

## MODELLING SUSTAINABLE DEVELOPMENT SATISFACTION LEVEL FROM COMMUNITY PERSPECTIVE: COMBINING IMPORTANCE- PERFORMANCE ANALYSIS WITH SOCIAL PROGRESS INDEX

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**Abstract:** This study introduces a novel approach by combining Importance-Performance Analysis (IPA) and the Social Progress Index (SPI) to assess local Sustainable Development Goals (SDGs). Applied to Mantanani Besar Island, the method effectively captured community needs, demonstrating high reliability for lifestyle (78%), environment (65%), and socioeconomics (90%). The socioeconomic dimension achieved the highest satisfaction (67.3%), especially in community relationships (98.9%). In contrast, environmental satisfaction was the lowest (40.1%), with management scoring only 7.5%, raising concerns over changes driven by ecotourism (59.4%). Lifestyle satisfaction was moderate (49.7%), with challenges in water supply (56.1%) and electricity (55.2%), which is in line with previous studies. Additionally, this method identified key areas needing improvement such as COVID-19 response (18.0%) and food expenses (38.3%). Compared to traditional development indices like the Human Development Index (HDI) and Gender Development Index (GDI), this approach provides a more nuanced view of regional priorities. Overall, satisfaction was moderate (52.4%), highlighting socioeconomic and environmental issues requiring focused improvements. The approach emphasises the significance of uncovering latent regional challenges, offering a more responsive and sustainable tool for SDG assessments.

**Keywords:** Important-performance analysis, social progress index, sustainable development goals, community needs, satisfaction, development indices.

### Introduction

Humanity is currently confronting complex environmental, social, and economic (socioeconomic) challenges worldwide. At the Earth Summit in 1992 (Rio '92), the profound impacts of these issues on ecosystems were highlighted, promoting a focus on promoting "sustainable development". In response, the United Nations adopted the "2030 Agenda" in 2015, establishing 17 Sustainable Development Goals (SDGs) ratified by the United Nations General Assembly in September of this year. While the SDGs lack a precise definition, they are widely understood to balance environmental and socioeconomic dimensions to secure the well-being of future generations (Voon *et al.*, 2023). To date, various indices have been developed to evaluate and quantify progress

toward these goals, as summarised by the United Nations Development Program (UNDP) (2022). These indices offer a concrete framework for addressing multidimensional challenges and guide areas for improvement.

Recent studies have highlighted that existing indices often fail to fully capture the breadth of environmental and socioeconomic factors, particularly at the regional level (Diaz-Sarachaga *et al.*, 2018). Notably, disparities are especially evident in how these indices balance environmental and socioeconomic objectives (Khan *et al.*, 2021). A significant limitation is the reliance on national-level data, which often overlooks regional nuances and the actual needs of local populations. Furthermore, critical gaps exist in developing countries across Southeast

Asia in reliable data on poverty, income, and environmental conditions at the state or regional levels (Rongen *et al.*, 2014; Ngan *et al.*, 2022). This data deficiency complicates accurate assessments and frequently leads to ineffective policy decisions and a lack of targeted interventions (Stargars, 2016). For example, Malaysia's national SDG performance ranks 72<sup>nd</sup> out of 163 countries with an SDG index score of 70.4%. This surpasses the global average of 65.9% (Sachs *et al.*, 2023). State-level assessments reveal significant disparities, particularly in poverty and income, where the absence of reliable long-term data impedes accurate evaluation and socioeconomic progress (Rongen *et al.*, 2024). Moreover, in the environmental domain, a considerable gap exists between Malaysia's actual sustainable development progress and its Environmental Performance Index (EPI), largely due to insufficient attention to policy implementation and social dimensions of conservation efforts (Ngan *et al.*, 2022). Consequently, this disconnect between national indicators and regional realities underscores the urgent need for a sustainable development approach that genuinely reflects local needs.

In Malaysia, island tourism plays a significant role in the economy and is promoted as part of sustainable development efforts (Ng *et al.*, 2016). Shaari *et al.* (2024) reported that integrating sustainability reporting with tourism development can help mitigate the adverse effects of tourism on local communities and the environment, thus, fostering more sustainable growth. However, these measures often fail to fully capture the needs of local communities, as they do not adequately account for region-specific latent factors. This includes the unique socioeconomic and environmental challenges different regions face (Azam *et al.*, 2018). For example, in the Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA), it has been noted that the economic benefits of tourism development on Mantanani Besar Island tend to remain within the tourism sector, with limited spillover to

the broader local community (BIMP-EAGA, 2017). To address this issue, Pavelka *et al.* (2023) suggested that incorporating subjective indicators based on region-specific latent factors provides a more comprehensive understanding of well-being and quality of life at the local level. Note that these subjective indicators are essential for evaluating prosperity and development, as they can reveal underlying issues often overlooked in national or regional assessments. Nevertheless, the impact of tourism development on the satisfaction of community needs has not been sufficiently explored, particularly in areas like Mantanani Besar Island, where the focus remains on achieving sustainable development through tourism. The extent to which tourism development addresses community needs in such regions remains unclear.

This study introduces an innovative methodology that combines Importance-Performance Analysis (IPA) and the Social Progress Index (SPI) to evaluate the satisfaction of local community needs on Mantanani Besar Island. IPA reflects multiple factors based on the subjective perspectives of local communities, addressing region-specific socioeconomic and environmental challenges (Martilla & James, 1977). SPI, in turn, identifies areas for improvement by measuring these factors without relying solely on traditional economic indicators like Gross Domestic Product (GDP) (Stern *et al.*, 2022).

Integrating IPA with SPI provides a more nuanced understanding of local community needs and highlights specific areas requiring improvement. Additionally, comparing these results with traditional development indices strengthens the reliability of the findings, offering data-driven explanations for specific scores. In conclusion, this methodology demonstrates clear advantages over existing indices. If widely adopted, it has the potential to reveal the "true" critical factors for different regions, paving the way for tailored strategic frameworks. In essence, this approach could become a valuable tool in shaping strategies to enhance sustainability.

