International Journal of Enhanced Research in Management & Computer Applications,
ISSN: 2319-7471, Volume 15 Issue 1, January 2026

Circular Economy in Consumer Electronics: A Cross-Country Analysis of India and the UAE

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ABSTRACT

Principles of circular economy represent a major shift from traditional linear "take-make-dispose" consumption pattern towards regenerative resource management systems. Electronic products, in particular, present critical opportunities and challenges for circular economy implementation. Consumer awareness of circular economy principles and market for refurbished electronics has expanded globally, yet empirical evidence suggests that substantial awareness-to-behaviour discrepancies continue to remain in South Asian and Middle Eastern regions. In this context, this study addresses this gap by examining the environmental consciousness and circular consumption practices across two nations with India as a representative sample of low per capita income, highly populated economies and UAE representing high per capita income and less populated economies. This study utilises mixed-methods research examining adult consumer awareness and behaviour towards circular economy adoption in electronic products across India and United Arab Emirates, and policies related to circular economy in both nations. Independent samples t-test revealed remarkable convergence: nine of ten dimensions showed no statistically significant differences between India and UAE populations. One borderline significant finding emerged as UAE consumers preferring new devices significantly more. While demographic stratification revealed that male population in the UAE showed higher willingness-to-pay for CE-designed electronics. Overall, this research provides factual evidence that environmental consciousness and circular economy awareness is common among respondents from both counties but there are insufficient conditions for circular consumption behavior to be adopted while making the purchasing decisions of electronic products in reality.

Keywords– Circular Economy, Adult Consumer Behaviour, Refurbished Electronics, Environmental Consciousness, Awareness-Behaviour Gap, Geographic Divergence

INTRODUCTION

Circular economy is a concept that is rapidly gaining attention among researchers, scholars, environmentalists and economists. It proposes an alternative to the traditional mindset ‘take, make, and dispose’ of the linear economy. The European Commission and researchers point out that circular economy primarily focuses on minimising input of virgin materials and output of waste by closing the loops of resource flows. More precisely, it functions on the principle that the waste from one process should become a resource for another, successfully abolishing the concept of "end-of-life" disposal. In the context of an economic system, the concept of circular economy integrates organizational planning processes, customer and societal participation, ecosystem utilization, and economic resource flows in a way that maintains product and material value for as long as possible while avoiding waste.The traditional linear economy model is based on a simple supply chain concept assuming that raw material is extracted from earth, harvested and processed in the manufacturing stage of a product, and finally sold to consumers who readily discard it after its use is exhausted (McKinsey, 2015). In contrast, and serving as an environmentally and economically beneficial alternative, circular economy can be defined as a model in which each stage of the linear economy process is modified into a sustainable closed-loop by reducing, reusing, remanufacturing, refurbishing, repairing etc (Geissdoerfer et.al., 2017).

Transitioning from linear economy to a circular economy model would have major environmental and economic impacts. Among these are waste reduction, lower greenhouse gas emissions, resource conservation, enhancement of natural elements, energy and fuel savings, shorter supply chains, preservation of natural habitats and so on (CII, 2023). Economic implications include job creation in various sectors, boosting of entrepreneurship and innovation, and development of

healthy competition (CII, 2023). In fact, the UNDP states that such a shift could bring US$4.5 trillion in economic benefits by 2030 (Nie et.al., 2023).

Considering the various advantages of the circular economy, policymakers and industry leaders constantly debate globally on policies and strategies to achieve sustainability goals. Yet, this transition depends not only on institutional efforts but also on consumer participation. Despite growing awareness of environmental issues, most consumers- across both developed and developing economies- do not prioritise circular practices when making every day purchasing decisions, particularly in electronics. In this context, this paper aims to cover the circular economy in the electronic industry through an analysis of three major stakeholders- Government, Companies, and Consumers from two nations- India and the United Arab Emirates (UAE), as the UAE is a high-income nation with a small population while India is a low-income highly populated developing nation. The primary objective of this cross-country study is to analyse and evaluate Indian & UAE Government Policies along with their implications for circular economy, private manufacturers' efforts in promoting circular economy and sustainability, and at the consumer end- the difference in awareness and preferences towards circular economy while making purchase decisions of electronic products.

REVIEW OF LITERATURE

Globally, there are several breakthrough research and publications that highlight the concept of circular economy, right to repair and other related concepts to achieve long term goals of a more sustainable world. Following is an account of some of the significant and widely quoted publications:

Aggeri (2020) identifies the historical development of the circular economy in two phases- pre industrial revolution and post-industrial revolution. He states that the concept of circular economy is not recent and in fact was the dominant economic model before the 19th century. In this period, the concept of waste was limited and items were either reused or discarded to decay naturally. An important stakeholder group was the rag-pickers, who retrieved all available extra scrap and reused it to make various products like paper and fertilizer. However, this circularity in operations was superseded by the industrial revolution, from which stemmed the linear economic model. The hygienist movement in the late 19th century and the growth of consumerism were also contributing factors to this shift. Re-emergence of the circular economic model came in early 2000s, when the need for the same arose due to a hike in commodity prices and environmental concerns. Yet, the concept needed to be reinvented to be less resource intensive while maintaining quality standards. Such an effort was first brought about by Japan and China in 2000 and 2008 respectively, followed by the European Union in 2016 and France in 2020.

A report on 'Circular Economy as a Cornerstone for Meeting the Goals of the Paris Agreement' by Johannes Paul, Angelina Schreiner, Katja Suhr (2021) points out the pivotal role of circular economy principles in achieving Paris Agreement goals. The research encourages coordinators to design and implement CE-smart NDCs by highlighting the opportunities and challenges of such a move. The report identifies that stakeholders are not on track to meet the goals of the Paris Agreement and CE corrects this by changing production and consumption patterns, mitigating greenhouse gas action, opening investment opportunities, and supporting recovery towards a green economy. Several challenges to this integration include cost concerns in estimation of progress, and complexity in the multi- stakeholder collective effort; suggested solutions include financial incentives to stakeholders, and utilisation of CE-smart NDCs to achieve long term international strategies. Finally, the guide provides a "Roadmap towards CE-smart NDCs" to aid any party wishing to do the same.

