

An Empirical Investigation into Student Attitudes toward the Circular Economy in Chennai City

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Abstract:

The Circular economy is a crucial framework for promoting sustainability in an era of environmental challenges and depletion of natural resources. The traditional linear economy always roots towards the take-make-dispose model, but here the circular economy plays a crucial role in achieving the Sustainable Development Goals. The circular economy promotes wise consumption and waste reduction, which is in line with the principles of sustainable goals. In an effort to create a sustainable and quality future understanding and sustainable practices need to percolate in the minds of young adults especially among the college students. For that study we need to investigate the students' practices, attitude and approach towards the circular economy and intent to create responsibility on sustainable practices. So the study aims to evaluate students' attitude towards circular economy. The information was gathered using the well-structured questionnaire and analysed through the descriptive analysis. Overall, it shows some level of awareness and practices brought among the students with the actual engagement in day-to-day life. The findings suggest that students have a positive attitude towards circular economy, but there are gaps in their knowledge and understanding of its principles and practices. The study highlights the importance of education in promoting circular economy practices and suggests that educational institutions in Chennai can play a crucial role in shaping student attitudes and behaviours. The study suggests that increasing the awareness through educational initiatives and hands-on workshops could encourage greater participation among youth, ultimately promoting more sustainably.

Introduction:

India, being one of the fastest-growing major economies in the world, is poised to play a significant role in the global transition towards a circular economy. The country has recognized the importance of adopting circular economy principles to achieve sustainable development, reduce waste, and promote resource efficiency. In recent years, the Indian government has taken several initiatives to promote circular economy practices, including the launch of the "Swachh Bharat Abhiyan" (Clean India Mission) and the "Make in India" initiative, which aims to promote sustainable manufacturing practices. Additionally, the government has also introduced policies such as the "Waste Management Rules, 2016" and the "E-Waste Management Rules, 2016" to regulate waste management and promote recycling. Furthermore, India has also set ambitious targets to reduce greenhouse gas emissions and transition to renewable energy sources, which is in line with the principles of a circular economy. As the Government of India's think tank, NITI Aayog provides directional and policy inputs to the Government and has

undertaken several initiatives to promote sustainable economic growth. Direct initiatives were taken to address the challenges in the utilization of waste as a resource and shape a perspective on the recycling industry in India. NITI prepared strategy papers on resource efficiency in the sectors of steel (with the Ministry of Steel), aluminium (with the Ministry of Mines), construction and demolition (with the Ministry of Housing and Urban Affairs), and e-waste (with the Ministry of Electronics and Information Technology). Steel Scrap Recycling Policy Steel Scrap Recycling Policy, notified in 2019, aims to enhance the availability of domestically generated scrap to promote CE and green transition in the steel sector.

The policy provides a framework to facilitate and promote establishment of metal scrapping centres in India for scientific processing and recycling of ferrous scrap generated from different sources, including End of Life vehicles. Raising and Accelerating MSE Performance (RAMP), launched in June 2022, is being implemented by the Ministry of Micro, Small and Medium Enterprises (MoMSME) over the five-year period 2022-23 to 2026-27. One of the sub-schemes under the RAMP programme is the MSE-Scheme for promotion and investment in circular economy (MSE-SPICE) dedicated to empowering MSMEs in embracing sustainable practices through circular solutions. The primary goal of this scheme is to promote resource efficiency, reduce environmental impact, and enhance the competitiveness of MSMEs in India. Ecomark Rules The Government of India notified voluntary Ecomark Rules in September 2024 to encourage demand for environmentally friendly products while promoting energy efficiency and CE principles. These Rules outline criteria for granting Ecomark for 17 product categories, including household and consumer products (such as cosmetics, batteries, soap and detergents, food items, plastic products, textiles, and electric/electronic goods), focusing on their environmental impact and quality standards. As for NITI Aayog concern it provides different provisions to minimize the wastage and to reuse them to the maximum extent for the environment concern. The real challenges occur when it starts initiating among the general public to make them understand and adopt the circular economy. As the development occurs the depletion is invoked on the environment.

