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The 5R paradox: A mixed-method systems and Islamic economic analysis in emerging markets

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ABSTRACT

The transition to a Circular Economy (CE) is pivotal for sustainable development yet remains under-tested in emerging markets where cultural and informal sectors dominate. This study empirically examines the impact of the 5R framework (Reduce, Reuse, Recycle, Refurbish, Renew) on the perception of a green economy in West Sumatra, Indonesia, serving as a microcosm of the Global South. Using a mixed-methods approach that combines quantitative regression (N = 700) and qualitative Causal Loop Diagram (CLD) analysis, we identify a significant paradox. While Reduce (β = 0.142), Reuse (β = 0.102), and Renew (β = 0.068) have a positive impact on green economy perception, Recycle (β = -0.013) and Refurbish (β = -0.004) demonstrate statistically significant negative impacts. We attribute this to a perception-practice gap where informal downcycling and second-hand goods are viewed as signaling backwardness rather than sustainability. By integrating an Islamic Economic perspective as a cultural lens, we highlight how religious values align with resource efficiency (*Khalifah*) but clash with the perceived "impurity" (*Najis*) of current informal waste practices. These findings challenge one-size-fits-all CE policies and suggest that achieving a Green Economy requires formalizing the informal sector and leveraging religious social capital to reshape public perception.

Keywords: circular economy, 5R paradox, emerging markets, Islamic economic perspective, waste management, systems thinking, sustainable development

INTRODUCTION

The contemporary global economic landscape is undergoing a profound and necessary paradigm shift, moving away from the extractive, linear "take-make-dispose" model toward a regenerative Circular Economy (CE). This transition is driven not merely by environmental altruism but by an urgent planetary necessity to decouple economic growth from resource depletion and environmental degradation (Geissdoerfer et al., 2017). While developed nations in the Global North have advanced in integrating CE principles into sophisticated industrial systems, the Global South faces a unique and precarious "double burden" (Winans et al., 2017). Emerging economies are under immense pressure to accelerate economic growth to alleviate poverty, while simultaneously grappling with an escalating waste crisis driven by rapid urbanization and nascent consumption patterns (Arisman & Fatimah, 2023).

Indonesia, as the world's fourth most populous nation, stands at the epicenter of this challenge. The archipelago nation faces a critical imperative to restructure its economic relationship with resources. Although the national government has committed to an ambitious "Green Economy" roadmap aiming to reduce marine plastic debris and carbon emissions (PPN/Bappenas, 2021), the translation of these high-level targets into provincial realities remains fraught with systemic complexities. The core challenge in Indonesia is not merely technological but deeply sociological and cultural. Policies that work in Jakarta or Surabaya do not necessarily translate effectively to regions with distinct cultural fabrics.

However, this challenge is not unique to one province. West Sumatra serves not merely as a local case study but as a critical microcosm and archetype of the Global South. With a population exceeding 5.7 million (BPS Sumatera Barat, 2025) and a deeply rooted Minangkabau culture, its socio-economic fabric—characterized by collectivism, deep Islamic religious adherence, and heavy reliance on the informal sector—mirrors conditions found in numerous emerging nations, from Egypt to Pakistan (Arefin, 2025; Sharif et al., 2022). Consequently, understanding the friction between policy aspiration and ground-level reality here offers generalizable insights for CE implementation across the developing Islamic world. Despite the local philosophy of Alam Takambang Jadi Guru (Nature is our teacher), the province generates approximately 980,348

tons of waste annually (Dinas Lingkungan Hidup Provinsi Sumatera Barat, 2023), signaling a systemic inefficiency that threatens the Sustainable Development Goals (SDGs) (Dey et al., 2024; Küfeoğlu, 2024).

A critical review of existing literature reveals a significant gap. Most CE research in developing contexts remains confined to the standard 3R framework (Reduce, Reuse, Recycle) (D'Amato et al., 2017; Ghisellini et al., 2016). This study argues that such a reductionist view is insufficient because direct transfers of these models often fail due to ignored contextual barriers (Bello et al., 2024; Govindan & Hasanagic, 2018). By ignoring the broader dimensions of Refurbish and Renew, standard models fail to capture the complex perception-practice gap (Schroeder et al., 2019). They often miss the nuancedreality where specific activities, like Recycling and Refurbishing, carry a stigma of poverty (associated with scavenging and used goods), while others are viewed aspirationally (Velis, 2017). Without expanding the lens to a full 5R framework, these hidden psychological barriers remain invisible.

Furthermore, standard Western-centric frameworks often overlook the profound role of religious values. In Muslim-majority regions like West Sumatra, Islamic Economic principles are not merely personal beliefs but distinct socio-economic drivers that govern behavior, consumption, and the relationship with nature (Abdelzaher, 2019). The absence of these systemic and cultural dimensions in current research limits the effectiveness of policy interventions.

This study aims to bridge these theoretical and empirical gaps by adopting a robust mixed-method approach designed to capture both the quantifiable impacts and the underlying systemic structures of circular economy adoption. Firstly, it utilizes Multiple Linear Regression (MLR) to measure the direct, distinct impact of each 5R pillar (Reduce, Reuse, Recycle, Refurbish, Renew)—explicitly going beyond the standard 3R framework—on the perception of a Green Economy, providing statistical validation of these relationships. Secondly, complementing the linear analysis, the study employs Systems Thinking via Causal Loop Diagrams (CLD) to map the complex interdependencies, feedback loops, and non-linear dynamics of social stigma that standard regression cannot reveal. Thirdly, and most notably, this study integrates a theological analysis as a critical cultural lens, interpreting findings through the principles of Islamic Economics. Drawing on the work of Rahma et al. (2025) and Thalgi (2024), this study examines how the concepts of Khalifah (stewardship) and Mizan (balance) interact with modern circular practices, positing that religious values can serve as potent, yet underutilized, drivers for sustainable behavior in Muslim-majority emerging markets.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Signaling Theory and Social Stigma

To understand consumer behavior in emerging markets towards circular practices, particularly regarding used or recycled goods, it is essential to look beyond simple economic utility. Signaling theory (Spence, 1978) provides a useful lens. In many developing societies, consumption is a primary signal of social status (Connelly et al., 2025; Song et al., 2024). The consumption of new, pristine goods signals economic success, modernity, and upward mobility (Bellezza, 2023). Conversely, the consumption of used, repaired, or recycled goods can unintentionally signal financial distress or lower social status (Cao & Xu, 2023).

