

From Digital Engagement to Sustainable Consumption: Examining the Role of Digital Literacy among Rural and Urban Consumers

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Abstract

Digital platforms have become a pervasive part of everyday consumer life, extending far beyond marketing exposure into how people research, discuss, share, and ultimately act on information relevant to sustainable living. This study examines the relationship between digital engagement the frequency, depth, and interactivity of consumers' use of digital platforms and sustainable consumption behaviour among rural and urban consumers in Tiruchirappalli district, Tamil Nadu, India, and tests digital literacy as a moderator of this relationship, alongside a direct rural-urban comparison on all study constructs. Primary data were collected from 342 usable responses (178 urban, 164 rural, from 365 originally collected) using a structured questionnaire administered across one urban and one rural zone of the district. Measurement reliability and validity were confirmed via Cronbach's alpha, composite reliability, and average variance extracted, all exceeding recommended thresholds. Independent-samples t-tests showed urban consumers reported significantly higher digital engagement ($t = 5.96, p < .001, d = 0.64$), digital literacy ($t = 5.76, p < .001, d = 0.62$), and sustainable consumption ($t = 2.72, p = .007, d = 0.29$) than rural consumers. Hierarchical regression showed digital engagement ($\beta = .382, p < .001$) and digital literacy ($\beta = .270, p < .001$) together explained 28.1% of additional variance in sustainable consumption beyond demographic controls. Contrary to expectation, digital literacy did not significantly moderate the digital engagement–sustainable consumption relationship ($\beta = .012, p = .841$), and this null moderation pattern held consistently across both urban and rural subgroups (three-way interaction $p = .801$). The findings indicate that digital engagement and digital literacy each independently and substantially predict sustainable consumption, but do not interact as hypothesised, suggesting the two operate as parallel rather than conditional drivers of sustainable behaviour in this setting, with clear implications for digital-inclusion and sustainability policy in rural and urban India.

Keywords: digital engagement; sustainable consumption; digital literacy; rural-urban comparison; digital divide; Tiruchirappalli; India

1. Introduction

Consumer interaction with digital platforms has moved well beyond passive exposure to online advertisements. Today's consumers actively search for product and sustainability information, participate in online communities, follow influencers and brands, share opinions, and co-create content a broader phenomenon captured by the construct of digital engagement, defined as the intensity and interactivity of a consumer's cognitive, emotional, and behavioural investment in digital platforms (Hollebeek et al., 2014). At the same time, growing attention to environmental and social sustainability has placed sustainable consumption the acquisition, use, and disposal of goods and services in ways that minimise environmental and social harm (Jackson, 2005) at the centre of both academic and policy debate in India (Government of India, 2021).

Whether and how digital engagement translates into sustainable consumption is likely to depend on consumers' digital literacy their capacity to navigate, evaluate, and act critically on the vast and often contradictory sustainability-related content encountered online (van Deursen & van Dijk, 2019). This dependency may, in turn, differ systematically between rural and urban consumers, who continue to experience markedly different levels of digital access, skill, and platform familiarity even within the same Indian district (Telecom Regulatory Authority of India, 2022). Tiruchirappalli district, with its contrasting urban corporation area and adjoining rural

taluks, offers a natural within-district setting to examine these dynamics while holding broader regional and cultural factors relatively constant.

This study examines (1) the direct relationship between digital engagement and sustainable consumption, (2) whether rural and urban consumers differ significantly in digital engagement, digital literacy, and sustainable consumption, (3) whether digital literacy moderates the digital engagement–sustainable consumption relationship, and (4) whether any such moderation itself differs between rural and urban zones. In doing so, the study moves beyond a narrow marketing-exposure framing to capture the broader, more interactive nature of consumers' contemporary digital lives, and situates digital literacy as a potential boundary condition on the translation of that engagement into genuinely sustainable behaviour.

The remainder of the paper is organised as follows. Section 2 reviews the relevant literature and develops the hypotheses. Section 3 details the methodology. Section 4 reports the results. Section 5 discusses the findings, followed by implications, limitations, and conclusions.