The purpose of adopting a circular economy approach is multifaceted and far-reaching. At its core, the circular economy seeks to redefine the traditional linear economy model of “take, make, dispose” and replace it with a more restorative and regenerative approach. By designing out waste and pollution, keeping products and materials in use for longer, and regenerating natural systems, the circular economy aims to create a more sustainable and resilient economy. This approach can help reduce greenhouse gas emissions, conserve natural resources, promote sustainable consumption and production patterns, and support sustainable development. Furthermore, the circular economy has the potential to unlock new economic opportunities, create jobs, and drive innovation. By adopting circular economy principles, businesses, governments, and individuals can contribute to a more sustainable future, reduce their environmental footprint, and promote a more equitable and prosperous society. Ultimately, the circular economy offers a powerful framework for achieving the United Nations’ Sustainable Development Goals (SDGs) and creating a better future for all.

The need for a circular economy has never been more pressing. As the global population continues to grow, our consumption patterns are putting an unprecedented strain on the planet’s resources. The traditional linear economy model of “take, make, dispose” is not only unsustainable but also incredibly wasteful, with an estimated one-third of all food produced globally being lost or wasted. Furthermore, the extraction, processing, and disposal of raw materials are having devastating environmental consequences, including climate change, deforestation, and pollution. The consequences of inaction are far-reaching and

alarming, from severe water scarcity and food insecurity to catastrophic loss of biodiversity. In contrast, a circular economy offers a powerful solution to these challenges. By designing out waste and pollution, keeping products and materials in use for longer, and regenerating natural systems, we can reduce our environmental footprint, promote sustainable development, and ensure a more prosperous future for all. The benefits of a circular economy are numerous, including reduced greenhouse gas emissions, conservation of natural resources, and creation of new economic opportunities. As the world grapples with the challenges of sustainability, the need for a circular economy is no longer a nicety, but a necessity. We must adopt a new economic model that prioritizes regeneration, restoration, and resilience, and we must do it now.

Review of Literature

The circular economy understanding it and practising them itself becomes a big challenge to facilitate it among the students through the educational institution. Even though most of the Universities around the world started to replace the linear economy to circular economy the awareness and attitude seems to be moderate in terms of adoption and practices (Abdul Latiff Abdul Rahman [et.al](#), 2023). The improper maintenance, disposal or household waste are also being a barrier in achieving circular economy goals. By analysing the attitude of the general public in Lucknow the participants expressed knowledge about recycling, environmental impacts, and local recycling processes. This shows a growing awareness of the importance of sustainable practices among consumers. The factors reflecting attitude reveal a solid commitment to prolonging product life, supporting policies, and willingness to pay more for sustainable products. This demonstrates that many consumers are inclined to adopt a circular economy (Utkarsha Yadav., [et.al](#) 2024). The penetration and scaling up of circular economy principles require significant efforts, as the existing environmental management activities are sector-specific and have a narrow focus. In this regard, the framework proposed in the study provides empirical validations through the development and measurement of circular economy indicators based on industrial and business sectors and their alignment with the SDGs, considering the organisational structure and contexts within which small, medium, and large businesses operate in India (Ananthi Rajayya., [et.al](#) 2025).

Sustainability across the three arenas (economics, environment and society) requires directing economic activity towards facilitating the recovery, regeneration and adaptability of ecosystems, all while fostering compatibility and resonance across the pluriverse Keith R. Skene., (2024). While considering the students' involvement in the circular economy can be enhanced only through the effectiveness of the educational module, it could change the student perceptions and most importantly the interactive and participatory teaching methods about the circular economy can endorse the sustainable development goals (Laius, A., Saarna, R.,[et.al](#).,2024). The CE implementation is closely connected to firms' broader processes of innovation and digital transformation. To transform traditional (linear) business models into data-driven circular solutions, digitalization can enable necessary disruptive innovations. This indicates that the circular economy can go hand in hand with digitalization through firms' innovation effect (Sarah Lichtenthäler., 2026). In the fashion and garment industry also circular economy can be widely used to reduce wastage. framework, aiming to extend the lifecycle of garments and materials through practices such as reuse, repair, recycling, and upcycling. Unlike the linear model, circular fashion promotes a closed-loop system in which products are designed, used, and reintegrated into the production cycle, thereby reducing waste and minimising environmental impact. This approach emphasises not only environmental sustainability but also resource efficiency and responsible consumption behaviour (Dr. Sarjoo Patel., [et.al](#).,

2026).

The curricular economy emphasizes principles of sustainable development, environmental awareness, and responsible behavior, focusing on solving issues related to environmental questions. Here the study preponded to investigate the students' attitude on the circular economy in Chennai City.

