

Designing a socio-development index framework for the Orang Asli Community using the Analytic Hierarchy Process

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Abstract

Despite many development programmes introduced since Malaysia's independence in 1957, the Orang Asli community remains relatively marginalised in key areas such as land ownership, education, healthcare, and income. Existing national development indicators, particularly income-based measures, do not fully reflect the specific needs and priorities of Indigenous communities. This study addresses this gap by developing a structured socio-development index for the Orang Asli. The study uses the Analytic Hierarchy Process (AHP), a multi-criteria decision-making method that applies expert judgment to compare indicators in pairs and assign relative importance weights in a systematic way. Fourteen experts participated in identifying and prioritising socio-development indicators through pairwise comparisons. The final index consists of nine main indicators and thirty-two sub-indicators. The results show that land recognition is the most important indicator, followed by healthcare, policy and legislation, educational achievement, economic empowerment, infrastructure, leadership empowerment, cultural heritage, and environmental sustainability. These results indicate that Orang Asli development priorities are mainly focused on structural rights and access to basic services rather than income alone. The main contribution of this study is the development of a validated and prioritised Indigenous socio-development index. Unlike conventional development indices, this index reflects the actual hierarchy of needs based on AHP-derived weights. It provides a practical tool for policymakers and researchers to measure, monitor, and improve Orang Asli socio-development in a more targeted and context-specific way.

Keywords: Analytic Hierarchy Process (AHP), index framework, multi-criteria decision-making, Orang Asli, socio-development

Introduction

Malaysia is a diverse, multi-ethnic nation where economic and social development has improved the well-being of many communities. However, the Orang Asli, the indigenous peoples of Peninsular Malaysia, maintain distinct ways of life, cultural traditions, spiritual beliefs, customs,

and legal systems that differ markedly from the dominant population. Despite decades of targeted programs through agencies such as the Department of Orang Asli Development (JAKOA), their socio-economic progress remains slow and uneven. Studies continue to highlight persistent disparities in education (Razak, 2022; Sawalludin et al., 2020), healthcare (Adenan et al., 2025), and economics (Khorl et al., 2024). For example, high dropout rates among Orang Asli children are linked to poverty, geographical isolation, and cultural barriers in formal schooling. Limited access to quality healthcare has resulted in poorer health outcomes, including malnutrition, preventable diseases, and inadequate maternal and child services. Economically, although some have transitioned to wage labor or small-scale entrepreneurship, many still face low income and job insecurity, especially those who have lost traditional lands and resources.

The Malaysian government, primarily through JAKOA, has embarked on comprehensive development programs for the Orang Asli, covering infrastructure, housing, public facilities, and access to basic utilities (Manaf et al., 2021). These initiatives include village resettlement programs, rural roads, provision of electricity and water supplies, social amenities, and education access. However, development efforts often focus mainly on physical infrastructure, education, or economic support without fully addressing cultural heritage, customary land rights, and environmental sustainability (Nicholas et al., 2010). The geographical distribution of Orang Asli communities further complicates equitable service delivery, with 37% living in remote areas (Masron et al., 2013). These challenges highlight the limitations of interventions that do not consider the interconnected and multidimensional nature of Orang Asli socio-development needs.

Currently, there is a lack of studies on socio-development assessment frameworks specifically designed for the Orang Asli community that integrate the diverse dimensions of their development. Existing indices and development benchmarks often overlook crucial socio-development aspects such as cultural preservation, land tenure security, and environmental sustainability. For example, Harun and Idris (2012), developed a Weighted Aboriginal Quality of Life Index covering eight indicators, emphasizing the importance of culturally relevant metrics. Omar (2016), proposed a Life Sustainability Index incorporating multiple indicators such as physical, natural, human, financial, social, and cultural capital. Abdullah et al. (2019) used a Multidimensional Poverty Index (MPI) approach to better capture poverty beyond income, focusing on education, health, living standards, and wealth. Saifullah (2022) also applied MPI to assess well-being among Indigenous peoples in Peninsular Malaysia, highlighting their higher risk of poverty due to limited access to education and employment. These studies underscore the need for an assessment framework that holistically captures the complex socio-development realities of the Orang Asli.