## Literature Review

### ***Combining Importance-Performance Analysis and Social Progress Index***

In Malaysia, tourism plays a crucial role in supporting the achievement of the SDGs and serves as a pillar of the nation's economic development (Ng *et al.*, 2016). However, the rapid expansion of tourism has increased environmental pressure on island regions, raising concerns among local communities (Shaari *et al.*, 2023). On Mantanani Besar Island, sustainable tourism initiatives have underscored the need for enhanced dialogue between local communities and stakeholders, equitable distribution of economic benefits, and strengthened environmental conservation efforts (BIMP-EAGA, 2017; Sulehan & Gabir, 2021). Despite the positive economic impacts, tourism's adverse environmental effects have disrupted the daily lives of local communities (Mansor *et al.*, 2021). Additional studies such as Chew *et al.* (2023) have emphasised the significance of incorporating community perspectives into tourism satisfaction assessments. This highlights the value of localised approaches in sustainable tourism development.

IPA is widely utilised to assess satisfaction in tourism by comparing the importance and performance scores of various factors, thereby aiding in the optimisation of resource allocation (Adam *et al.*, 2023). However, IPA has primarily focused on the perspectives of tourism operators and visitors, with limited research on the needs of local communities (Mansor *et al.*, 2021). Furthermore, despite its effectiveness, IPA has been criticised for not fully capturing the complexity of satisfaction and prioritisation (Oh, 2001). Thus, to address these limitations, this study introduces a novel approach by combining IPA with the SPI to statistically evaluate the subjective perspectives of local communities.

Integrating SPI enables the statistical analysis and prioritisation of multiple domain scores identified through IPA. By combining IPA's importance and performance scores with SPI's calculation method, these domains can be analysed at a more granular level, clearly

identifying the most critical dimensions and factors for the local community. The integration supports more effective resource allocation based on these insights.

Traditional SPI relies on statistical data at the national or regional level to establish priorities (Stern *et al.*, 2022; Inga-Hancoo *et al.*, 2023). However, this study is the first to explore the effectiveness of using the subjective perspectives of local communities in data-scarce regions like Southeast Asia. Accordingly, this approach not only captures the nuanced needs of these communities but also demonstrates the potential for utilising localised, subjective data as a proxy for traditional statistical metrics, which are often unavailable in these regions.

### ***Importance-Performance Analysis***

The IPA introduced by Martilla and James (1977) is widely recognised as an effective marketing tool for assessing service quality and customer satisfaction. This method helps identify areas needing improvement by plotting actual customer satisfaction with specific service or product factors on a two-dimensional coordinate system (Figure 1). The IPA matrix consists of two axes: "X-axis: Performance" and "Y-axis: Importance", reflecting respondents' evaluations of selective factors.

There are two main approaches to constructing the IPA matrix: Direct and indirect (Shinfuku & Sasjima, 2023). The direct method involves directly asking respondents to rate the importance and performance of each factor. In contrast, the indirect method uses statistical tools to infer the significance of factors from overall satisfaction and performance data. Although both methods are relatively easy to apply, they can yield different results and interpretations (Rodriguez-Valencia *et al.*, 2019). In particular, the IPA matrix is divided into four quadrants, each representing a various combination of importance and performance,

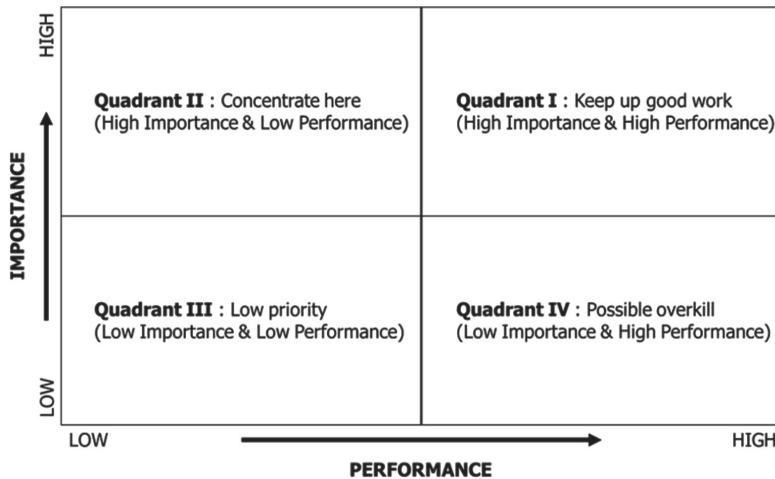


Figure 1: Importance-Performance Analysis (IPA)

providing organisations with a clear framework for prioritising areas for improvement (Martilla & James, 1977).

Four quadrants designed using the IPA method are defined as:

*Quadrant I (High Performance, High Importance)*

These factors are considered strengths that should be maintained and monitored to ensure continued satisfaction.

*Quadrant II (Low Performance, High Importance)*

These factors are areas of improvement that require immediate attention and resources to enhance satisfaction.

*Quadrant III (Low Performance, Low Importance)*

These factors are considered less important to local communities and although their performance is low, they may not need immediate attention.

*Quadrant IV (High Performance, Low Importance)*

These factors are over-performing in relation to their importance and resources could be reallocated to other areas requiring more attention.

Since its introduction, IPA has contributed to the development of numerous models and analytical methods and has been applied across various fields (Rodriguez-Valencia *et al.*, 2019). In Malaysia, for example, IPA has been used to identify areas for improvements in tourism facilities and environmental management as part of sustainable tourism initiatives (Adam *et al.*, 2023). However, previous studies have primarily focused on visitors and tourism operators, often neglecting the needs of local communities (Mansor *et al.*, 2021). On Mantanani Besar Island, supporting the local community is essential for developing successful sustainable tourism strategies (Sulehan & Gabir, 2020; Shaari *et al.*, 2023). Therefore, selecting factors based on the subjective needs of the local community is significantly important in the context of Mantanani Besar Island's tourism development.

When implementing IPA, there are two main approaches to select factors: Adopting common factors from existing literature or introducing factors based on independent judgement (Rodriguez-Valencia *et al.*, 2019). Considering the lack of prior research on the local community's needs on Mantanani Besar Island, this study adopts an independent evaluation to select and assess relevant factors. This approach is considered more effective for identifying

potential issues and addressing the specific needs of the local community, as subjective perspectives are believed to be more sensitive to latent regional challenges (Pavelka *et al.*, 2023). Despite that, this method also introduces complexity and difficulty in prioritising issues (Oh, 2001). Hence, by acknowledging these limitations, this study seeks to enhance the valuable insights IPA can provide in sustainable tourism development.

