

Classifying Villages by Rural Development Performance: Evidence from Belitung Regency, Indonesia

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Abstract

The implementation of village development must be guided by the achievement of development goals, namely creating an independent, advanced, prosperous, and just village community. The goals of village development can be realized if the development process is carried out by considering the potential, problems, characteristics, and typology of the village itself. This is necessary so that village development is on target, so that village development goals can be achieved. Based on this, the purpose of this study is to analyze village typologies based on the effectiveness of village fund utilization, poverty levels, and village development performance using effectiveness analysis methods, geographically weighted regression (GWR), and Moran index analysis. Based on the results of this analysis, village typologies can be developed that will serve as the basis for formulating more effective, efficient, and targeted village development policies. The goal is to increase the effectiveness and efficiency of village financial resource utilization, poverty alleviation, and improve village development performance in terms of governance, physical infrastructure development, community development, and community empowerment. The results of the study indicate that villages in Belitung Regency can be classified into eight village typologies, namely Typologies A, B, C, D, E, F, G, and H. Based on their conditions, villages included in Typology A are villages whose rural development needs to be prioritized by Belitung Regency.

Keywords: Village typology, Indicators, Poverty, Rural development

JEL classification: O18, R12, Q01

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1. INTRODUCTION

There are several definitions of the term "village." A village is a combination of the activities of a group of people and their environment. The result of this combination is a form or

appearance on the surface of the earth that arises from physical, social, economic, and political interactions, as well as cultural elements that interact with each other and with other regions. A village is a legal entity where a community lives and has the authority to govern itself. From an economic perspective, villages function as a very important source of raw materials and labor. According to Law Number 6 of 2014 concerning Villages, according to Article 1, a village is an independent community unit, has clear boundaries, and is able to regulate and oversee regional government affairs based on community initiatives, customary rights, and/or traditional rights recognized and upheld within the government system of the unitary state of the Republic of Indonesia. This explanation makes it clear that a village is an independent region that has the authority to control all aspects of its territory, including its economy.

Regional underdevelopment and imbalances between regions, including rural areas, arise from differences in the ability of various regions to identify and utilize their local resources. This underdevelopment is influenced by both internal and external conditions. Internal factors influencing underdevelopment include a lack of available resources. Regions that lack sufficient savings to invest in capital or infrastructure or have markets that are too small will result in very low productivity, creating an unbreakable cycle of underdevelopment. Poverty and underdevelopment are ultimately caused by limited market expansion, poor savings and consumption, a smaller capital stock in the economy, and low incomes (Benzaken et al., 2024; Oloyede et al., 2023; Quashie et al., 2024). In rural development in Indonesia, village funds are a crucial instrument for accelerating regional development while simultaneously reducing poverty levels in rural communities. Artino et al. (2019) finds that village funds have a negative relationship with poverty, meaning that increases in village funds tend to be followed by decreases in poverty levels.

In the context of rural development in Indonesia, to accelerate regional development and reduce poverty and regional disparities, the government is expected to take strategic and appropriate steps to improve rural development. One strategic step implemented by the government is the delegation of authority to local governments, known as Regional Autonomy. Through regional autonomy, the government has begun to focus on outlying areas by empowering districts and villages within the framework of the Unitary State of the Republic of Indonesia (NKRI) (Reku & Resosudarmo, 2024; Yao & Jiang, 2021; Zheng et al., 2021). The goal of rural development is to achieve community self-sufficiency, create independent and resilient communities socially, economically, and environmentally, and strengthen the relationship between rural and urban economic activities.

The Village Development Index (IDM) is an instrument for assessing the success of village development in Indonesia, reflecting the level of village development based on social, economic, and environmental aspects. The IDM plays a crucial role as an evaluation tool for village development achievements and serves as a basis for formulating development policy directions. Research (Muzaqi et al., 2022) shows that increases in village funds tend to be followed by a decrease in poverty levels and an increase in the IDM status in Indonesia. However, this increase is not evenly distributed, as there are still disparities in IDM achievement between western and eastern Indonesia, indicating that the effectiveness of village development is influenced by differences in regional characteristics and the quality of human resources.

Regional development, particularly rural development, is a top government priority aimed at reducing poverty, unemployment, and regional disparities (Zheng et al., 2021). Rural development is based on rural areas, emphasizing local wisdom within the region. This encompasses the demographic structure of the community, social and cultural characteristics, physical and geographical qualities, agricultural activity patterns, interactions between the rural and urban economies, the village institutional sector, and the attributes of residential areas.

To achieve rural development goals, all stakeholders must thoroughly understand the characteristics and challenges faced by each region, while also paying attention to the spatial dimension, which is crucial in determining the strategic steps to be taken (Lingua & Caruso, 2022; Wu & Yabar, 2021). The inclusion of the spatial dimension is expected to reduce regional disparities, especially in rural areas (Lingua & Caruso, 2022). Several strategic steps can be taken to accelerate rural development: first, local economic development strategies need to consider the spatial dimension to align with the characteristics of each region (Venkadavarahan et al., 2023; Zhu et al., 2024); second, reducing underdevelopment by improving rural development performance, particularly the performance of village government officials; third, increasing capital and infrastructure with greater impetus; and fourth, the need for a unified vision and strategy to accelerate rural development, which is implicitly embedded in regional development plans (Colocci et al., 2023; Hammond et al., 2024; Nielsen et al., 2023).

