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A Study on the Intersection of the Circular Economy and Supply Chain Management with Special Reference to Sustainable Business Practices in Bihar

• **Soofia Fatima** • **Sakshi Palak** • **Naincy Singh**
• **Yashita Shree**

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Corresponding Author : Soofia Fatima

Abstract: *The circular economy and supply chain management have gained increasing importance due to rising concerns over resource use, waste generation, and environmental sustainability. This paper is based on a research study conducted to examine how circular economy principles are understood and applied within business supply chains in Bihar. The primary objective of the study is to assess the level of awareness among business owners and to analyse the extent to which circular and sustainable practices are integrated into daily business operations. The study is based on primary data collected through structured questionnaires, field visits, and direct interactions with various business units. The findings reveal that while many businesses are familiar with general sustainability concepts, systematic adoption of circular economy practices remains limited. Most circular activities observed were informal in nature rather than strategically planned. The paper concludes that Bihar is at an early stage of adopting circular economy based sustainable supply chain practices and requires stronger awareness initiatives, improved infrastructure, and supportive policy measures to promote sustainable business development.*

Keywords: *Circular Economy, Supply Chain Management, Sustainable Business Practices, Waste Management, Bihar*

Soofia Fatima
Head, Department of Commerce
Patna Women's College (Autonomous),
Bailey Road, Patna–800 001, Bihar, India
E-mail: soofia.bcom@patnawomenscollege.in

Sakshi Palak
B.Com. III year, Session: 2023-2027,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Naincy Singh
B.Com. III year, Session: 2023-2027,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Yashita Shree
B.Com. III year, Session: 2023-2027,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Introduction:

The current global economic model is facing serious challenges arising out of high demands on resources, environmental conservation concerns, and large quantities of wasted materials. The conventional linear economic model of production, use, and wastage of materials does not seem to be effective in addressing sustainability concerns in the current resource-scarce environment. The need to address these challenges has given birth to the new concept of the Circular Economy, which suggests that resources be used in smarter ways to increase material circulation and lower wastage. At the same time, supply chain management is passing through a significant change to address sustainability concerns. The conventional supply chain function in businesses all over the world is slowly shifting from cost and speed to efficiency and sustainability. Sustainable

Supply Chain Management is aimed at putting considerations of the Circular Economy into practice.

In India, though there has been an increase in discussions on sustainability, adoption of circular and sustainable mechanisms varies significantly. Bihar, with a backdrop of a strong base of agricultural, MSME, food processing, textiles, and informal sectors, presents a great potential, though there is limited evidence of real-world implementations. This study aims to bridge this gap by examining how businesses in Bihar perceive, apply, and struggle with circular economy and sustainable supply chain practices.

Literature Review:

According to Bisaria, C. et al., (2023) "The linear model of production is no longer effective for sustainability from a long-term point of view. The relevance of circular practices such as reusing, repairing, recyclability, and remanufacturing. The role of reverse logistics, ESG-based assessment of suppliers, and technology have also been discussed. However, this article has discussed that circular supply chains are affected by increased costs, lack of skills among people, multiple suppliers, and deficiencies from a standardization point of view. The relevance of increased institutional support and alignment with policies has been discussed. Although this article is not specific to Bihar state, it is a relevant framework for assessing the efficiency of circular supply chains in underdeveloped regions.

According to Swarup, S. et al., (2024), on the case of the solid waste management system in Patna, "There are key factors contributing to the complexities, which include insufficient funds, infrastructural limitations, and the effective implementation of policies within the system. With regard to the study, it may be noted that the key challenges apply to all of Bihar, thereby emphasizing the importance of circular and sustainable supply chain management."

As per the report on the SDG India Index 2023-24 by NITI Aayog, India has shown steady progress towards the achievement of the SDGs. Yet, as the report suggests, "There are large variations among the states too. Bihar is one of the lowest-performing states, especially on dimensions such as clean energy, decent work opportunities, sustainable cities, and a responsible lifestyle. While the progress of India towards these global & indigenous sustainability parameters is laudable, the low position of Bihar indicates underlying concerns regarding the governance & infrastructures of the state."

