Scope of Circular Economy in the Health Sector of India

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Abstract

Since Industrialization, most of the economies around the world were following a linear manufacturing paradigm. In this mode of production, resources are extracted and processed into products which are later replaced by new versions. But, this mode of production faced a backlash in the 21st century, where advancements are made in all fields of life. The economic advancement and industrialization gifted the issue of resource depletion. Today, we are having the earth's resources at an unsustainable rate. This unsustainable system is the result of the linear economy that we were defending upon since the past. Thus, there is a need to shift from a linear economy to a circular economy for achieving the United Nations Sustainable Development Goals. In a circular economy, raw materials are utilised for production as well as wastes are recovered by the processes of recycling and reusing, thus reducing extraction of resources. Waste generation and management is a huge issue faced in India. The shift to a circular economy will give India an annual benefit of $624 billion by 2050 along with additional advantages such as conservation of environment, development of the economy, more job opportunities and decreased resource depletion. The adoption of a circular economy will have a positive impact on several sectors of India and the health sector is one among them. The amount of garbage produced per bed every day varies from 0.5 to 2.0 kilograms. In India, an estimated 0.33 million tonnes of trash are produced each year. Bandages, linen, and other infectious trash make up 30–35% of the solid hospital waste, followed by plastics (7–10%), disposable syringes (0–3%), glass (3-5%), and other general wastes (40–45%), including food. The adoption of two crucial circular economy opportunities namely, the use of performance models and recycling and waste reduction could result in significant potential savings, according to a case study on Danish hospitals.

The study intends to find the scope of the circular economy in the health sector of India. The study will help the policy makers on the same by giving an international perspective on the subject. This will help in implementing the pre- planned and new initiatives required for the shift towards a circular economy as well as in achieving Sustainable Development Goals.

Introduction

The economies around the world are following a Linear Production Paradigm which involves extraction of resources, using them and throwing them as garbage. Circular Economy is an emerging economic trend. Here, the production process is circular in nature, that is the end product will nit be a garbage, but a useful

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one. In a circular economy, steps are initiated to implement the three Rs- Reduce, Reuse and Recycle. This emerging trend is useful for both the economy as well as the environment as the resources can be protected and resource extraction costs can also be reduced at the same time. The Health Sector is one of those sectors which generates a major proportion of the waste and adoption of a circular economy will really help the sector in reducing the waste generation as well. Also, the adoption of Circular Economy in a developing country with growing benefits has its own advantages as well.

Literature Review

Ştefan Gabriel BURCEA (2015) conducted a study on the economic, environmental and social implication of informal waste collection and recycling. The paper examined the informal waste recycling practices used by individuals or businesses engaged in the recovery of recyclable materials from produced garbage and assessed the views and ramifications of the informal waste industry from three angles: economic, social, and environmental. Although informal garbage collection and recycling may not appear to be effective or practical at first glance, the social, economic, and environmental benefits that result from waste valorization opportunities are unquestionably greater in the informal waste sector than in the formal waste sector. The paper also discussed about the current challenges of informal waste activities and determinants of the occurrence and extension of informal activities in waste management as

Hillary Brown (2018) conducted a study titled Towards a Circular Energy Economy: Cross-Sector Successes in Brazil and India. In the article, the effectiveness of renewable energy produced by collaborative, cross-sector activities that also produce economic and social advantages is demonstrated by three exemplary situations, one in India and two in Brazil. The first, methane recovery in Belo Horizonte, Brazil, shows how an otherwise wasted energy source may be used in a closed-loop fashion in a community that is quickly urbanising. In the second instance, Omnigrid Micropower Company used the electricity demand from the telecommunications sector to promote the cost-effective building of small- to mid-size solar power plants in order to provide inexpensive electricity for some of India's poorest rural residents. Last but not least, Itaipu Binacional, the world's greatest producer of renewable energy, developed a rural waste-to-energy programme that electrified 2,200 homes to solve the contamination of its reservoir from agricultural waste. These innovative, cyclical ways to power production go beyond traditional, mono-sectoral methods of energy delivery to address the problem of energy poverty. They have promoted job development and allowed for economic expansion while reducing carbon emissions as integrated, multi-functional systems.