2. Literature Review and Hypothesis Development

2.1 Digital Engagement and Sustainable Consumption

Customer engagement theory conceptualises digital engagement as a multidimensional construct encompassing cognitive absorption, affective commitment, and active participation in digital platform use (Hollebeek et al., 2014; Brodie et al., 2011). Consumers who are more digitally engaged are exposed to a wider and more repeated stream of sustainability-relevant content product reviews, environmental campaigns, peer recommendations, and influencer-driven norms and are more likely to internalise and act on such content through repeated, interactive exposure rather than one-off advertising contact (Dolan et al., 2019). Building on the Value-Belief-Norm framework of sustainable behaviour (Stern, 2000), greater digital engagement should strengthen the activation of pro-environmental personal norms by increasing the salience and perceived social normativity of sustainable consumption:

H1: Digital engagement has a significant positive effect on sustainable consumption.

2.2 The Rural-Urban Digital Divide

Consistent with second- and third-level digital divide theory (van Dijk, 2020), rural Indian consumers continue to report lower internet infrastructure quality, device ownership, and platform usage intensity than urban consumers, despite converging mobile-data adoption rates (Internet and Mobile Association of India, 2023). These disparities plausibly extend beyond simple access to the depth and interactivity of digital engagement itself, as well as to the digital literacy and ultimately the sustainable consumption behaviours that follow from it, even within a single administrative district:

H2: There is a significant difference between urban and rural consumers in (a) digital engagement, (b) digital literacy, and (c) sustainable consumption.

2.3 Digital Literacy as a Moderator

Digital literacy encompassing operational, informational, and evaluative digital skills (van Deursen & van Dijk, 2019) is theorised to condition how effectively digital engagement translates into sustainable consumption. Consumers with higher digital literacy should be better equipped to critically evaluate the credibility of sustainability claims encountered through active digital engagement (e.g., distinguishing genuine eco-certification from greenwashing), strengthening the engagement–behaviour link, whereas less digitally literate consumers may engage extensively with digital platforms without converting that engagement into discerning, sustainability-consistent action (Hargittai & Micheli, 2019):

H3: Digital literacy significantly moderates the relationship between digital engagement and sustainable consumption, such that the relationship is stronger among consumers with higher digital literacy.

2.4 Zone as a Second-Order Moderator

Extending this logic, the rural-urban context may itself alter how digital literacy conditions the digital engagement–sustainable consumption relationship for instance, if urban consumers' generally higher baseline digital literacy produces a ceiling effect that flattens the moderation, while rural consumers' more varied digital literacy produces a more pronounced conditioning effect, or vice versa. Testing this three-way interaction clarifies whether any digital-literacy moderation is a uniform psychological mechanism or one that is itself shaped by geographic-infrastructure context:

H4: The moderating effect of digital literacy on the digital engagement–sustainable consumption relationship differs significantly between urban and rural zones.

2.5 Conceptual Framework

Figure 1 presents the conceptual framework guiding this study, integrating a direct-effects test (H1), a rural-urban mean-comparison test (H2), a first-order moderation test (H3), and a second-order moderated-moderation test (H4). Table 1 summarises the corresponding hypothesised relationships.