Export-Import Bank of India Working Paper (2025) "Transitioning to Circular Economy: A Possible Approach for India" investigates the issue of transition from a linear economic model of the country to a more resource-efficient, waste-minimizing economic model. In the paper, it was underlined that those sectors where circular practices could recover some value and reduce environmental pressure are industrial waste management, electronic waste recycling, and agriculture. It also underlined limitations in the form of insufficient infrastructure, lack of coordination, and low technological preparedness, and recommended more substantial political support and collaboration by stakeholders. Though the study had nationwide coverage, the underlying findings give an understanding of how circular economy approaches can be aligned at the state level, including Bihar

Karishma Kumari et al., (2025) "Sustainability in the Indian economy, focusing on Bihar. They connect fast economic growth with environmental issues like pollution and resource depletion and emphasize that long-term resilience is possible only with SDG-oriented strategies. This study locates Bihar as a state with immense potential for sustainable business practices despite the constraints in development and looks at sustainability as a pathway to inclusive growth.

Shravanthi A.R. et al. (2025) highlight, in their research on sustainable supply chains developed regarding agribusiness, different perspectives on circular economy approaches, thus focusing on the inefficiencies resulting due to linear supply chain realities. However, the highlighted research has shown that, through approaches like those exercised with regard to circular economy principles of approaches like reuse, recycling, and valorisation of by-products, sustainable supply chain performances can indeed be augmented for different agricultural supply chains, with particular importance attributed towards approaches like reduction of waste and efficiency of resources. Even though it was more focused on holistic agricultural supply chain mechanisms, this would be an important

perspective regarding approaches that can be developed in Bihar's business environment as well.

Rohila S. et al. (2025) conducted a comprehensive review of existing academic literature to investigate sustainable supply chain management within the framework of the circular economy. "This study revealed that integrating principles like reusing, recycling, remanufacturing, or the use of closed loop systems in supply chains decreases waste and enhances environmental sustainability. They highlighted the fact that despite growing academic interest, the practical applications of circular supply chains are now very limited due to technological challenges, policy gaps, and coordination issues among stakeholders. This study addressed greater collaboration, digital integration, and supportive institutional frameworks for moving forward with more circular and sustainable supply chain practices."

Research Gap:

The existing literature reveals certain gaps that merit further investigation.

1. There is limited sector-specific evidence on how circular economy principles and sustainable supply chain management are practically integrated into Bihar's supply chains.
2. There is a lack of research exploring the enabling conditions, such as policy support, financing mechanisms, technological adoption, and infrastructure, needed to implement sustainable and circular supply chains in Bihar.
3. The small business in Bihar lacks awareness about the circular economy and sustainable supply chain management.

Research Questions:

1. How aware are supply chain managers and local business owners in Bihar about practices related to the circular economy? In what way does this level of awareness impact their choices and actions?
2. Which types of circular business models, such as reusing, repairing, remanufacturing, recycling, and product-as-a-service, are most suitable and practical for the economic conditions in Bihar?
3. How do the current waste management systems in Bihar influence the development of reverse logistics networks needed for circular supply chains?

Objectives:

1. To explore the relationship between the circular economy and supply chain management, with a focus on business practices in Bihar.
2. To analyze the influence of state policies in supporting the growth of the circular economy and supply chain management in Bihar.
3. To determine the level of awareness among business owners regarding the principles of the circular economy and supply chain management.
4. To assess the extent to which industries in Bihar are effectively and efficiently applying the concepts of the circular economy and supply chain management.
5. To identify the challenges faced by local businesses and government authorities in implementing circular and sustainable supply chain models in Bihar, particularly concerning infrastructure, development, and awareness.

Research Methodology:

Problem Statement: Circular Economy and Supply Chain Management with special reference to Sustainable Business Practices in Bihar.

Research Design: Exploratory Research Design.

Design Model: For this study, Survey Design Model has been used.

Research Tools: Software Tools, Questionnaires, Surveys and Interviews.

Statistical Tools and Techniques: Likert Scaling Technique, Percentage Method, Chi-Square Testing Method.

Population and Sample of the Study: The population comprised various business units in Bihar including manufacturing MSMEs, retail outlets, food processing units, textile businesses, logistics operators, recycling units, waste processors, and street vendors. From this population, a sample of 59 respondents was

selected using convenience sampling based on accessibility and relevance to the study. **Sample Size:** A sample of 59 business units was taken for the study. Out of these, 26 responses were collected through structured questionnaires, while the remaining information was gathered through field visits and direct interactions with business operators across different sectors.