Aborujilah, et. Al. (2023), identifies the role of CE in achieving the United Nation's Sustainable Development Goals. Strategies like reducing consumption and encouraging the use of renewable resources for production could contribute to realising some specific SDGs. A detailed review on how CE principles cater to SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation and Infrastructure) is given. The impact of CE adoption across these SDGs is as follows: SDG 12- 40% reduction in waste generation, SDG 13- 30% reduction in carbon emissions, SDG 6- 25% reduction in water usage, SDG 7- 35% increase in renewable energy adoption, SDG 8- 20% increase in job creation in circular sectors and SDG 9- moderate improvement depending on investment. They conclude that such an approach is beneficial, though dependent on the level of policy, technology, and infrastructure support. World Economic Forum (WEF, 2019) in its report 'A New Circular Vision for Electronics' quotes- The access to electronics and digital technology has increased exponentially due to rapid innovation. A consequence of this is the mass creation of the by-product: e-waste (electronic and electrical waste). Only 20% of all globally produced e-waste is appropriately dealt with, while the rest mostly ends up in landfills or creates problems for informal workers in poor conditions. Proper utilisation of e-waste to its fullest extent could lead to the realisation of its total annual value of $62.5 billion. All stakeholders including manufacturers, designers, investors, policymakers and consumers play a role in reducing waste and optimising its economic

value. Further, this paper identifies the illegal movement of e-waste from developed countries to developing countries as a major global challenge. (Note: a diagram provided illustrates e-waste moving from powerhouses in Europe and Australia to India.) In a conscious shift to CE in electronics, products need to be redesigned for reuse and repairability, systems for buy-back and recycling need to be implemented by institutions, scraps need to be reincorporated back into the supply chain, and electronics increasingly need to be provided as a service rather than a product that has an "end-of-life" (electronics leased or rented out rather than being sold). The author concludes by emphasising the economic benefits of this shift, which is mainly job creation and reduction of costs for consumers (projected to be 14% by 2040).

Xu Pan et. al. (2022), identified the gap in circular economy research and found that most CE literature online only consisted of a focus on "4R" strategies. These studies also offered little details on the impact of CE practices on the development of the environment and economy in the waste electrical and electronic equipment (WEEE) industry. The current paper expanded to examine the "10R" CE strategies and broaden the spectrum of possible initiatives by policymakers and the general public. The extended 10R's, altered to fit the WEEE industry, are- refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle and recover. Zoka and Vida (2025) explored the awareness, challenges, incentives and opportunities relating to the circular economy in the electric and electronic equipment (EEE) industry in Slovenia and Croatia. While the paper analyses the afore-mentioned aspects of CE, we shall focus on summarising the "challenges" segment. They identified that micro and small businesses show indifference toward adopting CE policies, mainly due to insufficient funds, lack of technological knowledge and absence of proper awareness. Their primary research also suggested that most businesses were either completely unaware or inadequate in their understanding regarding support offered by the government and the EU. Another challenge noticed was the poor waste management by Croatia, evidenced by their statistic of double the e-waste in landfills than the EU average.

Research of Mahanth et. al. (2023) identified and analysed the barriers hampering CE practices in e-waste management in India. The most common and prevailing challenges were listed and sorted to assist industrial practitioners and policymakers in their plans of action. Firstly, it is mentioned how developing nations like India suffer at the hands of illegal import of e-waste from developed nations. A cause of this is the availability of cheap labour from the informal sector, which poses a major challenge for India. Requirement of technological infrastructure is another limiting factor. Here, 30 persisting barriers are listed which are further classified into social, economic and environmental. Summarising, the top 5 most crucial barriers identified are- 1. Uncertainty about the profitability of the circular business, 2. insufficient market demand, 3. lack of successful circular business models, 4. shortage of high-quality recycling materials, and 5. lack of adequate technology. Additionally, prominent among the 30 were consumer hesitancy to use CE modified products and low societal awareness.

Chersan et. al. (2023) investigated the circular economy practices implemented by the producers and manufacturers of electric appliances in the European Union. They analysed publications released by companies- predominantly sustainability reports- and verified the magnitude of information in each report under the following heads: innovation and R&D, supply chain, manufacturing, packaging, and logistics. Their findings verify similar company attitudes in the EU as that in developing countries like India. Their research confirms the commitments of companies towards sustainable practices and how their emphasis lies on environmental development rather than social or economic benefits, much like a large number of public companies in India. Additionally, their findings suggest that consumers benefit from and enjoy buying circular equipment because of advantages like lower price, easier repair, and convenient end of life disposal. Thiago et.al. (2022) analysed the laws concerning a shift from a linear economy to a circular economy proposed by different countries. Their conclusion cements Germany, Japan, and Sweden as pioneers of sustainable development, while recognizing China as the first country to integrate Circular Economy into law. Commitment and progress of countries was analysed using the tool-Framework 9R. The Framework 9R defines 9 stages or degrees of circularity and gives an idea of the initial stage of a country and prospective future stage. An observation can be made here regarding the stages in the framework which concern the electronics industry. From R3-R7, named "Extend lifespan of product and its parts", the strategies (including Reuse, Repair and Refurbish) are directly applicable to principles of CE in electronics. Further, these concepts are reflected in India and UAE's policies and initiatives, which will be evident in a later section of the paper.

Ewers et.al. (2018) recognised the urgent need for efficient resource management and aimed to analyse the policies formulated by various countries and organisations internationally. While countries like Russia and Brazil targeted individual sectors in their policies, other countries like South Africa or China focus on overall sustainability strategies. For example, South Korea introduced the "Green Credit Card" which is an economic incentive scheme for consumers to purchase environmentally friendly products. The paper then elucidates on sector specific initiatives by countries. In production, Indonesia grants "Green Industry" awards to resource efficient companies, India judges the reuse of building materials by companies with the Zero Effect Zero Defect (ZED) program, and Mexico provides government support to green business startups. South Africa has implemented Industrial Symbiosis- an arrangement that allows a company to reuse the unused resources and byproducts of another. The Global Network for Resource Efficient and Clean Production

(RECPnet) is a network consisting of 60 countries formed to optimise resource efficiency. The report by Ernst & Young (E&Y, 2022) on 'Regulatory landscape of the circular economy' mentions that the earliest indication toward circular economy came from Japan in the 1990's. This was spanned until 2022, followed first by the European Union (EU Roadmap to CE), then Germany (CE Act), Canada (Zero Waste Action Plan), USA (Framework for Recycling), Ecuador (CE Pact), Rwanda (Environment Policy), South Korea (Green New Deal), South Africa (Recovery Plans), France, and finally Finland. The paper progresses to regard countries in Europe, North America, Latin America, the Caribbean, Asia, and Africa on their attitude and initiatives regarding CE. Overall, China, Japan, Mongolia, Sweden, Finland, France, Germany, Tunisia, UAE, Uruguay, and Ecuador seem to be the most mature in terms of CE legislation, each having National CE Policies in place.

