

Green Jobs and Circular Economy in Darbhanga: An Interplay with Sustainability

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Abstract:- This study investigates the potential of creating green jobs through Circular Economy (CE) practices in Darbhanga, India and their ability to address environmental, unemployment and poverty issues. The research was conducted using a qualitative approach with structured questionnaires and snowball sampling. The study analysed the impact of CE on job creation and the challenges faced in implementing these practices. Regression analysis revealed that factors such as work opportunities, income generation, skill development and professional growth do not have a significant impact on job satisfaction among scrap pickers. This suggests that unmeasured factors, such as working conditions and social support, may have a greater influence on job satisfaction. This study suggests strengthening social security, providing targeted skill development, formalising the informal labor market, improving community engagement, ensuring tool and safety resource availability and focusing on external factors to enhance job satisfaction for scrap pickers.

Keywords:- Circular Economy, Green Jobs, Job Satisfaction, Scrap Pickers, Unemployment.

1. Introduction:- Darbhanga, located in the Mithilanchal region of Bihar (Chakravarty, 2024), is facing several serious issues. Environmental problems such as air and water pollution (Sharma et al., 2024) and waste management difficulties (Khan, 2020) have increased due to urbanisation (Veenapani and Chandra, 2024), industrialisation (Jha, 2019) and the growing population (Sharma et al., 2024). Additionally, high unemployment rates and widespread poverty, particularly among the youth, are also major concerns (Sharma et al., 2024).

The concept of CE is based on efficient resource use (Tukker, 2015), waste reduction (Shooshtarian et al., 2022) and the creation of closed-loop systems (Kara et al., 2022). It shifts the

traditional "take-make-dispose" model to one that emphasises reuse, repair and recycling (Elisha, 2020). This can promote environmental protection, economic growth and social equality (Guohui & Yunfeng, 2012). Green jobs, which contribute to environmental protection (Aceleanu, 2015) or resource conservation, such as renewable energy, waste management, sustainable agriculture and eco-tourism, could help address Darbhanga's challenges (Jacob, 2015).

Research Problem Statement: Darbhanga, like many other regions in India, is affected by environmental problems, unemployment and poverty (Nagdeve, 2007; Sinha, 2023). CE is an effective model that promotes sustainable development (Schroeder et al., 2019), but there has been limited research on its potential to generate green jobs and address these issues in Darbhanga (Sulich & Sołoducho-Pelc, 2022).

2. Literature Review :

2.1 The Relationship between CE and SDGs:- CE and the Sustainable Development Goals (SDGs) has been extensively studied, especially in the context of SDG 1: Poverty Eradication and SDG 8: Decent Work and Economic Growth. The SDG development process, which began at the Rio+20 UN Earth Summit in 2012, established a global framework for sustainable development, emphasising the need for businesses to contribute to achieving these goals (Pedersen, 2018). Of the 17 SDGs, CE practices have been considered crucial for advancing both SDG 1 and SDG 8 and several studies have highlighted their positive relationship. For instance, Ajwani-Ramchandani and Bhattacharya (2022) discussed how CE models, enhanced by digital technologies, can improve economic conditions and support the achievement of SDG 1, particularly through resource efficiency and sustainable business models. This highlights that CE can help reduce poverty, particularly by generating opportunities for inclusive growth in

underserved communities. Similarly, Rodríguez-Antón et al. (2019) conducted an international legislative analysis and showed that CE practices align with SDG 8, as they contribute to economic growth through sustainable production and consumption patterns. Their findings suggest that CE fosters innovation, improves resource use efficiency and generates employment opportunities, which are essential for decent work and economic growth. Dantas et al. (2021) further emphasised the integration of CE and Industry 4.0 technologies, noting that this combination promotes SDG 8 by advancing sustainable production systems that not only reduce waste but also create quality jobs in the green economy. Additionally, Schroeder et al. (2019) and Ortiz-de-Montellano et al. (2023) reinforced the importance of CE, stating that its practices are essential for promoting economic growth while ensuring environmental sustainability. The importance of CE in sustainable construction was highlighted by Ogunmakinde et al. (2022), who linked it to multiple SDGs, noting that CE strategies help reduce environmental impact while contributing to economic growth and decent work. Panchal et al. (2021) echoed these views, stating that CE performance, especially in the technical cycle, can support sustainable development and generate jobs and economic opportunities in the process.

2.2 Green Jobs and CE: A Conceptual Link:- The development of green jobs, which has become an important part of the broader framework of sustainability and economic development, has attracted significant global attention. The Green Jobs Initiative, launched through a joint effort by the United Nations Environment Program (UNEP), the International Trade Union Confederation (ITUC), the International Organisation of Employers (IOE) and the International Labour Organisation (ILO), highlights the potential of green jobs to help build sustainable economies (Staneff-Puica et al., 2022; UNEP, 2008).