Data Collection: Two types of data used in this study are as follows:

1. **Primary Data:** Primary data was collected mainly through surveys, personal visits, and field observations. A structured questionnaire was used to gather 26 responses regarding awareness of circular economy, sustainable supply chain practices, waste handling, and adoption barriers.
2. **Secondary Data**: Secondary data was sourced from books, research articles, government reports, and reliable online sources to support the theoretical framework of the study.

Hypothesis:

Null Hypothesis:

- **H :** Circular economy is not at all known among businesses, producers, and supply-chain participants in Bihar.

Alternate Hypothesis:

- **H_1:** Circular economy is picking up momentum among businesses, producers, and supply-chain participants in Bihar.

Discussion:

The findings of this study have shown that there is awareness of circular economy and sustainable supply chains in Bihar, though in an unstructured manner. Many of these stakeholders are seen to possess a fragmented level of awareness, with sustainability meaning only waste management, while its much broader definition in terms of resource and materials efficiencies is also a part of this definition. However, as almost all cases have pointed out, Bihar has a foundational level of preparedness, as shown by the case studies selected.

From **Energy & Renewable Sector, Tata Power's Renewable Microgrid plant in the city of Muzaffarpur** utilizes the readily available waste materials in the region like cow dung to create clean electricity while at the same time serving the region with a reliable fertilizer. This shows the possibilities of circularity in the creation of a decentralized chain of cleanly generated electrical and agricultural products.

Like this, the concept of **"Reverse Vending Machine (RVM)"** can also be taken as a form of circular practices at an urban level. This is initiated by Patna Municipal Corporation, which is a **"Waste Management & Urban Service Providers."** Incentivizing citizens who deposit plastic bottles and recycling this used material can be taken as a contemporary form of circular practices. Though such practices are not formally part of circular economy activities, they show that interest in circular practices is on the rise.

And from **Energy & Power Sector, The NTPC Kahalgaon Cement free Geopolymer Road Project** adds another example of the potential of industrial symbiosis that can exist within Bihar's supply chain. Using fly ash and GGBS, waste materials that have traditionally plagued environmental pollution, this initiative shows the potential of dealing with effective waste management on a massive scale.

Besides, the case of **Bihar's First Grain-based Ethanol Plant located at Purnia**, being set up by Eastern India Biofuels Private Limited i.e., the **Biofuel and Renewable Sector** is a classic case of illustrating circularity, as the plant is set to create circularity with the surplus quantity of grains such as maize and broken rice. It is an instance of structured circular economy development with the involvement of the government.

Overall, though the informal and unorganized application of circular practices is evident in the wider Bihar region, as the results of the above studies emphasize, the scope of the implementation of circular economy initiatives is affected by the low level of awareness and development of the region. The successful implementation of the initiatives demonstrates that Bihar has the prospect of moving from informal applications to an organized form of circular supply chain.

Government Policies and Initiatives:

Government of India has also announced several schemes in the direction of sustainability, waste management, and use of resources. Though many of these

initiatives would not often overtly refer to 'circular economy' their aims are very much in the spirit of circular approaches and Bihar is bound to follow the policy decisions taken by the Central Government just as any other state.

Programmes such as the Swachh Bharat Mission aim at sanitation initiatives and waste management through waste segregation, recycling and reusing of various disposal. Different programs relevant to MSME try to help small businesses and work in the way of encouraging cleaner production technologies and efficiency improvement. These practices indirectly lead to the promotion of sustainability strategies in the supply chain.

- **Swachh Bharat Mission:** The campaign addresses sanitation and solid waste management. Through the promotion of waste segregation, recycling, and scientific management, it is conducive to the operation of circular economy in which no waste materials are abandoned (Report of Ministry of Housing and Urban Affairs, 2014).
- **Plastic Waste Management Rules**: This is an effort to decrease the amount of plastic waste by recycling it and using it responsibly. It incentivizes a circular economy by encouraging responsibility from producers and consumers in managing plastic waste (Report of Ministry of Environment, Forest and Climate Change, 2016).
- The **E-Waste Management Rules:** These rules came out in 2016 from the Ministry of Environment, Forest and Climate Change. They are supposed to make sure that collecting and recycling old electronics happens safely. It helps get back those valuable materials that would otherwise just go to waste, which cuts down on losing resources and messing up the environment even more.
- **Extended Producer Responsibility (EPR):** This requires a mandate on the producers, thereby tackling post-consumer products, including plastic, electronics, batteries, and tyres.
- **National Green Hydrogen Mission:** It was launched in January 2023 with an aim to ensure that India becomes energy-independent by 2047 and achieves net-zero emission by 2070. It aims to increase production of green hydrogen, set up centres at ports, and introducing Green Hydrogen Purchase Obligations (GHPO) for heavy industries.

