https://doi.org/10.38104/vadyba.2023.2.12

Vadyba
Journal of Management
2023, № 2 (39)
ISSN 1648-7974

THE CIRCULAR ECONOMY TRANSITION IN THE EUROPEAN UNION

Samson Gbolahan Oyeranmi, Valentinas Navickas
Kaunas University of Technology

Abstract
The objective of this research project is to conduct a systematic review of the transition toward a circular economy within the European Union. The issue of unsustainability in the current global society is widely acknowledged within the European Union. This is attributed to the unequal distribution of benefits and costs related to resource utilization among member states of the European Union. The circular economy is acknowledged for its ability to efficiently address social and environmental issues. The transition from the existing linear economic model to a circular one has recently garnered increased attention from notable multinational corporations and influential stakeholders in attendance at the World Economic Forum. The establishment of circular economy models is crucial for promoting and enhancing the adoption of the circular economy. This research paper delves into the benefits of adopting a circular economy model in the context of industry, economy, and waste management. The development of design strategies for the circular economy is guided by a conceptual framework, and recommendations are subsequently provided in accordance with this framework.
Keywords: circular economy, linear economy, circular economy model, waste recycling, waste management, European Union.

Introduction

The circular economy theory delineates a conceptual framework for global economic systems that prioritize developmental and restorative objectives (Feiferytė and Navickas, 2016; Yamoah et al., 2022). This is a synthesis of multiple concepts that have been integrated to re-conceptualize the discourse surrounding resource utilization and waste management (Gbolahan, 2022; Di et al., 2022). The objective is to devise strategies that eliminate waste and negative externalities, safeguard and enhance natural resources, facilitate the circulation of goods, components, and materials at their optimal level of utility and value (Sohal and De Vass, 2022; Münster et al., 2022).

A circular economy is a sustainable economic model that involves the management of finite stocks and renewable flows (Testa et al., 2022). This model aims to establish a continuous cycle of positive development that safeguards and enhances natural capital, optimizes resource yields, and mitigates system risks (Meath et al., 2022; Wuni, 2022). This could lead to the resolution of complex issues like the extinction of species, climate change, the depletion of natural resources, water stress, population growth, conflicts over natural resources and energy, geopolitical disputes, human rights violations, and economic instability (Jesus et al., 2022; Münster et al., 2022).

The circular economy model employs optimal resources, methodologies, commercial tactics, and commodities to minimize waste (Chioatto et al., 2022). Removing the idea of end-of-life in favor of restoration, switching to sustainable energy sources, ceasing to use dangerous chemicals that impede reusability, and switching to renewable energy are all ways to achieve this goal (Blomsma et al., 2022; Khan et al., 2022). The realization of the potential of a circular economy, as aforementioned, is contingent upon a systemic transformation in the design of goods, services, systems, and infrastructure (Hettiarachchi et al., 2022). The success of designing for a circular economy is contingent upon the incorporation of diverse closed-loop system design methodologies (Seetharaman et al., 2022; Tan et al., 2022).

In recent years, there has been a notable evolution in the general framework surrounding the transition toward a circular economy, both within the European Union and on a global scale (Charef et al., 2022). The COVID-19 pandemic has revealed the susceptibility of the worldwide economic framework to numerous hazards, particularly those related to the security of supply chains for diverse products and resources (Chioatto et al., 2022; Charef et al., 2022). The ongoing conflict in Ukraine has led to significant increases in the prices of crucial commodities such as food, gasoline, and fertilizer, primarily due to the dominant market positions of Russia and Ukraine in these sectors (Chioatto et al., 2022; Böhmecke-Schwafert et al., 2022). Moreover, this has brought to light certain inadequacies in the global economic framework, resulting in a widespread predicament concerning the expenses associated with sustenance (Van et al., 2022; Eurostat, 2020). Inflation has exhibited a global upward trend since the onset of 2021. The Euro area's annual inflation rate escalated to 8.9% in July 2022, representing an increase from the 8.6% recorded in June 2022 (Awan and Sroufe, 2022). Similarly, in the European Union, consumer prices experienced a 9.6% surge in June 2022 relative to the corresponding period in the previous year (Awan and Sroufe, 2022; Giorgi et al., 2022).

