

From Digital Interaction to Responsible Tourism: Unveiling the Mediating Role of Sustainable Destination Perception

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Abstract

This study examines the influence of digital engagement and environmental awareness on destination sustainability perception and its impact on responsible tourism behaviour among tourists visiting Karimunjawa Island, Indonesia. The research aims to analyse both direct and indirect relationships among the variables within the context of sustainable tourism. A quantitative approach was employed, using a survey of 201 respondents who had visited Karimunjawa within the last two years. Data were collected through an online questionnaire using purposive sampling techniques and analysed using Partial Least Squares Structural Equation Modelling. The results indicate that destination sustainability perception has a significant positive effect on responsible tourism behaviour. Digital engagement significantly influences perceptions of destination sustainability and indirectly affects responsible tourism through this mediating role. However, environmental awareness does not significantly affect destination sustainability perception, either directly or indirectly through mediation effects. These findings suggest that digital interaction and online tourism communication play a more dominant role in shaping perceptions of sustainable destinations and responsible tourism behaviour than environmental awareness alone. The study contributes to the sustainable tourism literature by integrating digital engagement, environmental awareness, destination sustainability perception, and responsible tourism into a comprehensive research model. Practically, the findings provide insights for tourism stakeholders in designing digital-based sustainability communication strategies to promote responsible tourism behaviour in island tourism destinations.

Keywords: Digital Engagement, Environmental Awareness, Sustainable Destination Perception, Responsible Tourism, Karimunjawa Island.

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1. Introduction

Sustainable tourism has become a strategic issue in the development of global tourist destinations amid growing concern over climate change, environmental degradation, and the socioeconomic impacts of tourism activities [1] [2]. Marine-based and conservation-focused tourist destinations, such as Karimunjawa Island, face serious challenges in balancing growth in tourist visits with ecosystem sustainability [3]. Karimunjawa is a national park area with high marine biodiversity and is one of Indonesia's premier marine tourism destinations. However, the increase in tourism activities has also raised various environmental issues, such as coral reef damage, coastal pollution, and pressure on environmental carrying capacity [4] [5].

Research by [3] indicates that the development of the tourism sector in Karimunjawa has a positive economic impact on local communities, but also increases the risk of environmental degradation if not balanced with sustainable tourism management. These conditions underscore that the development of tourist destinations today must not only be economically oriented but must also foster responsible tourist behaviour toward the environment through a sustainable tourism approach [6] [7].

Advances in digital technology in the tourism industry

have transformed how travellers interact with tourist destinations [7]. Digital engagement through social media, online travel platforms, user-generated content, and destination-led digital communications plays a crucial role in shaping travellers' perceptions of a destination's sustainability [8] [9]. Modern travellers tend to consider ecological values, environmental conservation, and sustainable practices before deciding to visit a destination [10]. A study by [11] finds that digital engagement can enhance travellers' emotional attachment to sustainable destinations and strengthen their image. Additionally, research by [12] [13] states that digital transformation in tourism can serve as a strategic tool to promote sustainable behaviour through the digital dissemination of information and environmental education. This phenomenon indicates that digital engagement serves not only as a medium for destination promotion but also as a means of shaping tourists' perceptions and behaviours regarding the sustainability of tourist destinations.

A study by [14] [15] finds that digital engagement can enhance travellers' emotional attachment to sustainable destinations and strengthen their image. Additionally, research by [16] states that digital transformation in tourism can serve as a strategic tool for promoting sustainable behaviour through the dissemination of information and environmental education. This phenomenon indicates that digital engagement serves

not only as a medium for destination promotion but also as a means of shaping tourists' perceptions and behaviours regarding the sustainability of tourist destinations.

In addition to digital engagement, environmental awareness is also a key factor in shaping responsible tourist behaviour [17] [18]. Environmental awareness reflects tourists' level of awareness, concern, and understanding of the importance of preserving the environment while engaging in tourism activities [19]. In ecotourism destinations such as Karimunjawa, environmental awareness is highly relevant, as the quality of the tourism experience depends heavily on ecosystem sustainability. Recent research by [20] indicates that tourists with high levels of environmental awareness tend to exhibit more environmentally responsible travel behaviours, such as reducing plastic waste, maintaining the cleanliness of tourist areas, and supporting sustainable tourism practices [21]. However, most previous studies still treat environmental awareness as a direct predictor of responsible tourism behaviour without considering the role of sustainable destination perception as a mediating variable [17]. In fact, tourists' perceptions of destination sustainability are believed to be an important psychological mechanism that can explain how environmental awareness translates into responsible tourism behaviour [22].

