International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 21s, 2025
https://theaspd.com/index.php

Spatial Model For Planning Sustainable Leadership Development Through Leadership Skills: A Case Study In Kabupaten Bintan

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ABSTRACT

Spatial modelling provides valuable perspectives for analyzing and planning long-term leadership development, particularly in decentralized and tourism-dependent communities. This study offers a spatial model for assessing leadership abilities in Indonesia's Kabupaten Bintan, a region characterized by a variety of environmental and socioeconomic circumstances. Even though community-based leadership is becoming more and more important in spatial development, there are still few empirical studies that combine leadership and spatial analytics. Five fundamental leadership qualities including communication skills, critical thinking, moral & ethical skills, leadership skills and community involvement were evaluated quantitatively by distributing structured questionnaires to 300 respondents in seven villages. Relative Importance Index (RII) analysis was used to rank competencies, while GIS-based spatial mapping identified geographic differential in leadership capacities. Findings showed that moral and ethical skills were the highest attributes as evidenced by the top three indicators having RII values greater than 0.89 which were respect for the values of other cultures (RII = 0.907), does not criticize one's own ethics and culture (RII = 0.895) and respects the rights of others (RII = 0.894). Spatially, urban and coastal locations like Bintan Timur and Teluk Sebong had stronger leadership performance, whilst isolated areas like Teluk Bintan displayed lower scores on the majority of variables. These differences show how institutional support and infrastructure accessibility affect leadership preparedness. This research helps localize SDGs 11 (Sustainable Cities and Communities) and 13 (Climate Action) by offering useful insights for planners and policymakers to prioritize region-specific measures.

Keywords: *Spatial Analysis, Sustainable Leadership, GIS, Community Development*

1. INTRODUCTION

Community-based ecological services, particularly in fragile environments like coastal and tourism socio-ecological systems, are critically reliant on effective leadership. With the escalating complexity of environmental and societal issues, there is a greater need for precise and participatory approaches to 'sustainable' leadership, or sustainably focused leadership, adaptable to specific contexts. Sustainable leadership goes beyond modern management by identifying and incorporating social and ecological governance, resource management, and local community empowerment as integral components of decentralised governance frameworks (Springer et al., 2020; Wang et al., 2014). Where there is an intersection of resource dependency, socio-economic disparities, and the environmental divide, especially in tourism and coastal areas, nurturing sustainable leadership becomes crucial for building resilience and adaptability (Mola et al., 2012; Ghosh, 2011). Farming knowledge can form an effective and good intervention for city dwellers to move uplift to the better education and stand right at the higher degree of social cohesion (Ramzi et al., 2019).

Due to its large number of islands, Indonesia offers a vast coastal area that is ideal for researching grassroots sustainable leadership projects. The Bintan Regency in the Riau Archipelago is an illustration of that intersection. In the framework of Indonesia's developing tourism belt, Bintan faces changes in the

environment, faster economic expansion, and altered local administration as a result of decentralisation initiatives (Mola et al., 2012). In this regard, the management activities within the coastal and tourism communities serve as important drivers for sustainability outcomes. Unfortunately, considering the existing literature on the typologies and sociological predictors of sustainable leadership in such communities, coupled with advanced multivariate statistical methods, there remains a clear gap in empirical research.

In this study, sustainable leadership is defined as a multidimensional construct with five defining traits: community involvement, predictive sustainability thinking, ethical and moral foundations, effective communication, and analytical reasoning skills. These competencies align with both global leadership frameworks (Zacher et al., 2024) and culturally embedded leadership models in Southeast Asia that emphasize harmony, collective decision-making, and long-term communal welfare (Sajjad et al., 2024). The absence of quantitative studies that systematically classify patterns of sustainable leadership and analyse demographic features like age, gender, education, and occupation is noticeable alongside existing qualitative narratives on community leadership in Indonesia (Arman et al., 2024). This gap affects the development of appropriate context programmes for building capacity, as well as the localisation of the Sustainable Development Goals (SDGs), especially SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action).

2. LITERATURE REVIEW

Sustainable leadership has been recognized as a vital component in creating socio-ecological resilience and inclusive governance, especially in decentralized and resource-intensive regions. Besides, sustainable leadership defined as the practice of inspiring and motivating people to take actions that contribute to the long-term sustainability of an organization, a community, or society (Fry et al., 2021; Liao, 2022). Characterized by attributes like moral decision-making, community engagement, participatory governance, and long-term planning, sustainable leadership extends beyond management responsibilities to include values-driven changes (Magueta, 2024; Armani et al., 2020). Community leaders have become particularly important in maintaining stability and forward planning in vulnerable regions such as coastal and tourist zones, where socioeconomic inequality and environmental change intersect (Scott et al., 2020).