The European Union's endeavors to foster the circular economy are progressively recognizing the contemporary global milieu (Melchor-Martínez et al., 2022; Yamoah et al., 2022). The benefits of transitioning to a circular economy have been acknowledged by policymakers for a considerable period of time due to their potential positive impact on the environment, resource efficiency, and climate (Altamira-Algarra et al., 2022). Furthermore, certain contemporary endeavors have acknowledged the potential of circularity in the aftermath of the COVID-19 pandemic, as evidenced by the revised European Union Industrial Strategy and the Sustainable Products Initiative (Johansen et al., 2022; Gbolahan, 2023). Additionally, circularity has been recognized as a means of enhancing the European Union's resource and economic resilience, as exemplified by the proposed Batteries Regulation and the European Union Textiles Strategy (Ellen MacArthur Foundation, 2020; Nguyen-Tien et al., 2022). Hence, it can be inferred that the shifting global scenario is exerting an impact on the inclination toward transitioning to a circular economy via cohesive and comprehensive policy interventions (Chioatto et al., 2022; Awan and Sroufe, 2022).

Literature Review

The circular economy is a production and consumption model that emphasizes the importance of reusing, refurbishing, recycling, and repairing pre-existing materials and goods (Di et al., 2022; Hettiarachchi et al., 2022). The objective is to tackle worldwide concerns such as climate change, depletion of biodiversity, generation of waste, and contamination (Sohal and De Vass, 2022; Feiferytė and Navickas, 2016). The model is based on three fundamental principles: the eradication of pollution and waste by means of design, the conservation of products and resources, and the restoration of natural systems (Charef et al., 2022; Khan et al., 2022). The act of recycling serves to optimize the economic viability of a product's constituent parts upon reaching the end of their useful lifespan (Poponi et al., 2022). This diverges from the traditional linear economic paradigm, which is predicated on a linear sequence of extraction, production, consumption, and disposal (Böhmecke-Schwafert et al., 2022; Nguyen-Tien et al., 2022).

The model also incorporates the concept of deliberate degradation (Feiferytė and Navickas, 2016). The implementation of material reuse and recycling practices can contribute to the mitigation of biodiversity loss, the reduction of natural resource consumption, and the mitigation of landscape and habitat degradation (Eurostat, 2020; Poponi et al., 2022). The implementation of a circular economy model leads to a reduction in the overall quantity of annual greenhouse gas emissions, resource consumption, and negative environmental impacts (Blomsma et al., 2022; Böhmecke-Schwafert et al., 2022). Therefore, it is imperative to prioritize the development of goods that are designed with sustainability in mind, as this can significantly mitigate the ecological footprint of the product (Di et al., 2022). The implementation of durable goods that can be repaired, upgraded, and repurposed has the potential to mitigate waste (Giorgi et al., 2022). The issue of packaging waste is on the rise, as the average European generates approximately 180 kilograms of such waste per year (Seetharaman et al., 2022; Münster et al., 2022).

The utilization of primary resources is on the rise (Testa et al., 2022). However, the availability of fundamental constituents is limited (Poponi et al., 2022). The European Union exhibited a trade imbalance of €30.5 billion in 2021 due to its reliance on imported raw commodities, which account for roughly half of its total consumption (Wuni, 2022). In March 2020, the European Commission revealed the circular economy action plan, which aimed to enhance consumer empowerment, encourage ecologically sustainable product design, and decrease waste (Sohal and De Vass, 2022; Khan et al., 2022). Industries characterized by high resource consumption are being targeted, including but not limited to devices and computer technology, polymers, textiles, and construction (Chioatto et al., 2022; Tan et al., 2022).

In February 2021, the European Parliament approved a directive pertaining to the most recent circular economy action plan (Blomsma et al., 2022; Di et al., 2022). The directive advocates for further measures to be implemented in order to achieve a carbon-neutral, ecologically sustainable, non-toxic, and fully circular economy by 2050 (Khan et al., 2022; Wuni, 2022). In March 2022, the Commission introduced a series of measures aimed at expediting the transition toward a circular economy (Yamoah et al., 2022). These measures encompassed the promotion of environmentally sustainable products, equipping consumers with the necessary tools to facilitate the ecological transition, revising legislation pertaining to building products, and formulating a strategy for ecological textiles (Sohal and De Vass, 2022; Blomsma et al., 2022). The European Union put forth a proposal regarding packaging regulations in November 2022 (Di et al., 2022). The proposal recommends a transition to bio-based, biodegradable, and recyclable plastics in order to mitigate packaging waste and enhance package design (Feiferytė and Navickas, 2016). The proposal also emphasizes the importance of clear labeling to promote the recycling and reuse of materials, Figure 1.

Fig. 1. The circular economy model

Methodology

The Ellen MacArthur Foundation has proposed three fundamental principles to facilitate the transition toward a circular economy:

The first principle emphasizes the importance of preserving and enhancing natural capital through the management of finite resources and the regulation of renewable resource flows (Ellen MacArthur Foundation, 2020; Tan et al., 2022). This requires the careful selection of appropriate technologies and procedures that optimize the utilization of renewable and high-performing resources (Ellen MacArthur Foundation, 2020; Van et al., 2022).

