

GENERATION AND RECYCLING OF PAPER, CARDBOARD AND GLASS PACKAGING IN ROMANIA: A CIRCULAR ECONOMY PERSPECTIVE

Elena Dana BAKO^{a*}, Lucia SCORTAR^b, Adina Viorica RUS^c

^{a), b), c)} Babeș-Bolyai University, Faculty of Economics and Business Administration,
Cluj-Napoca, Romania

Please cite this article as:

Article History:

Bako, D.E., Scorțar, L. and Rus, A.V., 2025. Received: 15 September 2025
Generation and recycling of paper, cardboard and Accepted: 10 November 2025
glass packaging in Romania: A circular economy
perspective. *Review of Economic Studies and*
Research Virgil Madgearu, 18(2), pp.5-25.
doi: 10.24193/RVM.2025.18.133.

Abstract: This paper analyzes the evolution of the generation and recycling of paper/cardboard and glass packaging waste from 2005 to 2022 in Romania, highlighting the progress made, the challenges encountered and the prospects for the future. In study, data collected from official sources (Eurostat and the National Institute of Statistics) and processed using SPSS software to analyze macroeconomic trends and their impact on waste management. To assess the relationship between GDPs per capita and packaging waste generation/recycling, our analysis turned to Pearson correlations, identifying significant associations between these variables. The results of the analysis show that, in Romania, GDP per capita influenced paper and glass packaging waste streams (generated and recycled), and that economic growth could have supported more efficient investments in recycling by increasing the recycling rate of paper and glass. We find these associations useful for developing more effective strategies and policies in the context of the circular economy.

Key words: packaging waste; recycling; circular economy; sustainability

JEL Classification: Q01; Q53; Q56

* Corresponding author. E-mail address: dana.bako@econ.ubbcluj.ro.

References:

1. Barbato, P. M., Olsson, E. and Rigamonti, L., 2024. Quality degradation in glass recycling substitutability model proposal. *Waste Management*, 182, pp. 124-131. <https://doi.org/10.1016/j.wasman.2024.04.027>
2. Benzerga, R., Laur, V., Lebullenger, R., Le Gendre, L., Genti, S., Sharaiha, A. and Queffelec, P., 2014. Waste-glass recycling: A step toward microwave applications. *Materials Research Bulletin*, 67, pp. 261-265. <http://dx.doi.org/10.1016/j.materresbull.2014.07.037>
3. Blengini, A., Busto, M., Fantoni, M. and Debora, F., 2011. Eco-efficient waste glass recycling: integrated waste management and green product development through LCA. *Waste Management*, 32, pp. 1000-1008. <http://dx.doi.org/10.1016/j.wasman.2011.10.018>
4. Burggraf, P., Steinberg, F., Sauer, C.R. and Nettesheim, P., 2023. Boosting the Circular Manufacturing of the Sustainable Paper Industry - A First Approach to Recycle Paper from Unexploited Sources such as Lightweight Packaging, Residual and Commercial Waste. 56th CIRP Conference on Manufacturing Systems, Cape Town, South Africa, Volume: Procedia CIRP. <http://dx.doi.org/10.1016/j.procir.2023.09.027>
5. Defalque, C., Marins, F.A., Aneirson, F. S. and Rodríguez, E.I., 2020. A review of wastepaper recycling networks focusing on quantitative methods and sustainability. *Journal of Material Cycles and Waste Management*, 23, pp. 55-76. <http://dx.doi.org/10.1007/s10163-020-01124-0>
6. Delbari, S. A., Hof, L. A., 2024. Glass waste circular economy - Advancing to high-value glass sheets recovery using industry 4.0 and 5.0 technology. *Journal of Cleaner Production*, 462. <http://dx.doi.org/10.1016/j.jclepro.2024.142629>
7. Departamentul pentru Dezvoltare Durabilă. Strategia Națională privind Economia Circulară, 2022. [online] Available at: <https://dezvoltaredurabila.gov.ro/strategia-nationala-privind-economia-circulara-13409762>, [Accessed 3 April 2025].
8. Eurostat 2024. Packaging waste by waste management operations [online] Available at: https://ec.europa.eu/eurostat/databrowser/view/env_waspac/default/table?lang=en&category=env.env_was.env_wasst, [Accessed 4 February 2025].

