

Applying the ACES Framework to Assess Halal Tourism Readiness in Penyengat Island for Strengthening the Sustainable Maritime Economy and Culture

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Abstract. *Halal tourism is growing rapidly worldwide as Muslim travelers increasingly demand services aligned with Sharia principles. The Riau Islands, particularly Penyengat Island with its rich Islamic cultural and historical heritage, hold strategic potential to be developed as a leading halal tourism destination. This study evaluates its readiness using the ACES (Access, Communication, Environment, Services) framework with a descriptive mixed-method approach involving observation, questionnaires, interviews, and documentation. Findings show Penyengat Island achieved a score of 69, categorized as Ready. Accessibility and environmental aspects are strong, but communication remains weak, particularly in halal certification transparency, multilingual information, and digital promotion. Pareto analysis identifies communication and halal food access as priority improvements, while fishbone analysis highlights regulatory complexity, low digital literacy and language skills, limited halal technology, and insufficient community support as key challenges. Based on these findings, development strategies should focus on enhancing communication, simplifying regulations, improving human resources, and adopting digital technology to strengthen the sustainable competitiveness of halal tourism on Penyengat Island.*

Keywords: Culture; Economy; Framework; Maritime; Tourism.

1. Introduction

Tourism is a strategic sector that has experienced rapid and significant growth globally (1)(2). Tourism activities have become part of the lifestyle of modern society as a means of recreation, spiritual, educational, and cultural needs (3)(4). The growth of this sector contributes greatly to the global economy, including through increases in Gross Domestic Product (GDP), job creation, foreign exchange growth, and infrastructure development (5)(6). In recent years, there has been a shift in trends in global tourist behaviour. One of the emerging trends is the increasing demand for halal tourism, which is a form of tourism that accommodates the needs of Muslim tourists based on Islamic sharia principles in recent years, there has been a shift in trends in global tourist behaviour. One of the emerging trends is the increasing demand for halal tourism, which is a form of tourism that accommodates the needs of Muslim tourists based on Islamic sharia principles (7)(8). The 2024 Global Muslim Travel Index (GMTI) report notes significant growth in Muslim tourist travel, with an increase in preference for destinations that provide halal services such as certified cuisine, worship facilities, Muslim-friendly accommodation, and an atmosphere that supports Islamic values (9)(10).

As the country with the largest Muslim population in the world, Indonesia has enormous potential for developing a halal tourism ecosystem (11)(12). Indonesia is home to more than 284.4 million people, with around 87.2% of them being Muslim, and is blessed with cultural diversity and natural wealth that make it the largest archipelagic country in the world, consisting of 17,380 islands (13)(14). This geographical and demographic potential provides a strong foundation for developing an inclusive and sustainable halal tourism sector (15)(16). The government has also made this sector a part of its national development priorities through halal certification policies, strengthening the promotion of Muslim-friendly destinations, and various regulatory incentives (17)(18).

Although there has been progress nationally, the development of halal tourism has not been evenly distributed across all regions (19)(20). One area that has enormous potential but has not been optimally developed as a halal tourism destination is Penyengat Island, located in Tanjungpinang City, Riau Islands Province (21)(22). This island is known as the centre of Malay-Islamic scholarship and literature, which gave birth to Gurindam Dua Belas, the work of National Hero Raja Ali Haji. Due to its high historical and cultural value, Penyengat Island has been designated a National Cultural Heritage Site since 2018 (23). Penyengat Island is home to many historical relics, such as the Masjid Raya Sultan Riau, Benteng Bukit Kursi, Istana Kantor, Gedung Tengku Bilik, Perigi Tua, Tapak Istana, and a complex of tombs of sultanate figures. Additionally, distinctive Malay cuisine such as gong-gong, mie tarempa, otak-otak, and various other halal dishes serve as unique attractions that support the development of halal tourism (24)(25).

Penyengat Island has a strategic location as it borders Malaysia and Singapore. Easy access via Sri Bintan Pura Port makes it a potential opportunity to attract Muslim tourists from neighbouring countries. The island has also gained national recognition through the 2023 Indonesian Tourism Village Award (ADWI), demonstrating that this destination has competitive and accurate tourism potential (26). The significant potential of Penyengat Island has not yet been fully supported by structural and institutional readiness in developing an integrated and sustainable halal tourism ecosystem (27)(28).