During the review of literature, the researcher identifies that the 'Right to Repair' is also a critical sub-theme as repairing plays a huge role under the circular economy with respect to electronics. Using recycled spare parts to replace defective or damaged existing parts of a device, or simply fixing faulty parts, is significantly more sustainable than discarding a device due to a damaged part and purchasing an entirely new device with all fresh components. Recognising this, advocacy for a movement that grants consumers the choice to repair, alter, or replace their devices- either individually or through a 3rd party- has emerged (Ozturkcan, S. (2023). The Right- to- Repair (R2R) movement primarily argues optimising the following objectives (stated specifically by The Repair Association- a right to repair advocacy group): making information available through manuals, schematics, and guide documents; making parts and tools available; and designing future devices for repairability (Thorin Klosowski, 2021).

Regarding its affected stakeholders, R2R is extremely beneficial to consumers and 3rd party repair shops. To consumers, it offers more choice, access to self-repair, affordability in repairs, and option to reduce expenditure on new devices. To 3rd party repair shops, it stimulates economic activity and offers growth opportunities (medium.com, 2024). However, to the original manufacturer selling the device, or the OEM (Original Equipment Manufacturer), the option to repair externally is a direct charge against their profit (Svensson et.al., 2018). A consumer who is enabled to repair their device as opposed to buying a new one represents the loss of a sure sale for the OEM (Svensson et.al., 2018). Moreover, R2R deprives an OEM of revenue originating from after-sale repair services (Svensson et.al., 2018).

The following 2 papers provide an overview of UAE and India's adoption of Right to Repair: First- The cabinet resolution concerning 'Consumer Protection in UAE' serves both consumers and Right to Repair principles. Article 4 "Instruction on the Use and Installation of the Good" says that data on included parts and their dismantling/ installing technique is to be included with the good. Article 14 "Provider Obligations Regarding Spare Parts" dictates that sellers must provide the necessary spare parts for operation and repair of the good. Article 16 "Mechanism for Providing Spare Parts and Providing Maintenance Service" requires manufacturers to give maintenance services to the consumer when needed.

On the other hand, The Government of India has set up a committee to create a comprehensive Right to Repair framework. This committee identified the following 4 sectors where R2R can be implemented- Farming Equipment, Mobile Phones/ tablets, Consumer Durables, and Automobile/ Automobile Equipment. The committee aims to empower consumers, join efforts of original manufacturers and third-party sellers, and promote sustainable consumption and reduction in e-waste. The secondary section of this report analyses R2R initiatives of the USA, UK, EU, and Australia. Their initiatives ranged from the "Fair Repair Act" of the US to the EU's updated Right to Repair standards. India's R2R Roadmap is based on principles derived from worldwide initiatives- Sustainable Production, Product Standardisation and Guarantee, Marketing and Advertising, Public Procurement, and Waste Management (Roadmap for India's Right to Repair, October 2022). A white paper by World Economic Forum (WEF, 2025) mentions that circularity creates economic value across various sectors, the most prominent of which is the industrial sector. It allows businesses to remain competitive and productive. Research conducted in this paper shows that businesses which successfully achieve economic value through enabling of CE practices apply the following strategies- Establishing a cross functional mandate to align capacity sharing solutions as part of business strategy, extending product lifespan and design for sharing, and learning from data to maximise the value of destroyed assets. A CE model could therefore increase corporate revenues by boosting consumer demand and shifting from one-time sales to lifetime servicing. However, this transition requires extra resources and expertise.

A report by DSCE (2022) on 'Enabling a circular economy transition through energy, water, transport and waste management' provides a list of key companies in UAE and their CE initiatives. These include: "Emaar" utilises recycled materials and alternatives to cement, "Majid Al Futtaim" phased out single use plastics completely, "Consent" offers waste and recycling services, "Fuse" converts petrol and diesel fuelled cars into electric ones, "IKEA" aims to use only renewable materials by 2030, "Adidas" produces sportswear using recycled materials, and "Dubizzle" creates a platform for sale of second-hand electronics.

A report on 'case studies of Corporate-Led Initiatives on Biodiversity Conservation' by UN Global Compact Network India (UNGCNI, 2025) states that in India, the focus of businesses adopting circular principles lies in reducing, recycling, and reusing materials to produce sustainability and mitigate environmental degradation. Indian companies in sectors like textiles, packaging and electronics aim to reduce resource extraction and minimise environmental footprints by implementing CE models and policies like Extended Producer Responsibility (EPR). Tata Steel, ITC Limited, and Vedanta act as key catalysts to this shift by adopting closed-loop production models and recovering materials while reducing waste generation.

Vidal-Ayuso et.al. (2023) identified that consumers are key actors in the transition to circular economy, yet emphasised how research on their role regarding the same is obscure. They aim to expand on this gap and study consumer behaviour and decision making in CE. Their research highlighted 7 key areas covered in research publications- consumer behaviour, sustainable consumption, lifetime extension, recycling/ upcycling, packaging and waste, e-waste, and innovation. Further, it is evident that consumers make CE buying decisions using a framework called ADO (Antecedents, Decisions, Outcomes).

Antecedents include internal factors like perceived quality and awareness, and external factors like education by stakeholders. Decisions relate to the questions of repairability, durability, and environmental attitudes that arise in a buyer. Outcomes cover post-purchase concerns like satisfaction derived, willingness to "go green," and perceived risk of quality, contamination or effect on finances. Kashyap, R. (2025) conducted research to understand consumer attitudes regarding the circular economy in India.