In Bihar, it has been seen that most of the activities pertaining to sustainability have been carried out by local bodies of the government. Even though this has been done, it has not had much impact on businesses due to lack of knowledge and communication. Many business owners are not aware of the various facilities that are provided by various schemes of the government and how they can benefit from it. Hence, there is a lack of effective utilization of such potential.

DATA ANALYSIS AND INTERPRETATION

Classification on the Basis of Organization

Table 1. Basis of Organisation

Responses	Number of Respondents	Percentage
Manufacturing MSME	19	32.20 %
Food Processing	03	05.09 %
Retail Industry	05	08.47 %
Manufacturing	08	13.56 %
Textile	03	05.09 %
Recycling & Waste Processing	05	08.47 %
Others	16	27.12 %
Total Responses	59	100%

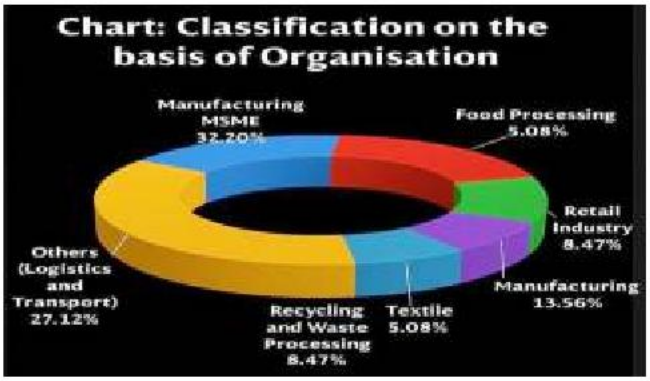


Fig. 1: Basis of Organisation

Interpretation – Fig.1. Shows that most of the respondents come from manufacturing small and medium-sized enterprises, accounting for 32.20%. A considerable number, 27.12% , are categorized under 'Others', showing a range of different types of organization beyond the primary sector. Traditional industries like Retail, Recycling and Waste Processing, Food Processing also contributed, although to a lesser extent, which suggest a well-rounded diverse group of respondents.

Classification on the Basis of Awareness of Circular Economy and Supply Chain Management

Table 2a. Awareness of Circular Economy and Supply Chain Management

Response	Number of Respondents	Percentage
Fully Aware	23	30.98%
Somewhat Aware	30	50.85%
Not Aware	06	10.17%
Total	59	100%

Awareness - Chi – Square Analysis

Table 2b. Awareness of Circular Economy and Supply Chain Management

Category	Observed Frequency	Expected Frequency	Chi – Square Contribution	Calculated Value
Fully Aware	23	19.67	0.565	Chi – Square Statistics = 15.426
Somewhat Aware	30	19.67	5.429	Degrees of Freedom = 2
Not Aware	06	19.67	9.497	P- Value = 0.0004

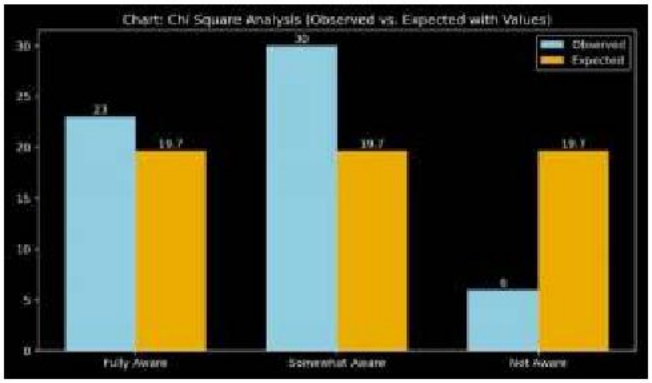


Fig.2.b: Awareness of Circular Economy and Supply Chain Management

Interpretation -The chi-square goodness of fit test was conducted to see if the awareness levels among organizations regarding Circular Economy and Sustainable Supply Chain Management are evenly distributed across three categories: 'Fully Aware', 'Somewhat Aware', and 'Not Aware'. The observed frequencies for each category are 23, 30, and 6, respectively. The expected frequency for this test is 19.67 for each category.