**Social Progress Index**

The SPI is a statistical tool that measures societal advancement beyond traditional economic metrics such as GDP (Stern *et al.*, 2022). Unlike economic indicators, SPI assesses progress across three key dimensions: “Basic Human Needs”, “Foundations of Well-being”, and “Opportunity”. Each dimension is further divided into specific criteria, allowing for a detailed evaluation of societal development (Figure 2). Accordingly, this comprehensive framework enables SPI to capture a broader range of factors, including human well-being, environmental quality, and social health.

While GDP remains the standard measure of economic performance, it has been criticised

for its inability to fully reflect socioeconomic progress, as it overlooks aspects such as environmental sustainability and individual well-being (Stern *et al.*, 2022). Consequently, there is increasing emphasis on multidimensional indices like SPI to provide a more accurate representation of modern development trends.

In Malaysia, the SPI ranks 54<sup>th</sup> out of 169 countries (Stern *et al.*, 2022), placing it in the second-highest rating in Southeast Asia after Singapore. However, a study by Inga-Hancco *et al.* (2021) has revealed significant disparities between urban and rural areas. This may distort the national SPI score and complicate accurate regional assessments of social progress. Moreover, this discrepancy underscores the limitation of relying solely on national data to reflect regional issues and development progress.

In regions like Southeast Asia, where comprehensive statistical data is often lacking (Rongen *et al.*, 2014), evaluating socioeconomic development, environmental conditions, and human well-being poses particular challenges. This lack of data hinders accurate assessments of tourism’s impact on local communities, where the expected benefits may not materialise and in

**Global Social Progress Index**



Figure 2: Defined demographic indicator in Social Progress Index (SPI)

some cases, tourism may contribute to cultural, social, and environmental degradation (Azam *et al.*, 2018). Relying on national-level data alone can lead to inaccurate evaluations of regional development, potentially impeding sustainable tourism initiatives.

Introducing IPA offers a valuable alternative in contexts with limited demographic data. While IPA provides useful insights into satisfaction and performance, it has been critiqued for not fully capturing the complexity of these factors (Oh, 2001). Notably, by integrating SPI's multidimensional approach, this study aims to enhance the analysis of local community needs. This combination allows for a more nuanced understanding of subjective priorities, addressing IPA's limitations, and offering a more comprehensive evaluation.

The strength of this study lies in its integration of subjective community perspectives with SPI, an approach often overlooked by conventional economic indicators. Thus, the methodology provides a more holistic view of sustainable tourism development, accounting for economic growth, the well-being of local communities, and environmental conservation. However, it is essential to note that this combined approach also introduces complexity, requiring more in-depth data collection and analysis, which may present logistical challenges. Despite these challenges, this methodology offers a more robust framework for understanding and improving sustainable tourism outcomes.

## Materials and Methods

### *Questionnaire Design*

In this study, we employed a questionnaire survey as the primary data collection method. The survey was divided into two sections. Section I focuses on collecting general demographic information to calculate traditional development indices. In contrast, Section II assesses the performance of selective factors from the community perspectives utilising the IPA and SPI approaches.

For demographic data, we follow the Department of Statistics Malaysia's 2010 MyCensus survey format. Section II comprises 19 questions (factors) organised into four categories: "Lifestyle", "Environmental", "Socioeconomic", and "Overall". The first three categories comprised six factors each, whereas the "Overall" category consisted of one factor. In the "Lifestyle" category, we examined "Water Supply", "Electricity Supply", "Food Expenses", "Health Status", "House Conditions", and "COVID-19 Impact". The "Environmental" category included "Solid Waste", "Marine Pollution", "Management", "Landscape", "Ecotourism", and "Conservation Activity". The "Socioeconomic" category covered "Economy", "Income", "Job Opportunities", "Government Support", "Community Relationships", and "Local Contributions".

These factors were selected with references to BIMP-EAGA (2017) and Sulehan and Gabir (2021), focusing on key issues affecting Mantanani Besar Island to better understand the local community's perceptions of the social and environmental impacts.

Performance of each factor was evaluated using a 5-point Likert scale (1 = Very Bad, 2 = Bad, 3 = Normal, 4 = Good, and 5 = Very Good). The survey was conducted in English and Malay to ensure clear understanding.

### *Sampling and Data Collection*

Data collection took place in the local communities of Siring Bukit and Padang villages on Mantanani Besar Island, located in northwest Sabah, Malaysia (Figure 3). The island covers an area of 2.06 km<sup>2</sup>, with coordinates at 6°42'46.8" N latitude and 116°21'19.08" E longitude. Data was collected between the 21<sup>st</sup> and 25<sup>th</sup> of November 2022 through face-to-face interviews covering every household on the island. The study primarily focused on long-term residents living on the island for more than five years to ensure accurate reflections of development levels. This includes short-term residents or individuals from other regions, which would have compromised this accuracy. Note that