Scope of the Study

The scope of the circular economy encompasses designing out waste and pollution, keeping products and materials in use as long as possible, and regenerating natural systems through practices like reuse, repair, remanufacturing, and recycling, aiming for a sustainable and resource efficient future. So seeds have to be laid from the student level so that it will penetrate among the younger generation to practice sustainable systems.

Purpose of Circular Economy

The purpose of adopting a circular economy approach is multifaceted and far-reaching. At its core, the circular economy seeks to redefine the traditional linear economy model of “take, make, dispose” and replace it with a more restorative and regenerative approach. By designing out waste and pollution, keeping products and materials in use for longer, and regenerating natural systems, the circular economy aims to create a more sustainable and resilient economy. This approach can help reduce greenhouse gas emissions, conserve natural resources, promote sustainable consumption and production patterns, and support sustainable development. Furthermore, the circular economy has the potential to unlock new economic opportunities, create jobs, and drive innovation. By adopting circular economy principles, businesses, governments, and individuals can contribute to a more sustainable future, reduce their environmental footprint, and promote a more equitable and prosperous society.

Need for the Study

Disposal of raw materials is having devastating environmental consequences, including climate change, deforestation, and pollution. The consequences of inaction are far-reaching and alarming, from severe water scarcity and food insecurity to catastrophic loss of biodiversity. In contrast, a circular economy offers a powerful solution to these challenges. By designing out waste and pollution, keeping products and materials in use for longer, and regenerating natural systems, we can reduce our environmental footprint, promote sustainable development, and ensure a more prosperous future for all. As the world grapples with the challenges of sustainability, the need for a circular economy is no longer a nicety, but a necessity. We must adopt a new economic model that prioritizes regeneration, restoration, and resilience, and we must do it now.

Statement of study

The world is facing unprecedented environmental and economic challenges, including climate change, resource depletion, and waste management. The circular economy has emerged as a potential solution, promoting sustainable consumption and production patterns. However, the successful transition to a circular economy requires a fundamental shift in individual attitudes and behaviours. So the study required to analyze the student attitude towards circular economy and the behaviour have to be distinguished for the future exhaustion of circular economy among the general public.

Objective of the Study

To analyze the extent of Awareness among the students regarding circular economy usages.

To study the extent of practices among students regarding circular economy for the sustainable resources use.

To examine the awareness and understanding of circular economy among the student behaviour towards circular economy.

Methodology

As per the need of the study, Convenience sampling techniques were used for this study, involving around 100 students from various colleges in Chennai city. To assess the students' prior knowledge about circular economy and recycling about the circular economy and the method of practicing the circular economy process and recycling. This study involved both primary and secondary data collected from primary and secondary sources. In the first stage the researcher has collected secondary data from Google scholar relating to circular economy patterns to understand various studies made on the research area and in the second stage, primary data was collected. The researcher collected primary data with 100 sample sizes with a well framed questionnaire to extract specific information for the purpose to understand and assess the students attitude on circular economy.

Demographic Chart

Age	16-18	4%
	18-20	18%
	20-23	61%
	23 & above	17%
Gender	Male	66%
	Female	34%
Course of the Study	Under Graduate	37%
	Post Graduate	63%

The above table is constructed on the basis of distribution of respondents based on their demographic status of the sample size. An analysis of the table reveals that out of 100 sample sizes 4 respondents belong to the age group of 16-18. 18 respondents belong to the 18-20. 61 respondents belong to the age group of 20-23 and 17 respondents belong to the age group of 23 and above. Out of the sample respondents 66 percent of them are male and the rest 34 percent belong to female. When it comes to education status, the majority of sample respondents were from the Post Graduates students which holds 63 percent, followed by 37 percent of them from under graduate background.

Distribution of Respondents based on the source of familiarity of the term Circular economy	
Academic courses / online article	28%
Mass media (tv, radio, news)	39%
Social media	22%
Friends /family	11%

The table states that 39 percent of the respondents got to know about circular economy terms through the mass media, and 28 percent stated that they got to know about circular economy through academic courses and online articles. Here social media also played a notable role in spreading the term circular economy where 22 percent of the respondents have stated. Rest 11 percent of the respondents mentioned through the family and friends pioneer the term.