The Divergence Between Global Frameworks and Local Implementation

The operationalization of Circular Economy (CE) principles varies profoundly across different geopolitical and economic landscapes. As defined by Kirchherr et al. (2017), the CE is widely understood in the Global North as an industrial system that is restorative or regenerative by intention and design. In these developed contexts, circularity is often synonymous with technological innovation, industrial symbiosis, and high-value material recovery (Korhonen et al., 2018). The focus is on efficiency optimization within a formal, regulated industrial framework.

In stark contrast, emerging markets grapple with a fragmented implementation reality. While the Global North focuses on production management, regions like West Sumatra are still navigating fundamental waste management challenges. Here, the implementation is not driven by high-tech industrial parks but is primarily sustained by the informal sector, waste pickers (pemulung) and scavengers who operate on the fringes of the economy (Ritzén & Sandström, 2017). This disparity highlights a critical implementation gap identified by Schroeder et al. (2019). In developing economies, the infrastructure for formal recycling is often non-existent. Consequently, Recycling transforms from a clean, industrial process into a labor-intensive, often unhygienic survival strategy.

Deconstructing the 5R Hierarchy in a Local Context

The Circular Economy operationalizes sustainability through the "R" hierarchy. While the foundational 3R framework (Reduce, Reuse, Recycle) is widely recognized (Ghisellini et al., 2016), this study expands the scope to a more granular 5R framework to capture the full spectrum of economic activities relevant to the Indonesian context.

The first pillar, Reduce (reduction at source), focuses on preventing waste before it is created. In the context of Indonesia, particularly in West Sumatra, this aligns closely with traditional values of frugality (hemat). Reike et al. (2018) argue that Refuse/Reduce is the highest value retention loop. In local culture, the avoidance of waste is seen as a sign of good household management and moral character. Similarly, Reuse involves extending product life cycles. In emerging markets, reuse is often a necessity driven by economic constraints. As observed by Zapata and Zapata Campos (2015), the "sharing economy" in developing nations is often informal and community-based, extending the utility of goods far beyond their primary life through "hand-me-down" practices.

However, the dynamics shift significantly when considering Recycle (material recovery). While theoretically representing the recovery of materials, Velis (2017) describes recycling in the Global South as survival circularity, a low-tech

Table 1. Comparative analysis of 5R implementation challenges in emerging markets (OIC and non-OIC contexts)

Country	Context	Key challenges in 5R implementation	Islamic/Cultural Economic Potential
Indonesia	Informal sector dominance; decentralized waste banks.	Social stigma of waste; lack of industrial processing; "dirty" image of recycling.	High potential for Waqf (endowment) funded waste infrastructure; Sadaqah for waste banks.
Egypt	Zabaleen (traditional waste collectors) system.	Integration of informal sector; hygiene concerns; modernizing traditional practices.	Using religious networks for community-based waste management education.
Malaysia	Developing formal infrastructure; varying enforcement.	Public apathy; reliance on foreign waste imports (historically); separation at source issues.	Halal supply chain principles applied to waste handling and logistics.
India	Massive informal recycling sector (Kabadiwalas).	Caste-based stigma associated with waste work; severe health hazards.	Relies on social entrepreneurship and frugal innovation (Jugaad).

Source: Adapted from Arefin (2025), Rahman et al. (2024), Sengupta et al. (2023), Velis (2017), and various country reports

process driven by scavengers. Wilson et al. (2006) further elaborate that this informal sector is often marginalized and stigmatized. This distinction creates a unique socio-economic dynamic where recycling is viewed as the domain of the desperate, lacking the dignity associated with formal employment. A similar challenge faces Refurbish (restoration). Literature suggests that in emerging markets, this sector suffers from a significant trust deficit. Drawing on Akerlof's (1978) theory of the market for lemons, Shashi et al. (2024) argue that in the absence of standardization, consumers perceive refurbished goods as having high functional risk. Koay et al. (2023) reinforce this, noting that consumers frequently prefer cheap, low-quality new goods over refurbished items due to unpredictability.

Finally, the concept of Renew (biological and energy renewal) is increasingly linked to "Green Growth." In the agrarian context of West Sumatra, this is adapted to mean the utilization of organic waste for household energy (biogas) or feed (Handayani et al., 2021). This aligns with the biological cycle in the Ellen MacArthur Foundation's butterfly diagram, symbolizing a shift towards self-sufficiency (EMF, 2019).

Comparative Context: Emerging Markets and Islamic Potential

To contextualize the challenges described above, **Table 1** compares Indonesia with other emerging markets.

The Islamic Economic Lens and Systems Thinking

This study employs Systems Thinking to decode complexity, utilizing Causal Loop Diagrams (CLD) as advocated by Bassi et al. (2021) and Crielaard et al. (2024) to visualize feedback mechanisms. However, the system is interpreted through Islamic Economics.

Islamic economic principles are posited as the "cultural software." Chapra (1992) defines Islamic economicsas a branch of knowledge that realizes human well-beingthrough an allocation of resources in conformity with Shariah. The concept of Khalifah (Stewardship) provides the normative foundation (Rahma et al., 2025). As Nasr (1968) articulates, humans are custodians of the earth, obligated to maintain its ecological balance (Mizan). This reframes environmental protection from a secular duty to a spiritual obligation (Muhamad et al., 2020). This is reinforced by the Quranic Prohibition of Waste (Israf), which supports Reduce and Reuse.

