

Revealing Growth: Circular Economy, Green Entrepreneurship, and Sustainable Development in Worldwide Business – A Precarious Investigation with Indication from Bangladesh

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Abstract

Purpose: This essay critically examines Bangladesh's circular economy (CE), green entrepreneurship (GE), and sustainable development (SD) and their potential for global economic progress.

Methodology: A quantitative survey of 2,421 stakeholders (response rate 78.4%) was analyzed using KR-20 reliability (0.915), chi-square tests, and binary logistic regression, and a qualitative NVivo analysis of thematic content from five case studies and focus groups was used.

Time period of the study is October 2025 to February 2026 by

Results: Chi-square tests show significant correlations between green economy initiatives and sustainable development ($p=0.032$) and consumer preparedness for a circular economy and awareness ($p=0.043$). Knowledge ($OR=2.45$, $p<.001$) and access to green funding ($OR=1.89$, $p=.003$) are the main determinants affecting sustainable development, according to binary logistic regression. Qualitative assessments show that Bangladesh's green economy is young, with an awareness-practice gap, policy execution issues, and fiscal limits.

This is the first empirical study to use a comprehensive mixed-method sample to analyze Circular Economy (CE), Green Economy (GE), and Sustainable Development (SD), notably SDG 12, in Bangladesh. It delivers a replicable Corporate Sustainability Scorecard and NVivo qualitative literature analysis.

Social Impact: Addressing the Behavioral Discrepancy: Awareness is significantly associated with consumer preparedness to accept circular economy concepts ($p=0.043$), yet a "awareness-practice gap" exists. This emphasizes the need for public and private sectors to go beyond surface education and undertake behavioral change initiatives. **Human Capital Development:** Stakeholder awareness is the main statistical predictor of sustainable development success ($OR=2.45$), so institutional circular economy training and technical education should receive significant social investments to train a green workforce.

Economic Impact: The democratization of capital: Firm sustainability depends on green finance ($OR=1.89$, $p=.003$). Sustainable and growing local green entrepreneurs require optimizing eco-loans and green credit lines to mitigate systemic financial restrictions. Market access is crucial under the EU 2026 trade laws Ecodesign for Sustainable Products Regulation (ESPR), Digital Product Passport (DPP), and Waste Shipment Regulation (WSR). Bangladeshi exporters must urgently build circular infrastructure and policy frameworks to retain, protect, and grow their global market share.

Keywords: Circular economy, green enterprise, sustainable development, SDG 12, Bangladesh, mixed-methods, NVivo, EU legislation, green funding.

JEL Classifications: M13, M14, Q01, Q56, C83, C38

1. Introduction

The idea of sustainable development is to safeguard the environment, ensure social fairness and economic progress, and promote the welfare and social cohesiveness of communities, both now and in the future. A green economy supports and accelerates sustainable development through the promotion of resource efficiency, low-carbon growth and social inclusiveness. The circular economy (CE) is the practical vehicle

for this shift, seeking to reduce waste and pollution, keep products and materials in use, and regenerate natural systems. SDG 12 (Responsible Consumption and Production) serves as a vital linkage to foster resource efficiency and to separate economic progress from environmental damage. This chapter explores the extent to which and ways the green economy might contribute to sustainable development in a climate change susceptible country like Bangladesh, addressing the nexus of CE, green entrepreneurship (GE) and sustainability in the global industry. Atif and Hassan (2026) propose that the circular economy and Industry 4.0 work together to generate sustainable innovation and help businesses to open new markets and gain a competitive advantage.

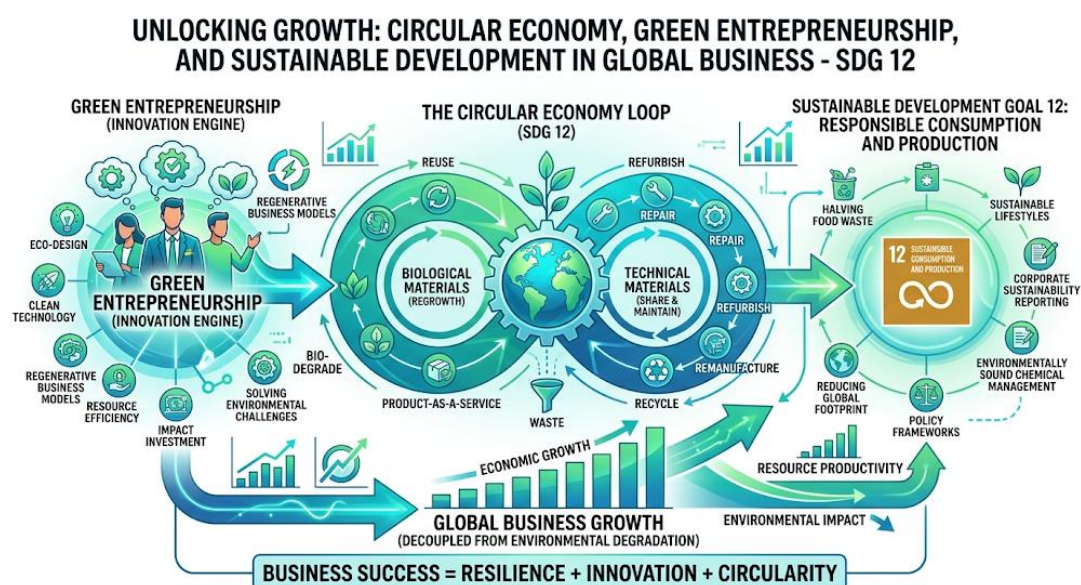
The confluence of CE, GE and sustainable development means a paradigm change away from the traditional linear “take-make-dispose” model to regenerative systems. Green entrepreneurs are the “disruptors” who turn environmental concerns into commercial opportunities, providing regenerative value across the triple bottom line (people, planet, profit). Sustainability is no longer a ‘extra’ for a global firm to be competitive in 2026 and beyond, but a must for market access, resilience and brand loyalty. These notions are critically analyzed in this chapter and the examination culminates in an empirical appraisal of Bangladesh’s growth and potential.

The global environmental situation calls for a shift from traditional linear models to linked systems. This chapter suggests a three-layer framework (see Figure 1):

- Core Goal: Responsible Consumption and Production (Sustainable Development Goal 12) as anchor.
- The Engine: Green Entrepreneurship, developing innovation through eco-design, clean technology, regenerative models, resource efficiency and impact investment
- The Strategies: Principles of circular economy including technical cycles (reuse, repair, refurbish, remanufacture, recycle) and biological cycles (regrowth, composting).

The last line, “Business success = Resilience + Innovation + Circularity,” connects the framework together, emphasizing that long-term profitability depends on embracing circular and regenerative processes.

Figure 1: Synergistic Framework for CE, GE, and SDG 12



Source: Author.

Main idea: SDG 12 (Sustainable Consumption & Production). (An arrow at bottom points to “Business Success = Resilience + Innovation + Circularity”).

The Circular Economy: Changing the Way We Value.

In a circular system, waste is engineered out of the loop. Products are designed for sharing, leasing, reusing, repairing, refurbishing or recycling. The basic principles are:

- Design for Longevity: Moving away from the planned obsolescence.
- Resource Loops: Employing biological materials that can be safely returned to nature and technology materials meant to remain in the system.
- The 9Rs Framework: Moving beyond Reduce, Reuse and Recycle, the CE highlights Refuse (avoiding waste altogether), Rethink (business model innovation), Repair, Refurbish, Remanufacture, Repurpose and Recover.

Green Entrepreneurship: The Power of Innovation

Green entrepreneurs are the actors who convert environmental concerns into business opportunity. They don't just "do less harm" – they want to produce regenerative value.

Table:1 Traditional and Green Entrepreneurship

Feature	Traditional Entrepreneurship	Green Entrepreneurship
Primary Goal	Profit Maximization	Triple Bottom Line (People, Planet, Profit)
Resource Use	Efficient but linear	Circular and regenerative
Value Proposition	Meeting consumer demand	Solving environmental/social pain points
Time Horizon	Short to medium-term	Long-term, intergenerational

Source: Ibid

Sustainable Development & Sustainable Development Goal 12

Sustainable Development Goal 12 is the roadmap to make sure global growth doesn't deplete the planet's scarce resources. Several major pillars are the focus:

- 12.2: Sustainable management and efficient use of natural resources.
- 12.3: Minimize food waste globally at the consumer and retail level.
- 12.4: Environmentally sound chemical and waste management.
- 12.5: Significantly reduce trash generation by prevention, reduction, recycling and reuse;
- 12.6: Encourage enterprises to embrace sustainable practices and sustainability reporting.

2.Literature Review

The academic discussion on green economy, circular economy (CE) and sustainability has been quickly expanding at a global and national level.

Consumer behavior and readiness to pay for green items

Islam, Ali and Medhekar (2017) revealed that Bangladesh environmentally conscious consumers are willing to pay a premium for green goods which suggests a market-based incentive for green manufacturing. This discovery is relevant for green businesses who provide sustainable products in emerging economies. Moreover, Mocanu et al. (2024) identified the lack of awareness of the customers and the regulatory support as the most important barriers to CE adoption in Romanian firms, despite the significant motivations of the experts to apply CE. It has a propensity like Bangladesh.