Although the concept of green jobs is widely accepted, it does not have a universally accepted definition, as pointed out by Bowen et al. (2018). However, according to the 2008 UNEP report, green jobs are those that contribute to environmental sustainability, such as reducing

energy and material consumption, minimizing pollution, reducing waste and restoring ecosystems. These jobs span across various sectors, including agriculture, industry, services and administration and they also play a role in climate change adaptation (UNEP, 2008). Green jobs are not only limited to environmental benefits such as producing eco-friendly products and services but also involve processes that adopt greener and more sustainable practices (Van der Ree, 2019).

For instance, in the field of wastewater treatment, green jobs play a critical role in conserving water resources and improving environmental quality (Otieno & Ochieng, 2018). Similarly, jobs in pollution control and waste management contribute significantly to environmental protection by reducing harmful emissions and cutting down on waste accumulation (Traversi et al., 2018). The Organisation for Economic Co-operation and Development (OECD) also further refines this understanding, stating that green jobs involve measuring, preventing and minimizing environmental damage across various industries (Battaglia et al., 2018). This reflects a growing recognition that green jobs are not confined to new industries, but are increasingly embedded in traditional sectors, supporting both environmental conservation and rehabilitation (Vesere et al., 2021).

As the global economy moves towards sustainability, businesses are reorganising existing roles or creating new ones to meet their environmental goals. This shift is particularly evident in the construction, transportation and renewable energy sectors, where green-collar workers those working in green jobs are applying the principles of sustainable development in their work (Rutkowska & Sulich, 2020).

The concept of green-collar workers distinguishes these roles from traditional blue-collar and white-collar workers. Green-collar workers ensure that industries and urbanisation follow environmentally safe and sustainable practices. For example, workers in waste management and sustainable agriculture directly contribute to reducing carbon emissions and

maintaining ecological balance (Rutkowska & Sulich, 2020).

Two main approaches are used in the study of green jobs: quantitative and qualitative. The quantitative approach typically uses statistical models to analyse the scale and scope of green employment in national or regional economies. Researchers evaluate the impact of green jobs on GDP, job creation and regional development (Sulich, Zema, & Zema, 2018). In contrast, the qualitative approach focuses on the specific skills and capabilities required for green jobs and studies how these workers contribute to sustainability goals (Van der Ree, 2019).

Green jobs not only help in environmental conservation but also contribute to building an inclusive and sustainable labor market. As different sectors adopt CE principles such as resource recovery, remanufacturing and recycling the demand for skilled workers in these areas will increase. This shift shows the need for continuous investment in green skills training and education to ensure that workers can succeed in a green economy (Bassi & Guidolin, 2021).

This research also highlights some important gaps in the literature: (1) a lack of focus on small towns or rural areas in developing countries and (2) insufficient study of the impact of green jobs on local livelihoods.

3. Research Objective and Hypothesis :

- Objective of this study are:
 - O1:** Analysing the impact of CE practices on the creation and growth of green jobs in Darbhanga.
 - O2:** To assess the challenges and barriers to implementing CE practices for green job creation in Darbhanga.
- Testable hypotheses related to the research objectives is:
 - H1:** CE practices positively impact job creation, leading to increased job satisfaction and future employment prospects.

4. Methodology :

- **Research Design:** This research adopts a qualitative descriptive design to study the impact of scrap picking (waste collection) work on job satisfaction and income generation.
- **Data Collection Methods:** Data for this study has been primarily be collected through structured questionnaire interviews. The structured questionnaire is designed in such a way that it can capture detailed and accurate responses from participants. It uses a Likert scale (Figure 1) to assess the level of agreement on various aspects.

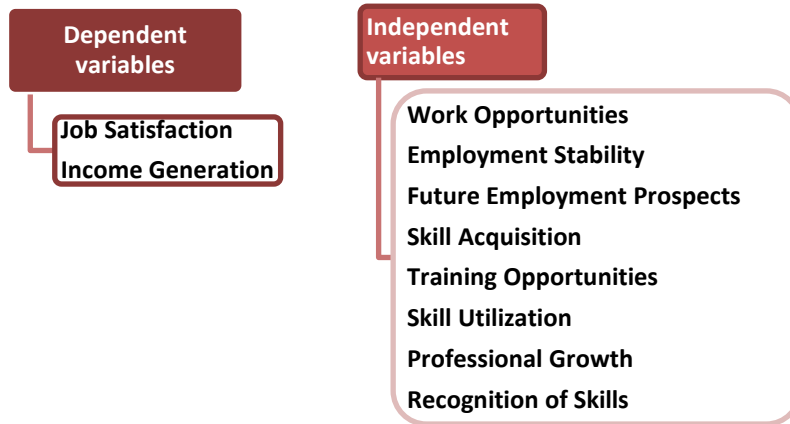
Figure: 1 Level of Agreement



Source: Created By Author

The dependent variables and independent variables (or predictors) in this study are:

