

A Review On Circular Economy As A Tool For Sustainable Development

Dr. Merensangla Longkumer*

¹* Assistant Professor, Department Of Rural Development & Planning,
School Of Social Science, Nagaland University E-Mail: merensangla@nagalanduniversity.ac.in
Ph.No: 9612678070

Abstract

The Circular economy (CE) is an economic model and a way to resource management that targets for the maximum use of resources and minimizing the production of wastes and environmental degradation. On contrary to the traditional linear economy which follows a ‘‘take-make-dispose’’ pattern, where resources are mined are used to manufacture different commodities and then finally disposed off as wastes. The main objective of the circular economy is to revive and renew the materials, while maintaining the quality of the commodities at every stage of the product’s life. This approach attempts to reduce the production of wastes and ultimately close the loop by enabling high value recycling processes. The incorporation of circular economy principles into wastes management signifies a crucial shift towards sustainable development, addressing the widespread challenges of increasing wastes generation and environmental destruction. The aim of this review paper is to explore the potential and limitations of the circular economy and is based on broad literature review. The concept of the circular economy should be viewed through the framework of Sustainable Development, recognizing the synergy between economic practices, social well-being and environmental conservation.

Key words: Circular economy, resources, linear economy, wastes management, sustainable development

How to cite this article: Longkumer M. A Review On Circular Economy As A Tool For Sustainable Development. Int J Drug Deliv Technol. 2026;16(8s): 799-803; DOI: 10.25258/ijddt.16.8s.90

INTRODUCTION

In today’s era, Sustainable development has become a core topic as it is identified as a basic development guideline in the 21st century. In order to successfully implement it, companies must understand the significance of this concept and suitably incorporate it into the basic business processes (Vicentijević, 2023). As a result, the concept of circular economy has been developed, which facilitates the sustainable and deliberate use of resources judiciously. In addition, it is based on the principles of sustainable development and is intended to swap the unsustainable linear economic model in all its components (Markovic, Radjenovic, 2020). The term circular economy appears to be formally used in an economic model for the first time by Pearce & Turner (1990). Based on the principle that ‘‘everything is an input to everything else’’, the authors critically examined at the traditional linear economic system and developed a new economic model, known as the circular economy, based on the principles of the first and second laws of thermodynamics (Rizos, *et al.*, 2017). According to Sauve, *et al* (2016), the circular economy prioritizes durable goods and move away from the traditional model of cheap production and fast disposal. It shifts the focus to products that can be repaired, dismantled, and recycled, effectively keeping materials in use longer and extending the product lifecycle. According to Preston (2012), the function of resources in the economy would be transformed through circular economy. The Wastes generated from the factories would become a significant input to another process – and products could be repaired, reused or upgraded instead of discarding off. Mitchell and Morgan (2015)

states that One route to improving resource efficiency is to develop what is known as a circular economy which involves keeping products and resources in use for as long as possible through recovery, reuse, repair, remanufacturing and recycling. ADEME (2014) stated that the goal of the circular economy is to minimize environmental footprints through resource efficiency and the promotion of social well-being. In 2017, Kirchherr, *et al.*, after examining 114 definitions of CE, defined CE as an economic system replacing the ‘end-of-life’ concept with restoration and focuses on 4Rs i.e. Reduce, Reuse, Recycling and Recovering materials in the process of production, distribution and consumption. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus fostering environmental quality, economic prosperity and social equity, for the benefit of the current and future generations. It is driven by novel business models and conscious consumers. Millar, *et al.*, (2018) pointed out that despite the individual prominence of the Circular Economy and Sustainable Development in the academic and wider literature, the exact relationship between the two concepts has neither been thoroughly defined nor explored (no change). Sustainable development is the key matter for leaders and policy makers in contemporary business. In order to accomplish sustainability in general, it is vital to move from a linear model of the economy to a circular one. This shift requires the change in business practices, which companies should implement in order to bring sustainability (Vicentijević, 2023). The circular