Figure 1. Conceptual Framework of the Study

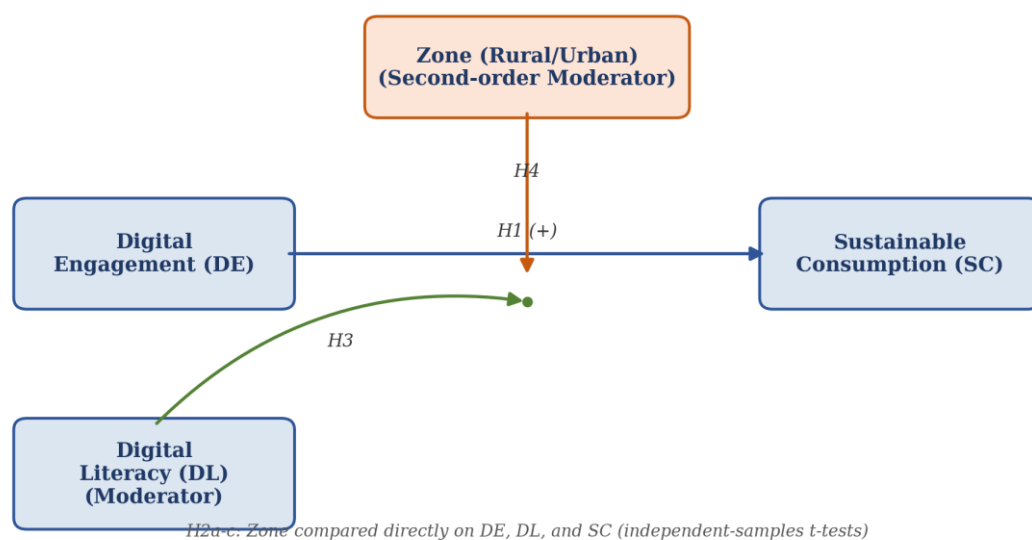


Figure 1. Conceptual Framework of the Study

Table 1. Summary of Hypothesised Relationships

Hypothesis	Relationship	Expected Direction
H1	Digital Engagement → Sustainable Consumption	Positive
H2a-c	Urban vs Rural differences in DE, DL, SC	Urban > Rural
H3	Digital Literacy × Digital Engagement → Sustainable Consumption	Positive (moderation)
H4	Zone × Digital Literacy × Digital Engagement → Sustainable Consumption	Significant three-way interaction

3. Methodology

3.1 Research Design and Study Area

This study adopted a quantitative, cross-sectional, comparative survey design across two purposively selected zones within Tiruchirappalli district: an urban zone (Tiruchirappalli city/corporation area) and a rural zone (a selected rural taluk within the district), chosen to maximise contrast in digital infrastructure and platform usage while holding broader linguistic and cultural context relatively constant.

3.2 Sampling and Data Collection

Data were collected using a structured, bilingual (English/Tamil) questionnaire administered to adult consumers who used the internet at least occasionally, via stratified sampling by zone followed by convenience sampling within each stratum. A total of 365 responses were collected (roughly 183 per zone); after removing incomplete responses and cases failing an attention-check item, 342 valid responses were retained (178 urban, 164 rural; 93.7% usable response rate), exceeding minimum sample requirements for the multi-group regression comparisons used in this study (Hair et al., 2019). Table 2 summarises the demographic profile of respondents by zone.

Table 2. Demographic Profile of Respondents by Zone (N = 342)

Variable	Category	Urban n (%)	Rural n (%)
Gender	Male	87 (48.9)	80 (48.8)
	Female	91 (51.1)	84 (51.2)
Age	18–25	41 (23.0)	38 (23.2)
	26–35	55 (30.9)	51 (31.1)
	36–45	43 (24.2)	39 (23.8)
	46–55	27 (15.2)	25 (15.2)
	56 and above	12 (6.7)	11 (6.7)
Education	Below Higher Secondary	17 (9.6)	28 (17.1)
	Higher Secondary	36 (20.2)	42 (25.6)
	Undergraduate	80 (44.9)	67 (40.9)
	Postgraduate & above	45 (25.3)	27 (16.5)
Occupation	Student	38 (21.3)	33 (20.1)
	Salaried/Employed	60 (33.7)	44 (26.8)
	Business/Self-employed	33 (18.5)	28 (17.1)

Variable	Category	Urban n (%)	Rural n (%)
	Agriculture	6 (3.4)	40 (24.4)
	Homemaker	41 (23.0)	19 (11.6)
Monthly Household Income	Below Rs. 20,000	44 (24.7)	58 (35.4)
	Rs. 20,000–40,000	63 (35.4)	60 (36.6)
	Rs. 40,001–60,000	45 (25.3)	31 (18.9)
	Above Rs. 60,000	26 (14.6)	15 (9.1)
Daily Screen Time	< 1 hour	10 (5.6)	18 (11.0)
	1–3 hours	52 (29.2)	64 (39.0)
	3–5 hours	68 (38.2)	55 (33.5)
	> 5 hours	48 (27.0)	27 (16.5)