Conversely, the concept of Taharah (purity) creates a complex interaction. Islam places a supreme value on cleanliness (Azmin Shompa et al., 2025). In a context where recycling is informal and dirty, it may clash with the aspiration for Taharah, creating a psychological barrier often missed in secular CE frameworks.

MATERIALS AND METHODS

Research Design and Population

To capture the multifaceted nature of the circular economy, this study employs a sequential explanatory mixed-method design (Clark, 2017). The quantitative phase tests hypothesized relationships to identify general patterns, while the qualitative systems phase explains the underlying mechanisms and cultural drivers. The population encompasses the economic backbone of West Sumatra, comprising households, farmers, and Micro, Small, and Medium Enterprises (MSMEs).

Sampling Technique and Demographic Profile

A purposive sampling technique was employed to select 700 respondents. Consistent with Etikan et al. (2016), purposive sampling is valid when the researcher deliberately chooses informants due to the specific qualities the informant possesses. The study specifically targeted respondents from seven key regions identified as high-waste generators (see **Table 2**) to capture the perceptions of actors most intensified in their interaction with waste.

Table 2. Waste generation in key regencies/cities of West Sumatra

No	Regency/City	Waste generation (tons/year)
1	Pesisir Selatan	56,558.72
2	Solok Regency	58,083.03
3	Sijunjung	36,471.20
4	Tanah Datar	47,382.56
5	Agam	80,163.78
6	Lima Puluh Kota	56,964.67
7	Pasaman	44,884.05
8	Dharmasraya	38,458.75

Table 2 (Continued). Waste generation in key regencies/cities of West Sumatra

No	Regency/City	Waste generation (tons/year)
9	Solok Selatan	27,542.75
10	Pasaman Barat	63,876.75
11	Padang Pariaman	79,593.54
12	Mentawai Islands	13,902.75
13	Padang City	236,296.62
14	Solok City	20,199.06
15	Sawahlunto	6,925.99
16	Padang Panjang	17,986.62
17	Bukittinggi	46,607.36
18	Payakumbuh	34,041.59
19	Pariaman	14,408.74
	Amount	980,348.53

Source: Dinas Lingkungan Hidup Provinsi Sumatera Barat (2023)

Table 3. Demographic profile of respondents (N = 700)

Category	Sub-category	Frequency	Percentage (%)
Gender	Male	237	33.86
	Female	463	66.14
Age	18 - 25 Years	281	40.14
	26 - 40 Years	246	35.14
	> 40 Years	173	24.72
Education	High School or below	137	19.57
	Diploma/Bachelor (S1)	492	70.29
	Postgraduate (S2/S3)	72	10.14
Residence	Urban	428	61.14
	Rural	272	38.86
Occupation	Households/SMEs	700	100.0

To address the need for contextual transparency, **Table 3** presents the demographic profile of the respondents. This profile is crucial for interpreting the results, particularly regarding the influence of education and gender on waste perception.

Quantitative Instrumentation and Operationalization

Primary data was collected using a structured questionnaire employing a 5-point Likert Scale. The instrument underwent rigorous validation. Prior to field testing, content validity was established through expert review. Subsequently, a pilot study (N = 30) confirmed reliability. As recommended by Hair et al. (2019) for social science research, Cronbach's Alpha coefficients exceeding the 0.70 threshold were required for all variables.

To ensure balanced weight, the researchers operated the variables with a uniform distribution of items (15 items per variable). This approach prevents any single variable from dominating the variance.

Special attention was paid to the operationalization of Renew (X5). Unlike industrial definitions, this concept was contextualized this for the local agrarian economy to mean household-level practices, such as the utilization of organic waste for biogas or composting, rather than high-tech energy production. Detailed operationalization is presented in **Table 4**.

Table 4. Operationalization of research variables and indicators

Variable	Concept	Key indicators (adapted for local context)	Items
Reduce (X1)	Minimizing waste at source	Reducing single-use goods	15
		Efficient consumption	
		Avoidance of Israf (waste)	
Reuse (X2)	Extending utility of items	Reusing decent items	15
		"Hand-me-down" culture	
		Utilizing old items for productive activity	
Recycle (X3)	Processing waste into material	Sorting waste	15
		Selling to waste banks or scavengers	
		Processing waste into raw material	
Refurbish (X4)	Repairing for reuse	Restoring function of damaged goods	15
		Repairing machinery/electronics	
		Buying reconditioned goods	
Renew (X5)	Biological renewal	Utilization of organic waste (composting, biogas)	15
		Eco-friendly agricultural inputs	
		Using renewable biological resources	

Table 4 (Continued). Operationalization of research variables and indicators

Variable	Concept	Key indicators (adapted for local context)	Items
Green economy (Y)	Sustainable economic growth	Perception of economic modernization	15
		Smart production/consumption	
		Extending product lifespan	
		Low carbon emissions	

Table 5. Multiple linear regression results

Model	Unstandardised (β)	Std. Error	t	Sig.	Impact direction
(Constant)	43.072	0.220	195.893	0.000	
Reduce	0.142	0.002	74.263	0.000	Positive
Reuse	0.102	0.002	49.339	0.000	Positive
Recycle	**-0.013**	0.002	-6.184	0.000	Negative
Refurbish	**-0.004**	0.002	-2.145	0.032	Negative
Renew	0.068	0.002	33.242	0.000	Positive

Dependent variable: Green Economy-based Circular Economy (Y)

Qualitative Systems Modeling and Validation

Complementing the survey, a Causal Loop Diagram (CLD) was constructed. As defined by Crielaard et al. (2024), CLDs are foundational tools in System Dynamics for articulating feedback structures. The development followed a multi-stage process to ensure validity and reduce subjectivity.