*Author for Correspondence: Merensangla@Nagalanduniversity.Ac.In

economy (CE) fosters a sustainable development approach by changing the way we use resources, where instead of the traditional economic model based on taking, using and discarding resources, the concept of recycling, reuse and long-term resource efficiency is introduced (Alka, *et al.*, 2024). According to Almeida-Guzmán, *et al.*, (2020), A sustainable development strategy should incorporate circular economy principles fostering a new economic paradigm that prioritizes resource preservation for future generations. The Ellen Mac Arthur foundation (2024) states that Circular economy is an economy that is restorative and regenerative by design and it is based on three principles - Eliminate waste and pollution, Circulate products and materials, Regenerate nature. According to Sasikala, *et al.*,(2023), The key principles of the Circular Economy include:

1. Design for sustainability: Products and services are designed with the intention of reducing environmental impact throughout their entire lifecycle.
2. Resource Efficiency: CE seeks to optimize the use of resources by promoting strategies like recycling, reusing and refurbishing.
3. Waste reduction: this can be achieved through improved product design, efficient production processes and effective waste management practices.
4. Regenerative practices: promotes the use of renewable resources and encourages practices that support the health and resilience of ecosystems.
5. Closed-loop systems: it envisions systems where resources are cycled back into the economy rather than being discarded.
6. Collaboration and Innovation: Circular economy fosters collaboration uniting stake holders, businesses, Governments and local communities to find innovative strategies for sustainable resource management (Krishanan,2023).
7. Consumer behavior and awareness: educating and engaging the consumers in adoption of the circular practices is an important aspect of Circular economy.

CIRCULAR ECONOMY PROCESSES

Rizos, *et al.*, (2017) has identified the core circular economy mechanisms and then mapped these processes to various sectors to demonstrate their projected impact. Eight processes has been identified that can be further classified into three different categories, namely i) using less primary resources, ii) maintaining the highest value of materials and products and iii) changing utilisation patterns.

MAIN CIRCULAR ECONOMY PROCESSES:

1. USE LESS PRIMARY RESOURCES:

- i. Recycling: recycling should not be understood only as mere recovery of materials but also as redirecting the recovered materials towards their next lifecycle. Recycling should not be confused with reuse as the latter does not require the reprocessing of materials into new products, materials or substances.
- ii. Efficient use of resources: enhanced resource efficiency is intrinsically linked to eco-design, a holistic approach that encompasses recycling, remanufacturing and life extension, alongside strategic material selection and dematerialization(Almeida,*et al.*, 2010)
- iii. Utilisation of renewable energy sources: the increasing use of renewable energy sources is a core requirement for the transition to a circular economy. Various renewable energy technologies exists to replace fossil fuels in the electricity, building and transport sectors.

2. MAINTAIN THE HIGHEST VALUE OF MATERIALS AND PRODUCTS

- i. Remanufacturing, refurbishment and re-use of products and components: In refurbishment and remanufacturing, the materials value is preserved by restoring a products core components to their original functional state. While 'refurbishment' and 'remanufacturing' are often used, remanufacturing involves a more extensive process to restore a product to 'as-new' condition, whereas refurbishment typically involves less thorough restoration of a product's value (Van Weelden *et al.*, 2016). Reuse of a product is direct re-usage and/or re-sale of either the whole product or a part of it (JRC, 2011b).
- ii. Product life extension: it refers to products and components that are designed with the objective of having a long-term durability and long life spans.

3. CHANGE UTILISATION PATTERNS

- i. Product as service: Product as service refers to the concept of offering the product as a service which challenges the traditional business approach of selling tangible products. It can be implemented via practices of leasing, renting, pay-per-use or performance-based business models.
- ii. Sharing models: facilitated by digital advancements, sharing models have moved beyond car-sharing and accommodation to include the collaborative use of industrial technology and infrastructure(Balanay & Halog, 2016),
- iii. Shift in consumption patterns: Technological advancements as well as improved information for consumers can result in a shift in demand patterns. For example, many consumers choose products or services that deliver utility virtually instead of materially. Examples include digital books, smart phones, music and online stores. These shifts may in turn lead to resource savings and productivity gains.