Academically, there remains a research gap in the sustainable tourism literature, particularly regarding the integration of digital engagement, environmental awareness, sustainable destination perception, and responsible tourism into a single comprehensive conceptual model. Most previous studies have examined only partial relationships between variables, such as digital engagement and destination image, environmental awareness and pro-environmental behaviour, or sustainability communication and tourist satisfaction [23] [24]. Research on tourism in Karimunjawa itself is still dominated by studies on community-based tourism, environmental conservation, and the socio-economic impacts of tourism [25]. To date, empirical research specifically examining the influence of digital engagement and environmental awareness on sustainable destination perception and its impact on responsible tourism in small island destinations like Karimunjawa remains very limited. Therefore, this study offers novelty by developing a sustainable tourist behaviour model that integrates perspectives from digital tourism and environmental psychology in the context of marine tourism destinations in Indonesia.

This study has a strong theoretical foundation in the Stimulus-Organism-Response (SOR) Theory. In the context of sustainable tourism research, digital engagement and environmental awareness are positioned as stimuli that influence tourists' psychological state (organism) specifically, their perception of a sustainable destination, which in turn drives the formation of responsible tourism behaviour

as the tourists' final response. The relevant SOR Theory is used because it explains how external stimuli, such as digital interactions and environmental awareness, can shape tourists' internal perceptions of destination sustainability, which in turn influence responsible tourism behaviour. Additionally, this study is supported by the Theory of Planned Behaviour (TPB) [26], which explains that individual behaviour is influenced by attitudes, subjective norms, and perceived behavioural control. In this study, environmental awareness and sustainable destination perception can be seen as precursors to the formation of tourists' positive attitudes toward sustainable tourism practices, thereby encouraging responsible tourism behaviour. The integration of these two theories provides a comprehensive conceptual framework for explaining the relationship between digital, psychological, and tourist behavioural factors in the context of sustainable tourism at marine destinations such as Karimunjawa Island.

The urgency of this research is becoming increasingly relevant as demands grow for tourism destination management that is adaptable to digital transformation and global sustainability issues. As a nationally recognised premier marine tourism destination, Karimunjawa requires a management strategy based on tourist behaviour to ensure that environmental, social, and economic sustainability can be achieved simultaneously. This study is expected to make a theoretical contribution to the literature on sustainable tourism, particularly regarding the development of responsible tourism behaviour through digital engagement and environmental awareness. Additionally, the findings of this study are expected to serve as a foundation for local governments, destination managers, tourism industry stakeholders, and local communities in designing more effective digital communication strategies, environmental education programs, and sustainable tourism policies on Karimunjawa Island. Thus, this study is highly relevant, both academically and practically, to supporting the development of sustainable tourism in Indonesia.

2. Research Method

This study employed a quantitative survey approach to examine the relationships among digital engagement, environmental awareness, sustainable destination perception, and responsible tourism behaviour among tourists visiting Karimunjawa Island, Indonesia. The target population consisted of tourists who had previously visited Karimunjawa Island. Considering that the exact number of tourists who met the research criteria could not be accurately identified, the sample size determination followed the recommendation of Hair et al. (2021), which suggests that the minimum sample size in Partial Least Squares Structural Equation Modelling (PLS-SEM) should range from five to ten times the total number of indicators used in the study [27]. Since this study used 36 indicators, the minimum sample size was calculated as 36×5 , yielding 180

respondents. Therefore, a total of 180 respondents were included in this study to ensure adequate statistical power and accurate model estimation.

The sampling technique used in this study was purposive sampling, in which respondents were selected based on specific criteria relevant to the research objectives. The inclusion criteria required that respondents be at least 18 years old and have visited Karimunjawa Island within the last two years. These criteria were established to ensure that respondents possessed sufficient experience and understanding regarding the tourism conditions, environmental sustainability practices, and digital tourism engagement associated with Karimunjawa Island. Data were collected through an online questionnaire distributed via social media platforms and tourism-related online communities. The questionnaire employed a five-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”) to measure respondents’ perceptions and attitudes toward the research variables.