9. Gavrilescu, D., Seto, B.C. and Teodosiu, C., 2023. Sustainability analysis of packaging waste management systems: A case study in the Romanian context. *Journal of Cleaner Production*, 422. <http://dx.doi.org/10.1016/j.jclepro.2023.138578>
10. Govardhan, B., Nakkeeran, G. and Dipankar, R., 2024. Recycling glass waste into concrete aggregates: enhancing mechanical properties and sustainability. *Asian Journal of Civil Engineering*, 26, pp. 1–19. <https://doi.org/10.1007/s42107-024-01181-y>
11. Government Decision no. 1.074/2021 on the establishment of the guarantee-return system for non-reusable primary packaging, [online] Available at: <https://legislatie.just.ro/Public/DetaliiDocument/247209>. [Accessed 31 March 2025].
12. Huang, Y., Chen, Z., Liu, Y., Xin, Lu J., Bian, Z., Yio, M., Cheeseman, C., Wang, F., Poon, C.S., 2023. Recycling of waste glass and incinerated sewage sludge ash in glass-ceramics, *Waste Management*, 174, pp. 229-239. <https://doi.org/10.1016/j.wasman.2023.12.007>
13. Le Pera, A., Sellaro, M., Grande, G., Bencivenni, E. and Migliori, M., 2023. Effect of quality of separately collected glass, paper plus cardboard and lightweight packaging waste on environmental, energetic and economic sustainability of the material recovery facility operations. *Journal of Cleaner Production*, 425. <https://doi.org/10.1016/j.jclepro.2023.138973>
14. McDougall, F., White, P., Franke, M. and Hindle, P., 2003. *Integrated Solid Waste Management: a Life Cycle Inventory*. Blackwell Publishing.
15. Nikou, V., Sardianou, E., 2025. Determinants of paper packaging waste: evidence across 28 EU countries. *Journal of Material Cycles and Waste Management*, pp.1-16. <http://dx.doi.org/10.1007/s10163-025-02195-7>
16. Oikonomopoulou, F., DeBrincat, G. and Fuhrmann, S., 2023. Glass and circularity. *Glass Structures & Engineering*, 8, pp. 165–166. <https://doi.org/10.1007/s40940-023-00230-3>
17. Popa, M., Salanță, I.I., Scortar, L.M., Isopescu, A.G., 2011. *Etica în afaceri. Sinteze și studii de caz*. Risoprint: Cluj-Napoca.
18. Premathilaka, K.K.W., Liyanapathirana, D.S., Leo, C.J. and Hu, P., 2024. Application of recycled waste glass to replace traditional quarried aggregates: A comprehensive review. *Journal of Building Engineering*, 86. <https://doi.org/10.1016/j.jobe.2024.108846>

19. Returo. Beneficiile Sistemului de Garanție-Returnare, [online] Available at: <https://returosgr.ro/despre-returo>, [Accessed 1 April 2025].
20. Rotenstein, E., Testarea ipotezelor statistice, [online] Available at: <https://www.math.uaic.ro/~eduard/Capitolul%206.%20Testarea%20ipotezelor%20statistice.pdf>.
21. Scortar L.M., 2017. *Managementul deșeurilor*. Cluj-Napoca: Risoprint.
22. Yuan, X., Wang, J., Song, Q. and Xu, Z., 2024. Integrated assessment of economic benefits and environmental impact in waste glass closed-loop recycling for promoting glass circularity. *Journal of Cleaner Production*, 444. <https://doi.org/10.1016/j.jclepro.2024.141155>