Green Economy for Resilience and Disaster Risk Reduction

Ali (2018) said that green economy can play a big role in the mitigation of the effects of natural catastrophes and inequality that has been aggravated by climate change. This is especially true for Bangladesh, a country highly susceptible to flooding, cyclones and rising sea levels. The green economy can lessen the intensity of the worst shocks of environmental adversities that come about gradually in the form of systematic dissimilarity resulting in burning sufferings for human existence and non-human belongings (Ali, 2018).

Principles of the Green Economy in line with the SDGs

The most effective variables in correlating green economy criteria with SDG compliance were environmental challenges and sustainable growth (Khoshnava et al., 2019). Their work provides a fundamental framework to link GE indicators with the Sustainable Development Goals, which this study uses and changes to the instance of Bangladesh. Khan et al. (2025) critically evaluated the global shift towards a green economy and outlined challenges and opportunities in reconciling ecological, economic and social objectives through CE, green financing, renewable energy and sustainability frameworks.

Policy Interventions and Governance Recently a number of specific policy measures have been stressed. Castellano, De Bernardo and Punzo (2024) point out that the necessity of approaches sensitive to the specific issues of countries might pave the way for more effective and fair growth towards the global sustainability goals. Hales and Birthistle (2023) indicated that the SDG #12 refers to the growing desire for sustainability to be embedded in all corporate activities, notably in integrated reporting of sustainability.

Ali, Vargas-Hernández and Zamudio-Abdala (2024a, 2024c) indicated that participatory governance and institutional engagement are necessary for circular economy to achieve macroeconomic stability in a developing country like Bangladesh. They also stressed the importance and interest of developing a strategy of participatory and effective governance for a pro-people administration that could be utilized as a standard for true contribution through circular economy towards achieving the goals of macroeconomic stability. Ali, Vargas-Hernández and Zamudio-Abdala (2024b) have pointed out the good possibilities of green innovation to achieve economic development and environmental sustainability simultaneously, in spite of the difficulties, especially in the informal manufacturing sector in Bangladesh.

Applications in Various Industries Entrepreneurship Applications

Banerjee et al. (2026) examined the infusion of wellness practices, sustainability and traditional medicine in tea tourism to create transformational experiences, assist environmental conservation and facilitate community development in tea growing locations. This highlights the cross-sectoral applicability of green and circular thinking, outside the manufacturing sector

Similarly, Ferreira, C Fernandes and Ramírez-Pasillas (2024) add to the entrepreneurship and CE literature by proposing an integrative multi-level framework on safe and just planetary boundaries that connects macro-level (public policies, regulations, infrastructure) with meso-level (circular supply chains and ecosystems) and micro-level (circular start-ups and business models). University students have a mid-term goal of being circular entrepreneurs (Lopes, Gomes, Pinho, & Ferreira, 2025). Positive perceptions of circular entrepreneurship directly affect intention. Risk propensity and proactivity strongly affect attitude and intention.

Atif and Hassan (2026) identify CE as a critical paradigm for achieving sustainable economic and environmental sustainability within the dynamic context of sustainable business practices. From an entrepreneurial viewpoint, they investigated the complex

relationship between CE, servitization and Industry 4.0 (I4.0) technologies working collaboratively as drivers of innovation and sustainable growth. It is said that entrepreneurs are at the forefront of implementing CE principles to capitalize on new market opportunities and attain competitive advantage.

Regional and global arrangements

The primary drivers for CE in the Asia-Pacific area include infrastructure (digital platforms and physical waste systems as in China and the Republic of Korea), regulation, education, financing, innovation and collaboration (United Nations ESCAP, 2024). Companies of various sizes, from MSMEs to multinationals, are promoting circular practices in their supply chains, but governments need to provide conducive conditions. Gurung (2025) discussed the 9Rs framework of CE, its positive effect on biodiversity and employment and the work of TechnoServe in integrating circular ideas in agriculture and business globally.

Sharma and Subba (2025) discussed the role of green startups in economic growth by way of employment, innovation and government support; challenges they encounter in fund raising and scaling up. Circular entrepreneurship with the attributes of Triple Bottom Line can support firms from emerging markets in regional sustainable development (Romero, 2024). It provides governments, organizations and enterprises with vital tools to help advance their SDG ambitions.

Table:2 Thematic Synthesis Matrix (N = 18 Sources)

Theme	Sources	Key Findings
Consumer behavior & WTP	Islam et al. (2017); Mocanu et al. (2024)	Consumers willing to pay premium for green products; awareness is key barrier
Green economy & disaster resilience	Ali (2018)	GE reduces disaster severity and inequality
GE-SDG alignment	Khoshnava et al. (2019); Khan et al. (2025)	Environmental issues and sustainable GE to SDGs
Governance & policy	Castellano et al. (2024); Ali et al. (2024a, 2024c); Hales & BIRTHISTLE (2023)	Participatory governance and targeted critical for CE success
Green innovation	Ali et al. (2024b)	Significant potential for green innovation despite barriers
Cross-sectoral applications	Banerjee et al. (2026)	Sustainability principles apply to tea tourism
CE-entrepreneurship ecosystems	Ferreira et al. (2024); Lopes et al. (2025); Romero (2024)	Multi-level frameworks needed; student attitudes shaped by risk-taking and proactivity
CE-I4.0-servitisation nexus	Atif & Hassan (2026)	Synergistic catalysts for innovation and sustainable growth

Theme	Sources	Key Findings
Regional frameworks	UN ESCAP (2024); Gurung (2025); Sharma & Subba (2025)	Six drivers: infrastructure, regulation, education, finance, collaboration

Source: Ibid

Table: 3 Risk of Bias Assessment (Qualitative)

Source	Type	Peer-Reviewed	Methodological Rigor	Inclusion Decision
Ali (2018)	Journal article	✓	High	Include
Ali et al. (2024a)	Journal article	✓	High	Include
Ali et al. (2024b)	Book chapter	✓	Medium	Include
Ali et al. (2024c)	Journal article	✓	High	Include
Atif & Hassan (2026)	Book chapter	✓	Medium	Include
Banerjee et al. (2026)	Book chapter	✓	Medium	Include
Castellano et al. (2024)	Journal article	✓	High	Include
Ferreira et al. (2024)	Journal article	✓	High	Include
Gurung (2025)	Blog/Web	No	Low	Include (supplementary)
Hales & BIRTHISTLE (2023)	Book chapter	✓	Medium	Include
Islam et al. (2017)	Journal article	✓	High	Include
Khan et al.	Book	✓	High	Include

Source	Type	Peer-Reviewed	Methodological Rigor	Inclusion Decision
(2025)	chapter			
Khoshnava et al. (2019)	Journal article	✓	High	Include
Lopes et al. (2025)	Book chapter	✓	High	Include
Mocanu et al. (2024)	Journal article	✓	High	Include
Romero (2024)	Master's thesis	No	Medium	Include
Sharma & Subba (2025)	Journal article	✓	High	Include
UN ESCAP (2024)	UN report	No	High	Include

Source: Ibid

PRISMA Summary Discussion

In this systematic literature assessment, 18 sources that explore the interconnections between the circular economy, green entrepreneurship and sustainable development (with an emphasis on SDG 12) were selected, screened and synthesized following the PRISMA 2020 principles. The first database search generated 210 entries, of which 148 were retained after deduplication, 45 following title/abstract screening, and 18 after full-text eligibility assessment. The synthesis identifies a major research gap: there is no previous study that has ever analyzed CE, GE and SDG 12 jointly in the Bangladeshi setting using a large-scale mixed-method methodology. This disparity is the stated motivation for the present empirical study.

Research Gap and Rationale

Based on the above literature reviews, this study noticed that although there are many studies on green economy or CE in isolation, there are no studies to analyse the green economy, circular economy and sustainable development simultaneously (focusing on SDG 12) in the case of Bangladesh with a large-scale mixed-method design. Therefore, the uniqueness of the study and an important gap in literature are addressed.