The measurement instruments used in this study were adapted from previous validated studies to ensure construct validity and reliability. Digital engagement was measured using indicators of tourists’ interactions with digital tourism platforms, social media, and online tourism information. Environmental awareness was measured using indicators that reflected tourists’ environmental concern and ecological consciousness. Sustainable destination perception was assessed based on tourists’ perceptions of destination sustainability practices, while responsible tourism behaviour was evaluated using indicators of environmentally and socially responsible tourist actions. Prior to full-scale data collection, the questionnaire underwent a pilot test involving several respondents to ensure clarity, readability, and content validity.

Data analysis in this study employed Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS software. PLS-SEM was selected because it is suitable for predictive and exploratory research models involving complex relationships among latent variables and does not require strict assumptions regarding data normality [27]. The analysis process consisted of two stages: evaluation of the measurement model (outer model) and evaluation of the structural model (inner model). The outer model assessment included tests of convergent validity, discriminant validity, composite reliability, and Cronbach’s alpha. Meanwhile, the inner model evaluation examined path coefficients, coefficient of determination (R^2), predictive relevance (Q^2), and hypothesis testing using bootstrapping procedures to determine the significance of relationships among variables. This analytical approach enabled a comprehensive examination of both direct and indirect effects among the proposed research constructs.

3. Result and Discussion

The demographic characteristics and visitor behaviour of the respondents in this study were used to provide an

overview of the study’s tourist profile. The analysis of respondent characteristics includes demographic aspects such as gender, age, education level, occupation, and income, as well as visit behaviour aspects such as visit frequency, sources of tourism information, visit purposes, and visit duration to Karimunjawa Island. Identifying these characteristics is important for understanding tourist behaviour patterns and for interpreting research results on digital engagement, environmental awareness, sustainable destination perception, and responsible tourism behaviour. Next Demographic Characteristics and Visitor Behaviour on Table 1.

Table 1. Demographic Characteristics and Visitor Behaviour

Characteristic	Category	Total	%
Gender	Male	108	53,7%
	Women	93	46,3%
Age	18–24 years old	72	35,8%
	25–34 years old	81	40,3%
	35–44 years old	31	15,4%
	45–54 years old	13	6,5%
	55 years and older	4	2,0%
Final Education	High	58	28,9%
	School/Vocational		
	School/Equivalent		
	Diploma	36	17,9%
	Bachelor	84	41,8%
	Magister	20	10,0%
	Doctor	3	1,5%
	Occupation/Status	47	23,4%
	Civil Servants	18	9,0%
	Private	76	37,8%
Income/Allowance per Month	Employees/Employees		
	Self-Employed/Entrepreneur	29	14,4%
	Tenaga Profesional	11	5,5%
	Housewives	8	4,0%
	No/Not Working	12	6,0%
	IDR < 2,000,000	39	19,4%
	IDR 2,000,000 – 4,999,999	74	36,8%
	IDR 5,000,000 – 9,999,999	56	27,9%
	IDR 10,000,000 – 19,999,999	22	10,9%
	IDR 20,000,000 – 49,999,999	6	3,0%
Domicile	IDR 50,000,000 and above	1	0,5%
	Don't want to mention	3	1,5%
	In Central Java	88	43,8%
	Outside Central Java	79	39,3%
	Outside Java	30	14,9%
	Overseas	4	2,0%
Long Stay in Karimunjawa	1 day	17	8,5%
	2 days 1 night	69	34,3%
	3 days 2 nights	81	40,3%
	4 days 3 nights	24	11,9%
	5 days or more	10	5,0%
Types of Tourists	Domestic tourists	192	95,5%
	Foreign Tourists	9	4,5%
Visit Together	Alone	12	6,0%
	Pasangan	48	23,9%
	Family	39	19,4%
	Friends/Groups of friends	82	40,8%
	Tour group/travel agent	13	6,5%