3.3 Measures

All constructs were measured on validated multi-item, 5-point Likert scales (1 = strongly disagree, 5 = strongly agree). Digital engagement (6 items) was adapted from Hollebeck et al. (2014) and Dolan et al. (2019), capturing cognitive, affective, and behavioural engagement with digital platforms (e.g., active searching, sharing, and participating in online discussions). Digital literacy (5 items) was adapted from van Deursen and van Dijk (2019). Sustainable consumption (6 items) was adapted from Jackson (2005) and Stern (2000), capturing acquisition (choosing eco-friendly/ethical products), use (resource-conscious usage), and disposal (recycling/responsible disposal) behaviours, going beyond a single purchase-decision measure. Demographic and digital-usage variables (gender, age, education, occupation, income, daily screen time, and zone) were captured as controls and comparison variables.

The instrument was translated into Tamil via back-translation and pilot-tested with 30 respondents (15 per zone); minor wording revisions improved clarity, and no items were dropped.

3.4 Data Analysis Technique

Data were analysed in Python (NumPy, SciPy, pandas). Internal consistency was assessed via Cronbach's alpha, convergent validity via composite reliability (CR) and average variance extracted (AVE). Rural-urban comparisons (H2) were tested using independent-samples t-tests with Levene's test and Cohen's d. The direct effect of digital engagement on sustainable consumption (H1) was tested via hierarchical OLS regression (controls in Step 1; digital engagement and digital literacy in Step 2). Moderation (H3) was tested via mean-centred interaction-term regression with simple-slope analysis at ± 1 SD of digital literacy. Moderated moderation (H4) was tested via a three-way interaction term (digital engagement $\times$ digital literacy $\times$ zone), corroborated with subgroup moderation analyses run separately within urban and rural samples.

3.5 Common Method Bias

Common method bias was addressed procedurally (item randomisation, anonymity assurance, psychological separation of predictor and criterion items) and assessed via Harman's single-factor test. An unrotated factor analysis of all items yielded a first factor explaining 38.1% of total variance, below the 50% threshold, suggesting common method bias is not a serious concern.

4. Results

4.1 Measurement Model: Reliability and Validity

Table 3 presents reliability and convergent validity statistics. All Cronbach's alpha and CR values exceeded .70, and all AVE values exceeded .50, supporting adequate internal consistency and convergent validity.

Table 3. Reliability and Convergent Validity

Construct	Items	Cronbach's α	CR	AVE
Digital Engagement (DE)	6	0.891	0.917	0.647
Digital Literacy (DL)	5	0.861	0.900	0.643
Sustainable Consumption (SC)	6	0.889	0.915	0.643

4.2 Descriptive Statistics

Table 4. Descriptive Statistics — Overall and by Zone

Construct	Overall M (SD)	Urban M (SD)	Rural M (SD)
Digital Engagement	3.09 (0.81)	3.32 (0.78)	2.83 (0.76)
Digital Literacy	3.02 (0.78)	3.24 (0.77)	2.78 (0.72)
Sustainable Consumption	3.04 (0.79)	3.15 (0.80)	2.92 (0.77)

4.3 Rural-Urban Comparison (H2)

Independent-samples t-tests (Table 5) revealed significant urban-rural differences across all three constructs. Urban respondents reported significantly higher digital engagement ($t(340) = 5.96, p < .001, d = 0.64$, medium-to-large effect), digital literacy ($t(340) = 5.76, p < .001, d = 0.62$, medium-to-large effect), and sustainable consumption ($t(340) = 2.72, p = .007, d = 0.29$, small effect) than rural respondents. Levene's test indicated equal variances across all three constructs (all $p > .23$). H2a, H2b, and H2c are therefore all supported. Figure 2 illustrates these zone-wise differences graphically.