Her findings indicate that a consumer is indeed a mobilising factor in the adoption of CE practices in India. 94.7% of their respondents were aware of the concept of the 3 R's (Reduce, Reuse, and Recycle), and more than 50% were aware of the circular economy. Consumers in India prefer to repair their products over replacing them, however an obstacle identified here was the non-repairable design of majority products. Lusk, J., Mook, A. (2020) in their study, quote that The United Arab Emirates has a culture of excessive shopping and consumerism, both of which drive climate change and environmental degradation.

This paper recognises the insufficiency of data available on UAE consumer behaviour and attitude toward CE. They surveyed 163 undergraduate students and analysed gender, nationality, exposure to CE initiatives, efforts to reduce one's ecological footprints, and sustainable consumer behaviour as predictors for a positive or negative response in CE participation. Their results indicate that CE participation emerges from investments in sustainable/ durable items (designed for longevity) rather than concerns regarding the environment. Further, Emirati citizens were found to be more likely participants (particularly in repairing items) than expat residents- an observation justified by the more stable lifestyles of Emirati citizens.

RESEARCH METHODOLOGY

This study utilises mixed-methods research studies to examine consumer awareness and behaviour towards circular economy adoption in electronic products across India and United Arab Emirates, with specific focus on youth consumer segments and circular economy related policies of both nations. The methodology adheres to established research protocols in consumer behaviour studies, sustainability marketing, and circular economy research, employing both parametric and descriptive statistical approaches.

The foundational research phase employed independent samples' t-test analyses comparing consumer awareness across two geographic populations: India and the UAE. This initial phase analysed existing datasets comprising approximately 158 respondents (df=156) divided into four distinct demographic groups representing different consumer life stages and economic classifications. The first demographic group included young males aged 26-31 years, selected to identify whether consumer preferences varied by gender and age during early professional stages.

The second group encompassed mature consumers above 35 years, hypothesizing that life-stage effects might override geographic differences. The third group comprised high-income earners exceeding ≈$55,000 per annum, representing affluent consumer segments potentially with access to premium circular economy products. The fourth group included low-income earners below $55,000 annually, examining whether affordability barriers constrained circular economy adoption independent of awareness.

Additionally, the structured questionnaire included 10 dimensions of consumer awareness and behaviour which were measured across all samples using five-point Likert-scale instruments.

RESULTS AND ANALYSIS

IV.i. Cross country demographics

This study, in the first section, addresses the gap between the circular economy or environmental sustainability related policies of both nations, considering India as a representative sample of low-income highly populated economies and the UAE representing high-income and less populated economies.

BASIS OF COMPARISON	INDIA	UAE
Demographical	· Population~ 1.45 billion (2024) · Literacy rate (% of people ages 15 and above) ~ 76% (2022)	· Population~ 10.88 million (2024) · Literacy rate (% of people ages 15 and above) ~ 98% (2022)
Economic	· GDP (Per Capita, 2024) ~ 2.7K USD	· GDP (Per Capita, 2024) ~ 49.4K USD
Political	· Sovereign Socialist Secular Democratic Republic with a Parliamentary form of government which is federal in structure with unitary features (National Portal of India, 2025).	· Federal, Presidential, Absolute Monarchy (Forum of Federations, 2025).

IV. ii. Cross country policy analysis

INDIA

India can be classified as being in the transition stage to CE. Currently, India recovers and recycles just 20% of its raw material usage (Rajayya et.al, 2025). They also deal with a waste problem. India generates over 62 million tonnes of waste every year, (data by Central Pollution Control Board- CPCB), of which 31 million tonnes are discarded in landfills. This figure is set to increase to 165 million tonnes by 2030 (EAC-PM, 2023).

Emerging from its traditional take- make- waste model, the Indian government recognises the need to adopt a CE approach as vital in achieving their Sustainable Development Goals, and subsequently fulfilling their 2030 Sustainable Development Agenda (Rajayya et.al, 2025). Adopting a CE approach would boost economic growth without the depletion of India's natural resources.

The following regulatory, financial and awareness policies have been implemented by the Indian Central Government to promote CE

a. National Resource Efficiency Policy (NREP): Launched in 2019, NREP promotes sustainability in production and consumption, by enhancing resource efficiency and decreasing environmental degradation caused by production activities (EAC-PM, 2023). The policy encourages leasing, renting, and sharing of products and recycled products. The objectives of the policy are based on the following principles: (GOI-MEFCC, 2019)

- Limit primary resource consumption
- Utilise less material to produce higher values through optimising resource consumption
- Minimise waste creation
- Aim at using local resources and reducing imports
- Generate employment and start-ups that foster environment protection

b. Swachh Bharat Mission (SBM): SBM was launched in 2014 to advocate for cleanliness, hygiene, and effective waste management. It aligns itself with the goals of CE to achieve a "zero-waste country status" by reducing waste generation, segregating produced waste, and promoting recycling and composting schemes. (EAC-PM, 2023)

c. Atal Innovation Mission (AIM): Launched in 2016, AIM is Government of India's flagship initiative that aims at promoting innovation and entrepreneurship in the country. Their objective is to foster innovation and entrepreneurship across different sectors in the economy by developing programmes, providing platforms for taking initiatives and exhibiting collaboration of stakeholders. They perform this through their AIM Programs, that include,

- Atal Tinkering Labs, a space in schools designated to foster curiosity and innovation
- Atal Incubation Centres, incubators established at institutions to promote start-ups
- Atal Community Innovation Centres, centres that extend the benefits of technology led innovation to Unserved and Under-served regions of India. (AIM, 2025)

Further, following India's Federal Government System, some policies were implemented by the individual State Governments as well: (Chase India and ICCE, 2024)

i. Green Maharashtra Initiative (Maharashtra): The government set up 4 circular economy parks across major industries. These parks serve the primary purpose of recycling the scrap that is produced in these industries.
ii. T- Hub (Telangana): Atal Innovation Mission (AIM) and T- Hub partnered to create AIC T- Hub Foundation. AIC T-Hub Foundation supports promising startups that propose solutions that align with their themes. The largest innovation hub in the world and India's top incubator, T-Hub is driving new business models and next-generation goods. Their focus area includes startups in the Healthcare, Sustainability, EV/Mobility, Semiconductor and Space Tech sectors.
iii. Elevate 100 Program (Karnataka): Under this program, Karnataka fosters innovation by funding startups in different sectors, including ones specific to the circular economy sector. They promote new solutions supporting sustainable development, waste management, renewable energy and sustainable agriculture.