Southeast Asian cultural norms that place a strong emphasis on harmony, consensus, and respect for group values further influence sustainable leadership (Ndraha, 2023). However, there are few empirical models available to assess leadership qualities at the community level, and leadership is frequently conceptualized qualitatively. This limitation restricts the establishment of regional approaches that complement global sustainability frameworks like SDG 13 (Climate Action) and SDG 11 (Sustainable Cities and Communities). Consequently, mapping leadership capacities and better directing policy planning at the grassroots level require a data-driven and spatially informed strategy. Spatial planning is widely acknowledged as an effective technique for visualize identifying spatial disparities and addressing governance gaps in leadership development (Giaoutzi et al., 2021). Spatial analysis can be used to comprehend how infrastructure access, institutional closeness, and physical location affect leadership quality and community involvement (Agustina, 2021). Moreover, spatial modeling provides an essential foundation for planning sustainable development since leadership is a contextual construct that is strongly linked to place-based dynamics.

Recent research encourages the combination of governance and geographical models. While Urbano et al., (2021) mentioned that distributed leadership systems function best when influenced by spatial disparities, Paiuc (2021) highlights that institutions and geography together affect leadership behaviors. This point of view is consistent with the necessity of regional adaptation in leadership development, where the efficacy of policy interventions is determined by context, both social and spatial (Bonnett et al., 2023). Thus, more inclusive and sustainable planning techniques are made possible by a geographically grounded view on leadership, especially in jurisdictions with multiple villages or islands, like Kabupaten Bintan. Several case studies provide additional evidence for the advantages of spatially informed leadership development. For example, in Yogyakarta, Indonesia, climate vulnerability data was included into leadership training and decision-making frameworks through participatory spatial planning, strengthening leadership in villages vulnerable to disasters (Ayuningtyas et al., 2021). Similarly, geographic accessibility and data exchange amongst institutions were associated with tourist leadership success in the Southern Caspian Sea region (Ghadami et al., 2022). Besides, mayors in Poland's Greater Province who

combined spatial planning with participatory leadership techniques had superior sustainability outcomes (Ogryzek et al., 2021). These case study highlight how crucial it is to incorporate spatial awareness into leadership techniques.

In summary, although spatial planning has been used successfully in a number of case studies on governance and development, Indonesia has yet to fully integrate it with leadership evaluation. The gap between theory and practice is created by the absence of empirical assessments of leadership qualities that are based on geography. Therefore, this research makes a contribution by providing a spatial model that supports context-specific leadership development in line with sustainability goals by integrating quantitative leadership indicators with GIS analysis. This approach can ultimately improve local administration and guarantee that current leadership efforts benefit the welfare of future generations.

3. METHODOLOGY

This study used a quantitative descriptive method to evaluate the attributes of sustainable leadership in each district in Kabupaten Bintan, Kepulauan Riau, Indonesia. The investigation was based on a systematic survey conducted with community leaders which evaluated five fundamental components of sustainable leadership which are: (1) communication, (2) consideration skills, (3) morals and ethics, (4) management, and (5) participation at the grassroots level. Each aspect was rated using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

3.1 Data Preparation and Classification

In order to extract spatial patterns and classify leadership attributes, each variable's score was averaged at the village level. The analysis was performed on IBM SPSS Statistics (Version 27). For each dimension of leadership, the conversion from average score to categorical score assigned rank order classification, and mean scores were ascertained using ordinal scaling for categorization (low, moderate, and high). Binning is one of the pre-processing methods recommended to improve the analysis performed on continuous variables by transforming them into more informative categorical clusters (Bainter et al., 2020). The identified smear boundaries (cut points) maintained consistency and internal validity using percentiles with histogram inspection cross-checks of the data distribution to strengthen fidelity within constructs. The category that was most frequently cited, which reflected the general view of leadership ability in that village, was then assigned to each village based on the modal category of replies. This approach is consistent with earlier leadership mapping research that uses dominant value aggregation for regional interpretation (Ronay et al., 2024).