TABLE 1: APPLICATION IN DIFFERENT SECTORS AND EXPECTED EFFECTS

	CIRCULAR PROCESS	EXAMPLES OF SECTORS WHERE CIRCULAR PROCESSES CAN BE APPLIED
--	------------------	---

USE OF LESS PRIMARY RESOURCES	Recycling	Automobile industry, Textile industry, Building sector, Packaging sector, Critical Raw materials, Forest sector, Chemical industry
	Efficient use of resources	Building sector, Plastics industry, Mining and metals industry, Food sector
	Utilisation of renewable energy sources	Chemical industry, Food industry, Forest sector
MAINTAIN THE HIGHEST VALUE OF MATERIALS AND PRODUCTS	Remanufacturing, refurbishment, and reuse of products and components	Automobile industry, Manufacture of computer, electronic and optical products, Building sector, Furniture sector, Transport
	Product life extension	Manufacture of computer, electronic and optical products, Automobile industry, Household appliances, Building sec
CHANGE UTILISATION PATTERNS	Product as service	Household appliances, Transport, Building sector, Printing industry
	Sharing models	Automobile industry, Transport, Accommodation, Clothing
	Shift in consumption patterns	Food sector, Publishing sector, E-commerce sector

POTENTIALS OF CIRCULAR ECONOMY

As per Mishra and Ali (2024), Integration of circular economy with the waste management industry places a strong focus on maximizing the value of products, materials and resources throughout their entire lifespan. A key advantage of the circular economy is its ability to reduce waste and pollution by keeping materials and products in use for extended periods. By using resources more efficiently, businesses can lower costs and enhance profitability. The circular economy stands out among 21st century management models as the most effective framework for meeting the rigorous demands of Sustainable development (Skawinska and Zalewski, 2018). According to Ruokamo *et al.*, (2023), increasing the cascading use of wood, improving material efficiency, and optimizing the use and reuse of materials and products as well as extending the lifetime of buildings and optimizing space use have great potential for mitigating the pressures on biodiversity in Finland and abroad. These inner-cycle CE actions are typically able to reduce the environmental impact of production activities and the extraction of raw materials across industries and production chains. Sustainable waste management within the framework of a circular economy is both an environmental necessity and an economic opportunity. By rethinking waste as a resource and designing systems that promote reuse, recycling, and material recovery, society can significantly mitigate the detrimental impacts of waste generation while fostering innovation and driving economic growth (Kotyal, 2023). United nations (2015) implies that Advances in recycling tech are unlocking new ways to recover valuable materials from previously non-recyclable waste. Innovations like chemical recycling can break down complex plastics, enabling them to be reused in new products and closing the material loop. Kotyal (2023) states that the Home Appliance Recycling Law in Japan mandates that manufacturers take back and recycle old appliances, effectively closing the loop on electronic waste. Furthermore, Japan promotes community based

recycling initiatives, where local governments work with residents to enhance recycling rates and reduce waste generation. This multi-faceted approach has made Japan a leader in effective waste management practices. Beyond by Esade (2025) Traditionally, IKEA's business model focused on producing and selling affordable furniture, following a linear cycle where products were discarded at the end of their lifecycle. However, in its commitment to the circular economy, the company has implemented several strategies: it has launched furniture rental services and buyback programs where customers can return used furniture to be refurbished or recycled. This way, IKEA extends the lifecycle of its products, reduces waste generation, and minimizes the need for new resources.

LIMITATIONS

According to Murray, *et al.*, (2017), current conceptualizations of the circular economy frequently overlook critical social dimensions such as Gender, racial, financial equality as well as intra-generational equity. Millar, *et al.*, (2019), states that numerous contradictions and knowledge gaps exist regarding how the Circular Economy can improve social equity, promote economic growth and permanently reduce the rate of extraction of raw materials by closing material loops. This has led to the possibility of the Circular Economy, being undifferentiated from the linear economy in the sense that it could ultimately produce similar outcomes. In spite of the increasing interest, the formal alignment of Circular Economy (CE) with Sustainable Development (SD) largely remains undefined. Many CE concepts prioritize resource efficiency—such as waste reduction and material reintegration—while neglecting the social dimension, which creates significant barriers to achieving holistic sustainability. (Suárez-Eiroa, *et al.*, 2018). Sauve, *et al.*, (2015) points out that One of the obstacles that the circular economy faces is that manufacturing a durable, long-lasting product is typically more expensive than producing a short-lived, disposable

alternative products. The relationship between society and the environment is governed by the Second Law of Thermodynamics, or the law of entropy. This law states that energy conversions are never 100% efficient and that energy consumption is irreversible. Because energy is inevitably lost or degraded during use, material recovery and recycling become increasingly resource-intensive. As the recycling rate approaches 100%, the energy required increases nonlinearly due to rising entropy, making total material recovery physically impossible (EASAC, 2015). Recovering material flows is a tool for sustainability, not a guarantee of it. A truly circular economy must address underlying consumption patterns and social justice to avoid merely shifting environmental burdens elsewhere (Shivarov, 2020). Deksne (2024) points out that while the CE is seen as a potentially more environmentally sustainable economic model, concerns about rebound effects, technological limitations, and uncertainties regarding the extension of product lifetimes underscore the complexity of implementing it as a superior alternative to the current linear model.