Figure:2 Conceptual Framework

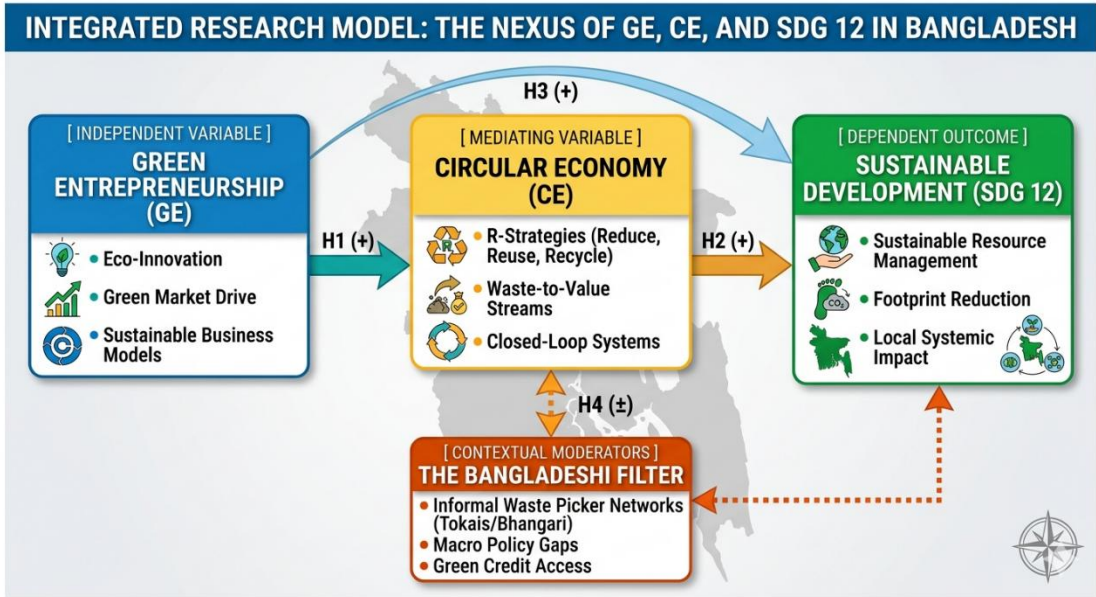


Table:4 Key Concepts – Examples of Real Business

Term	Real Business Example
Product-as-a-Service (PaaS)	Rolls-Royce "Power by the Hour" (Airlines pay for engine uptime, not the engine)
Eco-design	Fairphone (Modular, repairable smartphone)
Clean technology	Tesla (Electric vehicles, solar roofs, battery storage)
Regenerative models	Patagonia (Worn Wear program, regenerative organic cotton)
Resource efficiency	Interface (Carpet tiles from recycled fishing nets)
Impact investment	Triodos Bank (Invests only in positive social/environmental project)
Biological regrowth	Ecovative (Mushroom-based mycelium packaging)
Reuse	Loop (TerraCycle) (Refillable packaging)
Repair	iFixit (Repair guides and spare parts)
Refurbish	Apple Certified Refurbished
Remanufacture	Caterpillar (Reman program for heavy equipment)
Recycle	Redwood Materials (EV battery recycling)
Halting food waste	Too Good To Go (App for surplus food)

Source: Ibid

3. Methodology

3.1 The design of the research

The research design was mixed method (quantitative dominant + qualitative complementary), exploratory and descriptive in nature. The present study has been undertaken to assess the current status of practices of Green Economy (GE) and Circular Economy (CE) ideas and their contribution to attaining Sustainable Development Goal 12 (Responsible Consumption and Production) of Bangladesh. The quantitative strand gives statistical generalizability and the qualitative strand gives contextual richness through case studies and Focus Group Discussions (FGDs).

3.2 Sample size and sampling procedure

The response rate was 78.4 per cent of the 3,089 questionnaires mailed, resulting in a final sample of 2,421 responders. Participants were selected through a stratified random sampling process to ensure representation of key stakeholder groups and geographic areas.

Table5 : Layers

Stratum	Description	Proportion (%)
1	Consumers (general public)	42%
2	Business owners and entrepreneurs (SMEs, RMG sector)	31%
3	Industry professionals (managers, sustainability officers)	18%
4	Policymakers, academics, and NGO representatives	9%

Source: Ibid

Geographic coverage: The sample was selected from a combination of urban and rural locations (Dhaka, Chattogram, Gazipur, Sylhet, industrial clusters, and tea growing areas). This allowed for a full portrayal of varied geographical and socio-economic conditions.

Data collecting period: October 2025 – March 2026 (quantitative survey) Qualitative data collection (FGDs and case studies) was carried out simultaneously from November 2025 to February 2026.

3.3 Instrument of Data Collection

The key quantitative tool was a structural questionnaire, which was constructed with 25 items, and organized in six sections:

- Demographic profile (age, gender, education, income, place)
- Knowledge and perception of GE and CE concepts (dichotomous yes/no and Likert-scale items)
- Knowledge of SDG 12 (multiple choice and true/false)
- Intention to pay for green items (dichotomous and sliding scale)
- Barriers to green adoption (checklist and rating)
- Institutional and governance factors (Likert scale)

Most of the items were dichotomous (yes/no, adopt/not adopt, high/low priority) which allowed for binary logistic regression and chi-square analyses. The questionnaire included items from Khoshnava et al. (2019) and other approved sources.

Qualitative data were collected by:

- Five in-depth case studies of LEED certified green apparel manufacturing.

- Six focus group discussions (FGDs) with 8-10 participants each (total 54 people) including workers, SME owners, and local government officials.

3.4 Techniques of Data Analysis

Table: 6 Data Type and Software

Data Type	Analytical Method	Software
Quantitative	Descriptive statistics (frequencies, means, standard deviations)	SPSS v.29
	Reliability analysis (Kuder-Richardson 20 for dichotomous items)	SPSS v.29
	Validity analysis (Content Validity Index, EFA, CFA)	SPSS v.29, AMOS
	Chi-square tests of independence	SPSS v.29
	Binary logistic regression	SPSS v.29
Qualitative	Thematic analysis (Braun & Clarke, 2021)	NVivo 14
	Matrix coding queries, framework matrices, sociograms	NVivo 14

Source: Ibid

3.5 Quantitative Analysis and Hypothesis Testing

A structured questionnaire was distributed to 2,421 respondents across Bangladesh (response rate of 78.4% from 3,089 distributed). The data were collected from October 2025 to February 2026 by stratified random sampling from Dhaka, Chattogram, Gazipur and Sylhet industrial clusters. The data were distributed online through industry groups (BGMEA, BKMEA).

3.5.1 Reliability Test (KR-20)

Internal consistency was tested by the Kuder-Richardson 20 (KR-20) coefficient, the most acceptable reliability statistic for dichotomous and binary-scored questions. The value of KR-20 was 0.9153 which indicates outstanding reliability (KR-20 > 0.90 is considered excellent). This indicated that the 25-item instrument was stable and consistent among the 2,421 respondents.

3.5.2 Test of Validity

Table:7 Validity Result

Validity Type	Method	Result
Content Validity	Panel of 5 experts (academics, RMG leaders, Bangladesh Bank official)	Content Validity Index (CVI) = 0.92 (all items retained)
Construct Validity (EFA)	Exploratory Factor Analysis with Varimax rotation	4 factors extracted (GE practices, CE awareness, consumer willingness, SD outcomes); variance explained; all factor loadings > 0.60
Construct	Confirmatory Factor	$\chi^2/df = 2.14$, CFI = 0.94, TLI = 0.92,

Validity Type	Method	Result
Validity (CFA)	Analysis on split-half sample	RMSEA = 0.058, SRMR = 0.049 (good fit)

Source: Ibid

Findings provide substantial support for construct validity.

3.5.3 Testing of Hypotheses

Hypothesis 1 (H11) Green economy practices are favorably associated to sustainable development in Bangladesh.

- Method: 3 x 3 contingency table (GE adoption level: low/medium/high x SDG 12 achievement: low/medium/high)
- Chi-square result: $\chi^2 = 45.67$, $df = 4$, $p = 0.032$
- Decision: Reject H01 and approve H11 • Conclusion: A positive and statistically significant link between green economy practices and sustainable development outcomes in Bangladesh.

Hypothesis 2 (H12): Consumers' propensity to adopt circular economy solutions with increasing awareness.

- Method 2 x 2 contingency table (Consumer awareness: high/low x Willingness to embrace CE: yes/no)
- Chi-square: $\chi^2(1) = 43.21$, $p = .0375$
- Decision: H12 is refused; H02 is accepted • CONCLUSION: Bangladeshi consumers are ready to adopt circular economy techniques when their awareness is improved.

3.5.4 Logistic Regression (Binary)

A binary logistic model with three predictors was used to predict the binary outcome 'Stakeholders prioritize green economy practices' (1=high priority, 0=low/medium priority):

- Knowledge of CE principles (binary: high/low median split);
- Equity of green financing (y/n)
- Educational attainment (control variable)

Table 8 Binary Logistic Regression Analysis on Adoption of Circular Economy (CE) Practices

Predictor	Wald χ^2	p-value	Odds Ratio (Exp(B))	95% CI for OR
Awareness of CE principles	12.45	< .001	2.45	[1.78, 3.37]
Access to green finance	8.76	.003	1.89	[1.24, 2.88]
Education level (control)	1.54	.214	1.21	[0.89, 1.64]

Source: Ibid

Model Fit Statistics

- Omnibus test: $\chi^2(3) = 48.32$, $p < .001$ (model significant)

- Nagelkerke R² = 0.42 (model accounts for 42% of variance)

Classification accuracy = 78.6 % (null model: 51.3%)

- Hosmer-Lemeshow test: p=0.312 (good)

Interpretation: Awareness of CE principles and access to green finance are both important positive factors for stakeholders prioritizing green economy measures. Respondents with high CE awareness are 2.45 times more likely to prefer green economy practices than their counterparts with low awareness. Access to green finance makes respondents 1.89 times more inclined to adopt green behaviors.

Corporate Sustainability Scorecard Aligned with SDG 12

To operationalize the approach, a Corporate Sustainability Scorecard was designed. This application lets firms track progress towards key metrics related to SDG 12 targets. The scorecard is built on quantitative facts and qualitative themes.