Key Sources of Information	Colleagues/agencies	7	3,5%
	Social Media	103	51,2%
	Travel Website/Blog	29	14,4%
	Travel apps	24	11,9%
	Word of mouth	34	16,9%
Digital Platforms Used	Travel agent	6	3,0%
	Medium mass	5	2,5%
	Instagram	79	39,3%
	TikTok	46	22,9%
	YouTube	23	11,4%
	Google Search	31	15,4%
	Facebook	8	4,0%
	Twitter/X	3	1,5%
	OTA (Traveloka/Tiket.com)	9	4,5%
	Not using digital platforms	2	1,0%
Total Tour Expenses	IDR < 500,000	12	6,0%
	IDR 500,000 – 1,499,999	71	35,3%
	IDR 1,500,000 – 2,999,999	78	38,8%
	IDR 3,000,000 – 4,999,999	27	13,4%
	IDR 5,000,000 – 9,999,999	10	5,0%
	IDR > Rp 10.000.000	3	1,5%

Based on Table 1, the respondents in this study were predominantly male, numbering 108 (53.7%), while female tourists numbered 93 (46.3%). In terms of age, the majority of respondents were in the 25–34 age group (young Millennials), totalling 81 people (40.3%), followed by the 18–24 age group (Gen Z), totalling 72 people (35.8%). These findings indicate that tourists in Karimunjawa are predominantly young people who actively use digital technology and social media during their travels. In terms of education level, the majority of respondents held a Bachelor's degree (S1/D4), totalling 84 people (41.8%), followed by high school (SMA/SMK) or equivalent, totalling 58 people (28.9%).

This indicates that the majority of tourists have a relatively high level of education, suggesting they are more likely to be aware of sustainability and environmental issues. Based on the respondents' occupation or status, the majority were private-sector employees, totalling 76 people (37.8%), followed by students, totalling 47 people (23.4%), and self-employed individuals or business owners, totalling 29 people (14.4%). In terms of income, the majority of respondents had a monthly income or allowance of IDR 2,000,000 – Rp 4,999,999, totalling 74 people (36.8%), followed by the income group of Rp 5,000,000 – IDR 9,999,999, totalling 56 people (27.9%). These findings indicate that tourists in Karimunjawa are predominantly middle-class and have the financial means to travel domestically.

By place of residence, the majority of respondents were from Central Java, totalling 88 people (43.8%), while 79 respondents (39.3%) were from outside Central Java. Additionally, 30 respondents (14.9%) were from outside Java, and 4 respondents (2.0%) were

international tourists. These findings indicate that Karimunjawa is still dominated by the domestic tourist market, a trend reinforced by data on tourist types: 192 respondents (95.5%) were domestic tourists, while only 9 (4.5%) were international tourists. Based on length of stay, the majority of tourists spent 3 days and 2 nights (81 people, 40.3%), followed by 2 days and 1 night (69 people, 34.3%). This indicates that most tourists opt for short-term tour packages commonly offered by travel agencies to Karimunjawa. In terms of travel patterns, the majority of respondents visited with friends or a group of friends (82 people, 40.8%), followed by visits with a partner (48 people, 23.9%) and with family (39 people, 19.4%). These findings indicate that Karimunjawa is a popular destination for social and group recreational travel among young tourists. Regarding tourists' digital behaviour, the majority of respondents - 103 (51.2%) - obtained travel information through social media, followed by word of mouth (34, 16.9%) and travel websites/blogs (29, 14.4%). The most widely used digital platform was Instagram, used by 79 people (39.3%), followed by TikTok, used by 46 people (22.9%), and Google Search, used by 31 people (15.4%). These findings indicate that digital visual media plays a dominant role in shaping tourists' interest in Karimunjawa. Additionally, the most common digital activity tourists engage in while in Karimunjawa is uploading photos or videos in real-time, with 91 people (45.3%), followed by creating Reels, TikTok, or Shorts, with 42 people (20.9%).

This indicates a high level of digital engagement among tourists during their trips. In terms of travel spending, the majority of respondents spent between IDR 1,500,000 and 2,999,999 (78 people, or 38.8%), followed by 71 people (35.3%) who spent between IDR 500,000 and 1,499,999. Meanwhile, regarding the search for information on the environment and sustainability, 97 respondents (48.3%) stated they only briefly or did not specifically seek information on environmental and sustainability issues at the destination, while 64 respondents (31.8%) actively sought such information. These findings indicate that although some tourists are already concerned about the destination's sustainability, tourists' environmental awareness still needs to be strengthened through more effective digital education and communication about sustainable tourism practices on Karimunjawa Island.