Lewis Akenji and Magnus Bengtsson (2019) conducted a study on Circular Economy and Plastics. The study intends to introduce the circular economy idea as a critique of the dominant production and consumption model that is now in use, which is characterised by high material input and a sharply rising demand for natural resources. It acknowledges the numerous advantages that plastic materials have for human society while also drawing attention to the grave problems. It is also brought about by the pervasive and quickly expanding use of plastics. The section examines plastics from the perspective of the circular economy and provides a framework for tackling related sustainability issues. It makes the argument that moving toward a circular economy will necessitate coordinated policy interventions at all points in the life-cycle of plastics, including resource extraction and use, product design and manufacturing, trade and retail, use, recycling, and final disposal when necessary. The ability to develop and implement public policies that are more integrated and coherent is essential to approach plastics from a life-cycle perspective. The study also presents the circular economy as an emerging approach to sustainable resource management and sustainability issues related to plastics.

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Stefan Landsberger conducted a study titled The Circular Economy in China. According to the Chinese perspective, the three concepts of reduce, reuse, and recycle form the foundation of the circular economy concept. Over the past 40 years or more, China has experienced fast growth and industrialization, which has resulted in increasing environmental pollution, raising worries about rising waste and depleting resources. By disentangling economic growth from the depletion of natural resources and environmental deterioration, the circular economy seeks to address these environmental issues and achieve ecological and economic balance. In 1998, academics raised the circular economy concept for the first time. Although the circular economy as a strategy was formally embraced as a policy beginning in 2002, it required some time to develop the specific operational procedures. The Chinese government established a number of pilot projects to investigate how to implement the circular economy strategy. These projects were inspired by environmental regulatory regimes based on concepts of cleaner production, industrial ecology, and ecological modernization that were already in place in Germany (i.e., The Waste Avoidance and Management Act, 2002), Japan (i.e., The Basic Law for Establishing a Sound Material-cycle Society, 2002), and other countries. The Circular Economy Promotion Law, also known as the Recycling Economy Promotion Law, was adopted following these tests in 2009. But, the new laws, regulations and policies enacted were not complete and clear enough, which affected the result of circular economy.

Lewis Akenji and Magnus Bengtsson (2019) prepared a report titled Towards a Circular Economy for Plastics in ASEAN 1. The study has identified some of the significant gaps in resolving concerns related to plastics based on the existing state of countries in the Association of South East Asian Nations (ASEAN) area. The weaknesses found fell into four broad categories that are shared by the entire region: markets and money, policy and governance, information and knowledge, and technical competence. The four different types of gaps are discussed in the article, which is followed by a list of actions that are related to them. Some of these actions can be taken at the national level, and others can be a part of larger regional cooperation among ASEAN Member States. It is significant to remember that the stated measures constitute a range of answers that combine short-term and long-term remedies, not always easily applicable policy recommendations.

Lewis Akenji and Magnus Bengtsson (2019) prepared a report titled Towards a Circular Economy for Plastics in ASEAN 2. The article highlights the fact that activities could be streamlined and made more affordable by concentrating on problems and gaps in addressing plastics-related issues that are shared by most or all ASEAN Member States. They might also contribute to addressing problems that are essentially global, like trade. Initiatives at the regional level can also help the ASEAN community grow. The chapter outlines five regional initiatives for ASEAN that could complement and strengthen national actions. The initiatives include:

- ASEAN regional guidelines on circularity in plastics use
- ASEAN-wide network for research and innovation on plastics
- ASEAN technical standards for plastic products and recycled plastics
- ASEAN regional approach to phasing out harmful additives in plastics
- ASEAN framework agreement on plastic pollution.

A new ASEAN Working Group on the Circular Economy or Sustainable Consumption and Production is now being discussed, according to the report. A group like this would act as a strategic hub for the execution of upcoming projects. The suggestions offered here are meant to spark conversation and should be viewed as a contribution to ongoing dialogues amongst the ASEAN Member States as well as with the EU and other partners, it was also said.

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Ankur Chauhan (2020) conducted a study onFramework for Sustainable Healthcare Waste Management in India. According to the article, the healthcare industry has seen tremendous change in recent years, which has helped people worldwide by reducing mortality rates, curing epidemics, and improving patient care. With this advancement in patient care, there has been a significant increase in the production of dangerous, infectious, and poisonous waste. If the entire system of healthcare waste disposal had been structured in a flexible scenario, the management and disposal of this enormous waste could have been done in an appropriate manner. The study reviewed the past literature on the Composition of Healthcare Waste, the studies conducted to explore Best Practices in Healthcare Waste Management and on Disposal of Healthcare Waste. The author also proposed a Multi-criteria Decision Support Framework for Healthcare Waste Management.