UNITED ARAB EMIRATES

The most notable step toward adopting circular economy principles in the UAE was the implementation of the "UAE Circular Economy Policy," which was approved by the UAE cabinet in January 2021. This policy is the foundation for the UAE's government to transition into a completely circular model. It emphasises sustainable development and the protection of future generations' quality of life by adopting consumption and production methods that ensure the ideal use of natural resources. (The Government of UAE, 2025a)

The objectives of this policy include-

- Promoting environmental health
- Aiding and encouraging companies in the private sector toward cleaner production
- Fulfilling the UAE's vision to be a global pioneer of green development by decreasing the strain and stress of their natural environment

The following is the forecasted outcome of adopting the policy-

- Lessen environmental pressures
- Strengthen economic growth and inflow of funds for the country
- Maintain a steady supply of raw materials
- Increase competitiveness, stimulating employment and job opportunities
- Encourage innovation (The Government of UAE, 2025a)

Under the UAE Circular Economy Policy, the UAE Cabinet authorised the formation of the UAE Circular Economy Council. This council was to be led by the Minister of Climate Change and Environment while consisting of representatives from various sectors and agencies. (The Government of UAE, 2025b)

The objectives of the council are listed below-

- Ensure implementation of the strategy highlighted in the policy in coordination with relevant authorities
- Approve performance indicators related to the strategy's adoption
- Collaborate federal and local efforts
- Suggest general foundations of sectoral plans
- Initiate private sector participation
- Increase scientific research in circular economy fields and foster collaboration between public and private sectors (The Government of UAE, 2025b)

IV.iii. Comparative Analysis: India vs UAE

To perform a comparative analysis of the initiatives by the India and UAE governments, we first study the effectiveness of individual governments in implementing their policies and the progress made henceforth. Given below are the outcomes and results of each government's practice:

Initiatives by India have had success up to some extent. For example, the Swachh Bharat Mission has led to economic and environmental benefits across the country, as evidenced by its estimated economic savings of INR 4.9 trillion, and the 300,000 deaths avoided due to malnutrition and diarrhoea (Varshney et.al. 2025). However, on a larger scale, certain issues hinder the overall progress of these initiatives, causing circular economic development to be fragmented and less than potential. The theoretical existence of a circular economy and sustainable development focused plans is abundant.

The main issue faced is the implementation. India has a federal form of government, which means that to effectively implement initiatives across the country, a unified and multi-partied effort by the Central and State Governments must be made.

For example, the obstacles faced by EPR (Extended Producer Responsibility- a system that holds producers accountable for managing and disposing of their products after consumers use them) include insufficient investment, sparse adherence to regulations, poor coordination among organisations, and inadequately resourced oversight and enforcement (Sharma and Hartley, 2025). Additionally, from the consumer point of view, scepticism toward the government, cultural beliefs, apathy, and a lack of general understanding are major concerns (Varshney et.al. 2025).

Nevertheless, India has acknowledged this deficiency and subsequently introduced the National Circular Economy Framework (NCEF) in 2024. The NCEF has similar objectives as previous circular economy initiatives with "one of the key elements of this updated framework being its commitment to enhancing cross-sector collaboration" (CII, 2024). It focuses more on logistics and country-wide management of pre-established goals. Officially, the NCEF aims to advance the circular economy by fostering collaboration, promoting circular solutions, setting measurable targets, and establishing mechanisms for monitoring and policy alignment across industries.

The UAE has made significant progress in their Circular Economy Policy. For example, Abu Dhabi recycled more than 3.455 million tonnes of waste from across the emirate in 2022 (AARD.gov.ae, 2023). In the second meeting of the Circular Economy Council, in 2022, the Minister for Climate Change and Environment stated that "many key stakeholders in the UAE had already started to embrace circular economy principles." Further, 22 policies that focused on expedited implementation of CE transition were approved (MOCCAE.gov.ae, 2022).

Other efforts like a nationwide ban on single-use plastic shopping bags, and requirement of major entities like Expo City and Dubai World Trade Centre to publish sustainability reports have been imposed (APnews.com, 2024 & AARD.gov.ae, 2023). Lastly, detailed reports like the UAE Circular Economy Landscape Report 2023 have been published to document progress. The main problems faced by the UAE are consumer participation, which is improving but not universal. There is a need to integrate circular economy initiatives into daily practices. For businesses, initial costs are high and participation must be complemented with financial incentives (Bashir et.al., 2024; GenerisOnline.com, 2024 and Nie et.al., 2023)

Evidently, while India sees the circular economy as a sustainable development opportunity and focuses on resource efficiency, waste minimisation, and proper policy formation, the UAE sees it as a pillar of green growth and competitiveness while emphasising on innovation, technological integration, and economic diversity. The UAE demonstrates a stronger implementation model, while India works in a corrective and developmental phase.

IV. iv. Cross country consumer analysis: INDIA vs UAE

The structured questionnaire included 10 dimensions of consumer awareness and behaviour which were measured across all samples using five-point Likert-scale instruments. These dimensions encompassed awareness constructs (circular economy concept familiarity, refurbished electronics awareness), purchase behaviour dimensions (personal and work device replacement preferences), sustainability practice dimensions (maintenance guideline adherence, e-waste segregation and disposal practices), and attitudinal dimensions (environmental consciousness in purchasing decisions, corporate support for circular economy practices, environmental impact authenticity belief, and willingness to pay premium prices for circular economy-designed electronics).

***IV.iv.i.* Consumer Awareness and Behavioural dimensions (Percentage of Responses)**

Analysis of differences among India and UAE respondents with respect to Consumer Awareness and Behaviour towards circular economy in electronic products.

