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ASSESSING THE CRITICAL ISSUES & CHALLENGES IN ADOPTION OF CIRCULAR ECONOMY TRANSITION IN DEVELOPING ECONOMIES

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Abstract:
The circular economy is one of the most important means of achieving the Sustainable Development Goals. A circular economy is an economic system that aims to get the maximum value or output while producing products with the least amount of waste. Many countries are developing circular economy policies and strategies to promote new business models and encourage innovation. India has been also focusing on various innovative strategies and policies such as Make in India, Smart Cities, and Swachh Bharat Abhiyan to promote economic growth with greater sustainability. The present study attempts to identify and study various critical issues and challenges faced by different sectors in the adoption of the circular economy in India. A detailed literature review has been conducted for the purpose of this study. The findings reveals that technology backwardness and low innovation, lack of quality in the circular product, lack of awareness and knowledge among consumers, suppliers and producers, lack of economic benefits, high investment cost and huge shortage of skilled manpower are some of the key challenges impacting the adoption of Circular Economy (CE) in country like India. The circular economy not only provides economic and environmental benefits but also helps companies reduce dependence on scarce resources and achieve sustainability. The findings and suggestions will help all the stakeholders, like managers, companies, and governments, to find more functional ways or methods for adoption of the circular economy (CE).

Keywords: Circular economy, Issues & Challenges, Sustainability, Circular economy Adoption.

Introduction:

CE (Circular Economy) is one concept that has been gaining greater attention from all the stakeholders, such as individuals, industries, government, and academia, over the years (Abdelmeguid et al., 2022). CE (Circular Economy) is basically an idea that encourages the linear principles of take, make, and waste to be converted to circular flows or processes, that involve use, re-use, recycling, arrangement, assemblage, and circulation (Halog & Anieke, 2021). It places an emphasis on minimizing waste and improving resource consumption while keeping in mind various economic, environmental, and social implications. It seems to be an effective approach to achieving the SDGs (sustainable development goals) by reducing waste and protecting the environment while carrying out all economic activities wisely (Halog & Anieke, 2021). The principle of circular economy proposed by Potting et al., (2017, p. 5) focuses on the 9 R's: refuse, rethink, reduce, reuse, repair, remanufacture, repurpose, recycle, and recover, providing an opportunity to encourage more sustainable production and consumption (Trevisan & Liu, 2022). The ever-increasing population of India has increased the demand for many natural resources such as energy, water, raw materials, and land and thus placed pressure on the environment (Govindan & Hasanagic, 2018). The conventional linear economy model is based on the concept of take-make-use-destroy and creates challenges to the sustainability in terms of the impact on society, such as human capital, environment and other scarce natural resources (Rathi et al., 2022).

The linear pattern of production is not sustainable in the long run for the environment and businesses. The current linear model must be replaced with a circular one that not only saves money but also provides higher sustainability by minimising its adverse effects on the environment (Lewandowski, 2016). Under a linear economy model, it is highly challenging to achieve economic growth targets, environmental goals, and socioeconomic development (Rajeev Rathi). Most of the previous articles were in the context of developing countries like China, Indonesia, Vietnam, Bangladesh etc. shown in the Table no.1 and in particular for India (Table 2), literature is focused on automobile, plastic waste, SMEs. Textile and clothing, manufacturing etc**.** (Nudurupati et al., 2022,Sharma et.al., Lobo et.al., 2022, Singhal et.al., 2022, Mathivathanan et.al., 2022**)**. The main aim of this research is to critically examine the major issues and challenges in the adoption of a circular economy in India. In particular, the research questions are as follows:

RQ1. To understand the concept of the Circular economy and investigate various issues and challenges in the circular economy adoption in developing economies.
RQ2: To critically examine the current practices, issues and challenges in the Circular economy transition in India across the various sectors.

The rest of the paper is organised as follows. Section 2 provides a critical review of the existing literature on circular economy from a developing countries and an Indian perspective. Section 3 provides the research methodology, which is basically descriptive analysis, collected mostly from secondary sources. Section 4 discusses the issues and challenges associated with implementing circular economy in many developing economies. Section 5 provides a description

of current practices, prospects, and challenges in the adoption of the circular economy in India. Section 6 deals with discussion and recommendations, and the last section of the paper shows the conclusion and future implications.