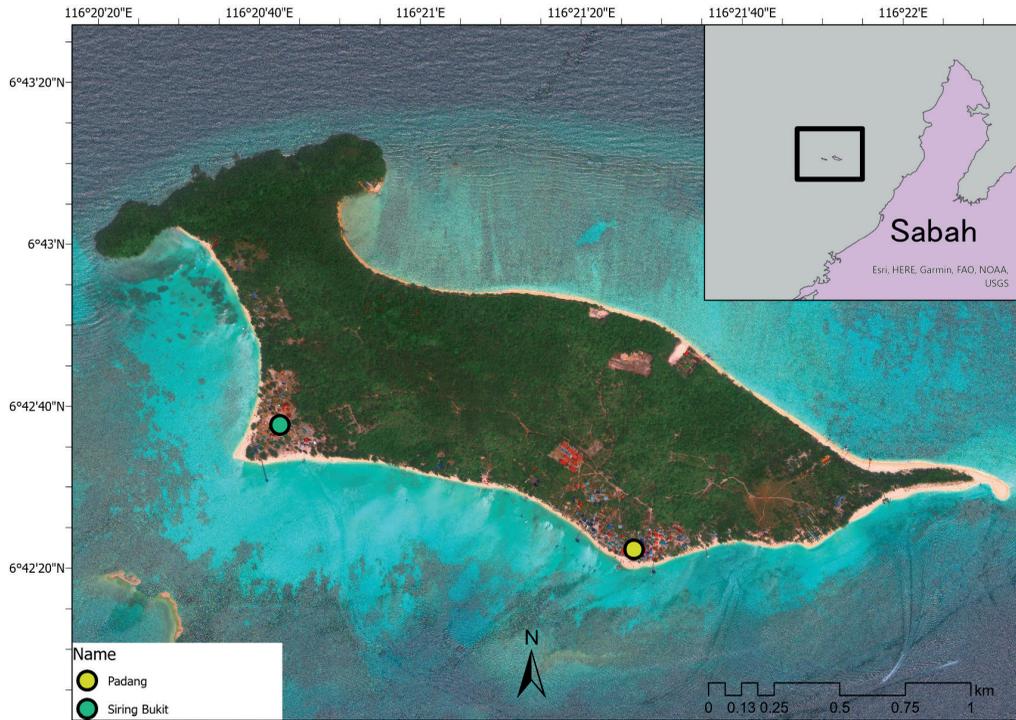


Figure 3: Location of Mantanani Besar Island

respondents mainly consisted of household heads and their parents. The survey respondents mainly consisted of household heads and their partners. Out of 122 participating households, data from 120 (98%) was deemed valid.

**Development Indices**

This study estimates regional human development levels based on the theoretical framework established by UNDP (UNDP, 2022). Using demographic data from the questionnaire survey in Section I, we calculated the Human Development Index (HDI) and the Gender Development Index (GDI). The HDI, developed by economist, Mahbub ul Haq and the GDI, introduced by the UNDP measure gender gaps in human development achievements. These indices serve as simple yet comprehensive metrics to evaluate living standards and human progress. They are particularly valuable in regions with limited data, as they provide relatively accurate indicators of quality of life.

The HDI and GDI calculation is based on three key dimensions: Life expectancy (Life Expectancy Index), mean years of schooling (Education Index), and Gross National Income (GNI: Economic Index) (UNDP, 2022). To facilitate comparison between the national and regional levels, the GNI value was adjusted from global to Malaysia’s national standard. Notably, this adjustment was necessary to avoid discrepancies that could arise from applying international standards to the development levels of Mantanani Besar Island. The formulas used for these calculations are as follows:

$$HDI = \frac{1}{3}(I_{Health} + I_{Education} + I_{Income}), \quad (1)$$

$$GDI = \frac{HDI \text{ in Female}}{HDI \text{ in Male}}, \quad (2)$$

where “ $I_{Health}$ ” represents the Life Expectancy Index, “ $I_{Education}$ ” stands for Education Index, and “ $I_{Income}$ ” indicates the GNI Per Capita Index.

For each index, the “Min-Max” linear transformation was utilised, given by the formula:

$$\frac{(I-I_{min})}{(I_{max}-I_{min})} \tag{3}$$

where “*I*” represents the actual value calculated from the questionnaire survey.

Due to the lack of population and mortality data for calculating “*I<sub>Health</sub>*” on Mantanani Besar Island, this study applied Lotka’s (1939) age-specific survival method using population data:

$$I_{Health} = \frac{\sum l_{x+n+1}}{l_x} + 0.5, \tag{4}$$

where “*l<sub>x</sub>*” represents the actual survival count in each age stage “*x*” and “*n + I*” represents the mortality rate from year *n* to year *n + I*.

Further, details on the calculation method and the minimum and maximum values for each index can be discovered in the UNDP 2021/2022 Technical Note. The index ranges from 0 to 1, with a value closer to 1 indicating higher development levels, and a value closer to 0 reflecting lower levels (Table 1).

**Measurement of Factors Importance and Performance Score**

In our research, we adopted Sagara *et al.* (2006) indirect approaches to measure importance and performance scores. The indirect approach is considered more effective at capturing variations in overall satisfaction compared to direct performance scoring (Shinfuku & Sasajima, 2023). The performance score was calculated by determining the proportion of responses rated as “Good: 4” and “Very Good: 5” for each factor relative to the total number of respondents. The importance variable was computed by calculating the correlation coefficient between

each factor and the “Overall” score. Moreover, the performance scores and importance variables were standardised to the same scale to ensure comparability, with 50 as the central value. Following the approach of Sagara *et al.* (2006), improvement scores were determined based on the quadrant position of each factor, which was subsequently adjusted for the SPI calculation.

The reliability and validity of respondents’ evaluations were assessed using Cronbach’s alpha coefficient for all factors and categories. An item was considered to have high consistency and internal validity if its Cronbach’s alpha exceeded 0.60 (Haynes *et al.*, 1995). The alpha value ranges from 0 to 1, with a higher value indicating high reliability.

**Modified Social Progress Index**

To calculate the SPI, we modified the traditional SPI calculation method described by Stern *et al.* (2022). According to Stern *et al.* (2022), SPI calculations require complete data and standardised scales. We addressed data insufficiencies by selectively choosing factors in the questionnaire and applying standardised scores from IPA. Furthermore, this approach strengthens the datasets, differing from Stern *et al.* (2022) method primarily in the score calculation process. While the traditional SPI uses Principal Component Analysis (PCA) to assign weights and transform these into component scores, our method applied equal weighting to each factor’s performance and importance values, averaging these to derive scores. Note that PCA was not applied in this study since IPA already incorporates dimension reduction steps similar to PCA’s variable relationships and pattern extraction. The resulting SPI scores were further

Table 1: Categories of development level

Class Category	HDI*	GDI*
Very high	≥ 0.8	≥ 0.9
High	0.7-0.79	0.8-0.89
Medium	0.55-0.69	0.7-0.79
Low	≤ 0.54	≤ 0.69

\*Authors’ estimations.

adjusted using improvement scores based on the quadrant classification of the IPA matrix (Table 2).

Consequently, we calculated the SPI scores for each category and overall SPI by averaging the scores of all categories (Stern *et al.*, 2022). The SPI scores range from 0 to 100, where 0 represents the lowest satisfaction level, and 100 represents the highest.

In the final stage of our analysis, we utilised R software version 4.2.3 (<https://www.R-project.org/>) and applied a Kruskal-Wallis test to identify significant differences in average satisfaction levels across categories. The null hypothesis assumed no differences between the measured values across categories and a significance threshold was set at  $p \leq 0.05$ .