Initially, a preliminary CLD was drafted. To rigorously validate this structure, a Focus Group Discussion (FGD) was conducted with five subject matter experts. Vennix et al. (1996) and Connolly and Doole (2024) emphasize that group model building increases the validity of system dynamics models. The expert panel for this study panel included environmental economists, waste practitioners, and Islamic scholars. This diverse panel ensured that both the economic mechanics and the religious interpretations (e.g., links between Sadaqah and economic behavior) were sound.

RESEARCH FINDINGS

Data Quality and Validity Check

The integrity of the data was established through rigorous testing. A pilot study yielded high validity. Reliability was exceptionally high, with Cronbach's Alpha values ranging from 0.850 to 0.907 across all variables, indicating strong internal consistency (Hair et al., 2019).

Given the exceptionally high R-squared values observed later, we addressed the potential for Common Method Bias (CMB). Following the procedure by Podsakoff et al. (2003), Harman's Single Factor Test was conducted. The results indicated that the total variance explained by a single factor was 40.41%, well below the threshold of 50%, suggesting that bias is not the primary driver. Classical assumption tests confirmed that OLS requirements were met: Residuals followed a normal distribution, Multicollinearity was absent (VIF < 10), and the Durbin-Watson statistic (1.992) indicated no autocorrelation.

Regression Analysis: The 5R Paradox

The multiple linear regression analysis yielded a model with substantial predictive power, indicated by an Adjusted R Square of 0.956. While high for social sciences, this reflects the cultural homogeneity of the respondents and the purposive sampling design.

As detailed in **Table 5**, the analysis reveals a striking paradox. The principles of Reduce (β = 0.142, p < 0.001), Reuse (β = 0.102, p < 0.001), and Renew (β = 0.068, p < 0.001) all demonstrated strong, positive, and significant impacts on Green Economy perception. This aligns with the hypothesis that resource efficiency and agricultural innovation are viewed as aspirational and positive.

Conversely, and counter-intuitively, the practices of Recycle (β = -0.013, p < 0.001) and Refurbish (β = -0.004, p < 0.05) showed statistically significant negative impacts. This implies that for every unit increase in engagement with current recycling and refurbishing practices, the perception of a modern, green economy actually decreases. This finding challenges the assumption that "more recycling is always better" for public perception in developing markets.

Qualitative Results: The Systemic Structure (CLD)

While the regression analysis provides a robust quantitative snapshot of what is occurring (i.e., the negative coefficients), it inherently lacks the capacity to explain the systemic mechanisms driving these counter-intuitive results. Why, in a developing economy, does recycling correlate with a lower perception of a green economy? To decode this "black box," the study transitions from linear regression to systems thinking.

The Causal Loop Diagram (CLD) was constructed to visualize the underlying feedback structures (the "engine room") of the local circular economy. To address complexity, the diagram has been simplified and color-coded to distinguish between reinforcing (growth) and balancing (stagnation) loops.

Based on the expert-validated CLD (**Figure 1**), specific feedback loops have been identified that explain why some R's are positive and others negative.

Reinforcing Loops: The Engines of Aspirational Growth

The CLD analysis identifies powerful positive feedback loops that drive the success of Reduce, Reuse, and Renew. First, the Business Opportunity Loop (R1) illustrates a virtuous cycle particularly relevant to the Renew variable. When agricultural SMEs implement 5R principles (such as converting

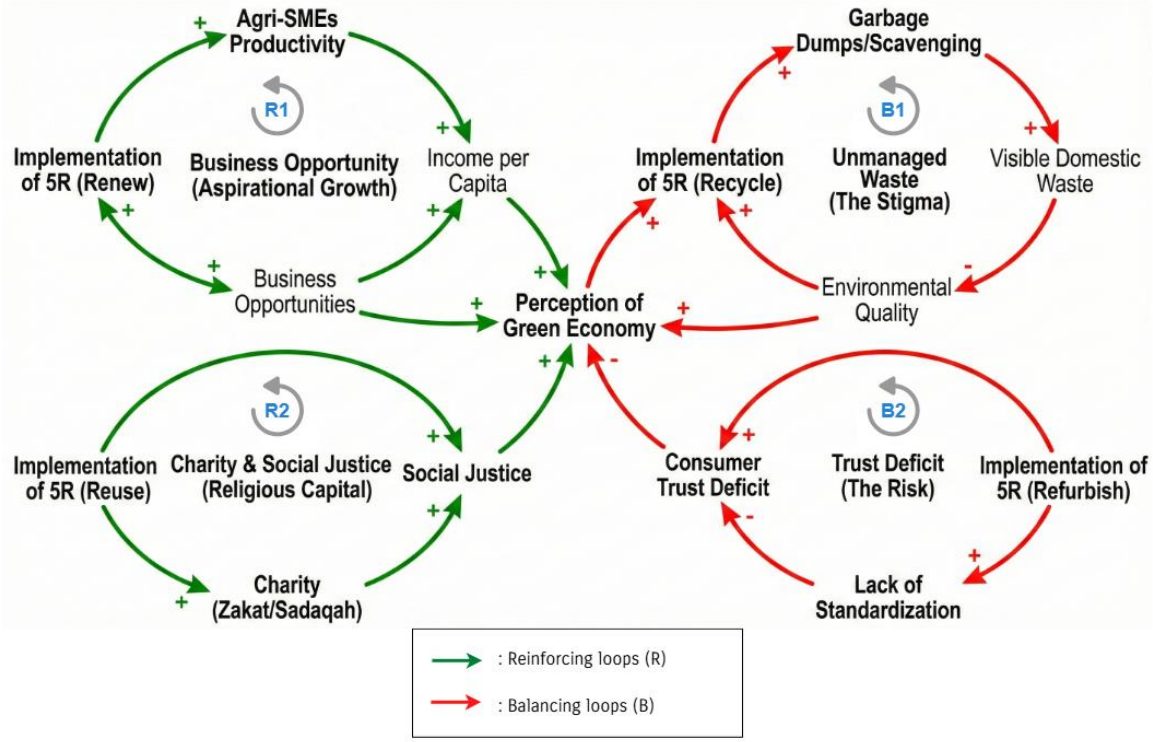

Figure 1. Causal loop diagram of circular economy system in West Sumatra (Source: Authors' own elaboration)

cow manure into biogas or organic fertilizer), it creates immediate, tangible value. This leads to new business opportunities, increased labor absorption in rural areas, and higher income per capita. As incomes rise, these farmers and SMEs are more capable and willing to invest in further circular technologies, reinforcing the adoption cycle. This explains why Renew is positively correlated: It is an engine of economic growth.