Therefore, this study aims to develop a socio-development assessment framework for the Orang Asli community. By applying the Analytic Hierarchy Process (AHP), the framework systematically prioritises relevant indicators and sub-indicators based on expert judgment. This allows a structured assessment of Orang Asli socio-development progress and provides a practical tool for policymakers and researchers to design more targeted and inclusive interventions. This approach supports the views of Hussain et al. (2017) and Ab Rahman et al. (2022), who emphasise that Indigenous development should consider land rights, cultural preservation, environmental sustainability, and social inclusion as key components of well-being.

Method

This study employed the Analytic Hierarchy Process (AHP) to develop a socio-development assessment framework for the Orang Asli community. AHP is a multi-criteria decision-making method developed by Saaty (2008) that structures complex decision problems into a hierarchical model and evaluates criteria through systematic pairwise comparisons. It is suitable for this study because it enables the prioritisation of socio-development indicators and sub-indicators based on expert judgment, producing quantitative weights that reflect their relative importance.

The indicators and sub-indicators used in this study were derived from a prior Fuzzy Delphi Method (FDM) study conducted by Zulkipli et al. (2026). The identification process aimed to determine the essential components that contribute to the socio-development, well-being, and advancement of the Orang Asli community. To ensure contextual relevance, the process involved a comprehensive review of existing socio-development frameworks together with expert evaluation and consensus, enabling the selected indicators to reflect the specific needs and socio-cultural realities of the Orang Asli community. The Fuzzy Delphi Method is a structured consensus-building technique that combines fuzzy set theory with the Delphi method, allowing experts to express judgments under uncertainty while achieving consensus (Che Jamaludin et al., 2025; Hsu & Sandford, 2007). In the earlier study, experts evaluated a broad set of socio-development indicators for the Orang Asli context. After the consensus process, only indicators that reached agreement were retained. As a result, nine main indicators and 32 sub-indicators were confirmed and used as inputs for the AHP analysis in this study (Zulkipli et al., 2026).

In the AHP stage, experts conducted pairwise comparisons between indicators and sub-indicators using a structured scale to determine their relative importance. These comparisons were processed using standard AHP procedures, including eigenvalue estimation and consistency ratio analysis, to ensure logical consistency in expert judgments (Saaty, 2008). The resulting weights were then aggregated to produce the final ranking of socio-development indicators within the framework.

Sample of the study

This study used a purposive sample of 14 experts. This approach is appropriate for the Analytic Hierarchy Process (AHP) because it relies on informed expert judgment rather than large or random samples (Waris et al., 2019; Zulkefli et al., 2026). Experts were selected based on their knowledge and experience in Orang Asli socio-development to ensure that the evaluation reflects informed decision-making.

The selection criteria included (i) strong knowledge of Orang Asli socio-development issues, (ii) at least five years of professional experience, (iii) minimum bachelor's degree (with doctoral degree preferred for academic experts), (iv) willingness to participate throughout the study, and (v) ability to communicate effectively during expert evaluation sessions (Jamaludin et al., 2025; Zulkefli et al., 2024).

The expert panel consisted of academicians, policymakers, practitioners (including officers from JAKOA and related agencies), legal professionals, and Orang Asli individuals working in professional fields such as academia, law, and public administration. This composition ensured that the evaluation was based on informed and relevant expert perspectives.

In terms of composition, policymakers accounted for 42.86%, non-governmental organisation (NGO) representatives 35.71%, and academics 21.43%. Regarding academic qualifications, 35.71% held doctoral degrees, 28.57% held master's degrees, 28.57% held bachelor's degrees, and 7.14% held diplomas. The average working experience among the experts was 33.33 years, indicating a high level of professional exposure in relevant fields.