Vikas Thakur, A Ramesh (2015) conducted Healthcare waste management research: A structured analysis and review (2005-2014). The article conducted a comprehensive analysis of the fragmented knowledge regarding hospital waste management and disposal, taking the years between January 2005 and July 2014 into account. The aim of the study was to determine the trends in the literature on healthcare waste management with regard to the journals that were published, the major areas of research in healthcare waste management, the methodologies used in healthcare waste management research, the regions that received the most attention from researchers, and the potential scope of future healthcare waste management research. After using both quantitative and qualitative methods of analysis, the findings will demonstrate the significance of healthcare waste management in healthcare operations, provide a comparative analysis of the various publications, and provide light on potential future research fields.

Sonal Narang, Dimpal Vij (2021) prepared The COVID-19 Pandemic: An analytical study on opportunities for circular economy practices in India's healthcare sector. The research emphasises the linear economy's weaknesses and how the pandemic crisis presents opportunities for change to integrate sustainable development and circular business strategies into India's healthcare industry. The paper offers governmental and market-driven proposals for the healthcare sector's adoption of the circular economy sustainability.

The World Health Organization released a report on Circular Economy and Health: Opportunities and Risks. It was mentioned in the article that the idea of a circular economy provides a path to long-term development, excellent health, and respectable employment while protecting the environment and its natural resources. The Sustainable Development Goals (SDGs), particularly SDG 12 on responsible consumption and production, are predicted to be considerably aided by the transition from a linear economy (take, make, discard) to a circular economy (renew, remake, share). The coverage of the health effects of a shift to a circular economy, however, has been somewhat scant thus far. Therefore, the report's goal is to address this shortcoming and create the framework for future policy development, frame the shift within a health perspective, the evaluation of research requirements and involvement of key stakeholders in health consequences. It demonstrates how the move to a circular economy offers a significant chance to produce significant health benefits, including direct advantages for health care systems and indirect advantages from lowering adverse environmental effects. However, in processes involving hazardous materials, for instance, circular economy strategies and particularly national, regional, and local implementation plans need to be identified and address these risks. There are also risks of adverse and unintended health effects.

Objective

1. To find the scope of the circular economy in the health sector of India.
2. To suggest policy and recommendations to the authority concerned.

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Research Methodology

The study is based upon secondary data. Several analytical and descriptive techniques have been used to analyse the current waste management system in India as well as the merits of adopting a circular economy in the country. Several research papers, articles and different reports published by the World Health Organization (WHO) as well as the Central Pollution Control Board (CPCB) have been referred for the same.

Scope of the circular Economy in India

In the conventional healthcare economy, we extract environmental resources, manufacture the equipment, employ them in hospitals, and then discard them. Then, for a brighter future, it is preferable to go from the "Extract-Innovate- Discard" method to "Take-Use-Recycle" the medical waste.The linear economy model is being pursued for a number of reasons:

- The idea that discarding used equipment reduces the risk of infection.
- Recycling process is challenging since it necessitates collection, transportation, cleaning, testing, and occasionally disinfecting equipment before recycling.
- The cost of reuse exceeds the cost of the equipment.

But the linear model is not sustainable due to the current economic pressures on healthcare since it is just too expensive and inefficient. Several studies comparing single-use disposables versus reusable equipment have also shown that single-use disposables usually cost less. Numerous studies that contrasted single-use versus reusable equipment found that single-use disposables often resulted in increased petrochemical use and worldwide greenhouse gas emissions over the course of their lifetimes. In fact, studies on cost-effectiveness also show that even while the expenses of purchasing single-use equipment are typically lower. However, the cost of equipment with multiple uses is distributed equally, highlighting the fact that it has a significantly lower lifetime cost due to reusables and making it appear less expensive than equipment with single-use disposables.

Table 1: Total number of Treatment Equipment in various Sates and Union Territories of India

States and Union Territories	Total Number of Treatment Equipment
Andaman & Nicobar	NIL
Andhra Pradesh	36
Arunachal Pradesh	NIL
Assam	7
Bihar	12
Chandigarh	6
Chattisgarh	13
Daman and Diu	NIL
Delhi	13

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Goa	NIL
Gujarat	77
Haryana	34
Himachal Pradesh	8
Jharkhand	3
Jammu & Kashmir	15
Karnataka	105
Kerala	13
Ladakh	NIL
Lakshadweep	NIL
Madhya Pradesh	50
Maharashtra	75
Manipur	3
Meghalaya	1
Mizoram	NIL
Nagaland	NIL
Orissa	22
Puducherry	3
Punjab	27
Rajasthan	28
Sikkim	NIL
Tamil Nadu	40
Telangana	40
Tripura	NIL
Uttarakhand	7
Uttar Pradesh	56