## Results and Discussion

### Demographic Profile

Table 3 presents the demographic information of the local communities on Mantanani Besar Island. The respondents comprised 102 males and 115 females from 120 households, with an average household size of five, resulting in a total population of 561. The male-to-female ratio was nearly equal, with 285 males (50.8%) and 276 females (49.2%). The largest age group was 40 to 50 years (33.3%) while the smallest was those aged 60 and above (6.7%). Ethnically, the Bajau group was predominant, accounting for 548 individuals (97.7%), followed by Kadazan/Dusun ( $n = 6$ , 1.1%), and other ethnic groups ( $n = 7$ , 1.2%). The primary occupations included fisheries (36.9%), tourism (3.7%), and school teaching (2.8%). A notable proportion

of respondents reported unemployment, which reflects the challenging local economic conditions.

On the other hand, Sulehan and Gabir (2021) suggested that introducing sustainable tourism development can improve the social environment of local communities. However, our findings reveal that the local community on Mantanani Besar Island has not fully benefited from employment opportunities linked to the tourism industry, nor have they received adequate income from such activities (BIMP-EAGA, 2017). This issue has been exacerbated by the COVID-19 pandemic, drastically reducing tourist numbers and negatively impacting the local social environment (Gössling *et al.*, 2020). Additionally, the decline in tourism has led to the closure of several tourism-related facilities, raising environmental concerns due to abandoned structures.

In terms of monthly income, approximately half of the households ( $n = 104$ , 47.4%) reported no income. According to the Department of Statistics Malaysia (2022), most households were classified below the poverty line between 2005 and 2020. Respondents in this study can be considered “significantly poor”, with 68 households (31.3%) earning less than the average monthly income of RM357.00. Considering these circumstances, future sustainable tourism development efforts must strengthen employment opportunities and promote community-led initiatives that preserve cultural identity and support environmental conservation. This approach is essential for reducing poverty and achieving sustainable economic development within the local community.

Table 2: Categories of SPI scores

Class Category	Adjustment	Score Range
Possible over kill	+	$\geq 80$
Keep up the good work	No adjustment	61-80
Concentrate here	No adjustment	41-60
Need to improve	-	$\leq 40$

Table 3: Demographic profile of respondents

<b>Demographic Profile (n = 561)</b>		<b>Counts</b>	<b>Percentage (%)</b>
Gender	Male	285	50.8
	Female	276	49.2
Ethnic	Bajau	548	97.7
	Kadazan/Dusun	6	1.1
	Others	7	1.2
<b>Demographic Profile (n = 120)</b>			
Age stage (years old)	20-30	19	15.8
	30-40	26	21.7
	40-50	40	33.3
	50-60	27	22.5
	60+	8	6.7
<b>Demographic Profile (n = 217)</b>			
Education	Uneducated	58	26.7
	Primary	80	36.9
	Secondary	71	32.7
	University/college	8	3.7
Occupation	Business	3	1.4
	Fishery	80	36.9
	Homestay	1	<1.0
	Security	3	1.4
	Seller	2	1.0
	Teacher	6	2.8
	Tourism	8	3.7
	Other	5	2.3
None	109	50.2	
Poverty line*	No income	104	48.0
	Lesser than average (< RM357.00)	45	21.0
	Higher than average (> RM357.00)	68	31.3
	Higher than DOSM 2005 (> RM980.00)	25	11.5
	Higher than DOSM 2020 (> RM2,208.00)	4	1.8

Note: \*Poverty line adapted from Department of Statistics Malaysia in 2022.

### **Development Score**

Table 4 compares the HDI and GDI scores for Mantanani Besar Island with Malaysia's national scores. According to UNDP (2022), Malaysia ranks 62<sup>nd</sup> in HDI and 60<sup>th</sup> in GDI among 189 nations, indicating substantial

development progress. However, Yassin *et al.* (2011) emphasised that while Malaysia has experienced significant economic growth, these benefits often fail to reach local communities at the regional level.

Table 4: Development score in Mantanani Besar Island and Malaysia

	HDI	GDI	Female HDI	Male HDI
Mantanani Besar Island	0.51	0.66	0.65	0.44
Malaysia	0.83	0.98	0.79	0.81

Our research supports Yassin *et al.*'s (2011) findings, highlighting the low development level on Mantanani Besar Island and the stark disparities between national and regional levels. It is essential to note, however, that the methodological differences between our study, which employed the UNDP (2022) method. Meanwhile, Yassin *et al.*'s (2011) survey-based approach suggests further comparative studies using their methods to assess score accuracy. Considering the limited research on regional development scores in Malaysia, our study provides valuable benchmarks for evaluating future regional development trajectories.

Life expectancy on Mantanani Besar Island was 79.6 years, surpassing the national average of 73.6 years (UNDP, 2022), indicating no health-related issues as measured by HDI and GDI. Despite that, income performance, inferred from demographic data was low and the limited educational opportunities on the small island further contributed to the lower development score. Given the island's small size (2 km<sup>2</sup>), expanding educational facilities is challenging.

Additionally, the income disparity highlighted by BIMP-EAGA (2017) underscores the limitations of current development indices in addressing these regional issues effectively.

Alternatively, Rasyid (2019) and Sulehan and Gabir (2021) argued that tourism development could improve socioeconomic and environmental conditions by empowering the local community. Conversely, our findings suggest that addressing region-specific challenges remains difficult without clear identification of improvement factors through appropriate development indices. This highlights the inadequacy of relying solely on specific statistical indicators for assessing regional development and underscores the need for more tailored approaches.