Circular Economy:

The idea of Circular economy was first proposed in China in the year 1998 and is basically a concept that encourages the conversion of a linear approach to production to circular processes that consist of use, re-use, recycling, repair, assemblage, and circulation (Halog & Anieke, 2021). In emerging economies like India with a huge population, the depletion of natural resources like energy, fuel, and electricity is a serious concern. As a result, the circular economy principle must be promoted in order to protect the society, business and the environment.

Presently, the majority of businesses in India follow the "Take, make, and dispose" method, in which raw materials are transformed into finished goods and sold to final customers and thus resulting in dispose or waste (Patwa, Sivarajah, Maiti, et al., 2021). The stability of our future is being threatened by this linear economy model of mass production and consumption (Esposito et al., 2018). As a result, it is unsustainable, and transitions to a circular economy now become necessary. Reuse, repair, recycling, sustainable supply, and responsible consumption are all aspects of the circular economy (Esposito et al., 2018). Presently, we are consuming resources 50 per cent faster rate than can be replaced. According to OECD 2021 studies, the circular economy has the potential to cut the use of new materials by 53 percent by 2050 and by 32 percent over the next 15 years. Despite numerous policies, initiatives, and measures, the adoption of the CE (Circular economy) model is still in its infancy stage in many industries, but it is crucial for achieving resource efficiency, cost savings, competitive advantage and to achieve sustainable outcomes (Nudurupati et al., 2022). It is widely known that CE (Circular economy) may promote economic growth by giving firms new employment possibilities, saving money on the cost of raw materials, lowering prices and enhancing supply security, all while reducing environmental pressures and its negative effects impacts (Patwa, Sivarajah, Seetharaman, et al., 2021).

. Redesign or remanufacturing is the main stage in transitioning from a linear economy to a circular economy, The CE (Circular economy model) offers a competitive advantage to satisfy consumer expectations and give value. (Rathi et al., 2022). The circular economy emerged as an alternative model to the linear system. The Circular Economy (CE) distinguishes itself from the Linear Economy by focusing on reusing and replacing resources rather than consuming them. The principle of Circular economy is about decoupling economic activities based on the intake of limited resources and eliminating waste out of the system (Lake & Author, 2021). Companies must rethink and adapt their business models and the methods they provide value to their clients for Circular economy transformation, while keeping in mind various environmental and social factors at the same time (Suchek et al., 2021). We can say, CE (Circular economy) involves

systemic changes that build long-term resilience and generate economic and business opportunities while returning social and environmental benefits.

Review of recent literature: (2015 to 2022)

The circular economy (CE) has been in the focus for the past decade, but it became the centre of attention in the last couple of years. Most businesses still operate based on the linear model principle of "take, make, and dispose," in which they use the raw material, transform it into a finished product, and finally sell it in the market to the end consumer (Patwa, Sivarajah, Seetharaman, et al., 2021). According to (Esposito et al. (2018), the linear economy model of mass production and consumption will result in instability and unsustainability in the future. Many developed and developing economies are concerned about the rapid consumption of natural resources and their rapid depletion. The constantly rising world population has tremendously increased demand for many products that have adverse economic and social impacts (Halog & Anieke, 2021). By the year 20230, India will have a USD 10 trillion economy, half of which can be achieved through the implementation of CE (circular economy). A new circular economy model seems to be a win-win situation in terms of sustainability costs and corporate social responsibility toward the environment (Rathi et.al., 2022). It is very important to understand the link between the adoption of Industry 4.0 practices and concept of Circular model and how the technology support all stakeholders such as customers, suppliers and producers in all the phases of circular life cycle (Rosa et al., 2020). One of the fastest-growing solid wastes in the world is plastic garbage. Over time, laws relating to plastic waste have changed in India, and numerous laws have occasionally been implemented to safeguard the environment from the damaging impacts of plastic garbage (Hossain et al., 2022). Despite several attempts, legislation, and international strategic collaborations by the Indian government, the adoption of the circular economy (CE) in Indian SMEs (small and medium enterprises) is still in its infancy (Nudurupati, Sai Sudhakar). To achieve sustainability in the current environment of degrading and unbalanced water supplies, it is necessary to create solid economic models for effective management of urban water resources (Kakwani & Kalbar, 2020). The 2030 Sustainable Development Goals set by the United Nations seek to reduce food waste by half. To reduce food waste, circular economy practises should be incorporated into the food supply chain (Ardra & Barua, 2022). Large numbers of small and marginal farmers work in India's agriculture, which faces a number of sustainability concerns related to water consumption, soil quality, food access, and farmers' income. Utilizing agricultural leftovers as a raw material to create new textile products is highly advantageous in the emerging circular economy (Härri et al., 2020). Supply networks for manufacturing businesses have expanded globally over time. Products made in developing countries are exported to industrialised countries for mass consumption.. The unsustainable pattern of resource consumption and waste production, Indian government should develop a national strategy for efficient alignment of rising number and diverse skillset of people in the circular manufacturing ecosystem (Mangla et al., 2018). There are many significant barriers in terms of finance, government regulation and lack of HR skills in Circular economy transition (S. Saha et al., 2021, Hossain et