The second principle emphasizes the optimization of resource yields through the circulation of products, components, and materials in both technical and biological cycles (Ellen MacArthur Foundation, 2020; Seetharaman et al., 2022). This involves designing for remanufacturing, refurbishing, and recycling to ensure that technical components and materials remain in circulation within the economy, thereby preserving their embedded energy and other value (Melchor-Martínez et al., 2022; Gbolahan, 2023). The term also pertains to the promotion of the safe reintroduction of biological nutrients into the biosphere, thereby rendering them useful as feedstock for a subsequent cycle (Ellen MacArthur Foundation, 2020; Münster et al., 2022).

The third principle emphasizes the importance of enhancing system effectiveness by identifying and eliminating adverse externalities (Charef et al., 2022). This involves mitigating harm to human well-being, including but not limited to food, transportation, housing, education, health, and leisure. Additionally, it entails managing externalities such as land use, air, water, and noise pollution, as well as the release of hazardous substances and climate change (Gbolahan, 2023; Tan et al., 2022).

The Ellen MacArthur Foundation has established four distinct modes of value creation based on the aforementioned principles. The four cycling strategies under consideration are: smaller and faster cycling with reduced energy and resource consumption; extended cycling duration; cascaded utilization; and pure regenerative cycling (Ellen MacArthur Foundation, 2020; Seetharaman et al., 2022).

Results

Renewable energy sources include waste, but their potential remains largely unrealized (Wuni, 2022). The process of waste management encompasses five fundamental phases, namely generation, reduction, collection, recycling, and disposal (Münster et al., 2022; Awan and Sroufe, 2022). One of the primary goals of waste management is to optimize the five stages involved in the process in order to implement the most efficient and cost-effective practices that are in line with the socio-technological and environmental limitations that are imposed, Figure 2 (Blomsma et al., 2022; Feiferytė and Navickas, 2016).

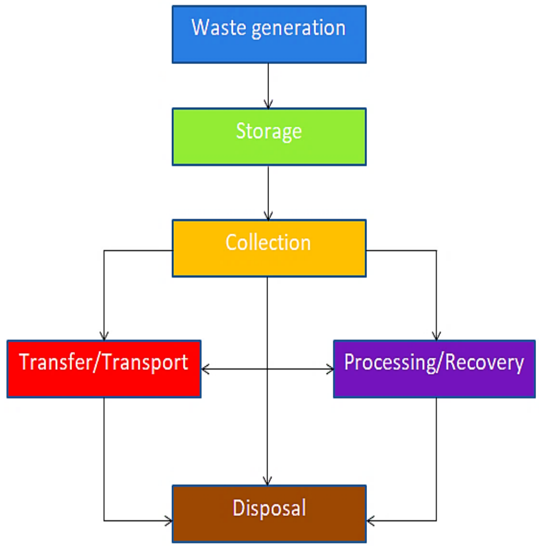

Fig. 2. Functional elements of Waste Management

The European Union witnessed a total waste production of 2,153 million tonnes in the year 2020, which encompassed all economic activities and households (Di et al., 2022, Eurostat, 2020). This translates to 4,813 kg per capita, Table 1.

According to data from 2020 in Figure 3, the construction sector made up 37.5% of the total contribution in the European Union, with mining and quarrying following at 23.4% (Hettiarachchi et al., 2022; Eurostat, 2020). Other sectors that contributed significantly included waste and water services at 10.8%, manufacturing at 10.7%, and households at 9.4%. The remaining 8.2% was attributed to waste generated from other economic activities, with services accounting for 4.4% and energy for 2.3%.

Table 1. Waste generation by economic activities and household, 2020 (% share of total waste)