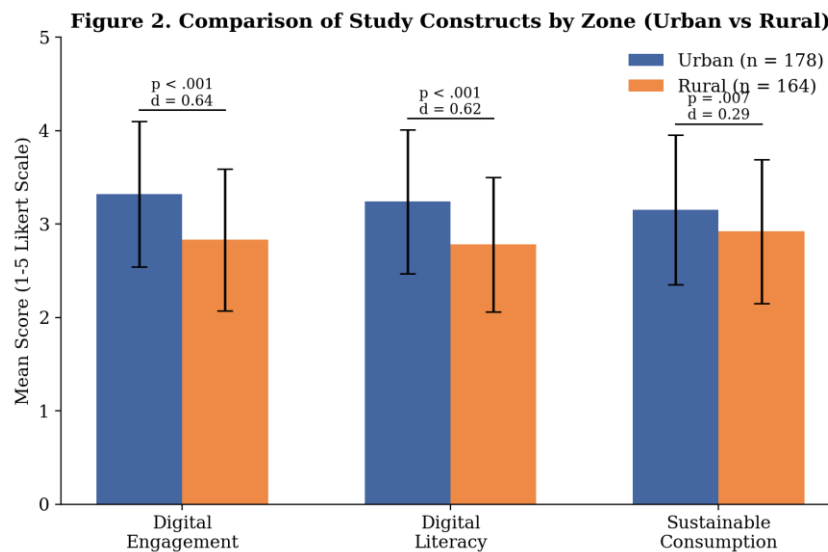


Figure 2. Comparison of Study Constructs by Zone (Urban vs Rural)

Table 5. Independent-Samples T-Test Results (Urban vs Rural)

Construct	Urban M (SD)	Rural M (SD)	t	p	Cohen's d	Decision
Digital Engagement	3.32 (0.78)	2.83 (0.76)	5.96	< .001	0.64	H2a Supported
Digital Literacy	3.24 (0.77)	2.78 (0.72)	5.76	< .001	0.62	H2b Supported
Sustainable Consumption	3.15 (0.80)	2.92 (0.77)	2.72	.007	0.29	H2c Supported

4.4 Correlation Analysis

Table 6 presents bivariate Pearson correlations, with the square root of AVE on the diagonal. All diagonal values exceed off-diagonal correlations, satisfying the Fornell–Larcker criterion for discriminant validity.

Table 6. Correlation Matrix and Discriminant Validity

Construct	DE	DL	SC
DE	0.805		
DL	0.273**	0.802	
SC	0.464**	0.372**	0.802

Note. Diagonal values are the square root of AVE. ** $p < .001$.

4.5 Hypothesis Testing: Direct Effect of Digital Engagement (H1)

Hierarchical OLS regression tested the effect of digital engagement on sustainable consumption. Step 1 (controls: gender, age) was not significant ($R^2 = .001$, $p = .87$). Step 2, adding digital engagement and digital literacy, produced a significant increase in explained variance ($\Delta R^2 = .281$, $F\text{-change}(2, 336) = 65.91$, $p < .001$). As shown in Table 7, digital engagement significantly and positively predicted sustainable consumption ($\beta = .382$, $SE = .047$, $t = 8.15$, $p < .001$), as did digital literacy ($\beta = .270$, $SE = .048$, $t = 5.56$, $p < .001$). H1 is therefore strongly supported.

Table 7. Hierarchical Regression Results for Sustainable Consumption

Predictor	B	SE	t	p	Decision
Constant	1.089	0.200	5.43	< .001	—
Gender (Female = 1)	0.030	0.073	0.42	.677	n.s.
Age (grouped)	-0.022	0.031	-0.69	.488	n.s.
Digital Engagement	0.382	0.047	8.15	< .001	H1 Supported
Digital Literacy	0.270	0.048	5.56	< .001	—

Note. Step 2 $R^2 = .282$, $\Delta R^2 = .281$, $F\text{-change}(2, 336) = 65.91$, $p < .001$.