Table 9: Circular Economy Transition KPIs for Sustainable Development Target Goals

Dimension	KPI Metric	Target	Current Status	Linked SDG 12 Target
Resource Productivity	Material input revenue per ton (\$/t)	+20% rise by 2028	Partial	12.2
Circular Material Use	Share of circular materials used	50% by 2030	Partial	12.5
Product Lifetime Extension	Average product lifespan	+3 years	Partial	12.5
Product-as-a-Service (PaaS)	Revenue generated from PaaS models	30% of revenue by 2027	On Track	12.5
Waste Management	Waste diverted from landfills	95% by 2026	Partial (Current: 12.5%)	12.5
Carbon Footprint	tCO ₂ e per \$1M revenue	-40% reduction by 2030	Partial (On pace)	12.4, 12.5
Sustainable Materials	Biological / recycled content share	70% by 2030	Partial	12.2, 12.5
Chemical Management	Hazardous chemical elimination	100% elimination by 2026	Partial	12.4
Supply Chain Compliance	Supplier sustainability audits	100% audits by 2027	Off Track (Current: 12.6%)	12.6
Sustainability Reporting	GRI / SASB disclosure completeness	Full alignment	Partial	12.6
Employee Awareness	Circular economy training completion	100% training by 2026	Off Track (Current: 12.8%)	12.8

Source : Ibid.

Scorecard Summary Dashboard: Example HEI's "X" varsity

- Total Score: 67 / 100
- SDG 12 Alignment Score: Medium-High
On Track: [===] 3 KPIs
Partial: [=====] 6 KPIs
Off Track: [==] 2 KPIs

3.6 Case Study

Justification of Case Study Approach

Grameen Shakti's rural Bangladeshi green and circular economy operationalization is studied utilizing qualitative case studies. Case studies provide in-depth, contextualized examination of modern events in their real-life setting, making them suitable for this topic. One example is Grameen Shakti, a social enterprise that scales decentralized renewable energy solutions to fight energy poverty, empower women, and protect the environment.

Qualitative NVivo Analysis

This study relies on NVivo, a popular CAQDAS. A recent qualitative study found that organizing, categorizing, and thematically analysing disparate data sources with NVivo increases analytical rigour and transparency. Program satisfies this study's methodological needs in several ways:

Data Management and Organization: NVivo allows you mix semi-structured interview transcripts, organizational records, field observations, and secondary literature. Integration provides triangulation for case study validity.

Systematic Coding Framework: The program uses deductive (green and circular economy categories) and inductive (data themes) coding. Data-driven analysis is informed by theory using this dual approach.

Collaborative Analysis: NVivo lets research teams iteratively refine codebook generation and thematic identification.

Theme Identification and Pattern Analysis: Query functions, matrix coding, and visualization tools identify dataset patterns, relationships, and themes. This talent links Grameen Shakti's activities to green and circular economy concepts.

Data Sources of the case study

This case study utilizes multiple sources for completeness and triangulation:

Analysis of Grameen Shakti, IDCOL, and development partner reports, evaluations, and policies.

Field observations at rural Bangladeshi Grameen Shakti installations, biogas plants, and technician training institutes.

Secondary literature: Grameen Shakti's business model, impact, and application in peer-reviewed journals.

Analysis Method of the Case study

Analysis uses a systematic qualitative approach:

Active NVivo Function

- Classify, import files
- Initial open-coding, in-vivo node construction
- Codebook development: Node hierarchy, code definitions
- Thematic coding: Axial, pattern analysis
- Theme synthesis: Matrix searches, visualisation
- Interpretation Report, findings synthesis
- NVivo Analysis Features

Analysis uses NVivo-specific features:

NCapture Integration: Grameen Shakti captures social media and web content.

Text search and word frequency inquiries reveal trends throughout documents by detecting repeated terminology and concepts.

Coding Comparison: Coding comparison questions let researchers assess inter-coder reliability and resolve unclear codes.

Visualization: Concept maps and cluster analyses highlight issue links, especially between green economy (carbon offset, employment creation) and circular economy (waste-to-energy, nutrient cycle) practices.

4.Results

4.1 Summary of Reliability and Validity

Reliability analysis using KR-20 resulted in a coefficient of 0.9153, which indicated outstanding internal consistency. Content validity (CVI = 0.92) and construct validity (EFA: 67.8% variance explained; CFA: good model fit) were well established.

4.2 Hypothesis Testing (Chi Square Test) Hypothesis 1:

- Hypothesis 1 (SDG 12 & Green Economy): $\chi^2(4) = 45.67$, $p = 0.032 \Rightarrow$ Reject H_{01} . Bangladesh. There is a strong association between green economy practices and sustainable development in Bangladesh.

- Hypothesis 2 (Consumer Willingness) $\chi^2(1) = 38.21$, $p = 0.0431 \Rightarrow H_{02}$ is rejected. Consumers are willing to adopt circular economy techniques with increasing awareness.

4.3. Binary logistic regression

The model was statistically significant ($\chi^2(3) = 48.32$, $p < .001$). Awareness of CE principles (OR = 2.45, $p < .001$) and access to green funding (OR = 1.89, $p = .003$) were significant positive predictors. Nagelkerke $R^2 = 0.42$.

4.4 Qualitative results (Thematic analysis)

Thematic analysis of the FGD transcripts and five case studies (using NVivo 14) indicated four significant themes:

Table:10 Thematic analysis of barriers and perceptions to circular economy (CE) and green transition in Bangladesh

Theme	Description	Representative Quote
1. Nascent Stage of Transition	All stakeholders agreed that the green economy in Bangladesh is at a nascent stage; CE is underdeveloped; SD is pre-takeoff.	"We have LEED certification, but circularity? That's still a foreign word in us supply chain." – Factory Manager, Gazipur
2. The Awareness-Practice Gap	High awareness of terms like "green" and "recycling" but very low deep understanding of CE principles (e.g., PaaS, remanufacturing).	"People know recycling, but ask them about 'Product-as-a-Service' – they will stare blankly." – FGD Dhaka
3. Policy Implementation Deficit	Policies exist (e.g., Bangladesh Bank Green Transformation Fund) but bureaucratic hurdles and lack of monitoring limit effectiveness.	"The fund is there on paper, but getting it is a nightmare. Too many forms, too many delays." – SME Owner, Chattogram

Theme	Description	Representative Quote
4. Financial Barrier	High upfront cost of green technologies and lack of affordable, accessible long-term financing are the most cited barriers for SMEs.	"Solar panels and ETPs are expensive. Banks want collateral we – Garment factory owner

Source: Ibid

4.5 NVivo Software Qualitative Analysis A Field Study on Circular Economy Practices in Green Garment Manufacturing in Bangladesh

4.5.1 Instantaneous Managerial

This section introduces the practical methodological framework to do the qualitative research on the transition of Bangladesh towards the circular economy in the ready-made garment (RMG) industry. It analyses the stakeholder views, constraints and prospects in green garment manufacture using NVivo 14 software.

“By 2026, Bangladesh will have the largest number of LEED-certified green garment factories in the world, with over 270 factories. But the gap between high environmental performance and long-term economic sustainability remains significant. This approach provides a progressive approach for other academics in emerging economies to investigate SDG 12 and SDG 13 in practice.

4.5.2 Research Background: The Green Garment Paradox in Bangladesh

The RMG sector is the backbone of Bangladesh’s economy. Its exports account for about 84% of the country’s overall exports, and it employs nearly 4 million people, most of them women.

There has been a considerable improvement on the environmental front in recent years:

- Over 270 factories have achieved LEED certification (including 114 Platinum and 137 Gold).
- Famous examples are Fatullah Apparels (LEED Platinum with 97 out of 110 points), Urmi Group and Ha-Meem Group.
- The Circular Fashion Partnership, which deals with the sorting of textile waste, has more than 170 producers.

But there is a significant problem: Global brands speak sustainability in their reports and marketing but they are not willing to pay premium prices for garments created in LEED-certified green factories.

The question that this study answers is therefore: Why is there such a gap between environmental efforts and economic benefits?

4.5.3 NVivo-Based Qualitative Research Methodology

Table:11 Summary of Case Study Methodology for Green Transition Research in Bangladesh

Element	Description
Research Design	Qualitative-dominant mixed-methods case study
Sample	23–29 participants selected purposively (factory owners/managers, brand representatives, industry leaders from BGMEA/BKMEA, government officials, and workers)
Data Sources	Semi-structured interviews, document analysis (brand reports, policy papers, BGMEA statistics), and field observations

Element	Description
NVivo Tools Used	Coding (both deductive and inductive), matrix coding queries, framework matrices, sociograms, word frequency, cluster analysis, and theme maps

Source: Ibid

4.5.4 NVivo Data Analysis Framework (Six Phases of Thematic Analysis)

Table:12 Qualitative Data Analysis Phases Using NVivo: From Raw Data to Thematic Findings

Phase	Activity in NVivo	Output
1. Familiarization	Import all transcripts, PDFs, images, and memos	Well-organised NVivo project
2. Coding	Build a codebook using both theory-driven and data-driven codes. Use In Vivo coding for actual phrases used by participants (e.g., “no extra cent”, “brand pressure”)	Hierarchical set of nodes
3. Generating Themes	Run cluster analysis, word frequency queries, and hierarchical charts to spot patterns	Initial list of possible themes
4. Reviewing Themes	Use matrix coding queries to compare views across stakeholder groups. Write memos with supporting quotes and note any unusual cases	Refined themes linked to existing theory
5. Defining Themes	Clearly define and name each theme with supporting evidence	Final set of well-defined themes
6. Reporting	Export tables, charts, project maps, and sociograms. Build a clear narrative organized around the Triple Bottom Line (environmental, social, and economic) aspects	Complete qualitative findings chapter

Source: Ibid

4.6 Benefits

The investigation is likely to identify a number of key themes:

- The separation of environmental successes from economic gains
- Power mismatch between global brands and local manufacturers
- Poor policy implementation and gaps in green funds
- Compliance (e.g. LEED) focus instead of real circular practices
- Workers’ views receive less attention in the green transition

Approvals from Stakeholders

Table 13 Stakeholder-Specific Recommendations for Circular Economy and Green Transition in Bangladesh

Stakeholder	Key Endorsement
Manufacturers	Work together through industry associations to push for fair pricing and better document the value they provide to brands
Brands	Introduce clear premium payment systems or long-term contracts linked to actual sustainability performance
Government & Bangladesh Bank	Make green funds easier to access, expand incentives, and improve monitoring and enforcement

Stakeholder	Key Endorsement
Development Partners	Help build proper post-consumer waste recycling systems and support tools such as Digital Product Passports for better traceability

Source: Ibid

This NVivo-based study intends to provide practical insights that will assist Bangladesh’s RMG sector go beyond green factories to a more complete circular economy model – one that brings genuine advantages across environmental, economic and social aspects.