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West Bengal	22

Source: Data from Central Pollution Control Board (CPCB)

The various treatment equipment are incinerator, autoclave, shredder and deep burial. An incinerator is a furnace for burning waste. An autoclave is a machine that uses steam under pressure to kill harmful bacteria, viruses, fungi, and spores on items that are placed inside a pressure vessel. The shredders are useful machines for the volume reduction of bulky waste such as reams of paper, paper materials, bumpers, tires, refrigerators and the shredding of different materials such as scrap iron, aluminium, copper, plastic as well as municipal solid waste and industrial waste. In a deep burial, a pit or trench should be dug about 2 metres deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil. It is evident from the table that there are no Common Bio- medical Waste Treatment and Disposal Facilities in Andaman & Nicobar Islands, Arunachal Pradesh, Daman & Diu and Dadra & Nagar Haveli, Goa, Ladakh, Lakshadweep, Mizoram, Nagaland, Sikkim and Tripura. Also, Karnataka holds the largest number of treatment equipment, say, 105Nos. Kerala has only 13 treatment equipment which is higher in comparison with Meghalaya (1), Manipur and Puducherry (3), Assam and Uttarakhand (7), Chandigarh (6) and Himachal Pradesh (8).

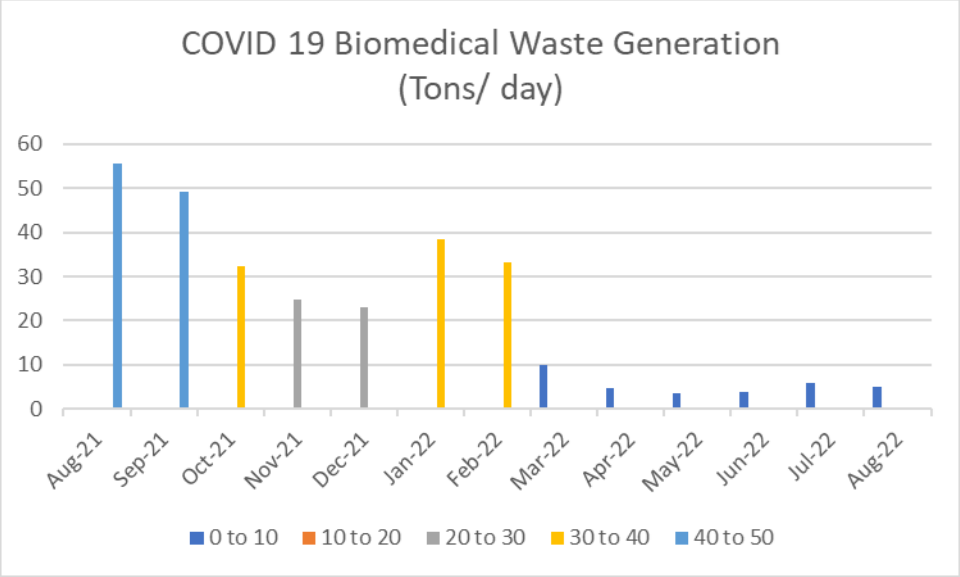

Figure 1: COVID 19 Biomedical Waste Generation from August 2021- August 2022

Source: Data from Central Pollution Control Board (CPCB)

The pandemic affected the health sector in several dimensions. One of them is the increase in the biomedical waste generated. The given figure illustrates the data of COVID- 19 biomedical waste generated from August 2021 to August 2022, measured in tons per day. It is evident in the figure that the amount of waste generated declined with passage of time. It was 55.56 tons per day during August 2021, which declined continuously up to 23.02 tons per day in December 2021. Then, it rose markedly to 38.41 tons per day in January 2022. However, a significant reduction was observed afterwards. By August 2022, the amount of waste generated accounted to 5.08 tons per day compared to that of 55.56 tons per day in August 2021.