4.6 Moderation Analysis: Digital Literacy (H3)

A mean-centred moderated regression tested whether digital literacy moderates the digital engagement–sustainable consumption relationship. As shown in Table 8, the interaction term was not significant ($\beta = .012$, $SE = .062$, $p = .841$). Simple-slope analysis showed the digital engagement effect was virtually identical at low digital literacy (-1 SD: slope = .372) and high digital literacy (+1 SD: slope = .392), confirming the near-zero interaction, as illustrated in Figure 3. H3 is not supported: digital literacy did not moderate the digital engagement–sustainable consumption relationship in this sample.

Figure 3. Simple Slopes: Digital Engagement → Sustainable Consumption at Low vs High Digital Literacy (Interaction n.s., $p = .841$)

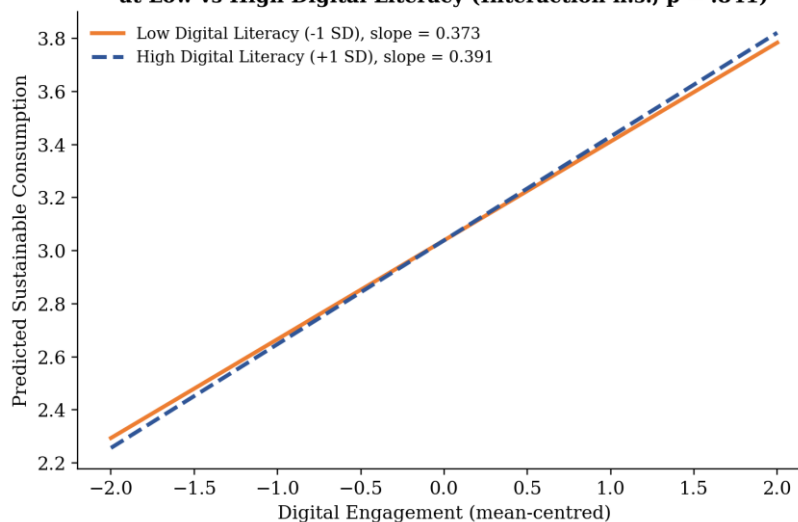


Figure 3. Simple Slopes of Digital Engagement on Sustainable Consumption at Low vs High Digital Literacy

Table 8. Moderated Regression Results for Sustainable Consumption

Predictor	B	SE	p	Decision
Digital Engagement (centred)	0.382	0.047	< .001	—
Digital Literacy (centred)	0.268	0.048	< .001	—
DE × DL (interaction)	0.012	0.062	.841	H3 Not Supported

Note. $R^2 = .281$. Simple slope at Low DL ($-1SD$) = .372; at High DL ($+1SD$) = .392.

4.7 Moderated Moderation: Zone as a Second-Order Moderator (H4)

A three-way interaction regression (digital engagement × digital literacy × zone) tested whether the (null) H3 moderation pattern differs between zones. As shown in Table 9, the three-way interaction term was not significant ($\beta = .035$, $SE = .140$, $p = .801$), and none of the two-way interactions involving zone reached significance. Subgroup analyses confirmed this: the digital engagement × digital literacy interaction was non-significant within both the urban subsample ($\beta = .006$, $p = .947$) and the rural subsample ($\beta = -.029$, $p = .787$). H4 is not supported.

Table 9. Moderated Moderation (Three-Way Interaction) Results

Predictor	B	SE	p	Decision
Digital Engagement (centred)	0.318	0.075	< .001	—
Digital Literacy (centred)	0.303	0.081	< .001	—
Zone (Urban = 1)	-0.099	0.079	.214	n.s.
DE × DL	-0.029	0.108	.786	—
DE × Zone	0.137	0.101	.176	n.s.
DL × Zone	-0.041	0.106	.700	n.s.
DE × DL × Zone	0.035	0.140	.801	H4 Not Supported

Note. $R^2 = .288$ for the full three-way interaction model.