**Importance-Performance Analysis**

Figure 4 presents the IPA results, with detailed scores for performance, importance, improvement, and reliability provided in Table 5. The plot includes 18 factors categorised into three

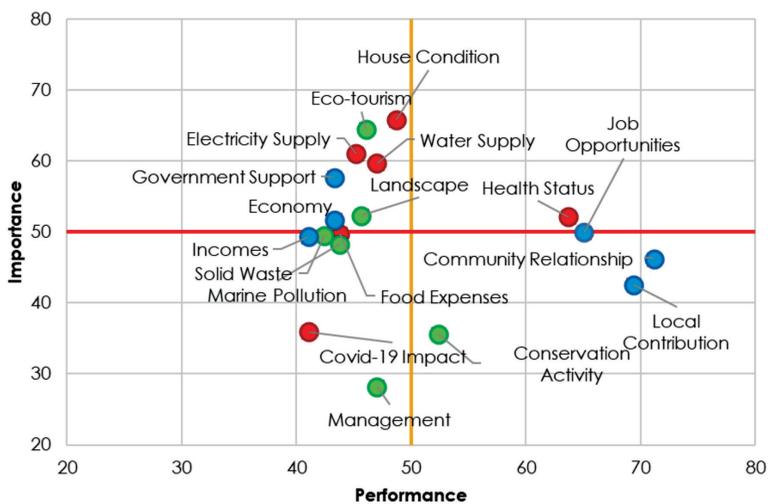


Figure 4: IPA results: Graphical presentation of all responses calculated by Sagara *et al.* (2006)

groups. In terms of performance, “Community Relationship” (71.1) in the socioeconomic category ranked highest, indicating a stable local social structure. Regarding importance, “House Condition” (65.8) in the lifestyle category emerged as the most critical issue for the local community, particularly concerning specific lifestyle challenges. Note that most factors across all categories scored below average in performance, suggesting dissatisfaction within the community. In particular, factors such as “House Condition”, “Electricity Supply”, “Water Supply”, “Ecotourism”, “Landscape”, “Government Support”, and “Economy” exceeded the average importance score, reflecting their significant influence on overall satisfaction.

These factors, previously undefined through traditional development indices, underscore the effectiveness of this analysis in identifying region-specific challenges. Several align with previous studies (BIMP-EAGA, 2017; Sulehan & Gabir, 2021), allowing us to infer underlying causes and demonstrate the value of this approach in uncovering potential root issues. Below is an exploration of factors identified within each quadrant. Quadrant I (Keep up the good work) features “Health Status” from the lifestyle category stands out, excelling in both performance and importance. This factor reflects the island’s strengths in satisfaction, with 63.7 for performance and 52.1 for importance (Table 5). Furthermore, this finding is consistent with our previous research on life expectancy, as indicated by HDI and GDI indices. Notably, the island boasts a life expectancy of 79.6 years (based on HDI), surpassing the Malaysian national average of 73.6 years. This high score reinforces the reliability result as a just-right satisfied factor among the 18 factors evaluated.

Quadrant II, labelled “Concentrate Here”, includes seven factors: The “House Condition”, “Ecotourism”, “Electricity Supply”, “Water Supply”, “Government Support”, “Landscape”, and “Economy”. These factors are recognised as necessary. However, their low-performance scores indicate critical areas that need

improvement to enhance community satisfaction and sustainable tourism development on the island. Regarding lifestyle categories, the inadequate “Water Supply” and electricity infrastructure support (“Electricity Supply”) are the findings of BIMP-EAGA (2017). Note that residents rely on purchasing water bottles or privately sourcing and storing them in tanks. At the same time, electricity is supplied by small generators, which only operate from 18:00 to 06:00, which is insufficient to meet the community’s needs (Hamid *et al.*, 2021).

However, BIMP-EAGA (2017) reported that plans for tourism infrastructure were not approved by local governments, which aligns with our findings on the lack of “Government Support”. This underscores the importance of stakeholder consultations regarding the impact of tourism, as highlighted by Raysid (2019) and Sulehan and Gabir (2021). Additionally, the factor “Economy” reflects the inadequate preparation for the tourism boom and the resulting lack of employment opportunities for the local community, as noted by BIMP-EAGA (2017). This mismatch has led to unmet community needs for tourism development. While “Economy” aligns with our HDI and GDI measurements, these indices failed to clarify the underlying issues requiring economic improvement.

The local community is also concerned about the degradation of the “Landscape”. Although the ReefCheck organisation has implemented conservation efforts, these activities have largely focused on marine ecosystems (BIMP-EAGA, 2017; Sulehan & Gabir, 2021), neglecting the terrestrial land cover changes caused by tourism development. Rasyid (2019) advocated involving the local community in environmental conservation efforts to support sustainable tourism development. However, challenges related to “Ecotourism” remain unclear, highlighting the need for socioeconomic support and environmental training for the community when implementing tourism projects.

Historically, the local community held land rights on Mantanani Besar Island, who

sold or leased land to tourism companies under conditions meant to ensure a social environment (BIMP-EAGA, 2017). However, our study reveals that these conditions have not sufficiently reflected the community's interests. Therefore, future tourism development must align with local needs and include infrastructure that supports the community's social and environmental well-being.

In Quadrant III, labelled "Low Priority", six factors are identified: "Incomes", "Solid Waste", "Marine Pollution", "Food Expenses", "COVID-19 Impact", and "Management". Among these, "Incomes" stands out as a key factor requiring improvement, as indicated by our HDI and GDI results. The lowest satisfaction with the "COVID-19 Impact" is considered an area of future concern for the local community, particularly in the context of sustainable tourism development and tourist loss. Additionally, "Solid Waste", "Marine Pollution", and "Food Expenses" are significant factors that could potentially be reclassified into Quadrant II for priority improvement. Regarding environmental issues, Sulehan and Gabir (2021) emphasised strengthening the island's "Management" and increasing awareness through participatory "Landscape" conservation efforts. While the ongoing cooperative conservation activities between the local community and the ReefCheck organisation reflect positive engagement (Rasyid, 2019), their placement in this quadrant suggests that these efforts are not yet perceived as significantly contributing to community satisfaction. This indicates the need for a new approach integrating environmental conservation with socioeconomic benefits.

Finally, Quadrant IV (Possible Overkill) includes four factors: "Community Relationship", "Local Contribution", "Job Opportunities", and "Conservation Activity". Initially, this quadrant generally suggests that these factors do not require immediate focus (Rodriguez-Valencia *et al.*, 2019). Efforts to improve them should still be maintained. Over time, these factors could change in importance or performance and potentially

shift to Quadrant I or IV as they become more impactful. Furthermore, factors located near the borderline of other quadrants deserve special attention, as extreme evaluations may lead to misunderstandings (Oh, 2001) and they may act as hidden factors for higher satisfaction.