Distribution of the respondent according to the opinion on using old stuff than buying new one	
Likely to use old stuff	38 %
Neutral	40 %
Unlikely to use old stuff	22 %

The above table is constructed based on the opinion on using old stuff rather than buying new ones. Here it shows that 38 percent of them are likely to use old stuff, where 40 percent of them stand neutral and the rest 22 percent of them state that they were unlikely to use old stuff. The Asian mentality always tries to use old stuff instead of replacing it with new ones. But due westernized culture, availability of credit facilities for household stuff and a huge market platform intend to dilute the mentality of reusing it.

Distribution of Respondents based on their involvement in Circular Economy in day today life		
Habit of carrying their own reusable bag for shopping the Groceries	Mostly	52%
	Sometimes	16%
	Not at all	32%
Habit of retaining the things instead of buying new buying new stuffs	Often	47 %
	Sometimes	45 %
	Rarely	8%
Habit of using second hand outfits.	Often	4%
	Sometimes	19%
	Rarely	77 %

Habit of using the reusable water bottle instead of use and throw water bottle	Unlikely	64%
	Neutral	28%
	Likely	8%
Habit of reusing the items by changing the function or by recycling them	Often	25 %
	Sometimes	62 %
	Seldom	13 %

Sustainable consumption involves the environmentally friendly acquisition, use and disposal of domestic goods. One of sustainable consumption practices is the reuse of shopping bags. The concept of reuse of shopping bags takes two forms. The first reuse involves finding a new use of a product as a way of extending its useful life, such as using shopping bags as wrapping material for household waste and waste bin liners. The second method of reuse involves continuous use of the shopping bags for their original purpose repeatedly until they are no longer useful. Plastic shopping bags are light weight, flexible and waterproof when compared to cotton shopping bags. At the end of their life cycle, plastic bags are disposed of through landfill. Due to the light weight of plastic shopping bags, they can easily get blown away and increase litter. It is due to the amount of litter that has been attributed to plastic shopping bags that cotton

and paper shopping bags were suggested as alternatives. The above table clearly portrays the involvement of the respondents on circular economy on day today life especially among the students here nearly 32 percent of them indicates that they never carry the bags for shopping.

The circular economy is not just consumer preference, it is more of structural necessities where you need to uphold the habit of retaining things like gadgets and other electronic appliances by repairing and reusing it instead of buying new models as it arrives in the market. Nearly half of them stated they often use to retain and reuse until it becomes no longer it could be used, rest of them mention that sometimes they might be retaining the goods.

If every individual goes for the adoption of second-hand clothing, it would lower carbon-dioxide emissions by more than 2 billion pounds, equal to taking 76 million cars off the road for a day and save some 23 billion gallons of water and 4 billion kilowatt-hours of energy (ThredUp, 2022). Hygiene is a crucial factor influencing the adoption of second-hand clothing. Many buyers are concerned about the perceived cleanliness of the pre-used clothing and its owner, which forms a major obstacle in the buying process. Since clothing comes in direct contact with the users' body, consumers are more concerned about second-hand clothing in comparison to other previously owned items. So more than 75 percent of the respondents denied using second hand clothing.

Among the students in Chennai city, the college students who wish to consume bottled water at Chennai city indicated they would either use a reusable water bottle or "consider" using it if there were more water stations on campus. However, the inconvenience of using reusable water bottles comes from not only the location of water filling stations but also the necessity of carrying the bottle daily. In many cases, one of the main reasons for not using a reusable bottle, regardless of tap water quality, was the portability of the bottle becomes the main concern, so nearly 64 percent of students were unlikely to use the reusable water bottle. The habit of reusing the items by changing the function or by recycling them is also one among the notable steps under circular economy. Waste glass bottles, garments, some electronic and household waste can be recycled and reused as home decor, bags, mates whichever it could be reused without duping it as land filling waste. Even the residential grey water recycling method will also reduce the wastage which fills in the land and is used for toilets and for gardening purposes. Reusing and changing the function of the used item is usually seen under the Indian households this reflects nearly 62 percent comes under this category of reusing practices.

Hypothesis testing

Ho: There is no relationship between the level of difficulties in implementing a circular economy in day to day life.

Ho: There is no relationship between age and likelihood of fixing a broken electric appliance instead of buying a new one.

Ho: There is no association between age group and consideration of environmental impact when making purchasing decisions.

Test 1: Correlation: Testing the association between the level of difficulties (lack of infrastructure, limited access to technology, high operational cost and other) in implementing a circular economy in day to day life and government support in overcoming the barriers.