al., 2022). The lack of infrastructure, reprocessing difficulty, lack of technology, consumer behaviour and business process skills are some the significant challenges in adoption of circular economy on many developing countries and in India (Kandasamy et al., 2022, Patwa, Sivarajah, Seetharaman, et al., 2021, Nudurupati, SS 2022).

Research Methodology:

A systematic search was conducted on databases such as Web of Science (WOS), for access to quality publications. Relevant papers from the last few years, i.e., from 2015 to 2022, are being selected and combined to come up with meaningful insights on issues and challenges in the chosen subject or area.

An extensive search was conducted based on the 'topic' cell present in the databases for document types 'article' or 'review published' in the last eight years. In order to find relevant papers, the search terms "Circular Economy" AND "Challenges" OR "Barriers" were used. To ensure greater reliability, only journal publications and review articles were considered. Papers that were pertinent to the subject were found in the initial search with the help of selected keywords. Second level of searching was done after few filtrations in terms of types of publications, number of years, language and type of journals. Paper was reviewed on the basis of the abstract, conclusion, and discussion. In this round, relevant papers related to the topic were selected. After reading, we found a good number of papers on challenges or barriers to the adoption of the CE (Circular economy) mostly from developing and developed economies like China, UAE, Bangladesh, Vietnam, and the US, etc. Although we find some papers specifically on barriers or challenges to the adoption of the circular economy from India's perspective. Titles, abstracts and conclusion were examined to identify relevant works based on selected keywords and few filtration criteria's. Finally, we read the full text of the selected publications and excluded those without any specific barriers or challenges to the transition to CE.

Issues & Challenges in transition towards Circular Economy: Developing economies perspective

This paper provides a review of the previous studies to build comprehensive knowledge about the main challenges to the transition to CE. Table No. 2 shows various challenges in CE transition, as well as a description and paper supported by various authors.

Table 2. Issues & Challenges in transition towards Circular Economy in Developing Economies

S.No	Challenges/Barriers	Description	Reference/s
1	Lack of efficacy of recovery, remanufacture, recycling	The transition of CE requires policies and strategies in term of recovery and recycling of waste	(Morseletto, 2020), (Kazancoglu et al., 2020)