The calculated chi-square value is 15.492, with a degree of freedom of 2. The p-value is 0.0004. Since the p-value is less than 0.05, this result is statistically significant.

Therefore, the chi-square test rejects the Null Hypothesis (H) which states that circular economy is not at all known among businesses, producers, and supply-chain participants in Bihar.

This indicates that awareness levels are not evenly distributed among different organizations. The bar chart shows that the “Somewhat Aware” category is higher than expected, while the “Not Aware” category has a significantly lower frequency than anticipated. This imbalance suggests that organizations only have a partial understanding of circular economy concepts.

So the Alternative Hypothesis which is (H_1) circular economy is picking up momentum among businesses, producers, and supply-chain participants in Bihar is highly visible.

Classification on the Basis of Barriers in Adopting Circular Practices

Table 3. Barriers in Adopting Circular Practices

Responses	Number of Respondents	Percentage
High Cost	07	11.86 %
Lack of Technology	08	13.56 %
Lack of Awareness	36	61.04 %
Weak Policy Support	05	08.46 %
Market Uncertainty	03	05.08 %
Total Responses	59	100%



Fig. 3. Barriers in Adopting Circular Practices

Interpretation- Fig. 3 indicates that the primary obstacle preventing organizations from adopting circular practices is lack of awareness, which accounts for 61.04%. Other significant challenges include the absence of appropriate technology, at 13.56%, and high costs, at 11.86%. These statistics highlight both practical and financial limitations. Additional barriers, such as insufficient policy support, at 8.46%, and market uncertainty, at 5.08%, are less prevalent but still impact on the overall rate of adoption.

Classification on the Basis of Types of Waste Generation

Table 4. Types of Waste Generation

Responses	Number of Respondents	Percentage
Organic	09	15.25 %
Plastic	12	20.34 %
Paper	07	11.86 %
Metal	16	27.12 %
Hazardous	01	01.68 %
Mixed	14	23.75 %
Total Responses	59	100%

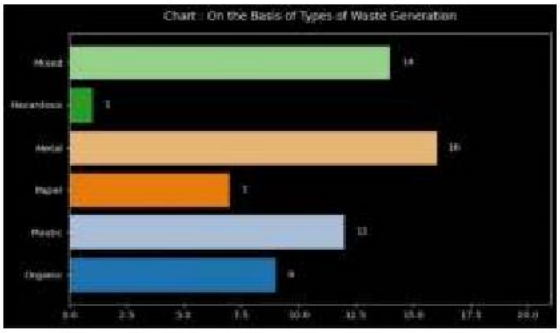


Fig. 4. Types of Waste Generation

Interpretation -Fig.4 Shows that metal waste (27.12%) and mixed waste (23.75%) are the most frequently generated types. This indicates that the respondents deal with a wide variety of waste materials in significant amounts. Plastic waste accounts for 20.34%, showing that there are still major challenges in managing plastic. Hazardous waste is produced in smaller amounts, at 1.68%.Organic and paper waste together show moderate levels of generation, suggesting that the waste types are mostly non-harmful but vary in quantity.

Classification on the Basis of Waste Management

Table 5. Basis of Waste Management

Responses	Number of Respondents	Percentage
Municipal Pick Up	25	42.37 %
Own Disposal	06	10.18 %
Sent for Recycling	17	28.80 %
Landfill	00	0.00 %
Third Party Recycling	11	18.65 %
Total Responses	59	100%



Fig. 5. Basis of Waste Management

Interpretation - Fig.5. Shows that municipal pick-up is the most frequently used waste management approach, accounting for 42.37%. This highlights a strong dependence on local government services for managing waste. About 28.80% of respondents choose to recycle their waste, reflecting a favourable outlook towards sustainable practices. Around 10.18% of people dispose of their own waste, while 18.65% use third-party recycling services. The absence of landfill usage indicates a move away from conventional waste disposal methods.

Classification on the Basis of Waste Segregation

Table 6.a. Basis of Waste Segregation

Responses	Number of Respondents	Percentage
Always	30	50.85 %
Sometimes	17	28.81 %
Rarely	08	13.56 %
Never	04	06.78 %
Total Responses	59	100%

Waste Segregation – Likert Scale

Table 6.b. Basis of Waste Segregation

	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
Always	O	o	o	•	o
Sometimes	O	o	•	o	o
Rarely	O	•	o	o	o
Never	•	o	o	o	o

Interpretation- The results derived from the Likert scale analysis show that organizations whose waste segregation practices are consistent tend to be more satisfied and aligned with the principles underlying sustainable waste management. The majority of the respondents lie in the category of "sometimes," meaning partial or inconsistent adherence. While both the "rarely" and "never" categories demonstrate dissatisfaction, pointing to lapses either in awareness, infrastructure, or commitment, the overall implication of these data is the necessity for focused awareness efforts and effective improvements in the waste-segregation systems themselves in advancing sustainability within organizations.