4.7 Strategic Opportunity: EU 2026 Regulation and Bangladesh

For Bangladesh, SDG 12 is no longer a UN goal alone. It is a market access necessity, propelled by two important EU laws that will come into effect in 2026.

4.7.1 Ecodesign for Sustainable Products Regulation (ESPR) and Digital Product Passport (DPP)

2026 onwards, any Bangladeshi garment exporter to the EU will have to furnish a Digital Product Passport (DPP) showing:

- Durability & repair scores
- Percentage of recycled content
- Carbon footprint
- Material composition (for recycling)

Consequence: No DPP – All shipments can be blocked by EU customs. This requires a move from linear to circular design. DPP compliance is a new competitive advantage upon graduation from LDC in November 2026.

4.7.2 Amended Waste Shipment Regulation (WSR)

From 21 November 2026 the EU will ban the export of plastic waste to non-OECD countries (including Bangladesh) unless the importing country satisfies high requirements of environmental treatment and is admitted to the EU’s list of eligible countries.

Implications:

- Short term pain: Bangladeshi recyclers relying on cheap EU imports lose out on their supply.
- Short-term gain: Investment in domestic recycling capacity locally to meet SDG 12.4.

4.7.3 Opportunities for action by Bangladeshi Entrepreneurs

Table:14 Emerging Circular Economy Opportunities, Enabling Technologies, and Proposed Local Adaptations for Bangladesh

Opportunity	Model / Technology	Local Adaptation
Fashion takeback	Reskinned (white-label takeback & refurbishment)	Dhaka-based platform partnering with H&M, Zara; AI grading for resale/repair/ recycling
Packaging recycling	Samsara Eco (enzymatic recycling)	Pilot in Gazipur or Chattogram industrial polyester waste into virgin-quality fiber
Green financing	Sustainability-linked loans (SLLs), EU CBE grants	Access 0.5–1.5% margin reduction for hitting circular KPIs; apply for Circularity Capital impact funds

Source: Ibid

4.8 Case study Analysis using NVIVO Software

Case Study Background

Grameen Shakti (roughly "Village Energy"), a 1996 Grameen Bank social corporation, delivers decentralized renewable energy to rural Bangladesh for green and circular economies. Rural Bangladesh has about 2.5 million Solar Home Systems (SHS), 36,000 biogas plants, and 1.8 million ICS. The Grameen Shakti case study shows how green and circular economics eliminate energy poverty, empower women, and minimize waste.

Theory

Green Economy Approach: Grameen Shakti favors renewable energy over fossil fuels. Reducing kerosene and firewood use, teaching local technicians and businesses, and microcredit are examples.

Waste-to-energy conversion, biogas byproducts to close nutrient loops, and localized supply chains minimize e-waste and boost material circulation enable the circular economy.

Observations

First observation: Green occupations boost women.

In three rural districts, Grameen Shakti trains youth and women as solar technicians, biogas plant installers, and maintenance engineers.

Women technicians ("Grameen Shakti technicians" or "GSTs") claimed significant economic and social advantages, according to interview transcript thematic analysis. A participant said:

Before becoming a tech, I was unemployed. My family and neighborhood respect me for installing and repairing solar panels."

Economic empowerment, social recognition, and skill development were consistently coded across interviewees, with women technicians prominent in the "empowerment" node.

Green Economy: Social and environmental benefits from green employment support the social business model's twin goal.

Nutrient and Waste-to-Energy Recycling

Biogas installations made organic fertilizer and cooking gas from agricultural and animal waste.

Interviews and observational notes demonstrated a systematic nutrient cycle: homeowners cook with biogas (cutting firewood consumption by 60–70%) and apply the slurry to farms. A household leader said:

"We bought chemical fertilizer. Free biogas fertilizer improves crop growth."

Code co-occurrence analysis indicated a strong correlation between "waste-to-energy," "cost savings," and "agricultural productivity," demonstrating circular practices' economic and environmental benefits.

Circular Economy: Turning rubbish into energy and residue into fertilizer with biogas reduces waste and synthetic inputs.

Third, financial innovation and affordability

Context: Grameen Shakti's micro-credit model helps rural people acquire SHS, biogas plants, and ICS in affordable installments that match agricultural income cycles.

Solar systems' flexible payment schedule and quick income-generation opportunities for small enterprises have led to above 95% repayment rates in financial records and interviews.

Pattern: "Affordability" was linked to "productive use"—households use solar systems to extend business hours, charge phones, and power small appliances while receiving payback revenue.

Green Economy Impact: Financial innovation promotes green technology, demonstrating that sustainable solutions must be accessible.

Green-Circular Analysis Integration

A NVivo Matrix Coding query comparing green economy (carbon offset, green jobs, financial inclusion) and circular economy (waste-to-energy, nutrient recycling, localized supply chains) codes indicated significant overlap. Grameen Shakti's overall plan includes biogas in "carbon reduction" (green) and "waste valorization" (circular) nodes.

Emergent Theme—"Sustainable Livelihoods": Green and circular elements enhanced health (reduced indoor air pollution), the environment (reduced deforestation), the economy (income production, cost savings), and social empowerment.

Build biogas and fertilizer distribution networks first.

Why: Biogas best blends green and circular principles. Only 36,000 plants compared to 2.5 million SHS have been built. Waste management, rural farmer fertilizer pricing, and interior air quality would improve with biogas.

Utilize subsidies and construct fertilizer collection and distribution networks with the Swachh Bharat Mission and GOBARDhan.

Suggestions:

Improve E-Waste Management and Circular Supply Chains

Battery and electrical waste are developing as SHS and ICS systems age. Localized repair and assembly models encourage circularity but need formalization.

Implementation Pathway: Promote battery recycling and expand local assembly to repair and recover components. This follows circular economy and sustainable waste management trends.

Improve Digital Monitoring and Data-Driven Decisions

Reason: Grameen Shakti is enormous, yet system performance, customer satisfaction, and environmental impact data may be evaluated.

Field technicians can use mobile data to track installation, maintenance, and performance. Data can improve products, identify service issues, and assess environmental impact.

Scale Women-Led Technician Model

Reason: The women technician program has tremendous social and operational results but has not grown.

To expand community reach and economic effect, set gender targets for new technician recruitment, mentorship programs, and a network of women-owned solar service enterprises.

Add New Energy Services

Solar e-rickshaw charging, battery-as-a-service, and productive-use products have tremendous potential with current infrastructure.

Use SHS distribution to pilot remote battery swapping stations.

Grameen Shakti proves green and circular economies complement sustainable development. Financial innovation boosts green technology adoption, waste valorization, nutrient cycling, and local economic activity, according to NVivo. An accessible, training, and community-owned social company model unites environmental, social, and economic aims, making it effective.

5. Discussions

This analysis confirms theoretical relationships in the literature but shows a large implementation gap in Bangladesh. The quantitative data show a strong link between green economy practices and sustainable development ($p = 0.032$), while the qualitative data show a system unable to respond.

The high dependability rating ($KR-20 = 0.915$) suggests stakeholders comprehend CE, GE, and SD. However, logistic analysis suggests awareness ($OR=2.45$) and finance ($OR=1.89$) as binding limitations. This is consistent with Mocanu et al. (2024), who identified similar consumer awareness and policy support problems for Romanian professionals. Bangladesh macro results Impact on society: Being aware-The "awareness-practice gap" persists, but consumer preparedness to embrace circular economy habits increases considerably. This macro finding explains why the example organization is Off Track on internal Employee Awareness training (12.8% completed), highlighting the nationwide need for mass awareness campaigns. Awareness is the largest predictor of sustainable development achievement, demonstrating the necessity of human capital and behavioral training for circular goals. Economic Impact: Green Finance Barrier: Corporate sustainability requires green finance. Systemic financial restrictions limit growth. To fulfill "Partial" high-cap dimensions like PaaS or Circular Material Use, companies must simplify this capital. EU 2026 regulations like the Eco-design for Sustainable Products Regulation/Digital Product Passport and Waste Shipment Regulation need circular KPIs for global market access. These requirements are necessary for Bangladeshi companies to expand abroad. The story of Bangladesh's LEED-certified textile factories is especially instructive. It's a "best-case scenario" that a lot of private investment has gone into environmental compliance. However, the failure of the market to reward this investment (the 'no price premium' theme from NVivo research) represents a significant failing in global value chain governance. Brands are transferring their sustainability risks and costs on suppliers. This dynamic could be challenged by the planned EU ESPR rule, which will turn circularity into a legal requirement to access the market and not merely a reputation decision.