CONCLUSION

Circular economy must be fully integrated with sustainable development. This necessitates a profound reconsideration of circular economy, broadening its scope from closed-loop recycling and short-term economic gains, towards a transformed economy that organises access to resources to maintain or enhance social well-being and environmental quality (Velenturf, Purnell, 2021). The concept of the CE should address inquiries such as whether it is possible for individuals to genuinely replenish natural capital, especially critical natural capital, while promoting high quality of life and well-being. Determining the size of our resource economy without depleting natural capital and the planet's absorptive capacity, as well as evaluating the resource intensity of a service-based economy, are also essential questions to be considered. The Circular Economy should prioritize a balance of environmental, social, and economic values, positioning the economy as a means to reorganize society and restore the environment rather than an end in itself (Velenturf, Purnell, 2021). The current concept and application of the CE does not fully cover all aspects of sustainability, as it may focus mainly on resource efficiency or wastes reduction but may not sufficiently consider social issues. The concept of the CE should be viewed through the framework of SD, recognizing the synergy between economic practices, social well-being and environmental conservation. This synergy would further enhance the holistic approach to achieving lasting global sustainability goals by addressing resource efficiency, social equity and environmental stewardship within a unified framework.

BIBLIOGRAPHY

1. Alka TA, Raman R and Suresh M. Research trends in innovation ecosystem and circular

- economy. *Discover Sustainability*. 2024;5(323). Doi: <https://doi.org/10.1007/s43621-024-00535-5>.
2. Almeida CMVB, Rodrigues AJM, Bonilla SH and Giannetti BF. Energy as a tool for Ecodesign: evaluating materials selection for beverage packages in Brazil. *Journal of Cleaner Production*. 2010;18:32-43.
3. ADEME (French Environment and Energy Management Agency). *Economie Circulaire: Notions*. Version modifiée octobre 2014.
4. BalanayR and HalogA. Charting Policy Directions for Mining's Sustainability with Circular Economy. *Recycling*. 2016;1(2):219-230.
5. Beyond by ESADE. Benefits of the Circular Economy for Businesses. <https://www.esade.edu/beyond/en/benefits-of-the-circular-economy-for-businesses/>. 2025.
6. Deksne J. Circular Economy as a tool for sustainable Development: A Theoretical Perspective. Creative Commons Attribution 4.0 International License 1.2025:102-110. Doi: <https://doi.org/10.17770>.
7. EASAC.. Circular economy: a commentary from the perspectives of the natural and social sciences. Halle. https://easac.eu/fileadmin/Reports/Easac_15_CE_web_corrected.pdf. 2015.
8. European Commission. Closing the loop - An EU action plan for the Circular Economy. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2015) 614 final.
9. JRC. Supporting Environmentally Sound Decisions for Waste Management - A technical guide to Life Cycle Thinking (LCT) and Life Cycle Assessment (LCA) for waste experts and LCA practitioners. JRC Scientific and Technical Reports (<https://tinyurl.com/zwen5p2>). 2011b
10. JRC. Scoping the Sharing Economy: Origins, Definitions, Impact and Regulatory Issues. (https://ec.europa.eu/jrc/sites/jrcsh/files/JRC1003_69.pdf). 2016b.
11. Kirchherr J, Reike D and Hekkert M. Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, conservation and recycling*. 2017; 127:221-232. Doi: <https://doi.org/10.1016/j.resconrec.2017.09.005>.
12. Krishanan Mohanan M, Dhinakaran Paul D and Rajalakshmi M. Consumer purchase Behaviour Towards Patanjali Products in Chennai. *Infokara Research*. 2023; 12(3): 21-27. Doi: 10.1093/ajae/aaq55.
13. Kotyal K. Sustainable waste management in the circular economy: challenges and opportunities. *Environmental Reports*. 2023; 5(2):1-5. Doi: <https://doi.org/10.51470/ER.2023.5.2.01>.
14. Korhonen J, Honkasalo A and Seppälä J. Circular economy: the concept and its limitations. *Ecological economics*. 2018; 143: 37-46. Doi: <https://doi.org/10.1016/j.ecolecon.2017.06.041>.