3.2 Relative Importance Index (RII)

The Relative Importance Index (RII) was used in this study to assess the perceived importance of each element of sustainable leadership. In survey-based studies, the RII is a commonly used technique for ranking variables, especially in the social sciences and built environment research (Kaffashi, 2016). Based on respondent ratings, it offers a normalized score that represents the relative weight of each item. A five-point Likert scale was used to evaluate each leadership quality: Communication Skills, Critical Thinking, Ethical & Moral Skills, Leadership Skills, and Community Involvement in Tourism Development with (1 being strongly disagreed with and 5 being highly agreed). The equation for RII analysis were as below:

$$RII = \sum W / (A \times N)$$

Where:

W =the respondents' weighting (from 1 to 5)

A = the maximum weight,

N = the number of respondents

3.3 GIS-Based Spatial Analysis

In order to improve the analysis of differences between the districts, GIS were utilised to spatially represent the categorized results for each of the five leadership variables. The data was incorporated with district boundaries spatial shapefiles for Bintan administrative district in ArcGIS (version 10.7.1). Each variable was mapped as a distinct layer, and the leadership dimensions of each were depicted using three colour-coded classes (low, moderate, and high). A stratified longitudinal examination of leadership capacities was shown in this instance by the coloured thematic maps, which were categorised by spatial concentration, variance by area, and correlation with socio-administrative variables.

4. RESULTS & DISCUSSION

4.1 Socio-Demographic Profile

The survey was completed by 300 people, who represent a cross-section of community leaders from different Bintan Regency subdistricts. The socio-demographic characteristics of the respondents are presented in Table 1. Seven important districts involved respondents, with Bintan Timur having the most presence (38.3%), followed by Bintan Utara (21.7%). These regions are more centrally located and urbanized, which may indicate a greater concentration of active leadership structures and community groups.However, Bintan Pesisir (3.7%) had the least participants, probably because of its remote location and smaller demographic base. 54% of respondents being female and 46% being male, the gender distribution shows gender equity. Majority of the respondents were between the ages of (35 and 44, 42%), and the minority were older adults (>65 years, 1.3%). The marital status respondents were 74.3% married, only a small percentage were widowed or divorced, whereas 20.7% of people were single. With 57.7% of respondents reporting SMA (high school) credentials, the majority had finished secondary school. Just 4.0% possessed a bachelor's degree, making up a very small portion of those with higher education degrees (S1). This pattern reflects the overall state of education in Indonesia's rural and semi-urban areas, where tertiary education is still lacking among the general population. For occupation, self-employed people made up the largest employment group (42.3%), suggesting that small-scale business owners, traders, and farmers make up the majority of the informal sector's workforce. Next in line are workers in the private sector (15%) and jobless people (15.7%). Notably, 25.7% of respondents mention they had "other" jobs, which could include more conventional positions or unpaid volunteer work. Interestingly, just 1.3% worked for the government, indicating that non-state actors play a major role in grassroots leadership in Bintan. The fact that 95% of respondents said their monthly income was less than IDR 5,000,000 highlights the financial difficulties that many people in the community face. The low-income profile emphasizes the need for inclusive, cost-effective, and context-sensitive leadership development programs that are closely related to local livelihood enhancements.

Table 1: Respondents's socio-demographic profile

Socio-demographic		**Percentage** (%)
Village	Teluk Bintan	11.0
	Bintan Utara	21.7
	Teluk Sebong	6.0
	Seri Kuala Lobam	7.7
	Bintan Timur	**38.3**
	Gunung Kijang	11.7
	Bintan Pesisir	3.7
Age	18-24	12.3
	25-34	20.7
	35-44	**42.0**
	45-54	18.3
	55-64	5.3
	>65	1.3
Gender	Male	46
	Female	**54**
Marital Status	**Married**	**74.3**
	Divorce	0.7
	Widow	4.3
	Single	20.7
Level of Education	Primary School	16.7
	SMP	13.7
	SMA	**57.7**
	MA	1.3
	D1,D2,D3	4.3
	S1	4.0
	S2	0
	S3	0

	Others	2.3
Occupation	Government	1.3
	Private	15
	Self-employed	**42.3**
	Unemployed	15.7
	Others	25.7
Income	**< IDR 5,000,000.00**	**95**
	IDR 5,000,001.00 – IDR 10,000,000.00	5
	IDR 10,000,001.00 – IDR 16,000,000.00	0
	>IDR 16,000,001.00	0

4.2 Relative Importance Index (RII) Analysis

The Relative Importance Index (RII) was used for identifying the components of leadership that community leaders in Bintan Regency valued the most. This method provided a more sophisticated knowledge of local leadership dynamics by allowing the ranking of particular skill sets according to perceived relevance. Table 2 displays the relative importance index (RII) analysis of Kabupaten Bintan.