Evaluation of the measurement model (outer model) was conducted to assess the validity and reliability of the research constructs before testing the structural relationships among variables. In the PLS-SEM approach, the outer model evaluation aims to ensure that each indicator accurately measures its corresponding latent construct. The evaluation process included tests of convergent validity using outer loadings and Average Variance Extracted (AVE), discriminant validity using the Fornell-Larcker criterion, and reliability testing using Composite Reliability and Cronbach's Alpha. Indicators with outer loadings greater than 0.70, AVE above 0.50, and reliability coefficients exceeding 0.70 were considered

acceptable, indicating that the constructs possessed adequate validity and reliability for further structural model analysis. Next Convergent Validity on Table 2.

Table 2. Convergent Validity

Variable/Indicator	Outer Loading	Cronbach's alpha	Composite reliability
Digital Engagement		0.944	0.946
DE01	0.802		
DE02	0.815		
DE03	0.828		
DE04	0.814		
DE05	0.857		
DE06	0.861		
DE07	0.835		
DE08	0.795		
DE09	0.864		
Environmental Awareness		0.949	0.952
AE01	0.806		
AE02	0.825		
AE03	0.842		
AE04	0.813		
AE05	0.883		
AE06	0.849		
AE07	0.849		
AE08	0.865		
AE09	0.859		
Destination Sustainability		0.939	0.941
DS01	0.731		
DS02	0.840		
DS03	0.835		
DS04	0.863		
DS05	0.882		
DS06	0.830		
DS07	0.882		
DS08	0.756		
DS09	0.758		
Responsible Tourism		0.944	0.947
RT01	0.866		
RT02	0.735		
RT03	0.856		
RT04	0.869		
RT05	0.859		
RT06	0.880		
RT07	0.849		
RT08	0.853		
RT09	0.707		

Table 2 presents the results of the convergent validity test for all constructs used in this study, including Digital Engagement, Environmental Awareness, Destination Sustainability, and Responsible Tourism. Convergent validity was evaluated using outer loading values, Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's Alpha. Indicators are considered valid when the outer loading values exceed 0.70, while AVE values should be greater than 0.50, and reliability coefficients such as Composite Reliability and Cronbach's Alpha should exceed 0.70. The results indicate that all indicators across the four constructs have outer loading values above the recommended threshold of 0.70, ranging from 0.707 to 0.883. This finding demonstrates that each indicator adequately represents its corresponding latent construct. In the Digital Engagement construct, the outer loading values ranged from 0.795 to 0.864, indicating strong correlations between the indicators and the construct. Similarly, the Environmental

Awareness construct showed outer loadings ranging from 0.806 to 0.883, indicating good indicator reliability. The Destination Sustainability construct also demonstrated acceptable loadings ranging from 0.731 to 0.882, while the Responsible Tourism construct exhibited loadings between 0.707 and 0.880. These results confirm that all measurement indicators possess satisfactory convergent validity. Next Fornell-Larcker Criterion on Table 3.

Table 3. Fornell-Larcker Criterion

Konstruk	Destination Sustainability Perception	Digital Engagement	Environmental Awareness	Responsible Tourism
Destination Sustainability Perception	0.821			
Digital Engagement	0.623	0.831		
Environmental Awareness	0.503	0.718	0.844	
Responsible Tourism	0.758	0.503	0.426	0.833

Table 3 presents the results of the discriminant validity assessment using the Fornell-Larcker Criterion. Discriminant validity assesses whether each construct in the research model is empirically distinct from other constructs. The Fornell-Larcker Criterion is fulfilled when the square root of the Average Variance Extracted (AVE) for each construct is greater than the correlation values between that construct and other constructs in the model. Based on the results in Table 3, all constructs satisfy the discriminant validity requirement.

The Destination Sustainability Perception construct has a square-root AVE of 0.821, which is higher than its correlations with Digital Engagement (0.623), Environmental Awareness (0.503), and Responsible Tourism (0.758). Similarly, the Digital Engagement construct shows a square-root AVE of 0.831, which exceeds its correlations with Destination Sustainability Perception (0.623), Environment Awareness (0.718), and Responsible Tourism (0.503). The Environment Awareness construct also demonstrates adequate discriminant validity, with an AVE square root of 0.844, which exceeds its correlations with Destination Sustainability Perception (0.503), Digital Engagement (0.718), and Responsible Tourism (0.426). Furthermore, the Responsible Tourism construct has a square-root AVE of 0.833, exceeding its correlations with Destination Sustainability Perception (0.758), Digital Engagement (0.503), and Environmental Awareness (0.426).