Data analysis

The data in this study were analyzed using Expert Choice software, Version 11.0, a widely used tool for Analytic Hierarchy Process (AHP) analysis. The responses of the experts were evaluated to determine the relative weights of each indicator and sub-indicator, which were subsequently used to develop the socio-development assessment framework. The AHP procedure is as follows:

1. Defining the problem: The first step in AHP is to identify the problem and determine the knowledge required to address it. In this study, the objective was to develop a socio-development assessment framework for the Orang Asli community.
2. Building the hierarchical structure: A hierarchical model was constructed following a top-down approach (Waris et al., 2019). The first level represented the overall goal, the second level consisted of the main indicators, and the third level included the sub-indicators of the assessment framework.
3. Constructing pairwise comparison: Indicators and sub-indicators were compared in pairs to assess their relative importance in relation to higher-level criteria. The comparisons were rated using Saaty's nine-point scale, ranging from 1 (equal importance) to 9 (extreme importance) (Saaty, 2008).
4. Calculating the weightages: The relative importance of each indicator and sub-indicator was determined using eigenvector calculations. The resulting eigenvector was normalized to derive the weights, showing the relative importance of each element in the hierarchy (Khamkanya et al., 2012; Waris et al., 2019).
5. Calculating the Consistency Ratio (CR): The consistency of expert judgments was verified to ensure reliability. The CR was calculated using the following formulas:

i. Consistency Index (CI):

$$CI = \frac{(\lambda_{max} - n)}{(n - 1)}$$

where λ_{max} is the maximal eigenvalue; n is the matrix size.

ii. Consistency Ratio (CR):

$$CR = \frac{CI}{RI}$$

In AHP, a CR value ≤ 0.10 was considered acceptable (Jamaludin et al., 2025). However, if this threshold was exceeded, the pairwise comparisons needed to be revised accordingly.

6. Synthesis of the results: The final step involved integrating the local weights of all indicators and sub-indicators to obtain global weights for the sub-indicators. These weights formed the basis for the socio-development assessment framework.

Results

The socio-development index used in this study was developed based on a prior Fuzzy Delphi Method (FDM) study by Zulkipli et al. (2026). In that study, expert consensus was used to validate socio-development components for the Orang Asli context. The process resulted in nine main indicators and 32 sub-indicators, which were confirmed for inclusion. These validated components formed the basis for the Analytic Hierarchy Process (AHP) analysis in this study. The results show that 32 sub-indicators were included in the socio-development index. These are organised under nine main indicators: Level of Educational Achievement, Complete Infrastructure, Economic Empowerment, Environmental Sustainability, Leadership Empowerment, Land Recognition, Level of Health Care, Policy and Legislation, and Cultural Heritage Empowerment. These nine indicators form the hierarchical structure used in the AHP model for weighting and prioritisation.

Data were collected from 14 experts. The AHP analysis was conducted using pairwise comparisons to determine the relative importance of each indicator and sub-indicator. The resulting weights reflect expert judgments on the priority of each component in the socio-development index. The consistency ratio (CR) values for all pairwise comparison matrices ranged from 0.00 to 0.05, which is below the acceptable threshold of 0.10. The overall CR for the model was 0.02, indicating a high level of consistency in expert judgments and confirming the reliability of the results. The global weights and rankings of the nine indicators are presented in Table 1. Land Recognition was ranked as the most important indicator (0.198), followed by Level of Educational Achievement (0.138) and Policy and Legislation (0.137). Environmental Sustainability recorded the lowest weight (0.055).

Table 1. Weightage of indicators for the Orang Asli socio-development index in Perak

Indicator	Global weight	Ranking
Land recognition	0.198	1
Level of educational achievement	0.138	2
Policy and legislation	0.137	3
Health care level	0.113	4
Economic empowerment	0.113	5
Complete infrastructure	0.111	6
Leadership empowerment	0.077	7
Cultural heritage conservation	0.059	8
Environmental sustainability	0.055	9

Note. CR = consistency ratio. Consistency ratio for the indicator-level matrix = 0.02.

The predominance of land recognition underscores the fundamental role of secure land tenure in Orang Asli socio-economic well-being, serving both as a material resource and as a cornerstone of cultural identity.