Secondly, the Charity and Social Justice Loop (R2) highlights a mechanism unique to the local culture. The analysis links Reuse to Social Justice and Charity (Zakat/Sadaqah). In West Sumatra, the act of reusing or passing down items is not merely an economic transaction; it is often framed as a charitable act to help extended family or community members. This transforms circular behavior into a spiritual act of "social justice," creating a strong, culturally embedded reinforcing loop. The more people reuse/share, the stronger the social fabric becomes, creating a positive perception of the Green Economy as an inclusive system.

Balancing Loops: The Structural Barriers to Recycling

The CLD also provides a compelling explanation for the negative impact of Recycling (X3) and Refurbishing (X4). The Unmanaged Waste Loop (B1) illustrates a systemic failure. Currently, the Recycle variable is trapped in a cycle characterized by "domestic waste," "unmanaged waste," and "environmental degradation." In the absence of formal, modern industrial infrastructure, Recycling in West Sumatra is not a hidden industrial process but a visible struggle. It is visually and socially linked to the informal scavenging sector and overflowing open dump sites. Consequently, the public associates Recycling not with a pristine, modern Green Economy, but with the failure of the waste management system. An increase in visible recycling activity (scavenging) is often a symptom of more unmanaged waste, leading to the observed negative regression coefficient.

Furthermore, the Trust Deficit Loop (B2) explains the negative perception of Refurbishing. Ideally, refurbishing should counter resource scarcity. However, the CLD reveals a break in the feedback loop: A lack of quality assurance. The local market for refurbished goods lacks standardization. This creates a trust deficit where consumers associate refurbished items with high functional risk. The loop shows that as the market floods with poor-quality refurbished goods, consumer trust erodes, reinforcing the preference for new goods and negatively impacting the perception of a sustainable economy.

DISCUSSION

Deconstructing the Paradox: Aspirational and Survival Circularity

The most significant contribution of this study lies in empirically uncovering a distinct dichotomy between what we term "aspirational circularity" and "survival circularity" within an emerging market context. This finding challenges the monolithic view of the 5R framework often presented in literature from developed economies, such as those by Ghisellini et al. (2016) and Kirchherr et al. (2017), where all circular components are typically assumed to work synergistically towards sustainability. However, our results show a clear divergence in an emerging market context.

The findings suggest that Reduce, Reuse, and Renew represent aspirational circularity. They are aligned with cultural virtues of frugality (hemat) and agricultural

modernization. The positive coefficient of Renew (β = 0.068) is particularly telling; it indicates that when circularity involves value-addition (e.g., waste-to-energy), it is embraced as a sign of progress. This aligns with findings by Korhonen et al. (2018) regarding the allure of green technologies but adds a localized agrarian nuance.

In stark contrast, Recycle and Refurbish represent survival circularity. The negative coefficient for Recycle (β = -0.013) contradicts the standard assumption that recycling is a gateway to the green economy. Instead, it is a rational response to the visual reality of the informal sector. As noted by Velis (2017), recycling in the Global South is often synonymous with "dirty work" and poverty. The public conceptually divorces the messy reality of scavenging from their aspirational vision of a pristine, modern Green Economy. Similarly, the negative impact of Refurbish supports the theoretical proposition of a Lemon Market (Akerlof, 1978) in developing nations. The information asymmetry regarding the quality of used goods leads to a collapse in trust. As observed by Shashi et al. (2024) in similar emerging market contexts, consumers perceive refurbished goods as risky "poverty coping mechanisms" rather than smart, sustainable choices.

The Islamic Economic Enabler: Purity and Function

The integration of the Islamic Economic perspective offers a unique pathway to resolve this paradox. This study uses Islamic principles not merely as theological concepts, but as a hermeneutic lens to interpret the behavioral patterns observed in the regression and CLD.

The strong positive performance of Reduce and Reuse can be interpreted through the lens of Khalifah (stewardship). Scholars like Nasr (1968) and Khalid (2002) have long argued that in Islamic theology, nature is sacred and its preservation is a divine trust. The findings on this study confirms that in a deeply religious society, "Reduce" is reinforced by the spiritual prohibition of Israf (wastefulness). This elevates economic efficiency to a form of piety (Muhamad et al., 2020), explaining why these behaviors are perceived so positively.

However, a critical tension arises with Recycling. The concept of Taharah (purity) is central to Islamic life. As noted by Azmin Shompa et al. (2025) regarding Islamic hygiene jurisprudence, cleanliness is half of faith. The current state of informal recycling (often involving scavenging in unsanitary conditions) clashes with this value. If the recycling process is physically dirty or involves contact with Najis (impurity), it is culturally devalued (Maghen, 1999). This suggests that the negative perception of recycling is not just about economic status, but about spiritual and physical hygiene. For the circular economy to be embraced, it must be "sanitized." Policies must transform recycling from a dirty activity into a clean (Thayyib) industrial process that respects the dignity and purity values of the community (Miftahorrozi, 2022).