Overall, the results confirm that each construct in the model possesses satisfactory discriminant validity, indicating that the constructs are empirically distinct and capable of measuring different conceptual phenomena. Therefore, the measurement model is considered valid and appropriate for further evaluation of the structural model. The Goodness of Fit (GoF) assessment in this study was evaluated using the Standardised Root Mean Square Residual (SRMR) to assess the overall suitability of the structural model for explaining the observed data. SRMR measures the average difference between the observed correlation

matrix and the model-implied correlation matrix, where lower values indicate a better model fit. In PLS-SEM analysis, an SRMR value below 0.10 is considered acceptable, while a value below 0.08 indicates a good model fit. Therefore, if the SRMR value obtained in this study falls below the recommended threshold, the proposed research model can be considered to have an adequate level of fit and is suitable for further structural analysis and hypothesis testing. Next Standardised Root Mean Square Residual (SRMR) on Table 4.

Table 4. Standardised Root Mean Square Residual (SRMR)

Kriteria	Saturated Model	Estimated Model
SRMR	0.067	0.067

Table 4 presents the results of the Goodness-of-Fit evaluation using the Standardised Root Mean Square Residual (SRMR) for both the saturated and estimated models. The results show that the SRMR for the saturated model is 0.067, and the estimated model also yields an SRMR of 0.067. These values are below the recommended threshold of 0.08, indicating that the discrepancy between the observed and model-implied correlation matrices is relatively small. This finding demonstrates that the proposed research model has a good fit and adequately explains the empirical data. Therefore, the structural model used in this study is acceptable and suitable for further hypothesis testing and analysis of structural relationships among the research variables. Next Coefficient of Determination on Table 5.

Table 5. Coefficient of Determination

Konstruk	R-square	R-square adjusted
Destination Sustainability Perception	0.394	0.388
Responsible Tourism	0.736	0.735

Table 5 presents the results of the coefficient of determination (R-square) analysis for the endogenous constructs in the research model, namely Destination Sustainability Perception and Responsible Tourism. The R-squared value indicates the extent to which the independent variables explain the variance in the dependent variables within the structural model. The results show that Destination Sustainability Perception has an R-square value of 0.394 and an adjusted R-square value of 0.388. This indicates that Digital Engagement and Environment Awareness collectively explain 39.4% of the variance in Destination Sustainability Perception, while other variables outside the model account for the remaining 60.6%. The Responsible Tourism construct shows an R-square of 0.736 and an adjusted R-square of 0.735. This result indicates that Destination Sustainability Perception, Digital Engagement, and Environment Awareness collectively explain 73.6% of the variance in Responsible Tourism behaviour. In comparison, the remaining 26.4% is explained by other factors not included in the study. The relatively high R-square value for Responsible Tourism suggests that the structural model has strong explanatory power in predicting responsible tourism behaviour among visitors to Karimunjawa Island.

Overall, these findings indicate that the proposed research model has satisfactory predictive power and adequately explains the relationships among the constructs studied.