	Manufacturing	Mining and quarrying	Energy	Waste/water	Construction and demolition	Households	Other economic activities
European Union	10.7	23.4	2.3	10.8	37.5	9.4	5.9
Belgium	20.9	0.0	1.5	31.4	30.5	7.8	7.9
Bulgaria	4.2	81.6	5.2	2.9	1.6	2.0	2.5
Czech Republic	12.1	0.3	1.1	15.5	42.9	15.9	12.2
Denmark	6.4	0.1	3.9	7.5	54.8	18.0	10.3
Germany	13.7	1.3	2.0	12.0	56.3	9.6	5.1
Estonia	24.6	15.2	36.0	4.6	9.8	3.4	7.4
Ireland	22.4	9.4	1.0	12.6	32.8	12.0	10.1
Greece	12.9	31.1	5.2	11.1	19.7	15.6	5.4
Spain	12.4	2.3	0.8	20.8	30.8	21.3	11.5
France	6.0	0.1	0.3	8.1	68.5	10.8	6.3
Croatia	7.5	11.6	1.1	16.3	23.8	20.2	19.5
Italy	15.2	0.8	0.9	24.6	37.9	16.6	4.1
Cyprus	9.5	6.9	0.1	6.5	50.2	17.0	9.8
Latvia	17.0	0.0	4.1	33.7	9.7	22.6	12.9
Lithuania	32.7	1.0	2.3	18.4	8.3	20.9	16.3
Luxembourg	6.5	1.1	0.3	3.5	82.1	2.2	4.2
Hungary	15.8	0.8	11.2	9.8	27.1	29.1	6.1
Malta	1.0	1.3	0.0	2.9	82.7	6.5	5.5
Netherlands	10.6	0.1	0.4	7.4	65.4	7.4	8.7
Austria	7.5	0.1	0.6	3.5	76.5	6.7	5.2
Poland	16.1	36.6	6.6	13.4	13.0	7.8	6.6
Portugal	17.8	0.1	1.3	22.9	10.7	31.8	15.4
Romania	4.6	84.3	3.1	2.0	0.9	3.0	22
Slovenia	17.9	0.1	12.1	3.8	6.3	8.4	51.4
Slovakia	24.0	1.6	5.5	8.9	9.0	18.5	32.5
Finland	8.2	75.1	0.8	1.0	11.8	2.1	1.0
Sweden	3.1	76.5	1.2	4.5	9.3	3.1	2.3

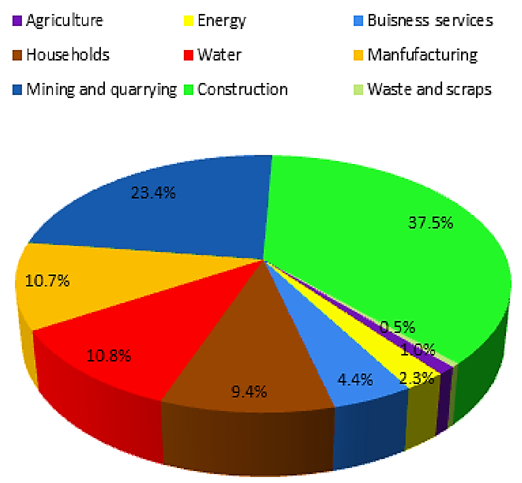

Fig. 3. Waste products generated by commercial and household activities

The waste generated from mining and quarrying, as well as construction and demolition activities, is largely categorized as major mineral waste (Eurostat, 2020). Figure 4 provides an analysis that differentiates major mineral waste from other types of waste. The major mineral waste constituted a significant proportion of the total waste generated in the European Union in 2020, accounting for approximately 64%, or 3.1 metric tons per inhabitant (Seetharaman et al., 2022; Eurostat, 2020). The distribution of primary mineral waste in the overall waste produced exhibited significant variation across member states of the European Union (Altamira-Algarra et al., 2022; Eurostat, 2020). This variation may be indicative, to some extent, of distinct economic frameworks. The European Union Member States with significant mining and quarrying activities, such as Finland, Sweden, and Bulgaria, as well as those with substantial construction and demolition activities, such as Luxembourg, generally had higher proportions of major mineral waste (Eurostat, 2020). In these countries, major mineral waste constituted between 84% and 89% of the total waste generated (Eurostat, 2020).

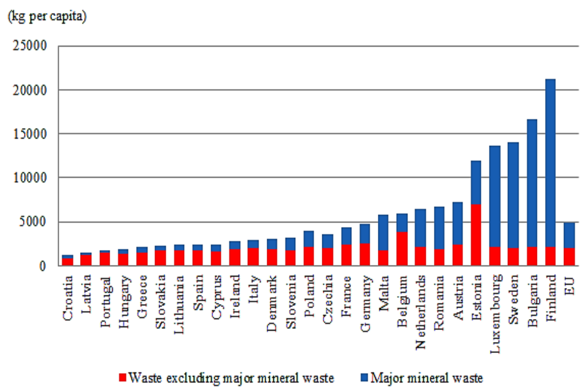

Fig. 4. Waste generated in the European Union States, 2020

The European Union processed approximately 1.971 billion metric tons of waste in 2020 (Eurostat, 2020). The aforementioned does not encompass waste that has been exported but rather pertains to the management of waste that has been imported into the European Union (Poponi et al., 2022). Consequently, the quantities that have been reported cannot be compared directly with those pertaining to waste generation (Ellen MacArthur Foundation, 2020).

The amount of waste that was recycled, utilized for backfilling, or incinerated with energy recovery witnessed a growth of 29.4% from 870 million metric tons in 2004 to 1,164 million metric tons in 2020, Figure 5. Consequently, the proportion of such waste recovery in overall waste treatment increased from 45.9% in 2004 to 59.1% in 2020 (Eurostat, 2020). The amount of waste that was disposed of experienced a reduction from 1,027 million metric tons in 2004 to 806 million metric tons in 2020, indicating a decrease of 21.3%. The proportion of waste disposal in the overall waste management process experienced a decline from 54.1% in 2004 to 40.9% in 2020 (Testa et al., 2022; Eurostat, 2020).