4.8 Summary of Hypothesis Testing

Table 10. Summary of Hypothesis Testing Results

Hypothesis	Result
H1: Digital Engagement → Sustainable Consumption (positive)	Supported
H2a: Urban > Rural in Digital Engagement	Supported

Hypothesis	Result
H2b: Urban > Rural in Digital Literacy	Supported
H2c: Urban > Rural in Sustainable Consumption	Supported
H3: Digital Literacy moderates DE → SC	Not Supported
H4: Zone moderates the DE × DL interaction (moderated moderation)	Not Supported

5. Discussion

This study examined the relationship between digital engagement and sustainable consumption among urban and rural consumers in Tiruchirappalli district, testing digital literacy as a moderator and zone as a second-order moderator of that moderation. Four of six hypotheses were supported, with both digital literacy moderation tests (H3, H4) returning clear null results a substantively informative pattern rather than a weakness of the study.

The strong positive effect of digital engagement on sustainable consumption (H1, $\beta = .382$) confirms that the depth and interactivity of consumers' digital platform use not merely their exposure to marketing content is a substantial driver of sustainable acquisition, use, and disposal behaviour, consistent with customer engagement theory's emphasis on active, participatory platform use as a stronger behavioural driver than passive exposure (Hollebeek et al., 2014). Digital literacy's comparably strong independent effect ($\beta = .270$) reinforces that consumers' own capability to navigate digital environments is a substantial and independent contributor to sustainable consumption in its own right.

The rural-urban comparisons (H2a–c) again confirm a persistent digital divide within a single administrative district, with the largest gaps in digital engagement ($d = 0.64$) and digital literacy ($d = 0.62$), and a notably smaller gap in sustainable consumption itself ($d = 0.29$) echoing a pattern in which rural consumers who do engage digitally convert that engagement into sustainable behaviour nearly as effectively as urban consumers, even though they engage less often and with less skill overall.

The clear null results for both digital-literacy moderation tests (H3: $\beta = .012$, $p = .841$; H4: $p = .801$) are a notable departure from the marginal trend observed in a related earlier analysis of digital marketing exposure specifically, and suggest that once digital engagement is measured more broadly capturing active, participatory platform use rather than passive marketing exposure digital literacy's role shifts from a possible conditioning variable to a fully independent, parallel driver of sustainable consumption. In other words, more digitally engaged consumers appear to convert that engagement into sustainable consumption at a similar rate regardless of their digital literacy level, while more digitally literate consumers independently consume more sustainably regardless of their engagement level. This pattern is consistent with a dual-pathway rather than a conditional model of digital influence on sustainable behaviour, and the flat simple slopes (.372 vs .392) leave little room for a suppressed or masked interaction.

6. Theoretical and Practical Implications

6.1 Theoretical Implications

This study contributes to the literature in three ways. First, it extends customer engagement theory into the sustainable consumption domain, showing that engagement's behavioural influence outperforms narrower marketing-exposure framings in explaining variance in sustainable behaviour (28.1% here versus a smaller share typically attributed to exposure-only measures). Second, by explicitly contrasting this study's clear null moderation findings against a related marketing-exposure-specific analysis, the study suggests digital literacy's

theoretical role may depend heavily on how broadly or narrowly the digital-influence construct itself is operationalised a distinction meriting further construct-clarification work in the digital consumer behaviour literature. Third, the moderated-moderation (H4) null result contributes further evidence that, at least in this district, digital literacy operates additively rather than conditionally across both rural and urban zones.

6.2 Practical and Policy Implications

For sustainability-focused organisations and NGOs, the findings suggest that campaigns to increase active digital engagement (participatory content, interactive campaigns, community-building) and campaigns to increase digital literacy are likely to function as two independent, additive levers for increasing sustainable consumption, rather than one being a prerequisite for the other's effectiveness meaning both can be pursued in parallel rather than sequentially. For rural-development policymakers, the substantially lower digital engagement and digital literacy observed in rural zones (the two largest gaps identified) represent the highest-leverage intervention points, both because they carry independent, additive effects on sustainable consumption and because closing them would allow rural consumers' currently strong per-unit-engagement sustainable behaviour to be realised at a larger scale.