Table 2: The relative importance index (RII) analysis

Variables	**RII**	**Rank**
COMMUNICATION SKILLS		
Able to communicate messages effectively to the community	0.815	1
Listens with an open mind to expressed viewpoints	0.796	4
Capable of responding effectively in discussions	0.787	5
Able to accept differing viewpoints	0.802	2
Always provides encouraging responses	0.805	3
CRITICAL THINKING		
Able to consistently evaluate when facing problems	0.780	5
Every difficult problem is considered in a realistic/practical manner	0.795	4
Thinks and plans ahead about what needs to be done when solving problems	0.823	1
Various views and perspectives are considered in problem-solving	0.798	3
Thinks clearly about the implications of decisions made	0.804	2
ETHICAL & MORAL SKILLS		
Everyone is treated equally without discrimination	0.873	5
All immoral acts are avoided	0.881	4
Respects the rights of others	0.894	3
Does not demean the values and ethics of other cultures	0.907	1
Does not criticize one's own ethics and culture	0.895	2
LEADERSHIP SKILLS		
Able to set priorities	0.805	4
Always does their best to complete tasks and responsibilities	0.831	1
Gives focus to the assigned tasks and responsibilities	0.821	2
Ensures that each goal can be achieved as planned	0.808	3
Tends to make decisions collectively as a group	0.779	5
COMMUNITY INVOLVEMENT IN TOURISM DEVELOPMENT		
Local communities are involved in the management of tourism development	0.758	4
Local communities provide full support for tourism development	0.825	1
Local communities involved in decision-making process for tourism development	0.773	3
Local communities provide full support for tourism development	0.831	2
Local communities are eager to be involved as workers in tourism development	0.748	5

The most highly ranked item among the five communication indicators was "Able to communicate messages effectively to the community" (RII = 0.815), which reflected the fundamental importance that message clarity plays in leadership.The significance of empathy and emotional intelligence in community involvement was highlighted by the high scores for the skills of "Always provide encouraging responses" (RII = 0.805) and "Able to accept differing viewpoints" (RII = 0.802).Items with lower rankings, such as

"Listens with an open mind" (RII = 0.796) and "Capable of responding effectively in discussions" (RII = 0.787), highlight areas that require work in real-time responsiveness and active listening, two skills that are crucial in participatory leadership settings. Effective communication is essential for mobilizing communities, resolving conflicts, and promoting inclusive decision-making.

In the critical thinking category, "Thinks and plans ahead about what needs to be done" received the highest rating (RII = 0.823), indicating the significance of planning and foresight in intricate, unpredictable situations. Following this, "Thinks clearly about the implications of decisions" (RII = 0.804) indicated that reputable leaders had a strategic mindset. However, "Able to consistently evaluate when facing problems" (RII = 0.780) came in last, suggesting that although strategic thinking is important, systematic evaluation under pressure might need more work. Critical thinking is essential for sustainable development because it enables leaders in fast-paced industries like coastal tourism to foresee obstacles, assess risks, and make wise decisions.

The most highly rated traits overall were ethical and moral skills, followed by respect for the values of other cultures (RII = 0.907). Followed closely by "Does not criticize one's own ethics and culture" (RII = 0.895) and "Respects the rights of others" (RII = 0.894). The high ratings in this category show that leaders are expected to behave honorably. Ethical leadership is considered the cornerstone of trust and long-term legitimacy in a multicultural culture like Indonesia, where cultural sensitivity is essential. Community cohesion is more likely to be maintained by leaders who adhere to moral standards.

For leadership skills, "Always does their best to complete tasks and responsibilities" (RII = 0.831) and "Gives focus to assigned tasks" (RII = 0.821) were the top scored in this component. These findings imply that the community strongly values leadership that is dependable, accountable, and committed. Conversely, "Tends to make decisions collectively" (RII = 0.779) received the lowest ranking, which can be a reflection of cultural tendencies toward directive leadership or limitations in participative processes. Performance and discipline-related practical leadership traits are essential for keeping local development projects moving forward, particularly those with little funding and supervision.