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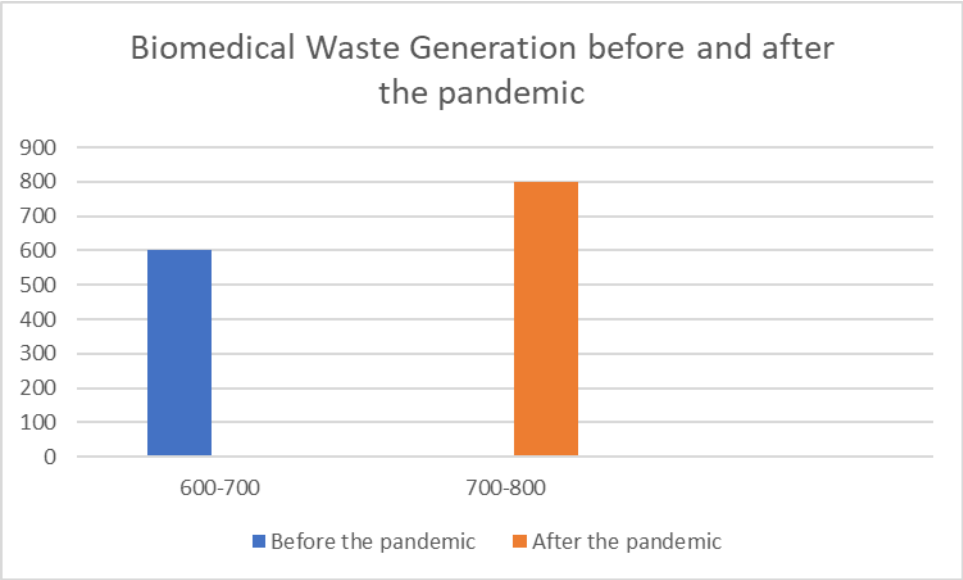

Figure 2: Comparison of Biomedical Waste Generated Before and After the Pandemic in India
Source: Data from Central Pollution Control Board (CPCB)

The above figure compares the amount of waste generated before and after the pandemic in tonnes. By compiling the data from the Central Pollution Control Board, it was found that approximately 600 tonnes of biomedical waste were generated before the pandemic, which increased to 800 tonnes post pandemic. An additional quantity of 200 tonnes of waste was generated during the times of the pandemic. The data from Figure 1 stands as a proof for the same.

It is indeed vital to discuss the international perspective on the topic. The adoption of two crucial circular economy opportunities could result in significant potential savings, according to a case study on Danish hospitals. Using performance models in procurement is the first which entails contracts in which the consumer pays for the usage of a product rather than the product itself (for example, via leasing). Since ownership may involve up-front investment costs, risks (repair, maintenance or obsolescence), and end-of-use treatment expenses, performance models can minimize purchasing and maintenance costs while maximising performance, which helps to lower total costs. The provider may simultaneously maximise resource use, drive efficiency, and secure sustainable revenue sources. Additionally, this model can provide producers with incentives to create goods that are simpler to maintain, repair, refurbish, or remanufacture. Magnetic resonance imaging (MRI) scanners, radiation treatment equipment, laboratory instruments, and (semi)durable goods like scalpels and surgical attire are just a few of the products that can be purchased in performance models. According to the report, hospitals in Denmark may save between €10 and €15 million by 2020 and between €70 and €90 million by 2035 by using performance models in procurement.

Thus, it is evident from the rest of the world that, circular sector has greater scope in today's time, especially in the health sector of India. Also, it is evident from table 1 that India has the necessary number of equipment required for adopting a circular economy. It is estimated that India will have an annual benefit of $624 billion by 2040, if the circular economy is adopted. Hence there is a huge scope for the term circular economy in its full fledged form.

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Policy and recommendations to the authority concerned

As the waste generated in the health sector are biomedical waste, they possess a safety hindrance in reusing. Thus, the next method that can be adopted is Recycling. Through recycling, the biomedical waste generated can be transformed into an innovative one. This method is more approachable and acceptable. It is good if the government takes steps to implement recycling as a mandatory process in the health sector. The government could take and offer necessary steps and support to enhance the research and development activities for better sterilization and recycling as well as develop innovative activities with regard to sustainable product design. It is also important to ensure the durability of the recycled product. This process of recycling will also reduce the extraction of new resources up to a certain extent.

Conclusion

Thus, from the study it is clear that the adoption of a circular economy in the health sector of India has its own scope and it is important for the government to adopt necessary steps for the implementation of the same as well. India has a strong advantage of having the necessary resources for development, proper implementation along with it can reap huge benefits. Recycling the biomedical waste will reduce the garbage as well as reduce the resource extraction for a new product at the same time, benefitting both the economy and environment at the same time.

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What is Circular Economy and why is it important for India?

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