The main challenges in developing halal tourism on Penyengat Island include the absence of specific regional regulations governing halal tourism, low awareness and understanding among stakeholders of the principles of Muslim-friendly tourism, and suboptimal supporting infrastructure such as halal-certified restaurants, worship facilities, and Sharia-based accommodation services. This reflects the failure to fulfil the principles of Islamic law, resulting in a lack of protection for Muslim consumers' rights and legal certainty for businesses in providing services that comply with halal standards. In addition, the absence of a systematic evaluation framework means that the development of halal tourism on Penyengat Island is still sporadic and unmeasured.

Given these conditions, an academic study is needed to assess the level of readiness of Penyengat Island in developing a halal tourism destination through a comprehensive and data-driven approach. One relevant approach is the Access, Communication, Environment, and Services (ACES) framework, which can be used to measure the readiness of a halal tourism destination from various interrelated aspects. This research can provide an accurate picture of the strengths, weaknesses, opportunities, and strategic challenges in the development of halal tourism.

2. Research Methods

This research is a descriptive study that aims to describe the readiness level of Penyengat Island in developing halal tourism. In order to achieve the research objectives, several procedural stages are carried out systematically. The workflow of this research is presented in Figure below:

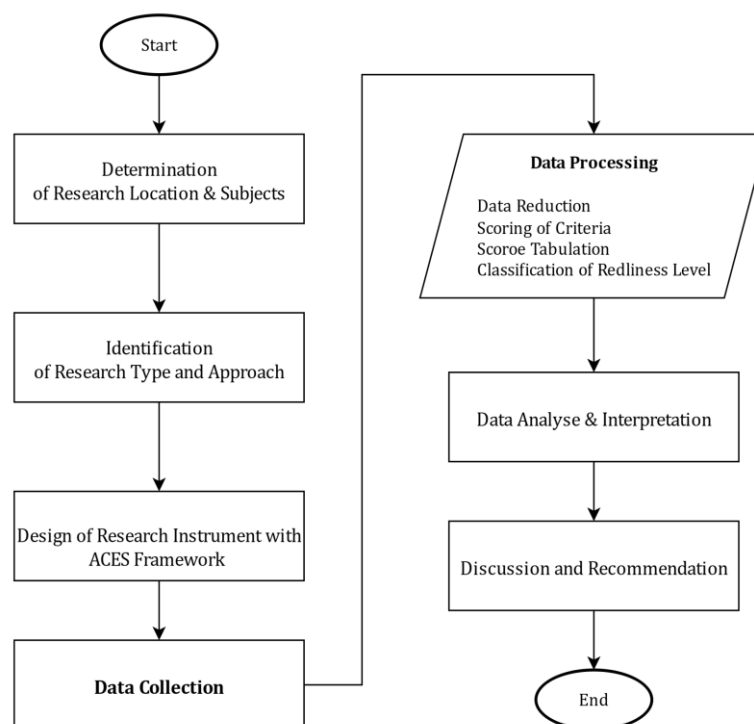


Figure: Research Methodology Flowchart

2.1. Determinations of Research Location and Subject

This research was conducted on Penyengat Island, Tanjungpinang City, Riau Islands Province. The location was chosen because the island holds significant historical, cultural, and religious values, making it highly strategic for the development of halal tourism. As a center of Malay-Islamic civilization, Penyengat Island preserves important heritage sites such as the Sultan Riau Grand Mosque, royal tombs, palaces, and fortifications, which strengthen its identity as an Islamic cultural heritage destination. In addition, the island offers unique culinary attractions dominated by halal Malay food and is recognized nationally, having won the Indonesian Tourism Village Award (ADWI) 2023. Its strategic position near Malaysia and Singapore, with easy access through Sri Bintan Pura Port, provides potential to attract Muslim tourists from neighbouring countries.

The research subjects consist of local stakeholders, including government agencies (Department of Culture and Tourism), local community leaders, tourism business actors (accommodation, culinary MSMEs, transport providers), and visitors. These diverse perspectives are essential for measuring the readiness of Penyengat Island in developing an integrated halal tourism ecosystem.