Lastly, community support for tourist development was the item with the highest rating (RII = 0.825), indicating favourable sentiments for regional tourism endeavours. However, the lowest score (RII = 0.748) was obtained for readiness to work in the tourism industry, suggesting a possible discrepancy between active engagement and support. Ratings for community participation in management and decision-making were moderate, indicating room for improvement in cooperative frameworks. Despite the community's support for tourism, these findings point to a contradiction: although actual workforce involvement may be limited by institutional challenges or a lack of opportunity, more inclusive tourism initiatives are needed.

4.3. Spatial Variation of Critical Thinking Skill in Sustainable Leadership across Villages

The distribution of critical thinking skill shows a differential distribution across the villages of Kabupaten Bintan. With the mode frequency approach based on the respondent scores of low (mean score <= 3.8), moderate (mean score 3.9 – 4.0) and high (mean score ≥ 4.1) critical thinking skills, the northern and coastal sub-districts like Teluk Sebong, Seri Kuala Lobam, and Bintan Pesisir showed a concentration of high-scoring subjects, as did Bintan Utara. These developments indicate that the northerly and coastal communities are likely to develop more critical thinking skill and sharpen the power of reflection in the leaders and citizens at large. As Werner & Bleich (2017) noted, critical thinking is indispensable for adaptive, ethical and visionary leadership. These are the characteristics that emerge from regions whose populations enjoy education, multidisciplinary governance, and public dialogue.

The critical thinking of sustainable leadership distribution shows a distinct distribution pattern across Bintan villages. From the mode frequency distribution analysis of each respondent's score on the integrated test (low, moderate, and high), there is a remarkable concentration of high critical thinking skill in the northern and coastal regions like Teluk Sebong, Seri Kuala Lobam, Bintan Pesisir, and Bintan Utara. This evidence indicates that these groups are likely to have more well-developed analytical skills and more reflective judgement skills. As noted by Ricketts (2005) and supported by Flores et al. (2012), critical thinking is also indispensable in leadership, whether it is adaptive, ethical, or visionary, and these are the areas that tend to have more schooling, multi-sectoral administration, and civic engagement.

On the other hand, low categories Teluk Bintan, Bintan Timur, and Gunung Kijang represent a lack of developed capacities in logical reasoning, strategic decision-making, and problem anticipation. This discrepancy supports place-based leadership readiness theory, which suggests that infrastructure within a region, coupled with socio-economic factors, leadership opportunities, and problem-based learning

resources, profoundly influences a learner's ability to think critically. The explanation behind the concentration of high-category districts along more urbanised coastal corridors may be guided by the spatial leadership theory relating proximity to decision-making centres and institutional aid to the development of cognitive leadership skills (Stamkou et al., 2022). Noting the absence of 'moderate' in this classification suggests a burgeoning gap in overall leadership capacity and an increased need for resources aimed at aiding lower-performing villages through spatially inclusive leadership development initiatives (Figure 2).