For instance, "Conservation Activity", which is plotted near Quadrant III is identified by Sulehan and Gabir (2021) as a beneficial action for improving the island's "landscape". However, despite these conservation efforts, the socioeconomic impact has not yet been clearly demonstrated, leading to skepticism about its relevance to the local community's needs. Rasyid (2019) suggested introducing job opportunities related to environmental conservation within the local community could support sustainable tourism development and enhance the social environment. However, placing these factors in Quadrant IV highlights the complexity of determining whether improvements should be made based solely on this method.

In conclusion, it is essential to note that relying only on the IPA results does not provide a complete understanding of the situation. Thus, further qualitative and contextual analysis is required to determine the most appropriate interventions for sustainable development.

### ***Community Perspectives Satisfaction Level***

Figure 5 presents the SPI result, with an overall satisfaction score of 52.4%, denoting moderate satisfaction within the island's community. While no significant differences were observed in the mean satisfaction score of each category ( $p = 0.28$ ), individual measurements provide valuable insights.

In the lifestyle category, the score stands at 49.7%. Notably, "Health Status" (66.4%) and "House Condition" (64.0%) were the factors with the highest satisfaction levels. "Health Status" aligns with past demographic data and the IPA results, confirming its reliability. On the other hand, "House Condition" shifted from Quadrant II to Quadrant I (Figures 4 and 5). This shift suggests that the results remain consistent

Table 5: IPA mean scores and reliability test results

	Mean Score		Improvement	Cronbach Alpha
	Performance	Importance		
<b>Lifestyle</b>				<b>0.78</b>
Water supply	47.0	59.7	0	0.71
Electricity supply	45.2	61.1	0	0.70
Food expenses	43.8	49.7	-2.61	0.74
Health status	63.7	52.1	0	0.77
House condition	48.7	65.8	0	0.68
COVID-19 impact	41.1	35.9	-5.75	0.84
<b>Environmental</b>				<b>0.65</b>
Solid waste	42.4	49.5	-3.06	0.66
Marine pollution	43.8	48.3	-2.70	0.59
Management	47.0	28.2	-9.52	0.65
Landscape	45.7	52.3	0	0.44
Ecotourism	46.1	64.5	0	0.49
Conservation activity	52.4	35.6	7.91	0.69
<b>Socioeconomic</b>				<b>0.81</b>
Economy	43.3	51.7	0	0.77
Incomes	41.1	49.3	-3.46	0.78
Job opportunities	65.1	49.9	10.3	0.77
Government support	43.3	57.7	0	0.81
Community relationship	71.1	46.1	16.6	0.78
Local contribution	69.3	42.6	15.8	0.78
<b>Overall (Average)</b>	<b>50</b>	<b>50</b>		<b>0.90</b>

even if the importance and satisfaction levels of “House Condition” are reversed. To verify this, a comparison of Cronbach’s alpha coefficients for the lifestyle category and “House Condition” was conducted (Table 4). The lifestyle category presented a value of 0.78 while “House Conditions” revealed 0.68. Excluding “House Condition” would reduce the overall reliability to 0.68, indicating that “House Condition’s” satisfaction level is reliable and can help clarify the complex prioritisation missed by IPA.

“Water Supply” (56.1%) and “Electricity Supply” (55.2%) scored below the average, supporting the findings of Hamid *et al.* (2021), which identified these as areas needing improvement for the local community. Meanwhile, “COVID-19 Impact” had the lowest satisfaction score and excluding it raised the overall reliability to 0.84 (Table 5). However, considering the concerns over future tourism decline noted by the local community (BIMP-EAGA, 2017), excluding this factor would not

be appropriate. Note that Cronbach's alpha coefficient assesses the internal consistency within a category, evaluating the validity of individual factors. In the case of "COVID-19 Impact", although most residents provided similar responses, its results differed from the overall consistency within the category, leading to a lower reliability score. Nevertheless, the community strongly desires improvements related to this factor, suggesting it should not be excluded in future satisfaction evaluations. Additionally, strengthening COVID-19 measures may lead to increased tourism, which could, in turn, promote infrastructure development and improve the social environment for stakeholders.

Among the three categories, the environmental category recorded the lowest satisfaction score at 40.1%, suggesting significant dissatisfaction with the environmental aspects of tourism development. The factor with the highest satisfaction in this category was "Ecotourism" (59.4%), indicating that some aspects of tourism development have garnered moderate satisfaction in addressing the social environment needs of the local community. However, according to BIMP-EAGA (2017), sufficient employment and socioeconomic support for the local community have not yet been fully established. Therefore, by shifting environmental management and conservation activities to a community-led approach, stakeholders in ecotourism could establish educational programs and create sustainable tourism-related employment opportunities. This would provide both environmental and economic benefits, enhancing the social environment improvements on the island and meeting the needs of the local community.

In contrast, satisfaction with "Management" was the lowest (7.5%), highlighting concerns related to "Landscape" (47.3%), "Solid Waste" (35.9%), and "Marine Pollution" (36.9%), which underscore the lack of adequate measures to address the island's environmental issues. Sulehan and Gabor (2021) expressed concerns about the environmental impacts of tourism and

suggested that community-driven conservation efforts are essential for improving environmental outcomes. Despite that, the lack of significant improvement in environmental management and pollution issues reflects the prominent needs of the local community, which were clarified in our research.

"Ecotourism" and "Landscape" have been identified as key factors for meeting community needs within the environmental category. Note that Cronbach's alpha values of 0.49 and 0.44 indicate high reliability. This highlights the necessity of improving the island's landscape while advancing ecotourism to improve the social environment for the local community through future tourism development.

Meanwhile, "Conservation Activities" (53.1%) initially classified as "Possible Overkill" shifted to "Concentrate Here", suggesting that while progress has been made in conservation efforts, there remains a need for further improvement in environmental conditions. Specifically, ReefCheck largely leads the island's environmental management. Nonetheless, the local community is not benefiting sufficiently from the socioeconomic gains. Thus, adopting a community-led approach, as recommended by Rasyid (2019) could catalyse further improvements in the social environment.

In the socioeconomic category, the satisfaction score was 67.3%. "Community Relationship" ranked highest at 98.9%, followed by "Local Contribution" (91.0%), and "Job Opportunities" (85.6%). The high scores for "Community Relationship" and "Local Contribution" suggest strong community cohesion and a positive view of local involvement in tourism development. However, the relatively high "Job Opportunities" score does not necessarily indicate optimal tourism development's impact on socioeconomic conditions. According to our demographic data, about 50% of the population remains unemployed, and only eight residents are directly involved in the tourism sector. This raises

questions about whether tourism development genuinely improves the local community’s socioeconomic situation.