Question		1 - Strongly Disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly Agree
Q1: Awareness level and familiarity with the concept of Circular Economy	India	1.40%	8.30%	36.10%	41.70%	12.50%
	UAE	10.60%	6.40%	34.00%	42.60%	6.40%
Q2: Awareness level of used and refurbished electronics products	India	1.40%	4.20%	5.60%	65.30%	23.60%
	UAE	4.30%	4.30%	10.60%	40.40%	40.40%
Q3: Preference to buy a new personal device over refurbished or used one	India	2.80%	4.20%	9.70%	37.50%	45.80%
	UAE	2.10%	2.10%	10.60%	42.60%	42.60%
Q4: Preference to buy a new work device over refurbished or used one	India	1.40%	6.90%	11.10%	40.30%	40.30%
	UAE	4.30%	6.40%	12.80%	38.30%	38.30%
Q5: Following manufacture prescribed maintenance / recycling guidelines	India	6.90%	9.70%	25.00%	37.50%	20.80%
	UAE	8.50%	12.80%	17.00%	36.20%	25.50%
Q6: Following prescribed practices to segregate and properly dispose-off e-waste	India	4.20%	15.30%	23.60%	34.70%	22.20%
	UAE	12.80%	10.60%	21.30%	31.90%	23.40%
Q7: Considering environment sustainability or circular economy while buying a new electronic device	India	6.90%	13.90%	23.60%	38.90%	16.70%
	UAE	12.80%	12.80%	21.30%	29.80%	23.40%
Q8: Companies should develop more products considering circular economy friendly practices	India	4.20%	6.90%	13.90%	45.80%	29.20%
	UAE	6.40%	6.40%	19.10%	36.20%	31.90%
Q9: Circular economy and environmentally sustainable products create real impact	India	2.80%	6.90%	22.20%	43.10%	25.00%
	UAE	8.50%	10.60%	21.30%	38.30%	21.30%
Q10: Willingness to pay more for electronics designed with circular economy principles	India	4.20%	12.50%	19.40%	43.10%	20.80%
	UAE	10.60%	14.90%	17.00%	34.00%	23.40%

IV.iv.ii. Statistical Analysis

The comprehensive t-test analysis reveals predominantly non-significant differences across the ten dimensions of consumer awareness and behaviour. Out of ten variables examined, nine dimensions yielded p-values exceeding 0.05, indicating no statistically significant differences between Indian and UAE consumers. This remarkable uniformity across vastly different geographic, cultural, and economic contexts suggests that consumer attitudes towards circular economy in electronics have converged globally, likely driven by international media exposure, multinational corporate messaging, and cross-border digital communication.

Independent Samples Test										
		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence	
									Lower	Upper
Q1	Equal variances assumed	.359	.550	.165	156	.869	.02707	.16444	-.29801	.35215
	Equal variances not assumed			.168	124.295	.867	.02707	.16131	-.29264	.34677
Q2	Equal variances assumed	.572	.451	-.704	156	.483	-.10422	.14803	-.39687	.18843
	Equal variances not assumed			-.654	98.244	.515	-.10422	.15945	-.42134	.21290
Q3	Equal variances assumed	.003	.954	-.046	156	.963	-.00810	.17446	-.35299	.33680
	Equal variances not assumed			-.047	120.807	.963	-.00810	.17307	-.35123	.33503
Q4	Equal variances assumed	.090	.764	-1.976	156	.050	-.35251	.17839	-.70518	.00015
	Equal variances not assumed			-1.939	112.697	.055	-.35251	.18182	-.71335	.00832
Q5	Equal variances assumed	.799	.373	.603	156	.547	.11658	.19333	-.26561	.49877
	Equal variances not assumed			.615	124.576	.540	.11658	.18948	-.25895	.49211
Q6	Equal variances assumed	.214	.644	1.039	156	.301	.19437	.18713	-.17557	.56432
	Equal variances not assumed			1.035	117.288	.303	.19437	.18779	-.17809	.56684
Q7	Equal variances assumed	.041	.841	1.445	156	.151	.28964	.20046	-.10665	.68593
	Equal variances not assumed			1.429	115.078	.156	.28964	.20266	-.11242	.69171
Q8	Equal variances assumed	.278	.599	.516	156	.606	.08078	.15643	-.22848	.39003
	Equal variances not assumed			.509	114.092	.612	.08078	.15868	-.23408	.39563
Q9	Equal variances assumed	.002	.961	.454	156	.650	.07566	.16649	-.25349	.40481
	Equal variances not assumed			.467	126.924	.641	.07566	.16198	-.24528	.39661
Q10	Equal variances assumed	.135	.714	1.691	156	.093	.29710	.17567	-.05018	.64439
	Equal variances not assumed			1.716	122.908	.089	.29710	.17309	-.04600	.64021

Only one dimension approached statistical significance: Preference for new work devices over refurbished alternatives (Q4: t = -1.976, p = 0.050), with UAE consumers demonstrating significantly stronger preference for new equipment in professional settings (mean difference = -0.353). Additionally, two dimensions showed marginal trends: Sustainability

considerations in purchasing decisions (Q7: p = 0.151) and willingness to pay premium for circular economy-designed electronics (Q10: p = 0.093), with Indian consumers trending slightly higher on both measures.

Comparison along different demographic divides between the two countries:
a. Gender comparison: India male respondents vs UAE male respondents