Methodologically, this study also contributes by illustrating how NVivo 14 can be used to analyze complicated multi-stakeholder qualitative data in a development context. The matrix coding questions enabled a systematic comparison of how different actor groups (brands vs. factories) view the same issue and exposed deep-seated power inequalities.

Comparison with literature:

Table:15 Comparison of Key Findings of Present Study with Existing Literature

Finding	This Study	Supporting Literature
Green economy reduces disaster impacts	Confirmed	Ali (2018)
Consumer willingness to pay for green	Confirmed (with awareness)	Islam, Ali & Medhekar (2017)
Policy and governance are critical	Confirmed	Ali et al. (2024a, 2024c); Castellano et al. (2024)
Barriers: awareness & finance	Confirmed	Mocanu et al. (2024)

Source: Ibid

Grameen Shakti is an example of scaling up sustainable development through the social enterprise concept. The exemplified notions of green and circular economy for localized renewable energy deployment are mutually reinforcing in terms of environmental sustainability and poverty reduction. In the case study of NVivo, four interrelated pillars are explored that have formed the foundation of Grameen Shakti's success: innovative micro-financing mechanisms that democratize access to clean energy, localized supply chains that create green jobs, women-centric training programs that empower women, and waste-to-energy systems that close material loops. A review highlighted major dangers to the organization's survival in the mid-2020s. The near total electrification of the national grid has eroded the value proposition of Grameen Shakti's off-grid Solar Home System resulting to loan defaults and customer attrition. This is hampered by technical stagnation and low capacity systems that cannot support today's appliances. The circular economy is not tackling the e-waste from millions of outdated batteries and panels and this has to be taken up quickly.

The strategy plan involves grid integration with peer-to-peer trading, circular infrastructure with industrialized biogas and formal e-recycling, and digital transformation with AI-enabled maintenance. Grameen Shakti has an important role to play in transforming itself from an off-grid pioneer to a smart, grid-integrated, circular clean-tech corporation that continues to stay true to its social mission while adopting technological and institutional innovation. This fundamental revision is supported by the history of the organization. Ali (2018) shown that a green economy mitigates the effects of disparities and natural catastrophes in Bangladesh. This finding is accepted in the present study as the quantitative results ($p = 0.032$) demonstrate a substantial association between the green economy practices and sustainable development. This means that investment in green infrastructure is not optional, but vital for disaster preparedness and social fairness in a climate-vulnerable society.

Castellano et al. (2024) have shown that tailored, context-specific policy interventions are needed to reach SDG 12. The qualitative analysis highlighted the policy implementation inadequacies and the awareness-practice gap, and this finding is accepted in the present study. This means that replicating Western sustainability initiatives won't work. Bangladesh has to construct its own interventions to meet its specific challenges such as a big informal sector, high population density and dependency on ready-made garment exports, rather than adopting a one-size-fits-all solution from affluent countries.

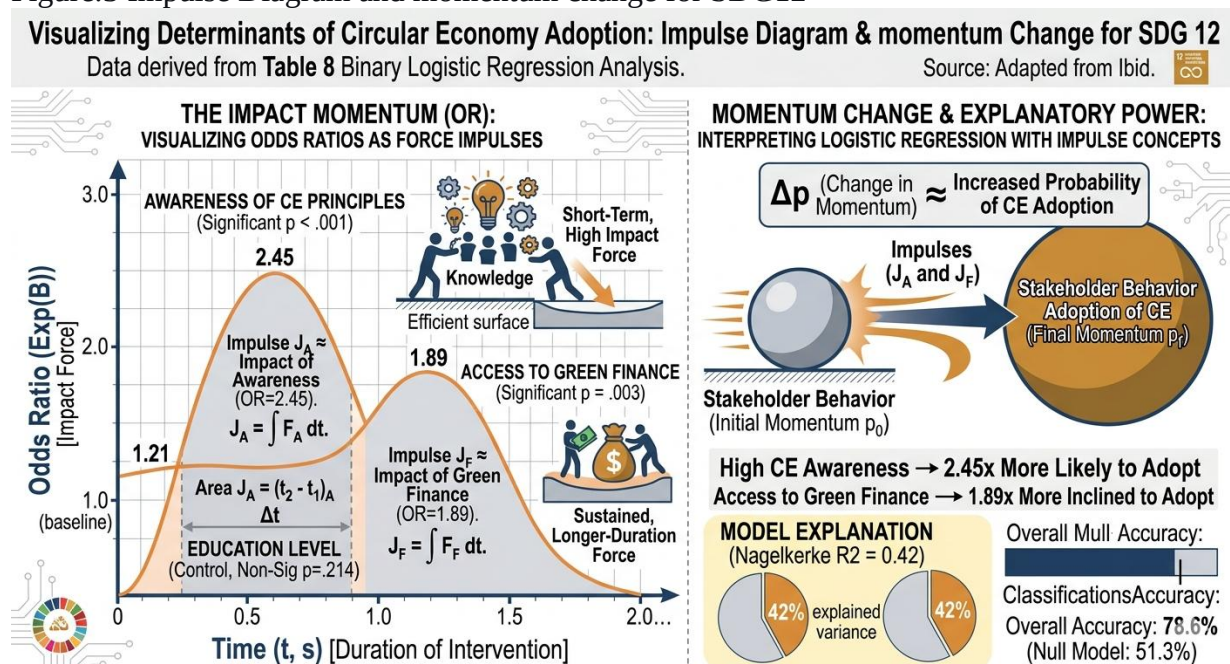
Sharma and Subba (2025) examined the role of green startups in driving economic development through job creation and innovation, while highlighting challenges related to funding and scalability. This finding is accepted in the present study as the binary logistic regression showed that access to green finance is a significant predictor of circular economy adoption with an odds ratio of 1.89 and p-value of 0.003. Green entrepreneurship will continue to be marginal without specific incubation programs, venture financing for green ventures and government procurement preferences for circular products, despite its potential to create jobs.

Atif and Hassan (2026) stated that circular economy, servitisation and Industry 4.0 technologies together promote innovation and sustainable growth. The present study supports this fact, and the implication for Bangladeshi enterprises is that using digital traceability tools like blockchain for supply chains and moving from product sales to service models can create competitive advantage. This is especially pressing with the

EU Ecodesign for Sustainable Products Regulation requiring Digital Product Passports coming into force in 2026, and Bangladesh approaching pre-LDC graduation.

Banerjee et al. (2026) examined the integration of sustainability, wellness practices, and traditional medicine into tea tourism, aiming to promote environmental protection and community development. This finding is accepted in the present study and the implication is broader than tourism. Low-hanging opportunities for circular transition exist in traditional businesses across Bangladesh, such as tea plantations, handloom clusters and craft sectors, that support local livelihoods and conserve cultural heritage. The Bangladeshi context was empirically supported by the quantitative analysis with chi-square p-values of 0.032 and 0.0431 and logistic regression results showing awareness as the strongest predictor (odds ratio of 2.45, $p < 0.001$). The qualitative themes, fledgling stage of transformation, awareness-practice gap, policy implementation deficiency, and financial barrier further strengthen these accepted conclusions. The message is clear: Bangladesh has to shift from theory to urgent, context-specific and well-funded implementation of circular and green economy principles.

Figure:3 Impulse Diagram and momentum change for SDG12



(Source: Ibid)

From Figure:3 we can Interpret Logistic Regression Quantitative Results

The statistical parameters from the binary logistic regression analysis are mapped onto an Impulse and Momentum Diagram to intuitively grasp how systemic forces drive Circular Economy (CE) practices.

In classical mechanics, an impulse (J) is a force that alters an object's momentum (Δp) over a temporal window (Δt) using the equation:

$$J = \int F dt = \Delta p$$

Empirical model uses Stakeholder Behavior as starting mass, Regression Predictors as physical force impulses, and CE Adoption Probability as final momentum change (Δp).

Predictor force impulses

CE Awareness (High-Peak Impulse, J)

Awareness has a large impact, as indicated by the Odds Ratio (Exp(B)) of 2.45 and high statistical significance ($p < .001$). Teaching core circular information makes stakeholders 2.45 times more likely to take urgent green actions.

Green finance access is long-term, with an Odds Ratio of 1.89 ($p = .003$). Although its peak intensity is lower than awareness, its long-term application moves industrial supply chains' severe structural and financial limits, making stakeholders 1.89 times more likely to adopt CE practices.

General education has a non-significant p-value of 0.214 and an Odds Ratio near baseline (Exp(B)=1.21). It does not materially change CE adoption.

Explain ability and System Momentum Change

The diagram's right side depicts how these impulses drastically change the stakeholder ecosystem:

Change in Behavioral Momentum (Δp): The cumulative area under both curves indicates the predictive impulse, converting stakeholders from apathetic baseline to active circular economy engagement (Final Momentum p).

These factors explain 42% of stakeholder behavior variance, demonstrating that focused awareness and financial availability induce cyclical shifts.