Classification on the Basis of How the Waste Material is Reused or Recycled

Table 7: How the Waste Material is Reused or Recycled

Responses	Number of Respondents	Percentage
In-house Reuse	16	27.12 %
Sold to Recycler	23	38.98 %
Converted to Compost or Biogas	01	01.70 %
Third Party Recycling	19	32.20 %
Total Responses	59	100%



Fig.7. How the Waste Material is Reused or Recycled

Interpretation- Fig..7. .Shows Unique Analysis of the data reveals that the major form of reuse or recycling of waste is selling waste to recyclers, with 38.98% of the responses. This clearly reveals that there is extreme dependence on other parties for recycling. Recycling services by third parties are also taken into consideration by 32.20%, indicating that more importance is given to external waste management solutions. Reuse is carried out by 27.12% of the firms internally, indicating that it is a practice by firms to re-utilise when possible. Contrary to this, biological recovery techniques like composting or biogas production are far less utilized, with only 1.70% adoption.

Classification on the Basis of Circular Economy Practices in Business Policy

Table 8: Circular Economy Practices in Business Policy

Responses	Number of Respondents	Percentage
Yes	22	37.29 %
No	18	30.51 %
Under Planning	19	32.20 %
Total Responses	59	100%

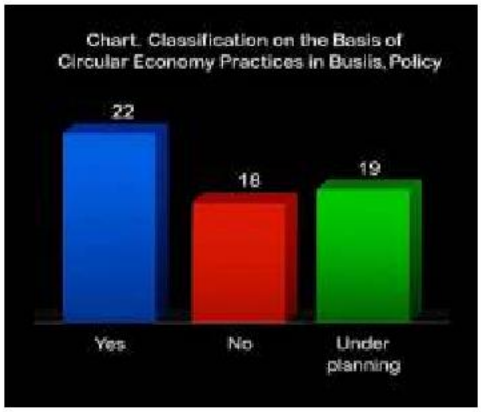


Fig. 8. Circular Economy Practices in Business Policy

Interpretation- Fig. 8 shows that large number of businesses, specifically 37.29%, have already integrated circular economy practices into their policies. On the other hand, 30.51% of respondents indicate they have not yet implemented these practices, suggesting there is still room for broader adoption. Additionally, 32.20% of businesses are currently in the planning phase, reflecting an increasing interest and a probable rise in future adoption.

Classification on the Basis of Practicing Reverse Logistics

Table 9: Practicing Reverse Logistics

Responses	Number of Respondents	Percentage
Yes	35	59.32 %
No	12	20.34 %
Planning to Implement	12	20.34 %
Total Responses	59	100%

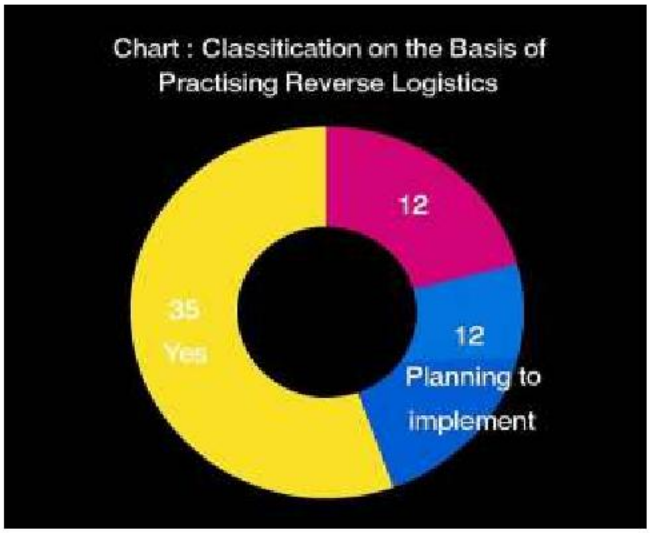


Fig. 9. Practicing Reverse Logistics

Interpretation- Fig. 9 shows that most respondents (59.32%) are currently using reverse logistics, reflecting a significant move towards sustainable return and reuse methods. Approximately one-fifth (20.34%) have not yet begun using reverse logistics, showing they are not part of sustainable supply chain practices. Another 20.34% intend to start using it, pointing to potential future growth and increasing recognition of its importance.