2.2. Identifications of Research Type and Approach

This research is a descriptive study that aims to illustrate the level of readiness of Penyengat Island in developing halal tourism. The study employs a mixed methods

approach, combining qualitative and quantitative techniques to ensure a comprehensive analysis. The qualitative approach is used to explore the perceptions and views of stakeholders, including local government, tourism actors, community leaders, and visitors. Data collection is carried out through interviews, observations, and documentation, which provide deep insights into the cultural, social, and policy aspects of halal tourism readiness. Meanwhile, the quantitative approach is applied to measure readiness across five main dimensions of halal tourism: accessibility, communication, accommodation, environment, and services. Data is collected through structured observation sheets and analysed using a scoring system (1–5), which is then classified into specific readiness levels. The integration of these two approaches, guided by the ACES framework (Access, Communication, Environment, and Services), enables the research to generate findings that are both academically valid and practically useful for the strategic development of halal tourism on Penyengat Island.

2.3. Design of Research Instruments

The research instruments were designed by referring to the ACES framework (Access, Communication, Environment, Services) to assess the readiness of Penyengat Island in developing halal tourism. Access variables refer to the ease of reaching Penyengat Island and the availability of basic facilities for Muslim tourists. Communication variables capture how well information and branding are managed to support halal tourism. Environment variables highlight the environmental and cultural dimensions that shape the tourist experience. And the last variable is Services, which emphasises the quality of direct services provided to Muslim tourists. Each variable is operationalized into five measurable indicators, making a total of 20 indicators presented in Table below:

Table Research Variables and Indicators

Variables	Code	Indicators	Descriptions	References
Access	A1	Transportation connectivity	Ease of access to Penyengat Island from Tanjungpinang	Battour & Ismail (2016)(29).
	A2	Local infrastructure supporting mobility	Quality of physical facilities to support halal tourism	Lestari et al. (2023) (30).
	A3	Availability of worship facilities	Easily accessible and representative	Battour & Ismail (2016)(29).
	A4	Access to digital information	Availability of digital information for halal tourism	Suhartanto et al. (2024) (31).
	A5	Access to halal food	Presence of certified halal restaurants	Battour & Ismail (2016)(29).
Communication	C1	Halal destination promotion	Intensity of halal promotion on social media/websites	Suhartanto et al. (2024)(31).
	C2	Transparency of halal certification	Availability of official halal certification information	Battour & Ismail (2016)(29).
	C3	Multilingual information	Tourism guides available in more than one language	Zulvianti et al. (2022) (32).
	C4	Prayer time & qibla direction information	Available in public spaces & hotels	Zulvianti et al. (2022)(32).
	C5	Use of digital media	Online access to halal tourism reviews/testimonials	Zulvianti et al. (2022)(32).

Environment	E1	Perceived environmental value	Environmental and natural conditions on Penyengat Island	Zulvianti et al. (2022)(32).
	E2	Halal-friendly facilities	Completeness of Muslim facilities in hotels & homestays	Battour & Ismail (2016)(29).
	E3	Sustainability & environmental management	Implementation of green tourism & halal principles	Zulvianti et al. (2022)(32).
	E4	Safety & comfort of the environment	Sense of security, comfort & Muslim-friendly hospitality	Lestari et al. (2023)(30).
	E5	Islamic cultural atmosphere & local heritage	Islamic architecture, heritage, religious events	Zulvianti et al. (2022)(32).
Services	S1	Muslim-friendly staff service	Attitude & competence of staff in serving Muslim tourists	Battour & Ismail (2016)(29).
	S2	Quality of halal tourism experience	Visitor satisfaction with halal services	Zulvianti et al. (2022)(32).
	S3	Ease of additional facilities	Availability of Muslim-friendly facilities	Zulvianti et al. (2022)(32).
	S4	Halal service standards	Existence of SOPs & halal certification	Lestari et al. (2023)(30).
	S5	Tourist satisfaction & loyalty	Feedback & satisfaction level of Muslim visitors	Suhartanto et al. (2024)(31).

2.4. Data Collection

The data collection process in this study was obtained through a mixed methods approach. Qualitative data were collected through interviews, observations, and documentation. Quantitative data were collected using observation sheets and structured questionnaires developed based on the ACES framework (Access, Communication, Environment, Services). Each of the 20 indicators was measured using a Likert-type scoring scale (1–5) to classify the level of readiness of halal tourism facilities and services.

2.5. Data Processing

The data obtained from the field were processed through several systematic stages to ensure accuracy and reliability of the research findings. The quantitative data collected using observation sheets and questionnaires were first subjected to data reduction. The scores were then organized into tabulations and further classified into readiness levels, including Very Ready, Ready, Less Ready, Not Ready). Meanwhile, the qualitative data gathered from interviews, observations, and documentation were analysed through content analysis, enabling the researchers to capture stakeholder perceptions, cultural contexts, and policy challenges. These findings were then integrated with the quantitative results to provide a comprehensive picture of halal tourism readiness on Penyengat Island. The final stage of data processing involved triangulation between quantitative scores and qualitative insights to enhance validity, followed by drawing conclusions and formulating recommendations for the development of halal tourism policies and strategies.