Figure: 2 List of Variables



Source: Created by Author

- **Sampling Method:-** This study uses snowball sampling, which is a non-probability sampling technique. For this study, data has been collected from 100 scrap pickers.
- **Data Analysis Techniques:-** Statistical techniques have been used to identify patterns and relationships between variables:
Descriptive Statistics:- Frequency analysis and multiple regression analysis have been applied to understand the distribution of responses for each variable.
SPSS (Statistical Package for the Social Sciences):- SPSS has been used in this study to analyse the data in order to understand the impact of independent variables on dependent variables.

5. Findings and Hypothesis Discussion:-

5.1 Impact of CE on Green Jobs in Darbhanga:- The regression analysis conducted in Darbhanga on the impact of Circular Economy (CE) on green jobs, particularly scrap picking, revealed that several key factors did not significantly influence job satisfaction. Specifically, there was no statistically significant relationship between work opportunities ($B = -0.007, p = 0.936$) and employment stability ($B = 0.021, p = 0.832$), indicating that the availability of job opportunities and the stability of these roles did not significantly affect job satisfaction. Similarly, income generation ($B = 0.031, p = 0.718$) and future employment prospects ($B = 0.056, p = 0.628$) also showed no significant contribution to job satisfaction, suggesting that the financial aspects or future work prospects in scrap picking did not

strongly influence job satisfaction. Additionally, factors related to skill development, such as skill acquisition ($B = 0.003, p = 0.971$), training opportunities ($B = -0.063, p = 0.522$) and skill utilization ($B = -0.044, p = 0.650$), had very little effect on job satisfaction, indicating that the ability to learn and apply new skills did not significantly enhance job satisfaction. Professional growth ($B = -0.132, p = 0.160$) and recognition of skills ($B = 0.051, p = 0.603$) also showed weak associations with job satisfaction, with professional growth having a slight negative effect that was not statistically significant. Recognition of skills, while a positive factor (Summerton et al., 2019), did not strongly influence job satisfaction. Overall, the results indicate that factors directly related to the nature of the work and its associated benefits, such as income, stability, skill development and recognition, do not significantly impact job satisfaction among scrap pickers (Table 1).

Table: 1 Regression Analysis of Variables.

Model	Unstandardize	Coefficients	Standardiz		
	d Coefficients		ed	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.342	.902		3.706	.000
Work_Opportunity	-.007	.083	-.009	-.080	.936
Employment_Stability	.021	.098	.023	.213	.832
Income_Generation	.031	.086	.038	.362	.718
Future_Employment_Prospective	.056	.116	.052	.486	.628
Skill_Acquisition	.003	.087	.004	.037	.971
Training_Opportunity	-.063	.098	-.067	-.642	.522
Skill_Utilisation	-.044	.097	-.051	-.455	.650
Professional_Growth	-.132	.093	-.160	-1.418	.160
Recognition_Skill	.051	.098	.054	.522	.603

a. Dependent Variable: Job_Satisfaction

Source: Created by Author.

The hypothesis H1, which states that CE practices positively impact job creation, leading to increased job satisfaction and future employment prospects, is not strongly supported by the data from this study. While CE practices may theoretically show potential for green job creation (Sulich & Sołoducho-Pelc, 2022), their practical impact on scrap pickers in Darbhanga has not resulted in significant improvements in job satisfaction, income generation, employment stability, or future job prospects.

5.2 Challenges in CE for Green Jobs in Darbhanga:-

The survey conducted in Darbhanga revealed several challenges in the context of Circular Economy (CE) for Green Jobs. Accessibility to tools and equipment was mixed: 43 percent of respondents found them either accessible (25%) or very accessible (18%), but 27 percent faced significant barriers, with 15 percent reporting poor accessibility and 12 percent extremely inadequate conditions. Financial support was similarly divided, with 41 percent considering it accessible (20%) or very accessible (21%), while 32 percent struggled, citing poor or no accessibility to financial resources. Price fluctuations were a notable concern for 52 percent of participants, with 30 percent experiencing frequent changes and 22