To bridge this gap, policy must leverage religious social capital more concretely (Thalgi, 2024). It is not enough to preach about nature; the infrastructure itself must be aligned with religious values. Specifically, we propose the integration of Islamic Social Finance (Waqf and Sadaqah) into waste management infrastructure. By using Waqf funds to build modern, clean Material Recovery Facilities (MRFs), the community can transform recycling from a dirty survivalist activity into a communal religious service. When recycling is managed by trusted religious institutions (like mosque-based waste banks) and maintained to standards of Taharah, the social stigma identified in our model can be dismantled.

Theoretical Implications

This study contributes to the global discourse on the Circular Economy by providing empirical evidence that CE is not a universal construct but a culturally relative one. Existing frameworks often assume a linear positive relationship between all R's and sustainability (Winans et al., 2017). The "5R Paradox" refutes this in the context of emerging markets, suggesting that without formalization and cultural alignment, certain circular activities can actually hinder the public's buy-in for a green transition. This necessitates a revision of CE models applied to the Global South to explicitly account for the "informality penalty" discussed by Wilson et al. (2006) and the "trust deficits" identified by Koay et al. (2023).

Demographic Context and Robustness

A potential concern regarding these findings is the demographic profile of the respondents (see **Table 3**), which skews towards women (66.14%) and younger, educated individuals. However, this study argues that this demographic profile actually strengthens the validity of the 5R Paradox. In West Sumatra (specifically the Minangkabau culture), women are the primary decision-makers for household consumption. Furthermore, younger and more educated individuals are typically the most environmentally conscious demographic globally (Mehraj et al., 2023; Wang et al., 2021). If even this ideal group holds negative perceptions of Recycle and Refurbish, it suggests that the cultural stigma is pervasive and structural. The negative coefficients are not artifacts of low education, but robust indicators of a systemic failure in how recycling is presented to the public.

CONCLUSIONS AND POLICY RECOMMENDATIONS

This study provides empirical evidence that the transition to a Green Circular Economy in emerging markets is non-linear, complex, and culturally embedded. Statistically, while the 5R framework explains the vast majority of Green Economy perception, the impacts are heterogeneous. Systemically, the negative perceptions of recycling and refurbishing are rational responses to "Balancing Loops" driven by informal waste management, social stigma, and lack of trust. Theologically, Islamic economic principles serve as potent cultural drivers for conservation but necessitate a cleaner, more dignified infrastructure to fully embrace the recycling sector.

Strategic Recommendations

To resolve the 5R paradox and unlock the full potential of the circular economy, policymakers must move beyond generic campaigns and adopt targeted systemic interventions:

Industrialize to sanitize (breaking loop B1)

The negative perception of recycling is linked to its "dirty" informal nature. There is an urgent need for the Provincial

Government to facilitate investment in modern Material Recovery Facilities (MRFs). By transforming recycling from "scavenging" into a formal, mechanized industry, the process becomes sanitized. This aligns the sector with the Islamic value of Taharah, removing the cultural stigma and increasing public participation.

Institutionalize trust (fixing loop B2)

To reverse the negative perception of Refurbishing, relying on national standards (SNI) is often too slow and bureaucratic for local SMEs. Instead, the provincial government should encourage "Community-Based Warranties" or a "Minang Green Guarantee" endorsed by local trade associations. This down-to-earth verification system would reduce information asymmetry at the local market level, bridging the trust deficit and legitimizing refurbished goods as smart economic choices.

Leverage religious social capital (reinforcing loop R2)

Moving beyond vague educational campaigns, we propose the establishment of Mosque-Based Waste Banks (Bank Sampah Berbasis Masjid). Given that mosques are the center of community life in West Sumatra, integrating waste collection points within mosque complexes—managed by the mosque committee (DKM)—instantly validates the activity. Furthermore, the Council of Ulema (MUI) should standardize Friday Sermons (Khutbah) to explicitly frame waste reduction not just as a civic duty, but as Fardhu Kifayah (communal obligation) and Sadaqah (charity), thereby tapping into the region's immense social capital (Thalgi, 2024).

Localize renew for MSMEs

Recognizing Loop R1 as a key engine of growth, specific grants should be directed toward rural MSMEs to utilize agricultural waste (biogas, composting). This reinforces the aspirational aspect of circularity, proving to the local community that green practices lead to tangible economic prosperity.

Limitations and Future Research

This study acknowledges certain limitations. First, the use of purposive sampling limits statistical generalizability to the broader Indonesian archipelago. Second, the notably high R2 value suggests a high degree of cultural homogeneity among respondents.

To address these gaps, future research should move beyond general perceptions and investigate specific socio-economic drivers. Specifically, studies should measure the income elasticity of demand for refurbished goods to determine at what income level consumers switch back to new goods. Additionally, research is needed to explore informal trust mechanisms (such as social collateral) within the waste picker communities, to understand how these can be formalized without destroying livelihoods. Finally, longitudinal studies are recommended to track how the perception of Recycling evolves as infrastructure modernizes.

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REFERENCES

Abdelzaher, D. M., Kotb, A., & Helfaya, A. (2019). Eco-Islam: Beyond the principles of why and what, and into the principles of how. *Journal of Business Ethics*, *155*(3), 623-643. https://doi.org/10.1007/s10551-017-3518-2

Akerlof, G. A. (1978). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics, 84*(3), 488-500. https://doi.org/10.2307/1879431

Arefin, M. R. (2025). The commodification of waste in Cairo, Egypt: Capital, colonial sanitation, and value's mobile frontier. *Antipode*, *57*(5), 1639-1662. https://doi.org/10.1111/anti.70052

Arisman, & Fatimah, Y. A. (2023). Waste management in Indonesia: Strategies and implementation of sustainable development goals (SDGs) and circular economy. In *Circular Economy Adoption* (pp. 131-157). Springer. https://doi.org/10.1007/978-981-99-4803-1_5