2.6. Data Analysed, Discussion, and Recommendation

The stages of data analysis, interpretation of findings, and formulation of recommendations will be presented in section 3. Results and Discussion.

3. Results and Discussion

Based on the research results obtained through questionnaires using the ACES (Access, Communication, Environment, Services) indicator-based assessment instrument, the level of halal tourism readiness can be described as follows:

3.1. Accessibility Aspect (Access)

The accessibility aspect received a total score of 20, indicating excellent readiness. The three main indicators Transportation Connectivity (A1), Local Infrastructure Supporting Mobility (A2), and Availability of Worship Facilities (A3) each obtained a maximum score of 5. This reflects that access to Penyengat Island is easily reachable, transportation facilities are adequate, and worship facilities such as mosques and prayer rooms are well-provided and representative. However, there are still weaknesses in digital information access (A4), which only scored 3, and access to halal food (A5), which scored 2. This means that although physical access is already very good, digitalization of information and the availability of certified halal restaurants remain limited, making this aspect a priority for further development.

Table Assessment Result of Accessibility Aspec

Variable	Code	Indicator	Description / Observation	Assessment Result
Access	A1	Transportation Connectivity (boats, piers, travel distance)	Ease of access to Pulau Penyengat from Tanjungpinang	5
	A2	Local Infrastructure Supporting Mobility (roads, piers, local transportation)	Quality of physical facilities to support halal tourism	5
	A3	Availability of worship facilities (mosques, prayer rooms, ablution)	Accessibility and representativeness of worship facilities	5
	A4	Access to digital information (websites, applications, transportation & prayer schedules)	Availability of digital information for halal tourism	3
	A5	Access to halal food (restaurants, clear halal labels)	Availability of certified halal restaurant	2
Total Score				20

3.2. Communication

Communication received a total score of 11, which is the lowest among all aspects. This indicates that the communication sector remains a weak point in supporting halal tourism on Penyengat Island. Promotion of halal destinations through social media and websites (C1) was rated as adequate, with a score of 3, but other aspects remain low. Transparency of halal certification (C2) only obtained a score of 1, reflecting the lack of official information regarding halal certification in

restaurants and hotels. In addition, multilingual information (C3), prayer schedule and Qibla direction information (C4), and the use of digital media (C5) each scored only 2. These results emphasize that the development of digital-based communication, provision of multilingual information, and transparency of halal certification are urgent needs for Penyengat Island to become more competitive as an international halal destination.

Table Assessment Result of Communication Aspect

Variable	Code	Indicator	Description / Observation	Assessment Result
Communi- cation	C1	Halal destination promotion (Muslim-friendly branding)	Intensity of halal promotion on social media/websites	3
	C2	Transparency of halal certification (restaurants, hotels)	Availability of official halal certification information	1
	C3	Multilingual information (Indonesian, English, Arabic)	Tourism guides available in more than one language	2
	C4	Prayer time & qibla direction information	Available in public spaces & hotels	3
	C5	Use of digital media	Online access to halal tourism reviews/testimonials	2
Total Score				11

3.3. Environment

The environment aspect also achieved a very high score, namely 20. The indicators of environmental value (E1) and the Islamic cultural atmosphere and local heritage (E5) each obtained the maximum score of 5, indicating that Penyengat Island holds strong advantages in terms of cleanliness, sustainability, and the richness of Islamic culture, such as architecture, heritage sites, and religious traditions. The indicators of sustainability & environmental management (E3) and safety and comfort (E4) both scored 4, showing that the principles of sustainable tourism have already been well implemented. However, halal-friendly facilities (E2) received a relatively low score of 2, highlighting the limited availability of hotels or homestays that fully provide Muslim-friendly amenities, such as alcohol-free accommodation or Qibla direction markers in rooms.