According to the aforementioned information, in the European Union during the year 2020, a majority of the waste (59.1%) underwent recovery operations, which included recycling (39.9% of the total treated waste), backfilling (12.7%), or energy recovery (6.5%) (Eurostat, 2020). The residual 40.9% was subjected to landfilling (32.2%), incineration without energy recovery (0.5%), or alternative disposal methods (8.2%) (Eurostat, 2020). Noticeable variations were evident among the European Union Member States with respect to their utilization of diverse treatment modalities. As exemplified, certain Member States have exhibited notably elevated rates of recycling (namely Italy, Belgium, Slovakia, and Latvia), while others have predominantly relied on landfills as a means of waste treatment (such as Romania, Bulgaria, Finland, Sweden, and Greece).

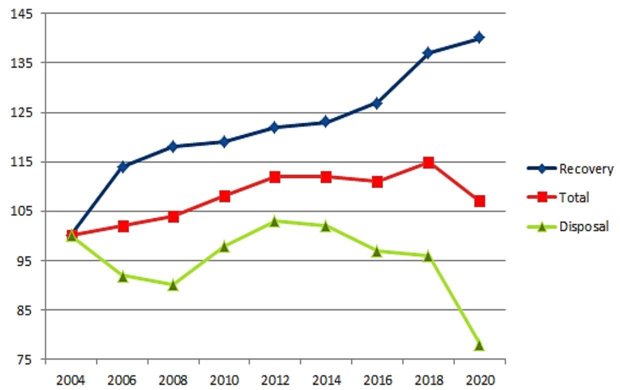

Fig. 5. Graphical illustration of waste treatment in the European Union, 2004-2020

Discussions

The European Union has been implementing active measures within the framework of the circular economy since 2014, with pertinent elements having been present in European Union regulations as far back as the 1970s

(Tan et al., 2022; Johansen et al., 2022). This includes guidelines pertaining to waste management, evaluation of the influence of certain public and private initiatives on the environment, repurposing of decommissioned automobiles and previously owned electrical and electronic devices, the Sixth Environment Action Program, the Thematic Strategy on the Sustainable Use of Natural Resources, and the Roadmap to a Resource Efficient Europe (Chioatto et al., 2022; Ellen MacArthur Foundation, 2020). The European Union Action Plan for the Circular Economy is regarded as the primary document for closing the loop and outlines proposed actions to be implemented in the European Union in the near future [20, 11]. The European Union has implemented several noteworthy documents pertaining to circular economy, such as Regulation (EU) 2018/848, Directive (EU) 2018/849, Directive (EU) 2018/850, Directive (EU) 2018/851, and Directive (EU) 2018/852. The European Commission has released a monitoring framework pertaining to the circular economy and has approved a document titled "A New Circular Economy Action Plan" (Blomsma et al., 2022; Florez et al., 2022).

The proposed theme is "Enhancing Europe's Competitiveness through Improved Cleanliness" (Hettiarachchi et al., 2022; Melchor-Martínez et al., 2022). The process of monitoring the implementation of circular economy goals and actions at all levels, namely micro, meso, and macro, is challenging due to the absence of a universally accepted set of indicators or a singular indicator, as well as the diverse range of indicators that may arise from varying interpretations of the concept of circular economy among stakeholders (Münster et al., 2022; Johansen et al., 2022). Several European Union member states have developed their own unique sets of indicators, resulting in challenges when attempting to compare the impact of circular economy-related initiatives across nations (Chioatto et al., 2022; Ellen MacArthur Foundation, 2020). The topic of selecting indicators for the purpose of conducting a comprehensive evaluation is a matter of ongoing discourse (Wuni, 2022; Blomsma et al., 2022). The primary focus lies on measuring the progress of the transition toward a circular economy and the effectiveness of implementing its objectives (Hettiarachchi et al., 2022). Additionally, there is a distinction made between circular economy assessment indicators and those used for linear economies (Khan et al., 2022; Awan and Sroufe, 2022). Another area of interest is establishing a benchmark for monitoring progress in implementing circular economy practices as well as evaluating the efficiency of measuring circular economy execution at the national, regional, or local level (Wuni, 2022).