7. Limitations and Future Research

This study has several limitations. First, its cross-sectional design precludes causal inference regarding the direction of the digital engagement–sustainable consumption relationship. Second, the study examined only one urban and one rural zone within a single district; generalisability to other Indian districts or states with different infrastructure and cultural profiles should be tested before broader claims are made. Third, the stratified-convenience sampling approach may under-represent consumers with minimal or no digital access, meaning the true rural-urban gap in digital engagement is likely understated rather than overstated here. Fourth, both moderation tests (H3, H4) returned clear, well-powered null results in this sample, but replication in other settings is recommended before concluding that digital literacy universally operates independently rather than conditionally it remains possible that literacy conditions engagement's effect in populations with more extreme or bimodal engagement levels than observed here. Fifth, sustainable consumption was measured via self-report; future studies could triangulate with observed or transaction-level behavioural data (e.g., actual eco-labelled purchase records) to strengthen validity. Finally, future qualitative research in the rural zone could help explain why rural consumers appear to convert digital engagement into sustainable consumption almost as efficiently as urban consumers despite substantially lower average engagement and literacy levels.

8. Conclusion

This study demonstrates that digital engagement and digital literacy each significantly and independently predict sustainable consumption among consumers in Tiruchirappalli district, and that urban consumers report significantly higher levels of both, along with modestly higher sustainable consumption, than rural consumers. Contrary to expectation, digital literacy did not moderate the digital engagement–sustainable consumption relationship, and this null pattern held consistently across rural and urban zones, suggesting the two constructs function as parallel, additive drivers of sustainable behaviour rather than as conditionally dependent mechanisms. These findings offer a more nuanced understanding of how digital life shapes sustainable consumption in a tier-2 Indian district and provide policymakers and sustainability practitioners with evidence-based guidance for pursuing digital-engagement and digital-literacy interventions in parallel, rather than assuming one is a prerequisite for the other's effectiveness.

References

- [1] Brodie, R. J., Hollebeek, L. D., Juric, B., & Ilic, A. (2011). Customer engagement: Conceptual domain, fundamental propositions, and implications for research. *Journal of Service Research*, 14(3), 252–271.
- [2] Dolan, R., Conduit, J., Frethey-Bentham, C., Fahy, J., & Goodman, S. (2019). Social media engagement behavior: A framework for engaging customers through social media content. *European Journal of Marketing*, 53(10), 2213–2243.

- [3] Government of India. (2021). India's Long-Term Low-Carbon Development Strategy. Ministry of Environment, Forest and Climate Change.
- [4] Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage Learning.
- [5] Hargittai, E., & Micheli, M. (2019). Internet skills and why they matter. In M. Graham & W. H. Dutton (Eds.), *Society and the Internet* (2nd ed., pp. 109–124). Oxford University Press.
- [6] Hollebeek, L. D., Glynn, M. S., & Brodie, R. J. (2014). Consumer brand engagement in social media: Conceptualization, scale development and validation. *Journal of Interactive Marketing*, 28(2), 149–165.
- [7] Internet and Mobile Association of India. (2023). Internet in India Report 2023. IAMAI-Kantar ICUBE.
- [8] Jackson, T. (2005). Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change. Sustainable Development Research Network.
- [9] Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424.
- [10] Telecom Regulatory Authority of India. (2022). Indian Telecom Services Performance Indicators Report. TRAI.
- [11] van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society*, 21(2), 354–375.
- [12] van Dijk, J. A. G. M. (2020). The digital divide. Polity Press.

Appendix A. Measurement Items

- [1] All items rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Sample items shown below; full 17-item instrument (6 DE, 5 DL, 6 SC), in English and Tamil, is available from the corresponding author upon request.
- [2] Digital Engagement (sample items): "I actively search for information about products and brands online." / "I regularly share or comment on content I find on digital platforms."
- [3] Digital Literacy (sample items): "I am confident using the internet to search for and compare product information." / "I can evaluate whether information I find online is trustworthy."
- [4] Sustainable Consumption (sample items): "I choose products that are environmentally friendly, even if they cost slightly more." / "I make an effort to recycle or dispose of products responsibly."