At the sub-indicator level, the AHP analysis produced CR values between 0.00 and 0.04, remaining well below the 0.10 threshold and confirming consistency in expert judgments. The global weights and rankings for the 23 sub-indicators are summarized in Table 2. Land tenure security, a sub-indicator under land recognition, emerged as the highest priority (0.085), reflecting its critical influence on both economic empowerment and cultural continuity. This was followed by quality of basic education (0.072) and clarity of legal land rights (0.070). In contrast, the preservation of traditional crafts received the lowest priority (0.018), indicating that while culturally significant, it is perceived as less directly impactful on socio-economic development outcomes.

Table 2. Global weightage and local weightage, Overall weightage ranking of indicators and sub-indicators

Indicators	Sub-indicators	Local Priority Weights	Global Priority Weights	Ranking of Sub-Factors under Main Factors	Ranking of Sub-Factors among other Sub-Factors
Level of education achievement	Completion of schooling	0.260	0.036	1	15
	Orang Asli educators	0.090	0.012	5	32
	Literacy rate	0.208	0.029	3	19
	Skills training	0.192	0.026	4	21
	Enrollment in higher education (IPTA/IPTS)	0.250	0.035	2	17
Complete infrastructure	Social amenities	0.208	0.023	2	20
	Public facilities	0.192	0.021	3	22
	Residential facilities	0.409	0.045	1	7
	Communication facility	0.191	0.021	4	23
Empowerment economic	Entrepreneur achievement	0.159	0.018	4	29
	Equity Savings	0.163	0.018	3	28
	Employment	0.291	0.033	2	12
	Household Income	0.387	0.044	1	8
Environmental sustainability	Involvement in forest conservation	0.462	0.025	2	6
	Level of pollution	0.538	0.030	1	2

Leadership empowerment	Involvement in NGO's	0.256	0.020	3	16
	'Batin' Institution and Community-Level Leadership	0.473	0.036	1	4
	Involvement in Politics	0.271	0.021	2	13
Land recognition	Land Gazette	0.527	0.104	1	1
	Land Ownership	0.166	0.033	3	27
	Land Access rights	0.308	0.061	2	11
Health care level	Health Level	0.465	0.053	2	5
	Health Service Accessibility	0.535	0.060	1	3
Policy and legislation	National Commitment to International Instruments	0.182	0.025	3	26
	National Commitment to Constitutional and Legislative Provisions	0.354	0.048	1	9
	Gender Empowerment and Equality	0.118	0.016	4	31
	FPIC Implementation and Self-determination	0.347	0.048	2	10
Empowerment of cultural heritage	Honouring the language	0.241	0.014	2	18
	Participation in cultural events	0.119	0.007	5	30
	Customary law and belief	0.262	0.015	1	14
	Indigenous knowledge	0.190	0.011	3	24
	Recognition of contribution in the nation	0.188	0.011	4	25

The ranking pattern reveals that experts prioritized tangible, foundational drivers of socio-economic well-being such as land rights, education quality, and healthcare accessibility, over symbolic or cultural aspects, although the latter remain integral to the overall socio-development framework.

Discussion

This study developed a socio-development index for the Orang Asli community using the Analytic Hierarchy Process (AHP). The results show that Orang Asli development priorities are different from conventional development indicators. Land recognition, healthcare, and governance are ranked higher than income and education. The consistency ratio values (CR = 0.00–0.05) confirm that expert judgments in the pairwise comparison process are consistent and reliable (Saaty, 2008).

Land as the main development priority

Land recognition is the most important indicator (global weight = 0.198), and land gazettement is the highest-ranked sub-indicator. This indicates that land security is the main priority in Orang Asli development. This finding supports Masron et al. (2013), who found that land is closely linked to the socio-economic conditions and settlement stability of Orang Asli communities. Land is not only an economic resource but also a key factor in overall well-being. Previous studies show that development policies often focus on infrastructure and resettlement, while land ownership issues receive less attention (Pah Rokiah Syed Hussain et al., 2017). Khorl et al. (2024) also explain that secure land ownership supports livelihood opportunities and economic participation. The AHP results suggest that without land security, other development efforts may have limited effectiveness.