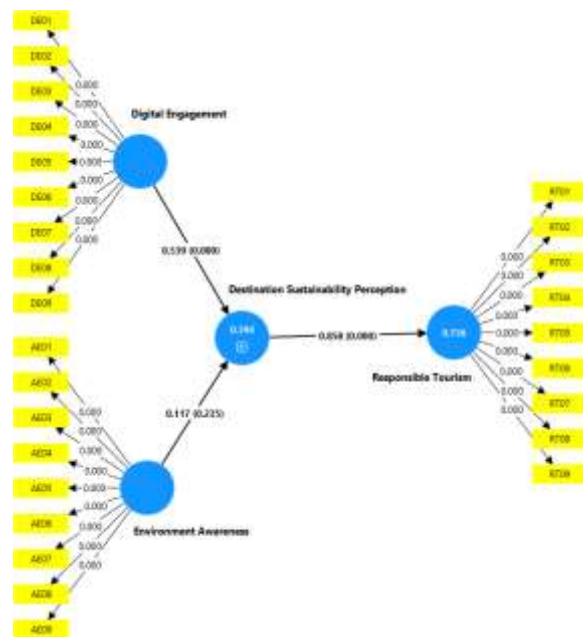


Figure 1. Bootstrap Result

Table 6. Hypothesis Test Results

Pengaruh Antar Variabel	Relationship	Original sample	T statistics	P values
Destination Sustainability Perception -> Responsible Tourism	Direct	0.858	20.899	0.000
Digital Engagement -> Destination Sustainability Perception	Direct	0.539	5.301	0.000
Environment Awareness -> Destination Sustainability Perception	Direct	0.117	1.187	0.235
Digital Engagement -> Responsible Tourism	Indirect	0.462	5.057	0.000
Environment Awareness -> Responsible Tourism	Indirect	0.100	1.174	0.240

Table 6 presents the results of hypothesis testing for both direct and indirect relationships among the research variables. The findings indicate that Destination Sustainability Perception has a significant positive effect on Responsible Tourism, with an original sample value of 0.858, a t-statistic of 20.899, and a p-value of 0.000. This result demonstrates that tourists who perceive Karimunjawa as a sustainable destination are more likely to exhibit responsible tourism behaviour. Therefore, the hypothesis that

Destination Sustainability Perception influences Responsible Tourism is supported. The results also show that Digital Engagement has a significant positive effect on Destination Sustainability Perception, with an original sample value of 0.539, a t-statistic of 5.301, and a p-value of 0.000. This finding indicates that higher levels of tourists' engagement with digital platforms, social media, and online tourism information contribute to stronger perceptions regarding the sustainability of Karimun Jawa as a tourism destination. Thus, the hypothesis examining the effect of Digital Engagement on Destination Sustainability Perception is accepted.

In contrast, Environment Awareness does not have a significant effect on Destination Sustainability Perception. The relationship shows an original sample value of 0.117, a t-statistic of 1.187, and a p-value of 0.235, which exceeds the significance threshold of 0.05. This result suggests that tourists' environmental awareness alone is insufficient to significantly shape their perceptions of destination sustainability. Therefore, the hypothesis proposing a direct influence of Environment Awareness on Destination Sustainability Perception is rejected. Regarding indirect effects, the results reveal that Digital Engagement has a significant indirect effect on Responsible Tourism through Destination Sustainability Perception, with an original sample value of 0.462, a t-statistic of 5.057, and a p-value of 0.000. This finding indicates that Destination Sustainability Perception successfully mediates the relationship between Digital Engagement and Responsible Tourism. In other words, tourists' digital interactions enhance perceptions of destination sustainability, thereby encouraging responsible tourism behaviour. Meanwhile, the indirect effect of Environment Awareness on Responsible Tourism through Destination Sustainability Perception is not significant, as indicated by an original sample value of 0.100, a t-statistic of 1.174, and a p-value of 0.240. This result demonstrates that Destination Sustainability Perception does not mediate the relationship between Environment Awareness and Responsible Tourism. Overall, the findings suggest that Digital Engagement plays a more dominant role than Environmental Awareness in shaping perceptions of sustainable destinations and encouraging responsible tourism behaviour among tourists visiting Karimun Jawa Island.

The results of hypothesis testing indicate that Destination Sustainability Perception has a significant positive effect on Responsible Tourism, demonstrating that tourists who perceive Karimun Jawa as a sustainable destination are more likely to engage in responsible tourism behaviour. In addition, Digital Engagement significantly influences Destination Sustainability Perception, suggesting that tourists' interactions with digital platforms, social media, and online tourism information contribute positively to their perception of destination sustainability. However, Environmental Awareness does not significantly affect Destination Sustainability Perception, indicating that environmental concern alone is insufficient to shape

tourists' perceptions of the destination's sustainability. Furthermore, the mediation analysis reveals that Destination Sustainability Perception successfully mediates the relationship between Digital Engagement and Responsible Tourism, whereas the mediating effect of Environment Awareness on Responsible Tourism is not supported. These findings imply that digital interaction plays a more substantial role than individual environmental awareness in encouraging responsible tourism behaviour among tourists visiting Karimun Jawa Island.