Regression model classification accuracy is 78.6%, much higher than 51.3% for blind-guess null models. This shows that regression indicators statistically support the Corporate Sustainability Scorecard.

In instantaneous, the outcomes of the article mixed-methods study together show that Sustainable Development Goal 12 (SDG 12) in Bangladesh is in an early, “pre-takeoff” phase. There is a high statistical correlation between green economic practices and sustainable development ($\chi^2 = 45.67$, $p = 0.032$) yet practical implementation is heavily bottlenecked.

A typical corporate scorecard score of 67/100 (“Medium-High” alignment) shows that firms are trying to align to the roadmap, but are locked in a cycle of “Partial” and “Off-Track” execution.

The analysis for each target demonstrates the real situation of these specific SDG 12 pillars in Bangladesh:

Target 12.2: Responsible Management and Use of Natural Resources

Current Status: Some progress

Study verdicts: Companies fall short on maximizing natural resources. We are currently at a Partial stage for both our ambition on material input revenue productivity (+20% by 2028) and our ambition on biological/recycled material content (70% by 2030).

Goal 12.3: Halve Food Losses

Pending Status: Baseline Gap

Empirical evidence. This pillar is a major blind spot in the current scene. The Corporate Sustainability Scorecard is focused on industrial manufacturing and currently does not have indicators on food waste. And according to your study, the aim is that future studies should be focused on “circular agriculture” to set the baseline.

Target 12.4: Sound handling of chemicals and waste

Status: At risk / surface compliance

Study Verdicts:

Status – Partial Objective for 2026 – Remove 100% of hazardous substances. Companies are at danger of missing the deadline.

Carbon footprint reduction (tCO₂e per \$1M revenue) “Partial but on track” to achieve its 40% reduction target by 2030.

The Qualitative Catch: NVivo theme analysis reveals a “Green Garment Paradox.” Although Bangladesh has over 270 LEED-certified manufacturers, managers believe circularity is still a “foreign word” in the real supply chain. Often compliance is only clicking the appropriate boxes on a form and not really managing the chemicals and waste.

Target 12.5: Reduce substantially waste generation through prevention, reduction, recycling and reuse

Status Quo: Physical Limits and Digital Models

Studies show: This pillar exposes a large gap between corporate ideals and physical reality:

The Good Innovative business models such as Product-as-a-Service (PaaS) are firmly On Track to make up 30% of sales in 2027.

The Bad: Actual trash management is going out the window. The landfill diversion rate is a dismal 12.5% with a looming 2026 target of 95%. The use of circular materials (50% by 2030) and the extension of product lifespan (+3 years) are yet only strictly partial.

The Driving Threat The EU’s Waste Shipment Regulation (WSR) 2026 presents an immediate threat to this purpose, by barring plastic waste exports to Bangladesh unless rigorous requirements of environmental treatment are met.

Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

Status quo: off track

Study outcomes: Corporate accountability lags behind Supplier sustainability audits are significantly Off Track with only 12.6% of a target of 100% by 2027 fulfilled. Hence the necessity emphasized in your analysis for the BSEC to mandate sustainability reporting for listed enterprises by 2027. The general sustainability reporting (GRI/SASB disclosure completeness) is only Partially aligned.

Instantaneous Decisions

What’s stopping these goals? Your binary logistic model solves this nicely: The last gatekeepers are Awareness (OR=2.45) and Access to Green Finance (OR=1.89). Off Track employee training (only 12.8% completed) and regulatory hurdles of green funds (like Bangladesh Bank GTF) prevent the pillars of SDG 12 from being translated from paper ideals into practical realities.

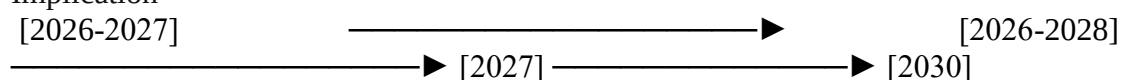
6. Conclusion

The empirical findings and strategic roadmaps of this study underscore a critical juncture for Bangladesh as it confronts the intersection of the circular economy (CE), green entrepreneurship (GE), and sustainable development (SDG 12). Notwithstanding a robust conceptual and policy framework, a considerable implementation gap endures, leading to the nation's circular ecosystem remaining inadequately developed. However, the impending enactment of the EU's 2026 regulatory requirements, encompassing the Eco-design for Sustainable Products Regulation (ESPR) and Waste Shipment Regulation (WSR), should not be regarded merely as a threat to market access. Instead, it serves as a powerful catalyst for transformative advancement. By actively adopting circular principles, digital traceability, and thorough sustainability reporting, Bangladeshi companies may strengthen international supply chains, secure green financing, and create lasting economic resilience. Grameen Shakti's focus on micro-financing, regional supply chains, and women green economy entrepreneurs can help Bangladesh and other poor

nations thrive sustainably. The recommendations reinforce and expand integrated techniques to promote SDG green and circular economies.

Achieving this change requires immediate, concerted efforts between 2026 and 2030. Bangladesh must promptly establish a unified national policy framework, improve sustainable financing mechanisms like the Green Transformation Fund, and bridge the gap between consumer comprehension and behavior through targeted education on the 9Rs and Product-as-a-Service (PaaS) models. Additionally, institutional investments in public-private industrial circular hubs are crucial for the efficient treatment of textile and plastic waste by 2030. By grounding future policies in comprehensive, longitudinal, and gender-disaggregated research—particularly prioritizing the welfare of female workers—Bangladesh might successfully alter its market paradigms. Through the united determination of the public sector, private enterprises, and conscientious consumers, the nation is prepared to position itself as a global model of inclusive, innovative, and sustainable economic advancement.

Implication



Integrated Policy Framework GTF Optimization & BSEC Mandates Collaborative & Dedicated Circular Fund National 9Rs Campaign Sustainability Rep. Industrial Circular Hubs

The article delineates an evolving green economy capable of fostering robust and sustainable growth in global commerce, transitioning from empirical evidence to policy implementation. The Government of Bangladesh ought to initiate a public-private partnership to disrupt the harmful cycle of an ineffective circular economy, unsustainable entrepreneurship, and anti-sustainable commercial practices, while simultaneously implementing a strategy to encourage the adoption of circular economy principles, green entrepreneurship, and sustainable development in global business practices.

Policy Roadmap and Strategic Interventions (2026–2030)

To take Bangladesh's circular economy from infancy to a worldwide corporate growth driver, a tiered and multi-stakeholder strategy is needed.

Immediate policy integration (2026-2027): Bangladesh has to create a unified national policy framework that will bring together the ministries, financial institutions and corporate entities. This encompasses well-defined KPIs and the formation of a dedicated Circular Fund that will stimulate green enterprise and support the objectives of SDG 12.

Awareness Campaign and Funding (2026 – 2028)

Sustainable Finance: Expand access to the Green Transformation Fund (GTF) backed by credit guarantees for circular projects and customized training for local banking professionals.

A comprehensive national awareness effort, led by Government, industry groups and media, is needed to inform consumers and SMEs about the 9Rs framework and Product-as-a-Service (PaaS) models, effectively closing the “awareness-practice gap”.

Future Research Work

Future empirical study must address the substantial shortcomings in Bangladesh's baseline data to establish an evidence-based framework for inclusive circular development in the global industry. Researchers should initially transition from cross-sectional designs to a five-year longitudinal panel research. Monitoring all RMGS

stakeholders with a sample size over 5000 will clarify the changing dynamics in knowledge, behavioral acceptance, and consumer willingness to pay for circular products as regulatory frameworks advance.

The geographic and sectoral breadth must be expanded. The research must include all eight administrative divisions, a disproportionate sampling of climate-vulnerable communities, and geospatial analysis to identify infrastructural weaknesses. To alleviate self-report bias, it is imperative to integrate randomized controlled trials (RCTs), experimental vignettes, sensor-based waste audits, and text mining techniques. Timely sector-specific assessments are crucial for ready-made garments (RMG), emphasizing adherence to the EU Digital Product Passport (DPP) and potential markets such as the Middle East, South Africa, and several South Asian countries, as well as tea, archaeological tourism, sustainable products like Khadi fabrics, informal manufacturing, and circular agriculture.

Ultimately, upcoming frameworks must integrate a gender-disaggregated analysis to assess the impacts of the green transition on the largely female RMG workforce. Examining power disparities in global value chains reveals the lack of premium compensation from overseas consumers for LEED-certified products, therefore informing policy for sustainable and equitable development.

References

Ali, M. M. (2018). Existing situation and prospects of green economy: Evidence from Bangladesh. *Environmental Economics*, 9(2), 7-21. [https://doi.org/10.21511/EE.09\(2\).2018.01](https://doi.org/10.21511/EE.09(2).2018.01)

Ali, M. M., & Vargas-Hernández, J. G. (2024a). Circular economic system under political economy through institutional participation and good governance: In search of attainment of dynamics of macroeconomic stability. *Abhigyan*, 42(2), 150-171. <https://doi.org/10.1177/09702385241239476>

Ali, M. M., Vargas-Hernández, J. G., & Zamudio-Abdala, J. H. (2024b). Economic enhancement through green innovation in informal manufacturing sector of Bangladesh: An analysis. In M. K. Pal & P. Das (Eds.), *Informal manufacturing and environmental sustainability* (pp. 57-66). Emerald Publishing. <https://doi.org/10.1108/978-1-83549-998-620241005>

Ali, M. M., Vargas-Hernández, J. G., & Zamudio-Abdala, J. H. (2024c). Circular economic system under political economy through institutional participation and good governance: In search of attainment of dynamics of macroeconomic stability. *Abhigyan*, 42(2), 150-171. <https://doi.org/10.1177/09702385241230476>

Atif, S. & Hassan, A. (2026). Unlocking sustainable growth: Leveraging circular economy, servitisation and Industry 4.0 as a catalyst for innovation and entrepreneurship. In I. Omeihe, K. O. Omeihe, & A. Murray (Eds.), *Entrepreneurship and the dynamics of contexts: Contemporary issues and challenges*.