Table Assessment Result of Environment Aspect

Variable	Code	Indicator	Description / Observation	Assessment Result
Environm- ent	E1	Perceived environmental value (cleanliness, sustainability)	Environmental and natural conditions on Penyengat Island	5
	E2	Halal-friendly facilities (alcohol-free hotels, qibla direction in rooms)	Completeness of Muslim facilities in hotels & homestays	2
	E3	Sustainability & environmental management (waste, conservation)	Implementation of green tourism & halal principles	4
	E4	Safety & comfort of the environment	Sense of security, comfort & Muslim-friendly hospitality	4
	E5	Islamic cultural atmosphere & local heritage	Islamic architecture, heritage, religious events	5
Total Score				20

3.4. Services

Services obtained a total score of 18, reflecting a fairly good level of readiness. Muslim-friendly service by staff (S1) and tourist satisfaction and loyalty (S5) each received a score of 4, confirming that human resource competence and Muslim tourist satisfaction are relatively strong. The indicator of comfort in supporting facilities (S3) even achieved the maximum score of 5, showing that supporting amenities such as halal restaurants, prayer rooms, and ablution facilities are sufficiently available. However, the overall halal tourism experience (S2) only scored 3, while halal service standards (S4) were still low at 2. This indicates that improvements are still needed in developing standard operating procedures (SOPs) and halal certification in hotels and restaurants so that service quality truly aligns with international halal tourism standards.

Table Assessment Result of Services Aspect

Variable	Code	Indicator	Description / Observation	Assessment Result
Service	S1	Muslim-friendly staff service (trained in accordance with sharia)	Attitude & competence of staff in serving Muslim tourists	4
	S2	Quality of halal tourism experience	Visitor satisfaction with halal services	3
	S3	Ease of additional facilities (halal restaurants, prayer rooms, ablution areas)	Availability of Muslim-friendly facilities	5
	S4	Halal service standards (hotel/restaurant certification)	Existence of SOPs & halal certification	2
	S5	Tourist satisfaction & loyalty (feedback, intention to return)	Feedback & satisfaction level of Muslim visitors	4
Total Score				18

Based on the assessment results, the level of readiness of Penyengat Island in developing halal tourism through the ACES indicators (Access, Communication, Environment, Services) obtained a total score of 69, which falls into the "Ready" category. This finding is consistent with the study by Isnaeni (33), as presented in the following table:

Tabel Halal Tourism Readiness Interval

Indicator	Score
Very Ready	78-90
Ready	63-77
Less Ready	48-62
Not Ready	33-47
Very Unprepared	18-32

Generally, these results illustrate that Penyengat Island has strong potential to be developed as a halal tourism destination, although there are still several aspects that need improvement.

To address the focus of these improvements, a Pareto analysis was applied to the results of the ACES (Access, Communication, Environment, Services) assessment instrument, so that the aspects most influential on readiness enhancement can be identified and prioritized. The outcomes of this analysis are presented in the following table and chart.

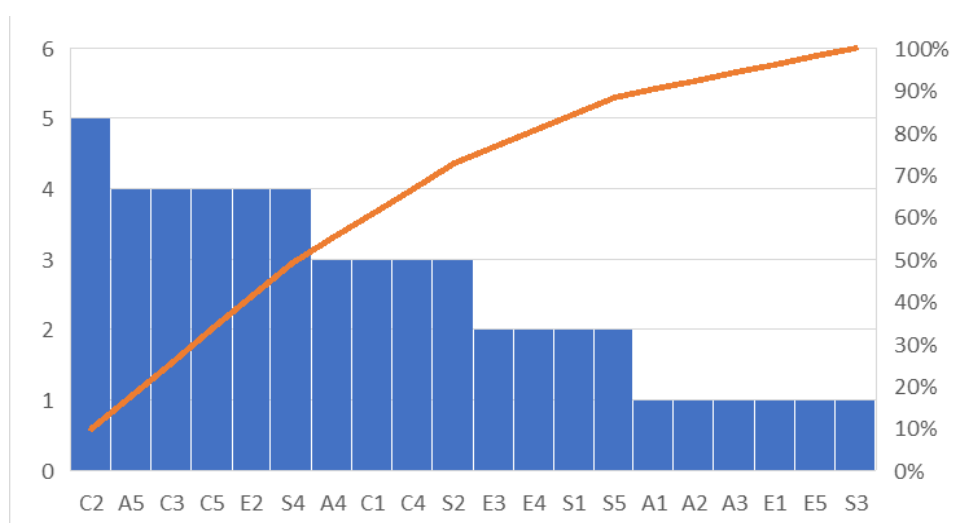


Figure: Priority Improvement Chart for Halal Tourism Readiness Based on Pareto Analysis (Penyengat Island)