From a theoretical perspective, these findings are consistent with the Stimulus-Organism-Response (SOR) Theory. In this study, Digital Engagement functions as the external stimulus that influences tourists' internal psychological evaluation, represented by Destination Sustainability Perception, which subsequently generates a behavioural response in the form of Responsible Tourism. The significant mediation effect supports the notion that tourists' behavioural responses are strongly influenced by their cognitive and emotional perceptions toward the destination. Moreover, the findings are relevant to the Theory of Planned Behaviour (TPB) developed by Ajzen (1991), which posits that individual behaviour is influenced by attitudes and perceptions shaped by information processing and social experiences. Digital engagement through social media and online tourism communication may strengthen tourists' positive attitudes toward sustainable tourism practices, thereby encouraging responsible behaviour during their visits. In contrast, the insignificant effect of Environment Awareness suggests that awareness alone may not automatically translate into sustainable destination perceptions unless supported by effective communication, destination experiences, or social influence mechanisms.

The findings of this study are supported by several previous studies in the sustainable tourism literature. The significant relationship between Digital Engagement and Destination Sustainability Perception is consistent with [28] [29], who found that digital interaction and online engagement significantly enhance tourists' perceptions of sustainable destination image and emotional attachment to destinations. Similarly, research by [6] [9] emphasised that digital tourism communication has become an important mechanism in promoting sustainable tourism behaviour and destination sustainability awareness. The positive influence of Destination Sustainability Perception on Responsible Tourism is also consistent with the findings of [16] [30], who reported that tourists with stronger sustainability perceptions are more likely to demonstrate environmentally responsible behaviour during travel. However, the insignificant effect of Environmental Awareness on Destination Sustainability Perception contrasts with several previous studies that identified environmental awareness as a significant predictor of pro-environmental behaviour. This discrepancy may be explained by the characteristics of tourists visiting

Karimunjawa, in which digital tourism experiences and social media exposure appear to exert a stronger influence on sustainability perceptions than personal environmental awareness alone. Consequently, the findings suggest that strengthening sustainable tourism communication through digital platforms may be more effective in promoting responsible tourism behaviour in island tourism destinations such as Karimunjawa.

4. Conclusion

In conclusion, this study demonstrates that digital engagement plays a significant role in shaping tourists' perceptions of destination sustainability and encouraging responsible tourism behaviour among visitors to Karimunjawa Island. The findings reveal that destination sustainability perception has a strong positive influence on responsible tourism, indicating that tourists who perceive a destination as environmentally and socially sustainable are more likely to engage in responsible travel practices. Furthermore, digital engagement significantly enhances perceptions of destination sustainability and indirectly influences responsible tourism through its mediating role. In contrast, environmental awareness does not significantly affect destination sustainability perception, suggesting that awareness alone may not be sufficient to influence tourists' behavioural perceptions without effective communication and experiential reinforcement. The results of this study provide important implications for sustainable tourism management, particularly for island destinations such as Karimunjawa. Destination managers, tourism stakeholders, and local governments should strengthen digital tourism communication strategies through social media, online campaigns, and sustainability-focused digital content to improve tourists' perceptions of destination sustainability and promote responsible tourism behaviour. The study also highlights the importance of integrating sustainability values into digital tourism experiences to create stronger emotional and cognitive engagement among tourists. From a theoretical perspective, this study contributes to the development of sustainable tourism literature by integrating digital engagement, environmental awareness, destination sustainability perception, and responsible tourism within a single conceptual framework. The findings also reinforce the relevance of behavioural and psychological approaches in understanding sustainable tourist behaviour in the digital tourism era. Nevertheless, this study has several limitations. The research focuses only on tourists visiting Karimunjawa Island and uses a cross-sectional design, which may limit the generalizability of the findings to other tourism destinations or different periods of observation. Future research is recommended to examine additional variables, such as environmental attachment, destination trust, green satisfaction, and social influence, to obtain a more comprehensive understanding of responsible tourism behaviour. Comparative studies across different tourism destinations and longitudinal approaches are also suggested to provide deeper insights into the

dynamics of sustainable tourism behaviour over time.

Acknowledgements

The authors would like to express their sincere gratitude to the Directorate of Research, Technology, and Community Service (Diktisainteks), Ministry of Higher Education, Science, and Technology of the Republic of Indonesia, for the financial support provided through the Penelitian Dosen Pemula (PDP) Grant Program 2026. The authors also extend their appreciation to all respondents who participated in this study and contributed valuable information to support the completion of this research.

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