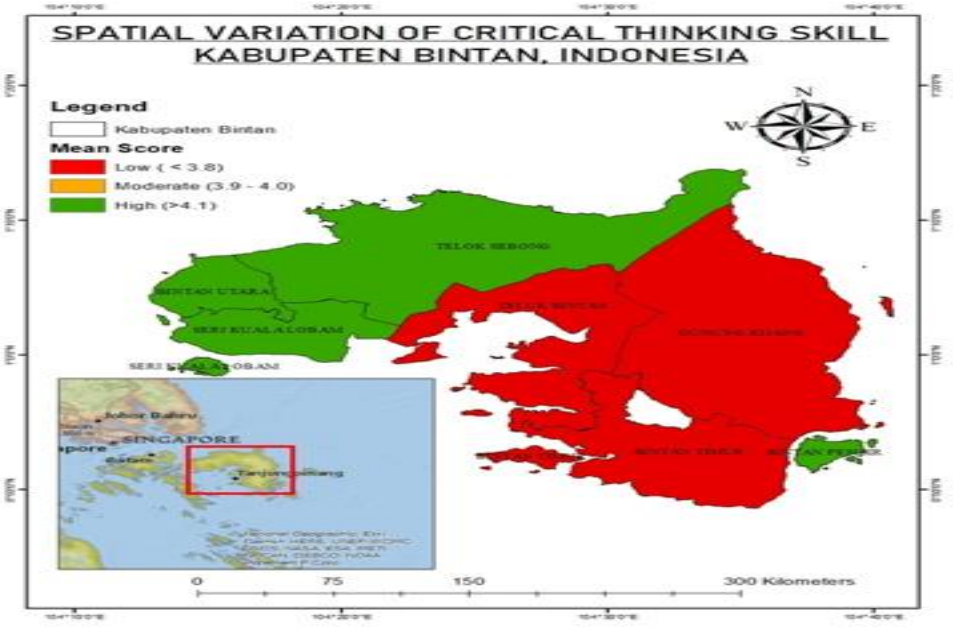

Figure 2: The spatial variation of critical thinking skills

4.4. Spatial Variation of Ethical and Moral Skill in Sustainable Leadership across Villages

The allocation of moral and ethical qualities, which is a key component of sustainable leadership, varies significantly between villages in Kabupaten Bintan. Through visual binning of means and categorising them as low, moderate, and high ethical skills, a pattern develops that suggests geographic clustering of ethical leadership principles. Districts like as Teluk Bintan and Gunung Kijang received low ratings (score < 4.0), indicating challenges in developing moral, transparent, and values-oriented leadership in these areas (Ouma, 2017) (Figure 3).

On the other hand, Teluk Sebong, Seri Kuala Lobam, Bintan Timur, Bintan Pesisir, and Bintan Utara were all considered to possess high moral and ethical skills (score ≥ 4.5). This supports the position of Onyia (2023) claiming that ethical leadership is usually supported in areas with a stronger backbone of social infrastructure and institutional engagement, as well as education. The existence of these administrative centre offices and active social organisations may influence the prevailing leadership skill, which has to be ethical to these regions (Demir et al., 2023).

Analysing the eastern and northern villages of Bintan with significant ethical leadership scores reveals a geo-socioeconomic gradient in the areas regarded as leading in 'southeast region' leadership. These results are in unison with the claims made by Riggio et al. (2010) that, while indirectly, geography affects how a leader develops in relation to the governmental, socio-political, and educational institutions at their disposal (Garfield et al., 2019). The more remote and less integrated parts, such as Gunung Kijang and Teluk Bintan, appear to be confronting ethical leadership value promotion, deficient institutional drive and civic voluntarism exhaustion. This gap in the ethical leadership area requires addressing with place-responsive approaches. Designing specific educational aids and civic engagement initiatives for lower-achieving districts has the potential to address these ethical disparities and promote progressive and strong leadership in Bintan. In agreement with (Yağmur, 2022), the ethical aspect of leadership is neither simply an action to take nor does it only involve a set of prescribed attributes; it is also fundamentally social and contextual.

The spatial allocation of moral and ethical competencies by village appears to align with levels of urbanisation and centrality of administration. Within Bintan, those villages that are more urbanised and institutionally anchored, such as Bintan Timur and Bintan Utara, tend to demonstrate more advanced leadership ethics, possibly because of heightened civic attention and regulatory visibility. In comparison,

the more peripheral or less developed areas, such as Teluk Bintan and Gunung Kijang tend to reflect a more passive engagement with ethics. This observation is supported (Demir et al. (2023), who cite reasoning that maintains that ethical leadership behaviours are unevenly distributed and usually aggregate towards the confines of stronger civic infrastructures and public civic activity.