15. Millar N, McLaughlin E and Borger T. The circular economy: Swings and roundabouts?. *Ecological Economics*. 2019; 158:11-19. Doi.org/10.1016/j.ecolecon.
16. Murray AK, Skene and Haynes K. The Circular Economy: An interdisciplinary exploration of the concept and its application in a global context. *Journal of Business Ethics*. 2017; 140(3): 369-380.
17. Morgan J and Mitchell P. Employment and the circular economy Job creation in a more resource efficient Britain. Green Alliance (<https://tinyurl.com/gmrnosb>).2015
18. Markovic MKB and Radjenovic T. Circular economy and sustainable development. *Economics of sustainable development*;2020 4(2):1-9.Doi: 10.5937/ESD2001001M.
19. Mishra M and Ali CS. A new path to Sustainability: Leveraging Circular Economy for waste management in India. *Chartered Secretary*;2024:111-118.
20. Skawińska E and Zalewski RI. (2018).Circular economy as a management model in the paradigm of sustainable development. *Management*. 2018; 22 (2):217-233. Doi.org/10.2478/manment-2018-0034.
21. Pearce DW and Turner RK.Economics of Natural Resources and the Environment, Hemel Hempstead: Harvester Wheatsheaf.1990
22. Preston F. "A Global Redesign? Shaping the Circular Economy", Briefing Paper, London: Chatham House.2012
23. Ruokamo E, Savolainen H, Seppala J., Sironen S, Raisanen M and Auvinen AP. (2023). Exploring the potential of circular economy to mitigate pressures on biodiversity. *Global Environmental Change* .2023; 78. Doi: <https://doi.org/10.1016/j.gloenvcha.2022.102625>.
24. Rizos VA, Behrens W, Van der Gaast, Hofman E, Ioannou A, Kafyeke T, Flamos A, Rinaldi R, Papadelis S, Hirschnitz-Garbers M and Topi C. Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers. *Sustainability*. 2016; 8 (11).
25. The Ellen MacArthur Foundation. The circular economy in detail. <https://www.ellenmacarthurfoundation.org/the-circular-economy-in-detail-deep-dive>. 2024.
26. Sauvé S, Bernard S and Sloan P. Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. *Environmental development*. 2015; 17: 48-56. Doi.org/10.1016/j.envdev.2015.09.002.
27. Suárez-Eiroa B, Fernández EG, Méndez-Martínez and Soto-Oñate D.Operational principles of circular economy for sustainable development: Linking theory and practice. *Journal of Cleaner Production*. 2018; 214: 952-961. Doi: 10.1016/j.jclepro.2018.12.271.
28. Sauvé S, Bernard S and Sloan P. Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. *Environmental Development*. 2016; 17: 48-56.
29. Shivarov A. Circular Economy: Limitations of the Concept and Application Challenges. *Economic sciences series*.2020; 9(3):144-152.
30. Sasikala B, Dhinakaran Paul D, Vijai C, Kokila V, Buvaneswari R. and Lakshmi Raja M. Circular Economy and Sustainable Development: A Review and Research Agenda. *European Economic Letters*. 2023;13(4): 558-569. Doi: <https://doi.org/10.36997/IJUSV-ESS/2020.9.3.144>.
31. United Nations. Transforming our world:The 2030 agenda for sustainable development.<https://sdgs.un.org/2030agenda>. 2015
32. Van Weelden E, Mugge R and Bakker C. Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market. *Journal of Cleaner Production*. 2016; 113: 743-754.
33. Vićentijević K. Sustainability and circular economy. International Scientific Conference Media and Economy, Banja Luka. 2023.Doi: 10.7251/BLCZR0623287V.
34. Velenturf Anne PM and Purnell P. Principles for a sustainable circular economy. *Sustainable Production and Consumption*. 2021; 27: 1437-1457. Doi: <https://doi.org/10.1016/j.spc.2021.02.018>