

Circular Economy Transition in the Eastern European Member States

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Abstract

Over the last 50 years the world has experienced unprecedentedly high rates of economic growth. Since 1970 global average per capita income has increased by almost twofold (WB, 2021a), significantly improving the standard of living and providing consumers better access to a higher quality goods and services. Coupled with over 110% increase in population (WB, 2021b), income growth has fueled higher levels of consumption, including the demand for material goods, which has increased by more than three times since 1970 reaching almost 90 billion tonnes as of today (Krausmann, 2018). Further increase in incomes and population together with a global convergence in material use patterns could result in over 2.5 times increase in global material demand by 2050, putting tremendous pressure on the Earth's ecosystem (Steffen et al., 2015). Such trends could also put at risk a success of the future climate mitigation policies, as materials management is a major contributor of the global greenhouse gas emissions (UNDP, 2017).

The need move to move away from the current use and utilization practices toward a more sustainable material consumption patterns is being conceptualized and promoted within a Circular Economy (CE) concept (e.g. Kirchherr et al., 2017; Korhonen et al., 2018). A number of recent studies have provided quantification of the current material use trends and economic assessment of the possible circular economy transition, mostly focusing on global trends and/or specific commodities, such as iron and steel (e.g. Winning et al., 2017; McCarthy et al., 2018; Wiebe et al., 2019; Aguilar-Hernandez et al., 2020).

Policy makers worldwide have also responded to the challenges of a more sustainable material consumption with European Union (EU) taking a global leadership in this area. In 2015 the European Commission has adopted the first Circular Economy Action Plan, which was further updated in 2020 and became one the main blocks of the European Green Deal (EC, 2020a). However, the level of efforts toward circular economy transition at the EU country level is something decided by national and subnational governments. Circular material use rates largely vary by the EU countries, though most of the EU member states have made substantial progress over the last 10 years (Figure 1).

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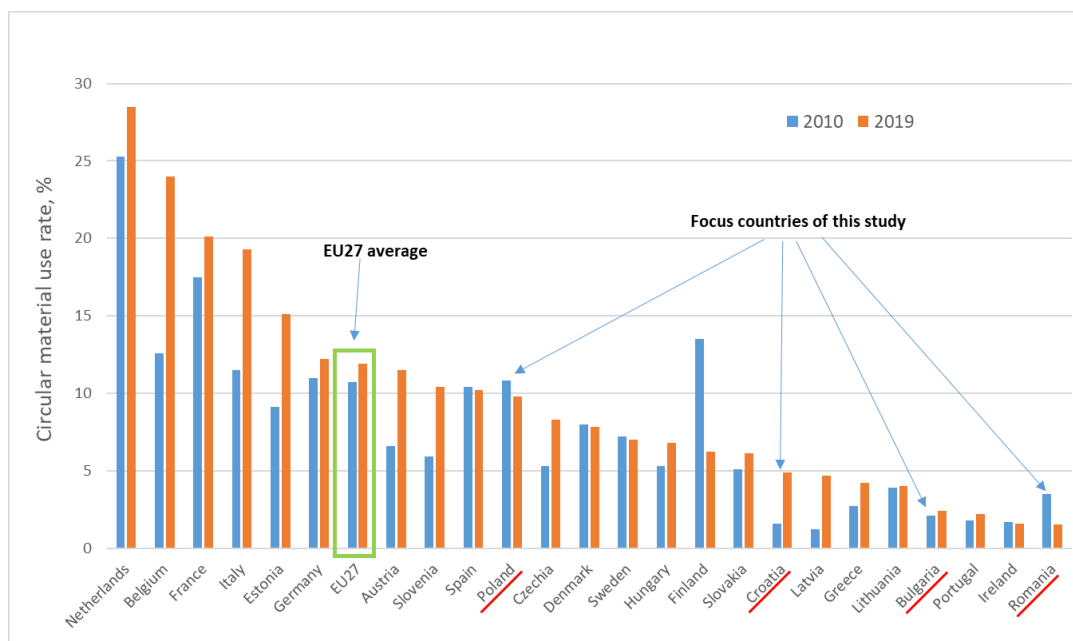


Figure 1. Circular material use rate in the selected EU countries in 2010 and 2019, %

Source: EC (2020b).

Notes: The indicator measures the share of material recovered and fed back into the economy - thus saving extraction of primary raw materials - in overall material use.

So far, only a handful of EU countries have adopted national resource efficiency or circular economy strategies/action plans (Figure 2). In some cases, especially in the Eastern European developing EU member states, policy makers are not well equipped with the sufficient knowledge of the circularity principles and potential impact of corresponding policies on their national economies (Domenech and Bahn-Walkowiak, 2019).

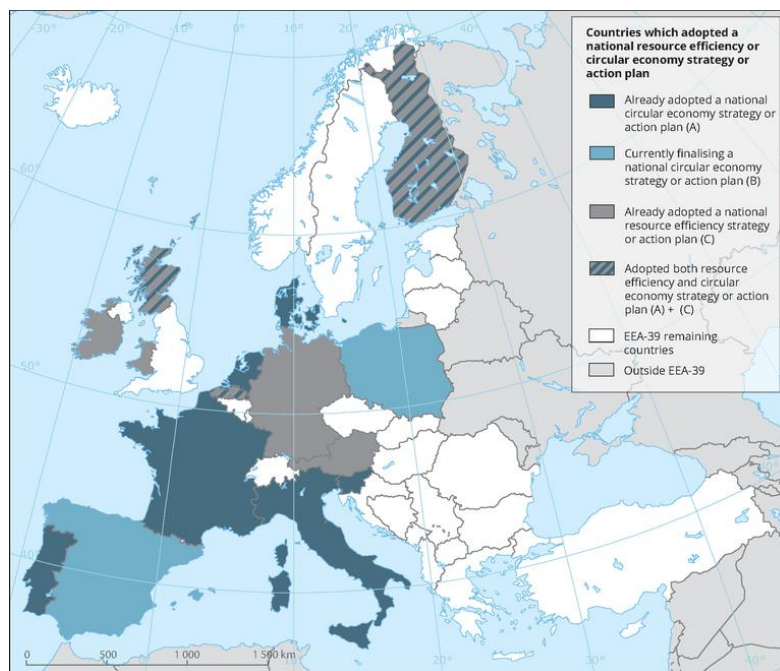


Figure 2. Circular economy strategies or action plans adoption status

Source: EEA (2020).