The European Commission recognized the significance of having a dependable set of indicators to evaluate advancements toward a more circular economy and the efficacy of European Union and national-level actions (Florez et al., 2022). Consequently, the Commission initiated efforts to establish a monitoring framework for the circular economy, which was officially adopted in 2018 (Awan and Sroufe, 2022; Johansen et al., 2022). The proposal put forth by the European Commission pertains to the measurement of advancements made in the implementation of the circular economy within the European Union and its constituent member states (Eurostat, 2020; Melchor-Martínez et al., 2022). The framework comprises a collection of metrics that consider the fundamental components of the circular economy (Di et al., 2022). Its purpose is to evaluate the advancement of initiatives that strive for a transition to a circular economy throughout the entire life cycle of natural resources, products, and services, as well as in the domains of innovation and competitiveness (Chioatto et al., 2022).

The aforementioned indicators are categorized into four distinct areas of circular economy policy that pertain exclusively to manufacturing and consumption, waste management, secondary raw materials, competitiveness, and innovation, as well as priority areas that are incorporated in the European Union action plan for the circular economy (Awan and Sroufe, 2022; Charef et al., 2022). The majority of the metrics encompassed in the European Union monitoring framework center on waste, as per the European Economic and Social Committee's assertion that waste-related data is robust, coherent, and commensurable. Nevertheless, it is imperative that any forthcoming surveillance endeavors transcend the realm of waste management and recycling (Gbolahan, 2023; Böhmecke-Schwafert et al., 2022).

In accordance with the Circular Economy Action Plan, the European Green Deal, and the Annual Sustainable Growth Strategy 2020, the Commission intends to revise the framework for monitoring the circular economy and enhance the monitoring of national plans and measures that are designed to expedite the transition to a circular economy (Seetharaman et al., 2022; Johansen et al., 2022). The proposed circular economy indicators aim to consider the pre-existing target domains as well as the interconnections among circularity, climatic neutrality, and the objective of attaining zero emissions (Gbolahan, 2022; Khan et al., 2022). It is postulated that metrics pertaining to resource utilization, encompassing both consumption and material footprint, will be formulated (Hettiarachchi et al., 2022; Melchor-Martínez et al., 2022). It is postulated that the initiatives executed within the framework of "Horizon Europe" and the utilization of Copernicus data will have a positive impact on the enhancement of circularity metrics, which are currently not accounted for in official statistical records, across multiple domains (Sohal and De Vass, 2022; Tan et al., 2022).

The present report's examination of the circular economy initiatives within the European Union reveals that the circular economy's notion has undergone a transformation at the European Union level (Testa et al., 2022). The current discourse has shifted its emphasis from solely managing waste to encompassing a broader range of priorities situated higher up in the waste hierarchy, Figure 6. This includes prioritizing the reduction and reuse of products (Münster et al., 2022; Johansen et al., 2022). Thus far, the current approach fails to sufficiently acknowledge the significance of reducing resource consumption in absolute terms as a means to fully achieve the transition toward a circular economy in the European Union (Wuni, 2022; Jesus et al., 2022).

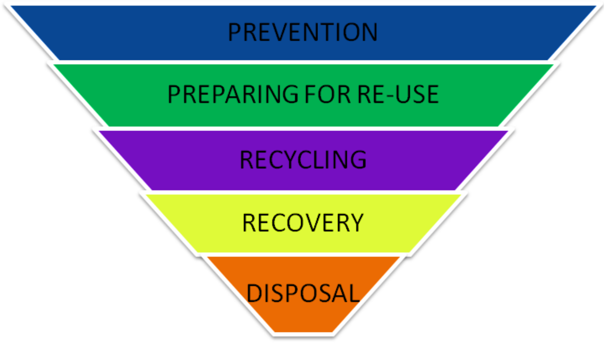

Fig. 6. Domestic solid management waste hierarchy

Conclusion

The adoption of a circular economy is an inevitable course of action due to the prevailing social and economic conditions of the European Union member states and the status of the natural environment (Jesus et al., 2022; Awan and Sroufe, 2022). Member states have been mandated to undertake the necessary procedures to transition their economies toward a circular model (Ellen MacArthur Foundation, 2020; Poponi et al., 2022). It is important to monitor the advancement of the transition toward the circular economy and the effectiveness of the implementation of circular economy objectives across different levels (macro, meso, and micro). Guidelines for developing indicators to assess the circular economy at different levels can be found in reports, strategies, and documents of international institutions, as well as in various scholarly publications. The objective of this paper is to analyze the European Union nations based on their progress toward achieving a circular economy.

This research paper analysis serves as an initial step toward future research in the field of the subject matter discussed in the article. This includes conducting a comprehensive examination of measures aimed at transitioning from a linear economy to a circular economy in European Union member states, as well as exploring the effects of such a transformation on economic growth, social and economic development within individual European Union countries.

References

Feiferytė, A., & Navickas, V. (2016). Use of a circular economy in entrepreneurial business. *Zeszyty Naukowe Politechniki Poznańskiej. Organizacja i Zarządzanie*.