Based on the Pareto analysis above, it can be concluded that the primary focus of improvement in the development of halal tourism on Penyengat Island should be directed toward the communication aspect, particularly in terms of halal certification transparency (C2), the provision of multilingual information (C3), the utilization of digital media (C5), and access to halal food (A5). In addition, supporting factors that warrant attention include the enhancement of digital information dissemination (A4), the promotion of halal destinations (C1), and the strengthening of the overall halal tourism experience (S2). Meanwhile, long-term improvements should be concentrated on infrastructure and transportation (A1, A2, A3), as well as reinforcing the Islamic cultural values that characterize the destination (E5, S3). By implementing improvement strategies that are systematically aligned with these priorities, efforts to enhance the readiness of halal tourism in Penyengat Island are expected to be more effective and deliver significant impacts.

Thus, the focus of improvements identified through Pareto analysis provides clear direction on the main and long-term priorities in the development of halal tourism on Penyengat Island. However, in order for this strategy to be implemented optimally, it is also important to understand the various fundamental obstacles

that still accompany the development process. These obstacles are seen in more detail through fishbone analysis, which describes a number of key challenges that need to be addressed immediately.

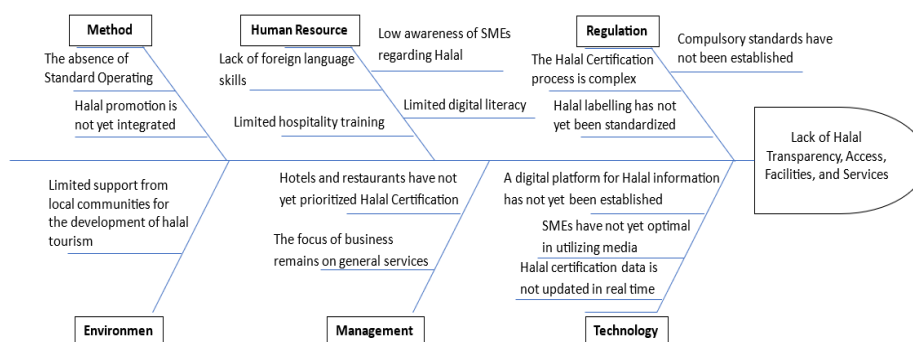


Figure: Root Causes and Strategic Improvements for Halal Tourism Services on Penyengat Island

The main challenges in developing halal tourism are illustrated by several factors in the fishbone diagram, including the absence of halal operational SOPs, low awareness among MSMEs, limited human resource skills, regulatory complexity, lack of local community support, weak management commitment, and suboptimal use of digital technology. The complexity of halal certification, which is considered complicated and expensive, discourages SMEs from participating (34), while limited digital literacy and low foreign language skills reduce the global competitiveness of halal destinations (35). In addition, the lack of standardisation of halal labels and the limitations of digital platforms have resulted in halal information being non-transparent and difficult for consumers to access (36). Local community support has also proven to be important for the sustainability of halal destinations, but in many cases, it has not been optimally integrated (37). On the other hand, the commitment of business management, which still focuses on general services rather than halal as a branding strategy, hinders the increase in the attractiveness of halal tourism (38). The use of technology such as blockchain and real-time halal digital platforms is proposed as a solution to increase transparency and consumer trust. Therefore (33), strengthening human resources, simplifying regulations, and adopting technology are key to accelerating the development of a competitive halal tourism ecosystem.

4. Conclusion

Based on the results of a questionnaire survey using the ACES (Access, Communication, Environment, Services) indicator-based assessment tool, Penyengat Island's level of readiness for halal tourism development received a total score of 69, which falls into the Ready category. This shows that Penyengat Island has strong potential to be developed as a halal tourism destination. However, there are still a number of aspects that require further attention in order

for development to proceed optimally. Through Pareto analysis, improvement priorities were identified that could be used as a focus for development. The results showed that the main factors that needed to be improved immediately were communication aspects, particularly halal certification transparency (C2), the provision of multilingual information (C3), and the use of digital media (C5), as well as access to halal food (A5). Supporting factors that are also important are the digitisation of information (A4), the promotion of halal destinations (C1), and the strengthening of the halal tourism experience (S2). Long-term improvements are focused on infrastructure, transportation, and the strengthening of Islamic cultural values (A1, A2, A3, E5, S3).

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