percent facing very frequent fluctuations. Market linkages were more reliable for some, with 40 percent rating them positively (25% reliable, 15% very reliable), but 32 percent found them unreliable or not reliable at all. Government support was a contentious issue: 38 percent considered it either supportive (25%) or very supportive (13%), but an equal proportion (38%) found it poorly supportive or non-supportive. Social acceptance was also mixed, with 35 percent feeling accepted (20% accepted, 15% very accepted) but 40 percent experiencing rejection or poor acceptance. Safety equipment was considered accessible by 50 percent (30% accessible, 20% very accessible), but 24 percent faced challenges, with 14 percent reporting poor access and 10 percent none at all. Health issues were prevalent, with 45 percent experiencing frequent or very frequent health incidents, while 25 percent faced them less often. Finally, adherence to safety standards was generally positive, with 52 percent believing they were well or very well followed, though 23 percent thought safety protocols were poorly followed or not followed at all. These findings highlight the significant barriers and inconsistencies that must be addressed to improve the conditions for green jobs in Darbhanga (Table 2).

Table: 2 Challenges in CE for Green Jobs N= 100

Indicator	Attribute	1	2	3	4	5
1. Access to Resources	Tools and Equipment	12 (12%)	15 (15%)	30 (30%)	25 (25%)	18 (18%)
	Financial Support	14 (14%)	18 (18%)	27 (27%)	20 (20%)	21 (21%)
2. Market Access and Stability	Price Fluctuations	22 (22%)	30 (30%)	25 (25%)	15 (15%)	8 (8%)
	Market Linkages	12 (12%)	20 (20%)	28 (28%)	25 (25%)	15 (15%)
3. Regulatory and Policy Barriers	Government Support	16 (16%)	22 (22%)	24 (24%)	25 (25%)	13 (13%)
4. Social and Community Challenges	Stigma and Social Acceptance	18 (18%)	22 (22%)	25 (25%)	20 (20%)	15 (15%)
5. Health and Safety Conditions	Access to Safety Equipment	10 (10%)	14 (14%)	26 (26%)	30 (30%)	20 (20%)
	Health Incidents	20 (20%)	25 (25%)	30 (30%)	15 (15%)	10 (10%)
	Safety Standards Compliance	8 (8%)	15 (15%)	25 (25%)	30 (30%)	22 (22%)

Source: Created by Author.

6. Conclusion and Research Horizons :- The regression analysis clearly shows that traditional factors such as work opportunities, job stability, income generation, skill acquisition, training opportunities, skill utilisation, professional development and recognition of skills do not have a significant impact on the job satisfaction of scrap pickers. While these factors are important for their livelihood and skill development, they do not affect their overall satisfaction. This suggests that other implicit factors play a more important role in job satisfaction. Furthermore, the green jobs sector in Darbhanga faces several challenges, including a lack of financial support, inconsistent market linkages and health risks, while social acceptance remains a major issue for many workers.

Recommendations for Improving Job Satisfaction and Working Conditions of Scrap Pickers:

- **Strengthening Social Security and Labor Rights:** Social security and labor rights can be strengthened to increase the job satisfaction of scrap pickers. For this, the government should include them in the formal sector.
- **Targeted Skill Development Programs:** Targeted and practical skill development programs can enhance the work capabilities of scrap pickers, providing them with more

opportunities for career growth and better job satisfaction.

- **Community Engagement and Awareness Campaigns:** Community engagement and awareness campaigns can help recognize the contributions of workers, reduce stigma and increase social acceptance, which will ultimately improve their job satisfaction.
- **Formalizing the Informal Labor Market:** Future research should consider ways to formalize the informal labor market of scrap picking, such as through cooperative models or other policy changes, to improve job security and long-term employment prospects.
- **Availability of Necessary Tools and Safety Resources:** The availability of necessary tools and safety resources should be provided by the government. This would help reduce health risks and improve working conditions, leading to better job satisfaction.
- **Focus on External Factors Affecting Job Satisfaction:** Future research should focus on external factors such as community support, family dynamics and societal perceptions of scrap picking, as these factors could have a greater impact on job satisfaction than the traditional job satisfaction factors.

Based on this study, future research could explore the impacts of green jobs and the CE,

particularly looking at how these concepts can help in sustainable development and job creation in Darbhanga. In addition, research could be conducted on the role of policies and community-based measures in the development of the green jobs sector, helping to understand how Darbhanga can use its local resources to achieve economic and environmental improvements. This study will also help in understanding the status of informal labor markets in the context of scrap picking and based on this, suggestions for policy improvements can be made to enhance workers' security and rights.

7. Limitation of the Study:- This study has a limited sample, as it is primarily based on the informal sector, especially scrap pickers. In the future, other related stakeholders can be included for a more detailed analysis. Additionally, only a few limited factors related to job satisfaction and income generation have been considered.

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