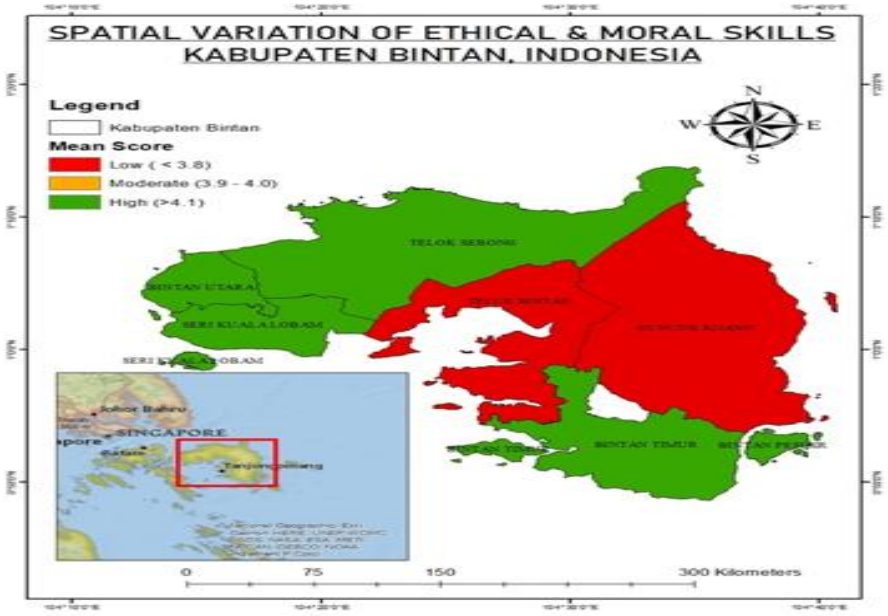

Figure 3: The spatial variation of ethical & moral skills

4.5. Spatial Variation of Leadership Skill in Sustainable Leadership across Villages

The examination of leadership skill as an element of enduring leadership sustainability demonstrates marked differences in the mean score spatially clustered by Bintan's villages. Using visual binning, the average scores were classified into three categories: low (≤3.8), moderate (3.9-4.0), and high (≥4.1). The outcomes reveal that Teluk Sebong, Bintan Pesisir, and Bintan Utara had high leadership skill profiles while Teluk Bintan, Seri Kuala Lobam, Bintan Timur, and Gunung Kijang had low scores (Figure 4). Remarkably, no village was dominantly categorised as moderate which shows a pronounced pattern in the coastal community's leadership buoyancy volatility with bifurcation tendency. The more economically developed and strategically located villages appear to score higher as a result of physical access to governance institutions, tourism and inter-village linkage infrastructure. As an example, Teluk Sebong and Bintan Utara are said to be administrative and commercial centres which may enhance the chances of encountering leadership development and local governance involvement opportunities. These findings support Mazzetti and Schaufeli (2022) who framed that effective leadership is frequently found where there is a well-developed, supportive environment and institutional infrastructure.

Conversely, the low-level leadership skills noted in Teluk Bintan, Seri Kuala Lobam, and Bintan Timur indicate a more profound cultural or structural barrier to leadership growth. These areas might suffer from decreased civic participation or lack resources for leadership training opportunities. As noted by Carstensen et al. (2024), sustainable leadership is dependent on distributed practices deeply rooted in the context. Hence, the geographic and socio-political constraints of these districts highlight the need for place-based, responsive strategies. With regard to spatial analysis, the pattern suggests possible coastal-interior divides areas with better access to institutions exhibits stronger leadership skills. This is consistent with the literature on spatial governance (van Raan, 2020), which posits that geographic centrality is a determinant of the development of civic infrastructure and eminent domain self-sufficiency.

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 21s, 2025
https://theaspd.com/index.php

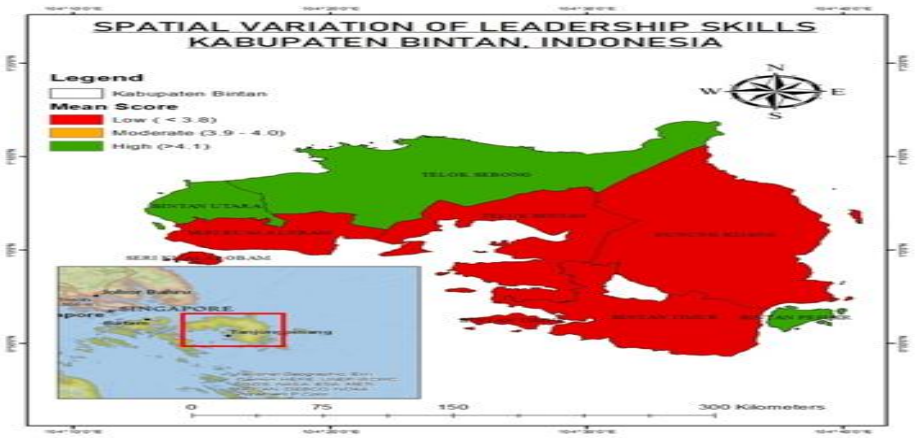

Figure 4: The spatial variation of leadership skills

4.6. Spatial Variation of Community Involvement in Sustainable Leadership across Villages

The spatial participation of the community as one of the components of sustainable leadership supports marked variability in the Kabupaten Bintan villages. As per the classification done using SPSS visual binning, Teluk Bintan emerged as the only village dominantly categorised under low community involvement skill (mean score ≤ 3.6). Less active civic engagement, a lack of participatory democracy, or a lack of chances for citizens to offer input are all possible causes of this, and they can seriously threaten the long-term viability of local leadership and development initiatives (Dang et al., 2022). Conversely, Gunung Kijang, Bintan Utara, Sri Kuala Lobam, and Teluk Sebong have comparatively greater levels of community engagement (mean score ≥ 4.1). Greater social capital, community infrastructure, geographical imaginaries, and local governance may be used in these regions to build civic infrastructure that facilitates civic engagement. Such findings are consistent with Rijal (2023) which emphasises the importance of citizen participation in strengthening democratic government and collaborative leadership and is supported by these findings.