X	X ²	Y	Y ²	XY
54	2916	58	3364	3132
35	1225	34	1156	1190
11	121	8	64	88
100	4262	100	4584	4410

Ho: There is no relationship between the level of difficulties in implementing a circular economy in day to day life.

H1: There is a relationship between the level of difficulties in implementing a circular economy in day to day life.

$$\begin{aligned}
 r &= \sum XY / \sqrt{\sum X^2 \times \sum Y^2} \\
 &= 4410 / \sqrt{4262 \times 4584} \\
 &= 4410 / \sqrt{19,537,008} \\
 &= 4410 / 4420.068 = 0.99
 \end{aligned}$$

Two variables are highly correlated. There is a significant relationship between the level of difficulties in implementing a circular economy in day to day life and are very highly correlated. This implies that the respondents had difficulties in implementing a circular economy in day to day life.

Test 2: Testing the association between preferred products with environmental friendly certificates.

X	X ²	Y	Y ²	XY
66	4356	86	7396	5676
34	1186	14	196	476
100	5512	100	7592	6152

Ho: There is no relationship between age and likelihood of fixing a broken electric appliance instead of buying a new one.

H1: There is a relationship between age and likelihood of fixing a broken electric appliance instead of buying a new one.

$$\begin{aligned}
 r &= \sum XY / \sqrt{\sum X^2 \times \sum Y^2} \\
 &= 6152 / \sqrt{5512 \times 7592} \\
 &= 6152 / \sqrt{41,84,7104} \\
 &= 6152 / 6468.93 \\
 &= 0.95
 \end{aligned}$$

Two variables are highly correlated. There is a significant relationship between the age and likelihood of fixing a broken electric appliance whereas buying a new one are highly correlated. This implies that the respondents had been fixing a broken electric appliance instead of buying a new one as a part of the circular economy.

Test-III: Chi-Square Test

Testing the association between age group and consideration of Environmental impact when making

purchasing decisions

Age	Environmental Product			
	Often	Neutral	Seldom	Total
16 -18	0	2	2	4
18 - 20	8	6	4	18
20 - 23	38	11	12	61
23 and above	3	2	12	17
Total	49	21	30	100

HO: There is no association between age group and consideration of environmental impact when making purchasing decisions.

H1: There is an association between age group and consideration of environmental impact when making purchasing decisions.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

O	E	O-E	(O-E) ²	$\frac{(\square - \square)^2}{\square}$
0	2	-2	3.8	2
2	0.8	1.2	1.3	1.6
2	1.2	0.8	0.6	0.5
8	8.8	-0.8	0.7	0.08
6	3.8	2.2	4.9	1.3
4	5.4	-1.4	2.0	0.4
38	29.9	8.1	65.8	2.2
11	12.8	-1.8	3.3	0.3
12	18.3	-6.3	39.7	2.2
3	8.3	-5.3	28.4	3.4
2	3.6	-1.6	2.5	0.7
12	5.1	6.9	47.6	9.3
				23.899

Calculated value=23.899

Degree of Freedom= (r-1) (c-1)

= (4-1) (3-1)

= (3) (2)

= 6

Value of the 6 degree of freedom @5% level of significance 12.592

H1: Accepted

H0: Rejected

Chi-Square Summary Result

X ² Calculated Value	23.899
Degree of Freedom	6
X ² Value @ 5% of significance	12.592

The calculated value (23.899) is greater than the table value (12.592). Hence H1 is Accepted, Ho is Rejected. Since, the calculated value (23.899) is greater than the table value (12.592) the alternative hypothesis is accepted and the null hypothesis is rejected. So, it reflects that there is significant association between the age group and consideration of environmental impact when making purchasing decisions.

Conclusion:

This study provides insights into the attitudes of students in Chennai towards the circular economy. The findings suggest that students have a positive attitude towards circular economy, but there are gaps in their knowledge and understanding of its principles and practices. The study highlights the importance of education in promoting circular economy practices and suggests that educational institutions in Chennai can play a crucial role in shaping student attitudes and behaviours. By promoting circular economy practices and educating students about its importance, we can work towards creating a more sustainable future for Chennai. Ultimately, this study demonstrates that students in Chennai are eager to adopt circular economy practices, but require education, support, and infrastructure to make sustainable choices a reality. The study suggests that increasing the awareness through educational initiatives and hands-on workshops could encourage greater participation among youth, ultimately promoting more sustainably.

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