Independent Samples Test										
		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence	
									Lower	Upper
Q1	Equal variances assumed	.240	.626	.238	55	.813	.062	.261	-.461	.585
	Equal variances not assumed			.236	51.572	.814	.062	.263	-.465	.589
Q2	Equal variances assumed	2.821	.099	-1.368	55	.177	-.423	.309	-1.043	.197
	Equal variances not assumed			-1.341	47.370	.186	-.423	.316	-1.058	.212
Q3	Equal variances assumed	.089	.767	-.954	55	.344	-.309	.324	-.958	.340
	Equal variances not assumed			-.947	51.339	.348	-.309	.326	-.964	.346
Q4	Equal variances assumed	2.163	.147	-.809	55	.422	-.256	.316	-.889	.378
	Equal variances not assumed			-.796	48.950	.430	-.256	.321	-.901	.389
Q5	Equal variances assumed	.407	.526	.054	55	.957	.016	.296	-.578	.610
	Equal variances not assumed			.055	54.898	.956	.016	.293	-.570	.603
Q6	Equal variances assumed	.382	.539	-1.551	55	.127	-.484	.312	-1.109	.142
	Equal variances not assumed			-1.537	51.197	.130	-.484	.315	-1.116	.148
Q7	Equal variances assumed	1.674	.201	-1.737	55	.088	-.547	.315	-1.178	.084
	Equal variances not assumed			-1.767	54.995	.083	-.547	.310	-1.168	.074
Q8	Equal variances assumed	.240	.626	.074	55	.941	.019	.252	-.486	.524
	Equal variances not assumed			.075	54.758	.940	.019	.247	-.476	.513
Q9	Equal variances assumed	.392	.534	-.233	55	.816	-.062	.266	-.595	.471
	Equal variances not assumed			-.230	48.600	.819	-.062	.270	-.605	.481
Q10	Equal variances assumed	2.940	.092	-2.423	55	.019	-.677	.280	-1.238	-.117
	Equal variances not assumed			-2.352	43.910	.023	-.677	.288	-1.258	-.097

This analysis examines 57 male respondents (n = 28 India, n = 29 UAE) across all ten dimensions. Levene's Test confirmed variance homogeneity across most dimensions. The statement 10 (Q10) suggests that UAE males demonstrate significantly

higher willingness to pay premium prices for CE-designed electronics and statement 7 (Q7) suggests that UAE males trend toward greater consideration of environmental sustainability when purchasing decisions (95% CI: -1.178 to 0.084). This marginal finding suggests evolving gender-based sustainability consciousness.

*b. **Age group comparison: India and UAE respondents aged 35 years and above***

Independent Samples Test										
		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence	
									Lower	Upper
Q1	Equal variances assumed	1.109	.294	1.134	130	.259	.195	.172	-.145	.536
	Equal variances not assumed			1.126	123.068	.262	.195	.173	-.148	.539
Q2	Equal variances assumed	4.727	.032	-.926	130	.356	-.153	.165	-.481	.174
	Equal variances not assumed			-.916	118.052	.361	-.153	.167	-.484	.178
Q3	Equal variances assumed	2.785	.098	.309	130	.758	.055	.177	-.295	.404
	Equal variances not assumed			.306	118.867	.760	.055	.178	-.299	.408
Q4	Equal variances assumed	1.366	.245	-.261	130	.794	-.049	.188	-.420	.322
	Equal variances not assumed			-.261	128.264	.795	-.049	.188	-.421	.323
Q5	Equal variances assumed	1.333	.250	1.253	130	.212	.233	.186	-.135	.600
	Equal variances not assumed			1.246	124.116	.215	.233	.187	-.137	.602
Q6	Equal variances assumed	5.387	.022	-.224	130	.823	-.042	.188	-.414	.330
	Equal variances not assumed			-.221	114.496	.825	-.042	.190	-.419	.335
Q7	Equal variances assumed	1.801	.182	-.495	130	.621	-.099	.201	-.497	.298
	Equal variances not assumed			-.491	121.316	.624	-.099	.202	-.500	.301
Q8	Equal variances assumed	1.311	.254	-.584	130	.560	-.097	.165	-.424	.231
	Equal variances not assumed			-.580	123.357	.563	-.097	.167	-.426	.233
Q9	Equal variances assumed	1.417	.236	.881	130	.380	.148	.168	-.184	.479
	Equal variances not assumed			.877	126.021	.382	.148	.168	-.185	.481
Q10	Equal variances assumed	1.390	.241	.261	130	.795	.047	.180	-.309	.403
	Equal variances not assumed			.259	123.701	.796	.047	.181	-.312	.406

This analysis examines respondents across both countries with age >35 years (df = 130). Levene's Test confirmed variance homogeneity for all dimensions (F-values ranging from 1.109 to 5.387, with p-values exceeding the threshold). Remarkably, all ten dimensions showed no statistically significant differences between Indian and UAE consumers aged above 35 years.

c. Income group comparison: Indian and UAE respondents with income more than $55,000 per annum

Independent Samples Test										
		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence	
									Lower	Upper
Q1	Equal variances assumed	.856	.357	.056	103	.956	.011	.198	-.382	.404
	Equal variances not assumed			.054	75.772	.957	.011	.205	-.397	.419
Q2	Equal variances assumed	.076	.784	-1.341	103	.183	-.278	.208	-.690	.133
	Equal variances not assumed			-1.333	83.806	.186	-.278	.209	-.693	.137
Q3	Equal variances assumed	.039	.844	-1.363	103	.176	-.301	.221	-.740	.137
	Equal variances not assumed			-1.384	89.615	.170	-.301	.218	-.734	.131
Q4	Equal variances assumed	.032	.858	-.636	103	.526	-.143	.224	-.587	.302
	Equal variances not assumed			-.641	87.793	.523	-.143	.222	-.584	.299
Q5	Equal variances assumed	1.292	.258	-.092	103	.927	-.021	.228	-.474	.432
	Equal variances not assumed			-.089	77.666	.929	-.021	.235	-.488	.446
Q6	Equal variances assumed	.406	.525	-.624	103	.534	-.128	.206	-.537	.280
	Equal variances not assumed			-.614	80.718	.541	-.128	.209	-.545	.288
Q7	Equal variances assumed	.050	.823	-1.275	103	.205	-.300	.235	-.765	.166
	Equal variances not assumed			-1.272	84.566	.207	-.300	.236	-.768	.169
Q8	Equal variances assumed	.018	.893	-1.496	103	.138	-.301	.201	-.699	.098
	Equal variances not assumed			-1.462	78.901	.148	-.301	.206	-.710	.109
Q9	Equal variances assumed	.260	.611	-.713	103	.478	-.145	.203	-.548	.258
	Equal variances not assumed			-.728	91.329	.468	-.145	.199	-.540	.250
Q10	Equal variances assumed	.000	.995	-1.268	103	.208	-.276	.218	-.708	.156
	Equal variances not assumed			-1.273	86.672	.206	-.276	.217	-.707	.155