Gbolahan, O. S (2022). Interaction between waste management and energy generation systems in terms of material properties and environmental impact in the European Union. *International Journal of Progressive Research in Engineering Management and Science*. https://doi.org/10.58257/ijprems30525

Di Vaio, A., Hasan, S., Palladino, R., & Hassan, R. (2022, January 7). The transition towards circular economy and waste within accounting and accountability models: a systematic literature review and conceptual framework. *Environment, Development and Sustainability*, *25*(1), 734–810. https://doi.org/10.1007/s10668-021-02078-5

Yamoah, F. A., Sivarajah, U., Mahroof, K., & Peña, I. G. (2022, February). Demystifying corporate inertia towards transition to circular economy: A management frame of reference. *International Journal of Production Economics*, *244*, 108388. https://doi.org/10.1016/j.ijpe.2021.108388

Sohal, A., & De Vass, T. (2022, March). Australian SME's experience in transitioning to circular economy. *Journal of Business Research*, *142*, 594–604. https://doi.org/10.1016/j.jbusres.2021.12.070

Münster, M., Sönnichsen, S., & Clement, J. (2022, August). Retail design in the transition to circular economy: A study of barriers and drivers. *Journal of Cleaner Production*, *362*, 132310. https://doi.org/10.1016/j.jclepro.2022.132310

Testa, F., Gusmerotti, N., Corsini, F., & Bartoletti, E. (2022, June). The role of consumer trade-offs in limiting the transition towards circular economy: The case of brand and plastic concern. *Resources, Conservation and Recycling*, *181*, 106262. https://doi.org/10.1016/j.resconrec.2022.106262

Meath, C., Karlovšek, J., Navarrete, C., Eales, M., & Hastings, P. (2022, May). Co-designing a multi-level platform for industry level transition to circular economy principles: A case study of the infrastructure CoLab. *Journal of Cleaner Production*, *347*, 131080. https://doi.org/10.1016/j.jclepro.2022.131080

Wuni, I. Y. (2022, September). Mapping the barriers to circular economy adoption in the construction industry: A systematic review, Pareto analysis, and mitigation strategy map. *Building and Environment*, *223*, 109453. https://doi.org/10.1016/j.buildenv.2022.109453

Jesus, G. M. K., & Jugend, D. (2021, June 28). How can open innovation contribute to circular economy adoption? Insights from a literature review. *European Journal of Innovation Management*, *26*(1), 65–98. https://doi.org/10.1108/ejim-01-2021-0022

Chioatto, E., & Sospiro, P. (2022, January 21). Transition from waste management to circular economy: the European Union roadmap. *Environment, Development and Sustainability*, *25*(1), 249–276. https://doi.org/10.1007/s10668-021-02050-3

Blomsma, F., Bauwens, T., Weissbrod, I., & Kirchherr, J. (2022, May 26). The 'need for speed': Towards circular disruption—What it is, how to make it happen and how to know it's happening. *Business Strategy and the Environment*, *32*(3), 1010–1031. https://doi.org/10.1002/bse.3106

Khan, S. A., Mubarik, M. S., & Paul, S. K. (2022, September). Analyzing cause and effect relationships among drivers and barriers to circular economy implementation in the context of an emerging economy. *Journal of Cleaner Production*, *364*, 132618. https://doi.org/10.1016/j.jclepro.2022.132618

Hettiarachchi, B. D., Brandenburg, M., & Seuring, S. (2022, April). Connecting additive manufacturing to circular economy implementation strategies: Links, contingencies and causal loops. *International Journal of Production Economics*, *246*, 108414. https://doi.org/10.1016/j.ijpe.2022.108414

Seetharaman, A., Shah, M., & Patwa, N. (2021, December 29). A Transition to a Circular Economic Environment. *International Journal of Circular Economy and Waste Management*, *2*(1), 1–13. https://doi.org/10.4018/ijcewm.288500

Tan, J., Tan, F. J., & Ramakrishna, S. (2022, February 3). Transitioning to a Circular Economy: A Systematic Review of Its Drivers and Barriers. *Sustainability*, *14*(3), 1757. https://doi.org/10.3390/su14031757

Charef, R., Lu, W., & Hall, D. (2022, September). The transition to the circular economy of the construction industry: Insights into sustainable approaches to improve the understanding. *Journal of Cleaner Production*, *364*, 132421. https://doi.org/10.1016/j.jclepro.2022.132421

Poponi, S., Arcese, G., Pacchera, F., & Martucci, O. (2022, January). Evaluating the transition to the circular economy in the agri-food sector: Selection of indicators. *Resources, Conservation and Recycling*, *176*, 105916. https://doi.org/10.1016/j.resconrec.2021.105916