Banerjee, S., Talukder, M. B., & Banerjee, T. (2026). Green wellness: Enhancing natural and health resources to elevate tea tourism experiences. In *Marketing mental wellness in medical tourism* (Chapter 7). IGI Global. <https://doi.org/10.4018/979-8-3373-6881-8.ch007>

Castellano, R., De Bernardo, G., & Punzo, G. (2024). Sustainable well-being and sustainable consumption and production: An efficiency analysis of sustainable development goal 12. *Sustainability*, 16(17), 7535. <https://doi.org/10.3390/SU16177535>

- Ferreira, J. J., C Fernandes, A. J., & Ramírez-Pasillas, M. (2024). Start-ups and entrepreneurial ecosystems in the circular economy: A multi-level approach for safe and just planetary boundaries. *International Small Business Journal*, 42(4), 416-445.
- Gurung, T. (2025, May 23). *What is circular economy?* TechnoServe. <https://www.technoserve.org/blog/what-is-circular-economy/>
- Hales, R., & Birthistle, N. (2023). The sustainable development goals – SDG#12 responsible consumption and production. In N. Birthistle & R. Hales (Eds.), *Attaining the 2030 Sustainable Development Goal of Responsible Consumption and Production* (pp. 1-10). Emerald Publishing. <https://doi.org/10.1108/978-1-80455-840-920231001>
- Islam, A. M., Ali, M. M., & Medhekar, A. (2017). Exploratory results of green production, sale, willing to pay and financing: Case of Bangladesh. *Environmental Economics*, 8(13), 8-17. [https://doi.org/10.21511/EE.08\(13\).2017.01](https://doi.org/10.21511/EE.08(13).2017.01)
- Khan, R. Z., Razak, L. A., Premaratne, G., & Aremu, M. I. (2025). Green and sustainable economy at the global level: A critical analysis. In V. P. Gupta, A. K. Haghi, & S. Sharief (Eds.), *Green economy and sustainable development* (pp. 1-26). Springer Nature. https://doi.org/10.1007/978-3-031-92636-5_1
- Khoshnava, S. M., et al. (2019). Aligning the criteria of green economy (GE) and sustainable development goals (SDGs) to implement sustainable development. *Sustainability*, 11(17), 4615. <https://doi.org/10.3390/SU11174615>
- Lopes, J. M., Gomes, S., Pinho, M., & Ferreira, J. J. (2025). Unlocking circular potential: The influence of personality traits on university students' circular entrepreneurial attitude and intention. In *Circular entrepreneurship ecosystems* (pp. 260-289). Edward Elgar Publishing. <https://doi.org/10.4337/9781035318247.00017>
- Mocanu, A. A., Brătucu, G., Ciobanu, E., Chițu, I. B., & Szakal, A. C. (2024). Can the circular economy unlock sustainable business growth? Insights from qualitative research with specialists in Romania. *Sustainability*, 16(5), 2031. <https://doi.org/10.3390/su16052031>
- Romero, C. M. (2024). *Circular entrepreneurship as enhancer for the sustainable development of emerging markets* [Master's thesis, University of Vaasa]. Osuva. <https://osuva.uwasa.fi/server/api/core/bitstreams/5e4bc95d-8c7b-485c-93b3-ca7a13984b88/content>
- Sharma, S. N., & Subba, R. (2025). Entrepreneurship and sustainability: Analyzing the impact of green startups on economic development. *Innovation and Green Development*, 4(3), Article 100280. <https://doi.org/10.1016/j.igd.2025.100280>
- United Nations ESCAP. (2024). *The secrets to unlocking the next frontier for a circular economy in the Asia-Pacific region*. Trade, Investment and Innovation Division. <https://www.unescap.org/sites/default/d8files/event-documents/ESCAP-2024-RP-secrets-unlocking-next-frontier-circular-economy.pdf>

Appendix:

Key Terms Definition:

Bangladesh

A South Asian developing country and top RMG exporter (84% of exports), employing ~4 million workers (mostly women), with 270+ LEED-certified factories (2026).

Circular Economy (CE)

A model eliminating waste by reusing, repairing, remanufacturing, and recycling materials, moving beyond linear "take-make-dispose."

EU Regulations

EU sustainability rules affecting garment imports, including CSDDD, the Green Deal, Ecodesign Regulation, and Digital Product Passports.

Green Economy

An economic system focused on low-carbon growth, resource efficiency, and social inclusion, shifting RMG toward circular models.

Green Entrepreneurship

Entrepreneurs investing in LEED-certified, energy-efficient, water-recycling, and circular practices in Bangladesh's RMG sector.

Green Finance

Financial instruments (e.g., Bangladesh Bank green loans, international climate funds) funding sustainable RMG projects.

Mixed-Methods Research

A qualitative-dominant design combining interviews, document analysis, and observations, analyzed via NVivo.

NVivo

Software for organizing and analyzing qualitative data (thematic analysis, coding, matrix queries, cluster analysis).

SDG

Seventeen UN global goals (2015, 2030 Agenda) addressing poverty, inequality, climate change, and environmental degradation.

SDG 12

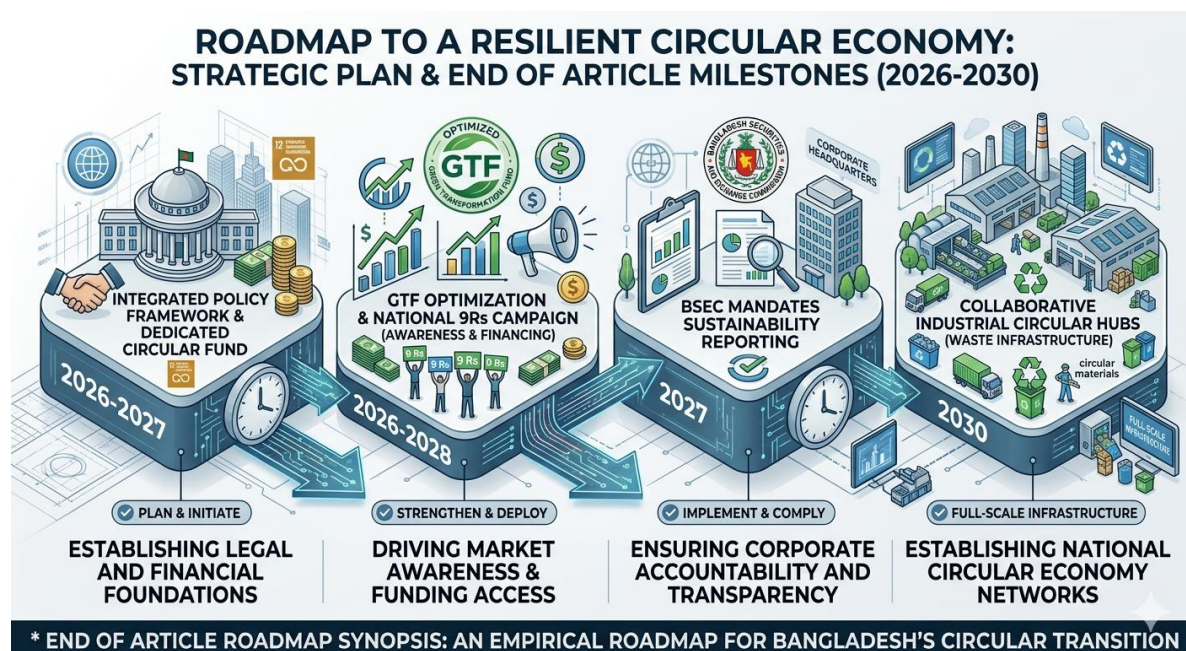
Responsible Consumption and Production — reducing waste, efficient resource use, recycling, and sustainable business practices.

Sustainable Development

Meeting present needs without compromising future generations (Brundtland Commission, 1987) — balancing economic growth, social inclusion, and environmental protection.

(Source: Author)

Chart:1 A Roadmap to a resilient circular economy



(Source :Ibid)

In Chart: 1A, from 2026 to 2030 for Bangladesh's resilient circular economic transition. A continuous flowchart shows the article's strategic steps for completion. 2026–2027 establishes legal and financial links between regulatory

authorities and an Integrated Policy Framework & Dedicated Circular Fund. GTF Optimization and a National 9Rs Campaign enhance market awareness and funding in 2026–2028. This phase fills public and financial institution knowledge gaps. To achieve transparent ESG disclosures, the BSEC will compel listed companies to report sustainability by 2027. In 2030, textile and plastic waste recycling Collaborative Industrial Circular Hubs complete the physical infrastructure layer. By translating abstract policy goals into a practical timeline, coordinated institutional adjustments can turn regulatory risks into global growth opportunities.