This analysis examines 105 high-income respondents (n = 64 India, n = 41 UAE) with annual income exceeding $55,000. Levene's Test indicated variance homogeneity (F-values ranging from 0.018 to 1.292, all $p > 0.25$). No statistically significant differences emerged across any of the ten dimensions among high-income earners. T-values ranged from -1.496 to 0.056, with all p-values exceeding 0.138. This is indicative of similar preferences in terms of sustainable consumer behaviour among higher income groups across different countries.

d. Income group comparison: Indian and UAE respondents with income less than $55,000 per annum

Independent Samples Test										
		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence	
									Lower	Upper
Q1	Equal variances assumed	.394	.533	2.493	51	.016	.623	.250	.121	1.124
	Equal variances not assumed			2.499	50.627	.016	.623	.249	.122	1.123
Q2	Equal variances assumed	5.384	.024	-.292	51	.772	-.070	.239	-.550	.411
	Equal variances not assumed			-.294	43.994	.770	-.070	.237	-.548	.409
Q3	Equal variances assumed	1.604	.211	1.114	51	.271	.312	.280	-.250	.874
	Equal variances not assumed			1.120	47.930	.268	.312	.279	-.248	.872
Q4	Equal variances assumed	.007	.932	-.373	51	.711	-.110	.294	-.700	.480
	Equal variances not assumed			-.373	50.291	.711	-.110	.294	-.701	.482
Q5	Equal variances assumed	.821	.369	1.669	51	.101	.473	.283	-.096	1.042
	Equal variances not assumed			1.664	49.293	.102	.473	.284	-.098	1.044
Q6	Equal variances assumed	.741	.393	-.462	51	.646	-.152	.330	-.815	.510
	Equal variances not assumed			-.464	49.647	.645	-.152	.329	-.813	.508
Q7	Equal variances assumed	.634	.430	-.375	51	.709	-.121	.323	-.770	.528
	Equal variances not assumed			-.376	50.309	.709	-.121	.322	-.768	.526
Q8	Equal variances assumed	.109	.742	.484	51	.630	.120	.247	-.377	.616
	Equal variances not assumed			.483	49.830	.631	.120	.248	-.378	.617
Q9	Equal variances assumed	.000	.989	1.110	51	.272	.329	.296	-.266	.924
	Equal variances not assumed			1.108	49.750	.273	.329	.297	-.268	.926
Q10	Equal variances assumed	.025	.874	.179	51	.859	.056	.311	-.568	.679
	Equal variances not assumed			.179	50.998	.859	.056	.310	-.567	.679

This analysis examines 53 lower-income respondents (n = 26 India, n = 27 UAE) with annual income below $55,000. Levene's Test indicated variance homogeneity (F-values ranging from 0.007 to 5.384, with p-value of 0.024 for Q2, warranting attention). As per statement 1 (Q1) India respondents with income <$55,000 demonstrate a significantly higher awareness of circular economy concepts compared to their UAE counterparts. This 0.623-point difference represents a large effect size (95% CI: 0.121 to 1.124). All remaining dimensions (Q2-Q10) showed no significant differences, despite some approaching marginality. This can be indicative of thorough market research done by cost sensitive buyers, but paradoxically choosing to buy new electronic devices over second-hand devices, likely due to maintenance issues later.

CONCLUSION

This study on the Circular Economy in consumer electronics offers meaningful cross-country insights by examining the roles of key stakeholders- governments, manufacturers, and consumers, in two demographically and economically distinct nation states, the UAE and India. The findings highlight how differing policies, corporate practices and consumer behaviours shape the adoption of circular practices, providing a foundation for more targeted policy interventions in terms of industry regulation, incentivising sustainable practices and educating consumers. In particular, India views the circular economy as a sustainable development opportunity, focusing on efficiency and policy, whereas the UAE prioritizes innovation and competitiveness, showcasing a more robust implementation model compared to India's developmental phase.

The independent samples t-test analysis reveals that Indian and UAE consumers share remarkably similar awareness levels and behavioural patterns regarding circular economy in electronic products. The only notable exception is the preference for new work devices (Q4), where UAE consumers demonstrate a significantly stronger preference for new equipment over refurbished alternatives. This finding has practical implications for corporate IT procurement strategies and B2B electronics marketing in these regions. The overall homogeneity across nine of ten dimensions suggests that globalisation and digital connectivity have led to convergent consumer attitudes towards sustainability in electronics across these geographically and culturally distinct markets.

The four-dimensional t-test analysis reveals that demographic variables interact differently across populations. The comparison of responses from India and UAE on the basis of gender and income varies only on the basis of few selective variables such as preference towards new vs refurbished devices and willingness to pay premium for circular economy which were proved to be statistically significant. On the other hand, age-based comparisons demonstrated no statistically significant difference of views and practices. The singular Q10 significance among young UAE males represents the clearest market differentiation opportunity, while the Q1 awareness gap among lower-income Indians presents an awareness-to-action translation challenge. Overall, the limited number of significant findings (3 out of 40 comparisons) underscores the dominant role of life stage and global consumer homogenisation in shaping circular economy attitudes, irrespective of national origin.

LIMITATIONS

The study on Circular Economy in Consumer Electronics, provides valuable cross-country insights of different stakeholders- the government, companies and consumers- but has few limitations that should be considered while interpreting the results and planning future research.

- The sample size of 158 respondents is relatively small for countries like India and UAE, especially given India’s large and diverse population. This limits the generalizability of the findings across different regions, cultures, and socioeconomic groups.
- This study relies primarily on quantitative questionnaire survey data analysed through statistical techniques. While this approach effectively identifies key consumer attitudes, it may overlook deeper qualitative insights into consumer motivations, barriers, and perceptions.
- Cross-sectional design of the study, which captures consumer behaviors at a single point in time. Given that sustainability and circular economy behaviours and market dynamics are rapidly evolving, longitudinal studies would better capture changes in consumer awareness and preferences.
- The survey required compulsory responses for workplace appliance usage, even from low-income participants who are unlikely to use such devices. This possibly led to arbitrary responses and introduced measurement error, affecting the accuracy of results related to workplace electronics.
- Finally, there can be some other limitations such as time, convenient sampling design, over representation of few respondent demographic groups and researcher’s unintentional biasedness.

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