Bintan Timur and Bintan Pesisir were classified as moderate (mean score between 3.7 and 4.0), and these districts reflect transitional zones where civic engagement exists but is inconsistent. Such regions are likely experiencing socio-political or administrative changes; therefore, these regions can be specially targeted for interventions to increase civic engagement. From the perspective of spatial analysis, the attention superior community participation in Teluk Sebong and Gunung Kijang lies either on the coast or close to tourism and industrial centres. These positional benefits may enable higher levels of community participation with governance systems as well as the adoption of environmental and social sustainability. In support, (Denwood et al., 2023) state that geographic accessibility combined with activity within a given area positively impacts participatory leadership frameworks. The spatial mapping for community involvement of sustainable leadership was shown in Figure 5.

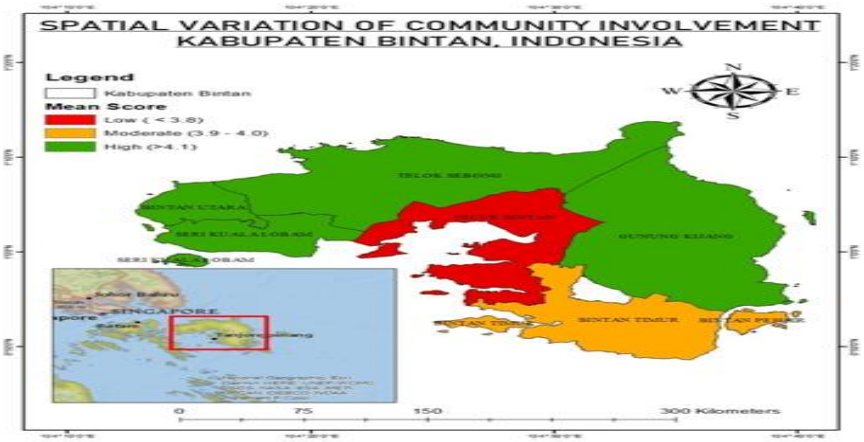

Figure 5: The spatial variation of community involvement

5. CONCLUSION

This study created a geographical model to assess sustainable leadership using Kabupaten Bintan's leadership skill components, with an emphasis on critical thinking, communication, leadership traits, ethical and moral abilities, and community involvement. The combination of quantitative survey data

with GIS-based spatial analysis yielded a more sophisticated knowledge of the demographic and geographic distribution of leadership competencies. Key findings show that community leaders place a high value on moral and ethical competence, closely followed by critical thinking and communication abilities. Spatial trends show that coastal, institutionally developed, and more urbanized areas like Bintan Timur, Bintan Utara, and Teluk Sebong have greater leadership capacities. Conversely, remote areas such as Teluk Bintan and Gunung Kijang continuously had lower scores on a number of leadership metrics, indicating inequalities in civic involvement and leadership development possibilities. These spatial variations highlight the need for focused, situation-specific leadership development initiatives, particularly in districts with poor performance. The top three leadership qualities across all categories, as determined by the total RII analysis, were:"Does not demean the values and ethics of other cultures" (RII = 0.907) – representing strong ethical-cultural sensitivity, "Does not criticize one's own ethics and culture" (RII = 0.895); and "Respects the rights of others" (RII = 0.894). The sociocultural concerns of Bintan's varied groups are reflected in these findings, which highlight the importance of moral and ethical competences as the foundation of community expectations for leadership. This study offers an approach for integrating sustainability into local governance by coordinating leadership development with SDGs 11 (Sustainable Cities and Communities) and 13 (Climate Action). Policymakers and planners can use the spatial leadership model presented here to pinpoint priority locations and more fairly distribute resources for long-term community resilience and leadership sustainability.

6. Acknowledgement

This research was carried out under the International Grant RC001 (UniSZA/2023/PGP/01) offered by the Universiti Sultan Zainal Abidin (UniSZA).

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