Azmin Shompa, Z., Akbar, M. A., & Mohd Mohadis, H. (2025). Harmonizing Maqasid al-Shari'ah with sustainable waste management practices: A conceptual framework for principles and implementation. *International Journal of Islamic and Middle Eastern Finance and Management*, *18*(1), 142-165. https://doi.org/10.1108/IMEFM-02-2024-0061

Bassi, A. M., Bianchi, M., Guzzetti, M., Pallaske, G., & Tapia, C. (2021). Improving the understanding of circular economy potential at territorial level using systems thinking. *Sustainable Production and Consumption, 27*, 128-140. https://doi.org/10.1016/j.spc.2020.10.028

Bellezza, S. (2023). Distance and alternative signals of status: A unifying framework. *Journal of Consumer Research*, *50*(2), 322-342. https://doi.org/10.1093/jcr/ucac049

Bello, A. O., Isa, R. B., Oke, A. E., Arogundade, S., & Lewis, J. M. O. (2024). Circular economy implementation in the construction industry: An examination of the barriers in a developing country. *International Journal of Building Pathology and Adaptation, 44*(1), 143-162. https://doi.org/10.1108/IJBPA-10-2023-0154

BPS Sumatera Barat. (28 Februari 2025). *Provinsi Sumatera Barat Dalam Angka 2025* [West Sumatra Province in 2025]. CSA. https://sumbar.bps.go.id/id/publication/2025/02/28/a757962d2ef9b6ce8943ed73/provinsi-sumatera-barat-dalam-angka-2025.html

Cao, C., & Xu, Q. (2023). A new perspective on extra consumer costs for green parcel packaging—An exploration of signal theory and green values. *Journal of Cleaner Production*, *382*, Article 135361. https://doi.org/10.1016/j.jclepro.2022.135361

Chapra, M. U. (1992). *Islam and the economic challenge.* International Institute of Islamic Thought.

Clark, P. V. L. (2017). Mixed methods research. *The Journal of Positive Psychology*, *12*(3), 305-306. https://doi.org/10.1080/17439760.2016.1262619

Connelly, B. L., Certo, S. T., Reutzel, C. R., DesJardine, M. R., & Zhou, Y. S. (2025). Signaling theory: State of the theory and its future. *Journal of Management*, 37(1), 24-61. https://doi.org/10.1177/0149206310388419

Connolly, J. D., & Doole, G. J. (2024). An analysis of participants' introductory experience with causal loop diagrams (CLDs) using group model building (GMB) scripts. *System Dynamics Review*, *40*(4), Article e1785. https://doi.org/10.1002/sdr.1785

Crielaard, L., Uleman, J. F., Châtel, B. D. L., Epskamp, S., Sloot, P. M. A., & Quax, R. (2024). Refining the causal loop diagram: A tutorial for maximizing the contribution of domain expertise in computational system dynamics modeling. *Psychological Methods, 29*(1), 169-201. https://doi.org/10.1037/met0000484

D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., Leskinen, P., Matthies, B. D., & Toppinen, A. (2017). Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of Cleaner Production, 168*, 716-734. https://doi.org/10.1016/j.jclepro.2017.09.053

Dey, S., Mondal, T., Karjee, S., & Samanta, P. (2024). Waste management towards achieving environmental sustainability. In P. Singh, & A. Borthakur (eds.), *Trash or Treasure* (pp. 207-230). Springer. https://doi.org/10.1007/978-3-031-55131-4_8

Dinas Lingkungan Hidup Provinsi Sumatera Barat. (2023). *Laporan Kinerja Instansi Pemerintah (LKjIP) Tahun 2023*. Pemerintah Provinsi Sumatera Barat.

EMF. (2019). *Circular economy diagram*. Ellen MacArthur Foundation. https://ellenmacarthurfoundation.org/circular-economy-diagram

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1-4. https://doi.org/10.11648/j.ajtas.20160501.11

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The circular economy–A new sustainability paradigm? *Journal of Cleaner Production, 143*, 757-768. https://doi.org/10.1016/j.jclepro.2016.12.048

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production, 114*, 11-32. https://doi.org/10.1016/j.jclepro.2015.09.007

Govindan, K., & Hasanagic, M. (2018). A systematic review on drivers, barriers, and practices towards circular economy: A supply chain perspective. *International Journal of Production Research, 56*(1-2), 278-311. https://doi.org/10.1080/00207543.2017.1402141

Hair, J. F., Gabriel, M. L. D. S., da Silva, D., & Braga, S. (2019). Development and validation of attitudes measurement scales: Fundamental and practical aspects. *RAUSP Management Journal*, *54*(4), 490-507. https://doi.org/10.1108/RAUSP-05-2019-0098

Handayani, D., Naldi, A., Larasati, R. R., Khaerunnisa, N., & Budiatmaka, D. D. (2021). Management of increasing economic value of organic waste with Maggot cultivation. *IOP Conference Series: Earth and Environmental Science*, *716*(1), Article 012026. https://doi.org/10.1088/1755-1315/716/1/012026

Khalid, F. M. (2002). Islam and the environment. *Social and Economic Dimensions of Global Environmental Change*, *5*, 332-339.

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*, 221-232. https://doi.org/10.1016/j.resconrec.2017.09.005

Koay, K. Y., Cheah, C. W., & Lom, H. S. (2023). Does perceived risk influence the intention to purchase second-hand clothing? A multi-group analysis of SHC consumers versus non-SHC consumers. *Journal of Product & Brand Management, 32*(4), 530-543. https://doi.org/10.1108/JPBM-11-2021-3721

Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. *Journal of Cleaner Production, 175*, 544-552. https://doi.org/10.1016/j.jclepro.2017.12.111

Küfeoğlu, S. (2024). Waste management emissions. In *Net Zero: Decarbonizing the global economies*. Springer. https://doi.org/10.1007/978-3-031-70322-5_11

Maghen, Z. (1999). Close encounters: Some preliminary observations on the transmission of impurity in early Sunnī jurisprudence. *Islamic Law and Society, 6*(3), 348-392. https://doi.org/10.1163/1568519991223784

Mehraj, D., Qureshi, I. H., Singh, G., Nazir, N. A., Basheer, S., & Nissa, V. U. (2023). Green marketing practices and green consumer behavior: Demographic differences among young consumers. *Business Strategy & Development*, *6*(4), 571-585. https://doi.org/10.1002/bsd2.263

Miftahorrozi, M. (2022). *The impact of zero-waste regulation and waste bank on socio-economic empowerment in Indonesia: Analysis from the perspective of Maqasid al-Shari'ah* [Master's thesis, Istanbul Sabahattin Zaim University].