Healthcare and governance

Healthcare accessibility is also highly ranked, especially health service accessibility (0.060). This shows that health is an important part of Orang Asli development. Ab Rahman et al. (2022) found that Orang Asli communities face difficulties in accessing healthcare due to distance, limited facilities, and low health knowledge. Governance-related indicators, such as constitutional recognition, FPIC implementation, and the role of the Batin institution, are also highly ranked. This indicates the importance of community participation and recognition of Indigenous leadership. Manaf et al. (2021) explain that development programmes are more effective when local communities are involved in decision-making and when institutions work together.

Education and income

Education and income indicators are ranked lower compared to land, health, and governance. For example, completion of schooling ranks 15th, and household income ranks 8th. This suggests that experts view education and income as dependent on more basic conditions such as land security and healthcare access. Fitri et al. (2020) found that Orang Asli students face barriers in education, including limited access, system challenges, and differences between school structures and local culture. The study highlights low completion rates and dropout issues. Adenan et al. (2025) report that Orang Asli communities face healthcare access challenges due to remote locations, limited health literacy, and reliance on traditional healthcare practices. These findings support the high ranking of healthcare in the AHP results.

Environment and infrastructure

Environmental sustainability and infrastructure are ranked at a moderate level. Pollution control and housing facilities receive higher importance than cultural indicators. This shows that the environment and housing are important for daily life, health, and safety. Mohd Harun and Hj Idris (2012) also found that environmental conditions and infrastructure strongly influence the quality of life of Orang Asli communities. However, these factors are less important compared to land and governance in the AHP results.

Culture and gender

Cultural preservation and gender-related indicators are ranked lower in this study. This does not mean they are not important. It only shows that urgent needs such as land, health, and governance are given higher priority. Omar (2016) explains that cultural and social issues often receive less attention when communities face basic survival challenges. Fitri et al. (2020) also note that cultural differences in education systems can affect student participation, so cultural factors remain important in the long term.

Methodological and policy contribution

This study contributes in two main ways. First, it develops a structured socio-development index for the Orang Asli community. Second, it combines the Fuzzy Delphi Method for selecting indicators with AHP for ranking them, improving the reliability of the framework (Zulkipli et al., 2026; Che Jamaludin et al., 2025). The findings also show that common development indices such as the Poverty Line Index (PLI) and Multidimensional Poverty Index (MPI) may not fully reflect Indigenous priorities, especially land rights and governance. From a policy perspective, the results suggest that Orang Asli development should focus on land security, healthcare access, and participatory governance. These are the key foundations for improving well-being.

Limitations of the study

This study has several limitations that should be acknowledged. First, the Analytic Hierarchy Process (AHP) is based on expert judgment. Although it follows a structured procedure, the results still reflect subjective assessments from selected experts. Therefore, the priorities identified in this study may differ if a different group of experts or other Orang Asli sub-groups and regions are considered. Second, the socio-development framework was developed using a defined set of indicators based on literature review and a prior Fuzzy Delphi study. While these indicators are validated and comprehensive, they may not fully capture all aspects of Orang Asli socio-development. In particular, intangible dimensions such as spirituality, emotional well-being, and intergenerational knowledge transfer are less represented. Future research should address these limitations by combining AHP with other methods such as longitudinal studies, participatory approaches, and mixed-method designs. This will help to further validate the framework and provide a more holistic understanding of Orang Asli socio-development.

Conclusion

This study developed a socio-development index framework for the Orang Asli community using the Analytic Hierarchy Process (AHP). The findings show that development priorities are not limited to income and education alone. Instead, land security, healthcare, and governance are identified as the most important foundations of well-being. These results suggest that sustainable development for Indigenous communities must focus on rights, access to essential services, and recognition of traditional leadership. The framework highlights that development cannot be fully effective without secure land tenure, accessible healthcare, and inclusive governance structures. At the same time, lower-ranked cultural and gender-related indicators should not be seen as unimportant. Rather, they reflect immediate priorities compared to long-term social and cultural considerations. These aspects should still be integrated into future planning to ensure balanced development. Overall, the proposed framework provides a structured and practical tool for assessing Orang Asli socio-development. It also supports more inclusive policy design by ensuring that Indigenous priorities are clearly reflected. Future work should continue to refine this framework and strengthen the inclusion of Indigenous perspectives in development planning.

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