	and reuse or materials or products	in order to increase efficiency and to maximise economic value of products or materials	
2	Technological, Financial, Infrastructural, Institutional and Societal barriers	Block chain smart contract technology plays an important role in overcoming CE challenges. Lack of technical skills and financial resources possess barriers to SMEs in India.	(N. M. Kumar, 2022), (Rizos et al., n.d.), (Goyal et al., 2021), (Kazancoglu et al., 2020)
3	Quality concerns, no guidelines to remanufacturing, lack of government support	Remanufacturing of product is an important component of CE. There is lack of government support and no clear cut guidelines to remanufacture goods in India	(Sharma et al., 2014), (Goyal et al., 2021), (Gedam et al., 2021),(Kazancoglu et al., 2020)
4	Barriers of cultural, business finance, regulatory and government, technological, managerial and supply chain management	Seven categories of barriers or challenges identified related to implementation of CE in food supply chain industry mainly in low and medium income group Countries.	(Ada et al., 2021), (N. M. Kumar, 2022), (Goyal et al., 2021), (Kazancoglu et al., 2020)
5	Government, finance and management related barriers	Out of 26 barriers, these three namely government, finance and management related barriers for adoption in sustainable production and consumption	(Goyal et al., 2021), (N. M. Kumar, 2022), (Morseletto, 2020), (Roy et al., 2022),(Gedam et al., 2021)
6	Lack of CE awareness, recyclability issues, financial problem and weak management vision, lack of skilled employees, lack of experience of SMEs	CE helps in achieving sustainability. Strong management will, training to employees, technology up-gradation plays key role in effective implementation of CE.	(N. Kumar et al., 2021), (Roy et al., 2022)
7	Lack of skilled workforce, shortage of funds, ineffective legislation and controls related challenges	The paper will provide some idea and solution to the policymakers and government of the developing countries for CE model in different sectors	(P. Kumar et al., 2021), (N. M. Kumar, 2022), (Roy et al., 2022)

8	Lack of incentives & appropriate policies, product complexity, financial, legal and economic barriers	There are significant barriers in the implementation in redesigning traditional linear chains to Circular supply chain mainly in terms of policies, product complexity	(Roy et al., 2022), (Rizos et al., n.d.), (Kazancoglu et al., 2020)
9	Lack of clear governance measures	Challenges of lack of government measures or governance in the mining industry in India	(Gedam et al., 2021),(P. Kumar et al., 2021)
10	Reprocessing difficulty, lack of transportation and infrastructure	Challenges of medical waste management mainly covered issues of transportation, infrastructure and reprocessing difficulties	(Kandasamy et al., 2022)
11	Lack of uniformity, standardisation, technical know-how, product design	Difficulty in product redesign, recycling and lack of standardisation are some of the major barriers in implementation of Circular supply chain in textile companies	(Kazancoglu et al., 2020)

(Source: Author compiled data from various previous studies)

Interpretation: It is inferred from Table No. 2 that the shift from a linear to a circular economy based on operations is not an easy task for most organisations or businesses. Lack of technology, lack of finance, and lack of appropriate governance measures were identified as the major challenges in many businesses in adoption of the CE (Circular Economy) principles. In addition to this, difficulties in product redesign, reprocessing, recycling, and the lack of skilled and experienced human resources were also found to be critical issues in the implementation of the CE (Circular economy) in most of the developing economies, including India.

Current Practices, Prospects and Issues in adoption of CE (Circular economy): An Indian Perspective

Circular economy adoption in India is still in its early stages. However, there is a growing shift from a linear to a circular economy as society, businesses, and government become more aware of its positive impact on ecology and ecosystems for the future. The below Table No. 3 shows the current practices, prospects, and issues in the transition towards CE (Circular economy) in India, along with mentioning the industry and related findings of the paper.

Table 3. Current Practices, Prospects and Issues in Adoption of Circular Economy in India

Author/s	Industry	Prospects & Current practices	Issues/Problems	Findings
(Sharma et al., 2014)	Manufacturing	Remanufacturing lead to profitable business, offer competitive price and improve quality of product at lower input cost There are many factors or drivers to promote remanufacturing of products in India like economic, social and environmental	Quality concern and no guideline related to remanufacturing identified as major barriers in CE transition	The feasibility of reuse or remanufacture of goods highly depends on comparative cost benefit over the new products. Experts viewed that there is considerable scope for growth in remanufacturing in India
(Kazancoglu et al., 2020)	Textile	Textile companies need all supply chain stakeholders to be circular in order to deliver a circular product. Transition of textile industry will reduce the use of resources and provides companies with more sustainable model.	Lack of technical knowledge, lack of skilled labour and standardisation in product design is the most influencing factor or barriers for textile companies	There are several barriers but lack of collecting, sorting and recycling revealed as the most important challenge among all other factors.
(Rizos et al., n.d.)	Small and Medium sized enterprises	Financial attractiveness, personal knowledge, government support and company favourable culture act as enablers to ease the transition of a CE model.	Company culture, lack of capital, lack of government support and technology and inadequate customer awareness found as some of the barriers in adoption of CE principles in SMEs.	Green consumer preferences, market value chains and supportive company culture support the SMEs circular business models. SMEs need to understand consumer's attitude and behaviour to