In this study, we will focus on four Eastern European Member States – Poland, Romania, Bulgaria and Croatia – to explore the policies toward circular economy transition in these countries (within a broader EU circular economy transition context). While most of the existing literature has global coverage (e.g. Winning et al., 2017; McCarthy et al., 2018; Wiebe et al., 2019; Aguilar-Hernandez et al., 2020), future progress in the area of circular economy transition would likely depend on a country level action. Thus assessment of the regional/local measures, including identifications of the potential economic implications and policy trade-offs of such transition is of a high importance for policy makers.

This paper:

- Introduces additional sectoral splits to the GTAP 10 Data Base. This includes explicit representation of the primary and secondary production activities for aluminum, copper, iron and steel, and other metals processing. Recycling activity and plastics are also disaggregated in the newly constructed database. Such splits are introduced for all 141 regions of the GTAP 10 Data Base.
- Using the dynamic computable general equilibrium model ENVISAGE (van der Mensbrugghe, 2019), develops the global baseline scenario of the material use accounts with the specific focus on four Eastern European Member States – Poland, Romania, Bulgaria and Croatia. Climate mitigation policy scenarios consistent with the Paris Agreement targets and the European Green Deal are further assessed in the context of their impacts on the material use patterns.
- Finally, a set of the additional policy measures (e.g. environmental taxes, subsidies, etc.) geared toward a more ambitious circular economy transition targets (consistent with the EU circular economy action plan (EC, 2020a)) is modeled and explored in the paper.

We believe that this paper would be of interest to both the modelling community, as it develops a version of the GTAP Data Base with additionally disaggregated sectors, as well as policy makers by providing additional insights on the potential economic implications and policy trade-offs of the circular economy transition.

Selected References

- Aguilar-Hernandez, A. Glenn, Rodrigues, F.D. João, Tukker, A. 2020. Macroeconomic, social and environmental impacts of a circular economy up to 2050: a meta-analysis of prospective studies. *J. Clean. Prod.* (2020), p. 123421. <https://doi.org/10.1016/j.jclepro.2020.123421>
- Domenech, Teresa, and Bettina Bahn-Walkowiak. 2019. Transition towards a resource efficient circular economy in Europe: Policy lessons from the EU and the member states. *Ecological Economics* 155: 7–19.
- European Commission (EC). 2020a. A new Circular Economy Action Plan For a cleaner and more competitive Europe. Brussels, 11.3.2020. <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>
- European Commission (EC). 2020b. Circular material use rate. https://ec.europa.eu/eurostat/web/products-datasets/-/cei_srm030
- European Environmental Agency (EEA). 2020. Countries which adopted a national resource efficiency or circular economy strategy or action plan. <https://www.eea.europa.eu/data-and-maps/figures/countries-which-adopted-a-national>
- Kirchherr, J., Reike, D., Hekkert, M. 2017. Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, Volume 127, December 2017, Pages 221-232. <https://doi.org/10.1016/j.resconrec.2017.09.005>
- Korhonen, J., Honkasalo, A., Seppala, J. 2018. Circular Economy: The Concept and its Limitations. *Ecological Economics*, Volume 143, January 2018, Pages 37-46. <https://doi.org/10.1016/j.ecolecon.2017.06.041>

- Kraussman, F., Lauk, C., Haas, W., and Wiedenhofer, D. 2018. From resource extraction to outflows of wastes and emissions: The socioeconomic metabolism of the global economy, 1900–2015, *Global Environmental Change*, vol 52: 131:140 <https://doi.org/10.1016/j.gloenvcha.2018.07.003>
- McCarthy, A., R. Dellink and R. Bibas, 2018, “The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches”, OECD Environment Working Papers, No. 130, OECD Publishing, Paris. <http://dx.doi.org/10.1787/af983f9a-en>
- Steffen et al. 2015. Planetary boundaries: guiding human development on a changing planet. *Science* 347: 736–746. DOI: 10.1126/science.1259855
- van der Mensbrugghe, D., 2019. The Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) Model. Version 10.01. Center for Global Trade Analysis, Purdue University. <https://mygeohub.org/groups/gtap/envisage-docs>
- Wiebe, K.S., M. Harsdorff, G. Montt, M.S. Simas, R. Wood. 2019. Global circular economy scenario in a multiregional input-output framework. *Environ. Sci. Technol.*, 56 (2019), pp. 6362-6373, [10.1021/acs.est.9b01208](https://doi.org/10.1021/acs.est.9b01208)
- Winning, M., Calzadilla, A., Bleischwitz, R. et al. Towards a circular economy: insights based on the development of the global ENGAGE-materials model and evidence for the iron and steel industry. *Int Econ Econ Policy* **14**, 383–407 (2017). <https://doi.org/10.1007/s10368-017-0385-3>
- World Bank (WB). 2021a. Adjusted net national income per capita (constant 2010 US\$). <https://data.worldbank.org/indicator/NY.ADJ.NNTY.PC.KD>
- World Bank (WB). 2021b. Population, total. <https://data.worldbank.org/indicator/SP.POP.TOTL>