Classification on the Basis of Awareness of Government's Policy to Promote Circular Economy

Table 10. a. Awareness of Government's Policy to Promote Circular Economy

Responses	Number of Respondents	Percentage
Fully Aware	16	27.12
Somewhat Aware	19	32.20
Heard About It	04	6.78
Not Aware	20	33.90
Total Responses	59	100.00

Awareness of Government Policy – Likert Scale

Table 10. b. Awareness of Government's Policy to Promote Circular Economy

	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
Always	O	o	o	o	•
Sometimes	O	o	o	•	o
Rarely	O	o	•	o	o
Never	•	o	o	o	o

Interpretation- The Likert scale analysis indicates that organisations with a better awareness of government circular-economy policies tend to be more satisfied and in line with sustainability goals.

A greater number of respondents are inclined towards the "somewhat aware" category, reflecting moderately good awareness but needing further improvement. The "not aware" group shows dissatisfaction and reflects how much more the government needs to communicate, train for, and create awareness within the people. On the whole, data indicate that though awareness exists, much efforts are called for in ensuring wide understanding and adaptation of circular economy policies.

Major Findings:

- Most state in India have a stand-alone policy for sustainable business practices and there are national level policies which all states follow but Bihar doesn't have any stand-alone policies.
- Not many in Bihar know much about circular economy, yet they grasp parts of it. Waste

control tends to be what comes to mind when sustainability is mentioned, missing broader links between reusing materials and smart supply networks. Those running tiny shops, working on farms, or dealing locally show this gap clearly.

- High Willingness to Adopt Sustainable Practices: Even though awareness is low, people involved care deeply about using circular and sustainable methods. When learning opportunities come up, rewards are offered, or financial gains show that curiosity often spreads fast.
- Industrial Expansion Creating Circular Opportunities: The rapid expansion of industries such as food processing, textiles, leather, dairy, cement, bioenergy, and ethanol, along with the revival of older industries, creates opportunities to include circular economy ideas in emerging supply chains.
- Emerging but Limited Circular Practices: Early efforts include reusing fly ash, turning trash into energy, making electricity from bagasse, and converting farm leftovers into fuel. While signs of progress appear, today's real-world use remains narrow.
- Farms and factories dump leftovers with little said about what they could become. Some materials sit unused because places to store them do not exist. People lack tools and training needed to turn waste into something useful. Hidden chances hide in these overlooked remains
- Sometimes rules help, yet few towns act on them. Even with clear directions from above, below things stall. Officials slow everything down, sometimes too busy or indifferent. Good ideas float just above real change.
- Infrastructure, financial, and supply chain limits slow progress. Recycling hubs are scarce, logistics weak, green tech pricey, funding tough to secure, supply chains scattered – these hold back circular adoption, hitting small firms and farmers hardest.
- Slow city advances while businesses take part more: Cities slowly upgrade their waste systems. Meanwhile, companies step in deeper – backing reuse projects, local groups, green manufacturing.
- Training matters when building skills. Projects showing how things work on farms matter too. A lot of plant material exists out in the countryside. Moving it around well helps systems stay strong. Farm-based circular efforts could grow stronger now.

Limitations:

- The study includes responses from 59 participants, but this number is not large enough to represent every type of business operating in Bihar, especially bigger industries or units located in far-off rural areas.
- Only 26 respondents filled out the formal questionnaire, while the rest shared information through visits and informal conversations. This naturally created differences in the level of detail and accuracy of the responses.
- Many participants were not familiar with the idea of a circular economy, which limited their ability to answer more technical or in-depth questions.
- Due to time constraints and limited access to different locations, the research team could not reach a broader range of districts or industry categories.
- Some of the findings depend on self-reported data, which may contain personal bias, unclear answers, or missing details.

Conclusion:

The findings of the study indicate that circular economy and sustainable supply chain practices in Bihar are still at a developing stage. Though the full-scale implementation is far from being comprehensive, it is evident that the level of awareness among business owners and other stakeholders within supply chains is increasing. Many businesses already practice primary activities like waste segregation, reuse, or the sale of recycled wastes; however, these activities lack a structure under a circular economic plan.

