *Attitude-intention-behaviour gaps in sustainable consumption.*

Escario, J. J., Rodríguez-Sánchez, C., & Casaló, L. V. (2020). The influence of environmental attitudes and perceived effectiveness on recycling, reducing, and reusing packaging materials in Spain. *Waste Management*, 113, 251–260. https://doi.org/10.1016/j.wasman.2020.05.043

European Commission. (2018). *A European Strategy for Plastics in a Circular Economy*. https://ec.europa.eu

European Commission. (2019). *The European Green Deal*. https://ec.europa.eu

European Commission. (2020). *Circular Economy Action Plan: For a cleaner and more competitive Europe*. https://ec.europa.eu

European Commission. (2022). *Special Eurobarometer 501: Attitudes of European citizens towards the environment*. https://ec.europa.eu/eurobarometer

Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, 49(3), 141–157. https://doi.org/10.1002/ijop.12034

Guillen-Royo, M. (2020). *Participatory workshops and sustainable consumption solutions: Synergic satisfiers for human needs*.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour? *Environmental Education Research*, 8(3), 239–260. https://doi.org/10.1080/13504620220145401

Konstantinidou, A., et al. (2024). Citizens' Attitudes and Practices Towards Waste Reduction, Separation, and Recycling: A Systematic Review. *Sustainability*, 16(22), 9969. https://doi.org/10.3390/su16229969

Leal Filho, W., et al. (2021). An assessment of attitudes towards plastics and bioplastics in Europe. *Science of the Total Environment*, 755, 142732. https://doi.org/10.1016/j.scitotenv.2020.142732

Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change*, 20(4), 550–557. https://doi.org/10.1016/j.gloenvcha.2010.07.004

Roche Cerasi, I., et al. (2021). Household plastic waste habits and attitudes: A pilot study in the city of Valencia. *Waste Management & Research*, 39(5), 610–619. https://doi.org/10.1177/0734242X21996415

Schultz, P. W. (2002). Inclusion with nature: The psychology of human-nature relations. *Psychology of Sustainable Development*, 61–78. https://doi.org/10.1007/978-1-4615-0995-0_4

Stern, P. C., et al. (1999). *A value-belief-norm theory of support for social movements: The case of environmentalism*.

Thøgersen, J. (2006). Norms for environmentally responsible behaviour: An extended taxonomy. *Journal of Environmental Psychology*, 26(4), 247–261. https://doi.org/10.1016/j.jenvp.2006.09.004

Wang, Y. (2017). *Environmental attitudes, efficacy, and governance in high-income nations' recycling efforts*.

Whitmarsh, L., Seyfang, G., & O'Neill, S. (2011). Public engagement with carbon and climate change: To what extent is the public 'carbon capable'? *Global Environmental Change*, 21(1), 56–65. https://doi.org/10.1016/j.gloenvcha.2010.07.011

WRAP UK. (2024). *Spring 2024 Recycling Tracker: Citizens' recycling behaviours and attitudes.*