BIMP-EAGA (2017) also noted that tourism’s economic benefits remain within the industry without significantly benefiting the local community. The high score for “Job Opportunities” might be due to alternative livelihoods such as fishing, which could mitigate dissatisfaction with job availability. However, this discrepancy questions the reliability of the “Job Opportunities” score, suggesting that while alternative employment exists, it does not lead to meaningful sustainable tourism development.

Despite the community’s expressed satisfaction with job availability, deeper socioeconomic and income-related challenges persist. These findings highlight the need to assess the reliability of these results in the context of the broader socioeconomic landscape.

On the other hand, factors like “Government Support” (50.0%), “Economy” (44.8%), and “Incomes” (33.6%) received lower ratings. These low scores, particularly for “Incomes” and “Economy”, align with our HDI and GDI results,

reinforcing the economic challenges faced by the community. Moreover, the need for stronger “Government Support” is a recurring theme in related studies (BIMP-EAGA, 2017; Rasyid, 2019). These findings suggest that while certain aspects of the community’s livelihood receive positive feedback, fundamental socioeconomic issues remain a significant concern.

Thus, when implementing tourism development, engaging stakeholders and focusing on community-led ecotourism and environmental management is crucial. Moreover, providing employment opportunities in these areas can improve the living conditions of the local community. This approach aligns with Rasyid (2019), who advocated for sustainable tourism development.

Overall, our integrated IPA and SPI approach provides insights comparable to development indices and has proven valuable in identifying local issues that traditional indices may not reveal. Therefore, future research should conduct satisfaction surveys on these factors to understand community needs better and advance sustainable tourism development.

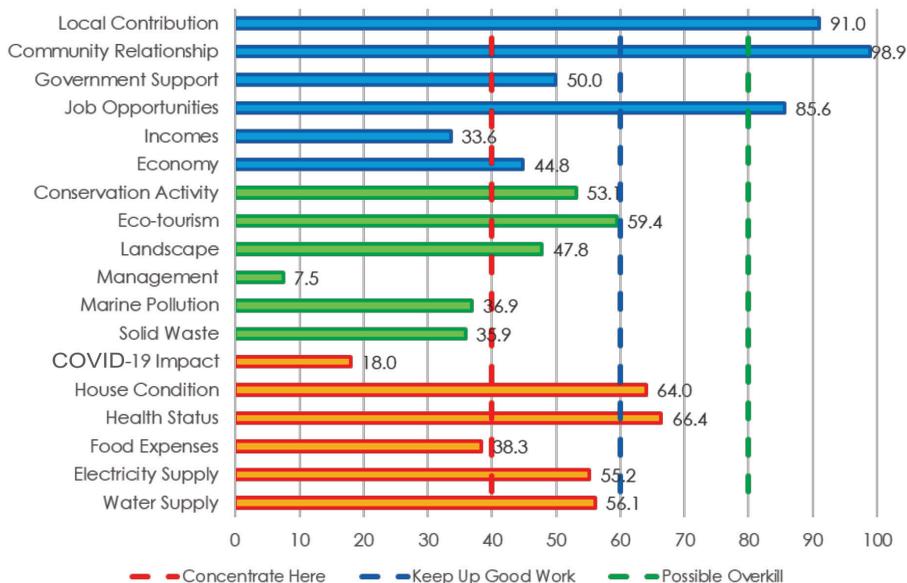


Figure 5: Each factor’s SPI score in Mantanani Besar Island

## Conclusions and Recommendation

Over time, various indices have been developed using demographic data to measure development levels from social, economic, and environmental aspects. Nonetheless, each index has limitations and does not provide a complete assessment. As applied in this study, the integrated analysis of IPA and SPI emerges as a valuable tool, shedding light on community well-being and the social environment from a community's subjective perspective, particularly in demographic data-scarce regions like Mantanani Besar Island. The careful selection of factors and thoughtful data interpretation remain crucial, especially considering each method's strengths (flexibility to freely select the factors) and drawbacks (importance of selective factors in target regions). Hence, by exploring our novel methodologies, this study opens up new avenues for enhancing sustainable development metrics.

Our innovative approach emphasises the significance of incorporating local subjective perspectives, laying the foundation for a more comprehensive understanding of sustainable development at the regional levels. Furthermore, our findings suggest emphasising government or organisational social environment support and improving community needs from the low scores. This, while simultaneously promoting environmental management, is expected to contribute significantly to the sustainable development of tourism on Mantanani Besar Island.

### Limitation of Questionnaire Design

While the questionnaire design had its challenges in factor selection, these were addressed with a focus on ensuring relevance to the local context. The factors were guided by the unique characteristics of the previous study (BIMP-EAGA, 2017; Sulehan & Gabir, 2021) rather than strictly adhering to the definition of the United Nations' SDGs. Notably, this allowed for a more tailored and context-specific assessment in Mantanani Besar Island, although future research might benefit

from aligning more closely with the SDGs for a broader analysis (Pavelka *et al.*, 2023). Our approach successfully balanced the need for comprehensive data collection with the practical considerations of survey length and respondent engagement (e.g., Sharma, 2022).

Additionally, while our 1-5-point Likert scale provided consistent measures, we acknowledge the potential for more nuanced responses with a 7-point Likert scale, which could reduce neutral responses and offer deeper insights (Joshi *et al.*, 2015).

### Social Progress Index's Calculation Methods

The study employed an indirect approach based on Sagara *et al.* (2006). While this method was effective, it is vital to recognise the potential limitations of relying solely on statistical measurement. To enhance the reliability of our modeling, future studies should consider comparing different models and approaches, allowing for a more robust analysis of community satisfaction (Rodriguez-Valencia *et al.*, 2019). This possibility of misinterpretations, especially in cases where responses may not accurately reflect the true state of the local community (Oh, 2001). In essence, this approach would mitigate the risk of overlooking critical factors and ensure a more accurate and reliable assessment.

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### Conflict of Interest Statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial, or financial conflicts and declare the absence of conflicting interests with the funders.

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