Böhmecke-Schwafert, M., Wehinger, M., & Teigland, R. (2022, March 15). Blockchain for the circular economy: Theorizing blockchain's role in the transition to a circular economy through an empirical investigation. *Business Strategy and the Environment*, *31*(8), 3786–3801. https://doi.org/10.1002/bse.3032

Van Bruggen, A. R., Zonneveld, M., Zijp, M. C., & Posthuma, L. (2022, July). Solution-focused sustainability assessments for the transition to the circular economy: The case of plastics in the automotive industry. *Journal of Cleaner Production*, *358*, 131606. https://doi.org/10.1016/j.jclepro.2022.131606

Eurostat. (2020). *Statistics explained*. Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics

Awan, U., & Sroufe, R. (2022, January 30). Sustainability in the Circular Economy: Insights and Dynamics of Designing Circular Business Models. *Applied Sciences*, *12*(3), 1521. https://doi.org/10.3390/app12031521

Florez Ayala, D. H., Alberton, A., & Ersoy, A. (2022, August 9). Urban Living Labs: Pathways of Sustainability Transitions towards Innovative City Systems from a Circular Economy Perspective. *Sustainability*, *14*(16), 9831. https://doi.org/10.3390/su14169831

Giorgi, S., Lavagna, M., Wang, K., Osmani, M., Liu, G., & Campioli, A. (2022, February). Drivers and barriers towards circular economy in the building sector: Stakeholder interviews and analysis of five European countries policies and practices. *Journal of Cleaner Production*, *336*, 130395. https://doi.org/10.1016/j.jclepro.2022.130395

Melchor-Martínez, E. M., Macías-Garbett, R., Alvarado-Ramírez, L., Araújo, R. G., Sosa-Hernández, J. E., Ramírez-Gamboa, D., Parra-Arroyo, L., Alvarez, A. G., Monteverde, R. P. B., Cazares, K. A. S., Reyes-Mayer, A., Yáñez Lino, M., Iqbal, H. M. N., & Parra-Saldívar, R. (2022, March 17). Towards a Circular Economy of Plastics: An Evaluation of the Systematic Transition to a New Generation of Bioplastics. *Polymers*, *14*(6), 1203. https://doi.org/10.3390/polym14061203

Altamira-Algarra, B., Puigagut, J., Day, J. W., Mitsch, W. J., Vymazal, J., Hunter, R. G., & García, J. (2022, April). A review of technologies for closing the P loop in agriculture runoff: Contributing to the transition towards a circular economy. *Ecological Engineering*, *177*, 106571. https://doi.org/10.1016/j.ecoleng.2022.106571

Johansen, M. R., Christensen, T. B., Ramos, T. M., & Syberg, K. (2022, January). A review of the plastic value chain from a circular economy perspective. *Journal of Environmental Management*, *302*, 113975. https://doi.org/10.1016/j.jenvman.2021.113975

Gbolahan, O. S. (2023). An overview of Nigerian macroeconomic and Financial Development. *International Journal of Research Publication and Reviews*, *04*(02), 877–887. https://doi.org/10.55248/gengpi.2023.42009

Ellen MacArthur Foundation. (2020). The business opportunity of a circular economy. *An Introduction to Circular Economy*, 397–417. https://doi.org/10.1007/978-981-15-8510-4_20

Nguyen-Tien, V., Dai, Q., Harper, G. D., Anderson, P. A., & Elliott, R. J. (2022, September). Optimising the geospatial configuration of a future lithium ion battery recycling industry in the transition to electric vehicles and a circular economy. *Applied Energy*, *321*, 119230. https://doi.org/10.1016/j.apenergy.2022.119230

RECEIVED: 15 March 2023 **ACCEPTED: 08 June 2023** **PUBLISHED: 06 October 2023**

Samson Gbolahan Oyeranmi, Master's degree graduate of Management at Pitirim Sorokin Syktyvkar State University (Russia). Email: oyeranmitimi@gmail.com; Author of 4 publications (published articles on economics, food insecurity, health, waste and energy-generating system in the European Union). He participated in various scientific research activities; now he is a doctoral degree candidate at Kaunas University of Technology (Lithuania). Fields of scientific interest: economic growth, business digitalization, industrial competitiveness, foreign investments sharing economy, tourism economics.

Valentinas Navickas, Doctor of social sciences (economics), professor at Kaunas University of Technology (Lithuania). Email: valentinas.navickas@ktu.lt; Author of more than 400 scientific publications (including monographies published in Czech Republic in 2013 and Slovak Republic in 2016, 2018) and scientific articles. Prepared 8 doctors of social science; now he is the research adviser of 3 persons maintaining a doctor's thesis of social (economics) science. Fields of scientific interest: development economics, competitiveness, economic growth, sharing economy, tourism economics. ORCID ID: https://orcid.org/0000-0002-7210-4410