				ensure effective implementation of CE.
(Reddy, 2015)	E-waste	The problem of environmental and ecological imbalances can be dealt easily with the growing awareness of e-waste disposable behaviour and companies will inclined more towards remanufacturing of e-waste such as electronic wastes, automotive wastes etc.	Quality concern, lack of incentives, unskilled workers and lack of consumer awareness and ignorance were some of the major factors or challenges in implementation of CE in remanufacturing of e-waste.	Environmental pollution generated in India due to due to e-waste. The results show that government incentive, green awareness, management vision, and return intention are the most influencing drivers for the remanufacturing of e-waste in India.
(Ardra & Barua, 2022)	Food supply chain	There are enablers like Industry 4.0, innovative technology that can accelerate the transition to CE in system of circular food supply chain	There are seven barriers mainly related to finance, technology, government and SCM etc.	Block chain technology and big data analytics plays a crucial role to support CE by improving laws, policies and promoting innovative technologies
(Kazançoğ lu et al., 2021)	Health care sector	Cloud computing was found as the most important solution of big data to overcome the barriers to CE in healthcare industry.	Insufficient infrastructure for managing residual waste, many organisational related challenges like lack of organisational readiness, lack of CE initiatives etc.	Findings of the study will help to support sustainable development initiatives in the healthcare sector.

(Kandasamy, J)	Medical waste	The Indian government should frame favourable policies of CE implementation to alleviate the identified challenges faced by the medical industry.	Lack of transport, lack of infrastructure and reprocessing difficulty identified as main challenges in adopting the CE in medical waste.	The present study helps many organisations in addressing the issues during the implementation of CE in healthcare industry. The concept of CE provides solution and leading to a better economic efficiency.
(K. Saha & Papagiannaki, 2021)	Textile & clothing	CE in TC industry will increase profitability, market image, business growth and more sustainability. Environmental value based supply chain will promote the use of regenerative ad biodegradable raw materials.	Lack of finance, human resource, technology and management reluctant is the major challenges for CE implementation	There is a need for collaborative efforts, knowledge sharing and proper marketing of waste recycling for the successful implementation of CE.
(Agrawal, 2020)	Automobile sector	Adoption of CE concepts into the sector leads to the minimisation of industrial waste and landfills, thereby enabling sus-tainable development	Challenges related to cultural, technological, market, finance and regulatory mechanism of the CE transition in automobile sector	Lacking ability to deliver high quality remanufactured products is the most critical problem in transition to CE in automobile sector

(S. Kumar et al., 2021)	Agriculture supply chain	There is lot of scope and adoption of Industry 4.0 is very crucial in implementation of CE principle in agri supply chain	Lack of government support and incentives, lack of policies and standardisation are some significant challenges to implementation of CE in agriculture supply chain.	With increase in pace of digitalisation, agri-organisation started adopting new technologies for more customer-centric and sustainable supply chain
(Gedam et al., 2021)	Mining	Support of government is very important for mining industry to achieve sustainable performance	Lack of clear government measures , high cost of investment, Lack of consumer interest and demand were identified as some of the main challenges in transition to CE faced by many developing economies	Mining industry plays a crucial role in global, social and economic development.
(Kakwani & Kalbar, 2020)	Urban water sector	Incorporating 6Rs strategies such as reduce, reuse, recycle, reclaim, recover, restore in urban water sector can accelerate the transition towards CE.	Some of the main challenges are social, economic, technical and governance related	Increasing urbanization and imbalance in water resources had shifted focus towards CE in water sector. Water resource management by all the stakeholders.
(Hossain et al., 2022)	Plastic waste management	Proper comprehensive solutions and material management and consumer acceptability of recycled product is important for sustainable CE	Complex process of recycling, expensive conversion process and difficulty in segregation, lack of financial support, transportation related challenges in management of huge plastic waste.	Due to unpreceded growth in consumerism across India, plastic waste management has become a critical issue in India like any other country in the world.