Such analysis also indicates that Bihar has those fundamental prerequisites that are needed to move

towards circular supply chains. Still, specific interventions would be needed that include building awareness levels, improving communication of strategies, enhancing waste management systems, and accessing technologically simple and cost-effective technologies. With timely institutional support and guidance, individual systems can easily move from those current informal and unorganized systems to a highly systematic and circular economy.

Recommendations:

1. **Strengthening awareness and training programs:** Carrying out focused awareness among small and medium businesses about the benefits of the circular economy. Bringing in training workshops, seminars, and district-level programs on reduction, reuse, recycling, and use of waste, and on sustainable supply chain practices. Collaboration with academic institutions, NGOs, and government departments for imparting hands-on learning modules.
2. **Development of clear and accessible policy frameworks:** Simplified guidelines and frameworks explaining the incentives, compliance norms, and opportunities in circular business should be laid down by the state government. Such policies related to recycling, repair industries, reverse logistics, and resource recovery should be communicated in local languages for better reach. Introduce mandatory reporting norms for high volume waste-generating industries.
3. **Access to Technology and Infrastructure:** Provide business-friendly access to modern waste processing technologies, low-cost recycling equipment, and digital tools for tracking supply chains. Establish small businesses' access to common collection centres, material recovery facilities (MRFs), and repair hubs. Strengthen reverse logistics infrastructure by improving coordination between municipalities, recyclers, and transport networks.
4. **Establish Financial Incentives for Circular Practices:** Provide financial incentives to companies engaging in recycling, remanufacturing, waste segregation, and other resource productivity technologies. Introduce financial incentives linked to the success of circular initiatives.
5. **Strengthen Collaboration Between Key Stakeholders:** Enhance partnerships between various factors such as manufacturers, retailers, waste processors, recycling enterprises, and local authorities. Encourage cluster collaboration to share recycling facilities and collect bulk waste together.
6. **Improve Municipal Waste Management Systems:** Municipalities should aim to improve the frequency of waste collection activities carried out in the municipalities, the tracking mechanisms installed in the waste management systems, the existing segregation systems, and the abilities being developed for the scientific disposal of waste generated in the region. Integration of informal waste collectors into the official recycling processes to strengthen reverse logistics
7. **Promote Sector-Specific Circular Models:** For manufacturing industries, models can be developed for material reuse, processes, etc. For industries such as retail and food processing, models can be developed for returns, composting, etc. For textile industries, models can be developed for repair, reuse, etc.

References:

Bisaria, C., & Sharma, V. (2023), 2nd International Conference on Women in Multifaceted Research, Sasaram, Bihar: Circular Economy and Supply Chain Management: A New Approach to Corporate Sustainability.

Kumari, P., & Mishra, S., International Journal for Research in Multidisciplinary Research (IJFMR), Volume 7, Issue 4, 2025, E-ISSN 2582-2160: Economy and Sustainability in the Indian Context: A Focus on Bihar.

Rohila, S., Das, R., & Guleria, S. (2025). Sustainable supply chain management through circular economy: A review-based study. International

Journal of Research Trends and Innovation (IJRTI), 10(2). ISSN: 2456-3315.

Shravanthi, A. R., Nithin, K. N., & Kondepudi, N. (2025). Sustainable Supply Chains in Agribusiness: The Role of Circular Economy Models, Vol. 2, Issue 10, 2024, 4(1). ISSN 3048-5207.

Swarup, S., Verma, U., & Kumar, R. (2024). Challenges in Sustainable Solid Waste Management in Patna: A Case Study of Patna Municipal Corporation, International Journal of Environment and Waste Management, Vol. 33, Issue 2, 2024, ISSN 1478-9868.

Theeraworawit, M., Suriyankietkaew, S., & Hallinger, P. (2022). Supply Chain Management in a Circular Economy: A Bibliometric Review, Sustainability, ISSN 2071-1050, Volume 14, Issue 15.

Export–Import Bank of India. (2025). Transitioning to circular economy: A possible approach for India. Working Paper No. 121 (December 2025)

NITI Aayog. (2024). SDG India Index 2023–24: Partnerships in the decade of action. New Delhi: Government of India. (December 2025)

Report of Ministry of Environment, Forest and Climate Change, 2016

Report of Ministry of Housing and Urban Affairs, 2014.