Muhamad, A., Syihab, A. H., & Ibrahim, A. H. (2020). Preserving human–nature's interaction for sustainability: Quran and Sunnah perspective. *Science and Engineering Ethics*, *26*(2), 1053-1066. https://doi.org/10.1007/s11948-020-00192-7

Nasr, S. H. (1968). *Man and nature: The spiritual crisis of modern man*. Unwin Paperbacks.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903. https://doi.org/10.1037/0021-9010.88.5.879

PPN/Bappenas (2021). *The economic, social and environmental benefits of a circular economy in Indonesia*. Kementerian PPN/Bappenas.

Rahma, N., Sugiyanto, C., & Susamto, A. A. (2025). Bridging circular economy and Islamic economic principles: Toward a sustainable economic model. *International Journal of Ethics and Systems*, 1-22. https://doi.org/10.1108/IJOES-01-2025-0038

Rahman, T., Deb, N., Alam, M. Z., Moniruzzaman, M., Miah, M. S., Horaira, M. A., & Kamal, R. (2024). Navigating the contemporary landscape of food waste management in developing countries: A comprehensive overview and prospective analysis. *Heliyon*, *10*(12), Article e33218. https://doi.org/10.1016/j.heliyon.2024.e33218

Reike, D., Vermeulen, W. J. V., & Witjes, S. (2018). The circular economy: New or refurbished as CE 3.0? — Exploring controversies in the conceptualization of the circular economy through a focus on history and resource value retention options. *Resources, Conservation and Recycling*, *135*, 246-264. https://doi.org/10.1016/j.resconrec.2017.08.027

Ritzén, S., & Sandström, G. (2017). Barriers to the circular economy–integration of perspectives and domains. *Procedia CIRP, 64*, 7-12. https://doi.org/10.1016/j.procir.2017.03.005

Schroeder, P., Anggraeni, K., & Weber, U. (2019). The relevance of circular economy practices to the sustainable development goals. *Journal of Industrial Ecology, 23*(1), 77-95. https://doi.org/10.1111/jiec.12732

Sengupta, D., Ilankoon, I. M. S. K., Kang, K. D., & Chong, M. N. (2023). Circular economy and household e-waste management in India. Part II: A case study on informal e-waste collectors (Kabadiwalas) in India. *Minerals Engineering*, *200*, Article 108154. https://doi.org/10.1016/j.mineng.2023.108154

Sharif, K., Farooqi, N., Kassim, N., & Zain, M. (2022). Analyzing informal value transfer networks through the lens of social exchanges. *Society and Business Review*, *17*(3), 394-420. https://doi.org/10.1108/SBR-05-2021-0059

Shashi, Centobelli, P., Cerchione, R., & Jhamb, D. (2024). What makes people hesitant from circularity: An analysis of risk, marketing mix, cost and inconvenience. *Journal of Consumer Behaviour*, *23*(1), 43-60. https://doi.org/10.1002/cb.2143

Song, S., Lian, J., Skowronski, K., & Yan, T. (2024). Customer base environmental disclosure and supplier greenhouse gas emissions: A signaling theory perspective. *Journal of Operations Management*, *70*(3), 355-380. https://doi.org/10.1002/joom.1272

Spence, M. (1978). Job market signaling. In *Uncertainty in economics* (pp. 281-306). Academic Press. https://doi.org/10.1016/B978-0-12-214850-7.50025-5

Thalgi, M. J. (2024). Altruism and social cohesion: An Islamic perspective of charitable acts for sustainable development. *Journal of Islamic Thought and Civilization*, *14*(2), 42-62. https://doi.org/10.32350/jitc.142.04

Velis, C. A. (2017). Waste pickers in Global South: Informal recycling sector in a circular economy era. *Waste Management & Research: The Journal for a Sustainable Circular Economy, 35*(4), 329-331. https://doi.org/10.1177/0734242X17702024

Vennix, J. A., Akkermans, H. A., & Rouwette, E. A. (1996). Group model-building to facilitate organizational change: An exploratory study. *System Dynamics Review, 12*(1), 39-58. https://doi.org/10.1002/(SICI)1099-1727(199621)12:1%3C39::AID-SDR94%3E3.0.CO;2-K

Wang, Y., Hao, F., & Liu, Y. (2021). Pro-environmental behavior in an aging world: Evidence from 31 countries. *International Journal of Environmental Research and Public Health*, *18*(4), Article 1748. https://doi.org/10.3390/ijerph18041748

Wilson, D. C., Velis, C., & Cheeseman, C. (2006). Role of informal sector recycling in waste management in developing countries. *Habitat International*, *30*(4), 797-808. https://doi.org/10.1016/j.habitatint.2005.09.005

Winans, K., Kendall, A., & Deng, H. (2017). The history and current applications of the circular economy concept. *Renewable and Sustainable Energy Reviews, 68*, 825-833. https://doi.org/10.1016/j.rser.2016.09.123

Zapata, P., & Zapata Campos, M. J. (2015). Unexpected translations in urban policy mobility: The case of the Acahualinca development programme in Managua, Nicaragua. *Habitat International*, *46*, 271-278. https://doi.org/10.1016/j.habitatint.2014.10.001