(Source: Authors compiled data from various studies)

Interpretation: The above Table No. 3 presents the current practices, prospects, issues, and findings of different papers related to challenges and circular economy practises adopted in Indian companies such as manufacturing, textiles, mining, plastic waste, e-waste, the urban water sector, automobiles, agriculture supply chains, manufacturing, health care, and small and medium enterprises. Lacks of infrastructure, finance, technology, and government support are some of the major common issues or problems being faced across all sectors of companies in India. Technology plays a key role in the effective implementation of the (Circular economy) which ensures the sustainability of any country in the long run.

Discussion and Recommendations:

In the previous section, we discussed the concept of the circular economy, its role and significance in emerging economies. In the literature review section, the contributions and studies of different authors have been presented in the field of circular economy across different sectors and countries. The major challenges in transitioning towards CE (Circular economy) in many developing countries, including India, have been covered, which shows that lack of technological know-how, shortage of funds, unavailability of skilled manpower, unclear government measures, and lack of incentives are some of the critical issues and challenges in the adoption of CE (Circular economy). The paper also covered the current practices, prospects, and challenges in transitioning towards CE (Circular economy) in context of India in different industry like automobile, Healthcare, Mining, Agriculture supply chain and Textile and clothing etc. CE (Circular economy) is still a new concept and very few companies in India started working in this direction. Several policy recommendations and implications for implementing CE (Circular economy) in the context of India are provided. The circular economy enhances the flow of products and waste generated by integrating the practises of reuse, recycling, and remanufacturing into their supply chains (Ellen MacArthur Foundation 2014). The principle of Circular economy leads to savings and has a potential to create plenty of employment opportunities (Mangla et.al. 2022). The block chain and smart contract technology help in dealing with circular economy related challenges in an efficient manner (N. M. Kumar, 2022). The government policies should give more focus on greening consumer preferences and company culture to implement CE in SMEs successfully (Rizos et al., n.d.). There is a need for a proper government mechanism to provide an environment for remanufacturing of goods (Singhal et al., 2020). Remanufacturing is one of the key strategies that may lead to sustainability in the production and consumption of electronic products, called as e-waste (Singhal et al., 2019). Together, all the stakeholders, such as the government, customers, and the manufacturer have to create awareness and an appropriate plan of action for the successful implementation of producing goods in an environment of circularity (Sharma et al., 2014).

Conclusion and Future Implications:

Rapid economic growth has helped India become one of the most important emerging developing economies, pushed by increasing per capita income of the population, providing employment and

other business opportunities (Yuan et al., 2008). The circular economy model is based on the approach of developing an economy by adopting a system that protects against the depletion of natural resources, energy, and fuel.

The shift from a linear to a circular economy based operations is not an easy task for most organization or businesses. Most of the business in India operates on the principle of "Take, make and dispose model", wherein the raw material transform into some finished product and sell in the market to the end consumer and thus resulting in waste (Patwa, Sivarajah, Maiti, et al., 2021). The stability of our future is being threatened by this linear economy model of mass production and consumption (Esposito et al., 2018). As a result, it is unsustainable, and a transition to a circular economy is necessary. Reuse, repair, recycling, sustainable supply, and responsible consumption are all aspects of the circular economy (Esposito et al., 2018). Presently, we are consuming resources 50 per cent faster rate than can be replaced. It is evident from many previous studies; that the circular economy has the ability to cut down on the consumption of new materials by 32% during the next 15 years and by 53% by the year 2050. 100 million tonnes of garbage might be eliminated globally in the next five years just by moving toward a circular economy. To transition to a circular economy, companies must rethink and innovate their business models and also engage in more sustainable practices (Suchek et al., 2021) to generate economic and business opportunities that build long-term resilience.

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