The implementation of the Village Law faces two main challenges: ensuring that village funds are allocated fairly according to village needs and utilized effectively to support village development. This demonstrates that the success of village development is not solely determined by the amount of funds received, but also by the village's ability to utilize village funds, poverty levels, and development achievements. Therefore, the effectiveness of village fund utilization, poverty levels, and rural development performance are important variables in understanding the conditions and needs of village development. Belitung Regency, as an archipelago consisting of 42 villages, has diverse village characteristics. This demonstrates that village development cannot be carried out with a uniform approach, so a village typology approach is needed to more accurately determine the conditions and development priorities of each village.

Based on the explanation above, the research objectives can be formulated as follows: 1) To understand and analyze the relationship between the effectiveness of village fund utilization, village development performance (IDM), and poverty; 2) To create a village typology based on the analysis of the relationship between the effectiveness of village fund utilization, village development performance, and poverty, to provide considerations in taking strategic and appropriate steps in accelerating rural development, especially in Belitung Regency, an island region (Hariyanto et al., 2023; Nielsen et al., 2023). This study is a follow-up to several studies related to the implementation of Law No. 6 of 2014 concerning Villages and mapping of village typologies. However, there has been no research that analyzes using the variables of village financial effectiveness, poverty levels, and village IDM. Therefore, this study can be said to be new and has never been conducted before. The results of this study are expected to be an alternative in formulating policies for village development in Belitung Regency.

2. RESEARCH METHODS

This research uses a quantitative descriptive approach. A quantitative approach indicates the research method used, while descriptive refers to data analysis techniques aimed at describing conditions or phenomena based on the data obtained. Quantitative descriptive research uses numerical data analyzed descriptively to provide an overview of the characteristics of the research variables. Data are collected through observation, documentation, and other techniques, then presented in tables, graphs, histograms, and descriptive statistical measures such as means and medians to facilitate data interpretation (Alfatih, 2016).

This study uses both primary and secondary data. Field observations were conducted from July to November 2023 with the aim of obtaining a direct picture in the field. This allows researchers to gain a better understanding and evaluate the actual conditions related to the use of village funds, poverty, and the overall and integrated performance of rural development in Belitung Regency. Meanwhile, the secondary data consists of data on the Village Development Index, regional characteristics of Belitung Regency, the number of poor people, and the realization and village budget of Belitung Regency and other secondary data.

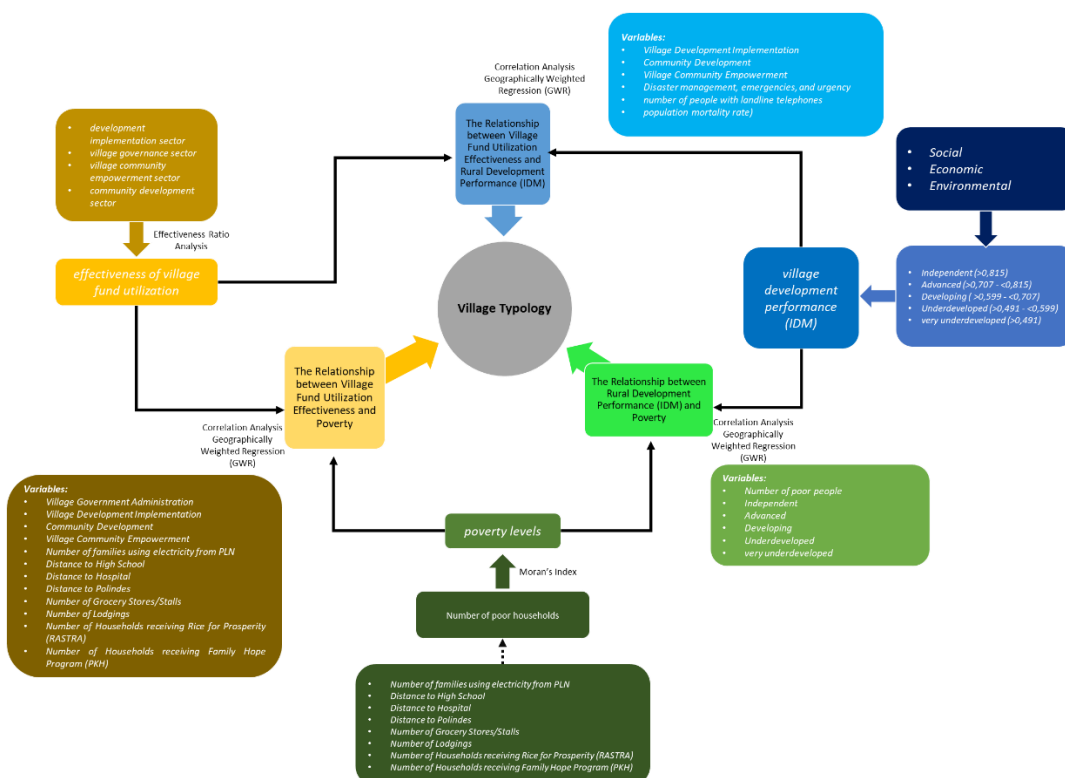


Figure 1. Research Framework

Source: Analysis Results

The selection of Belitung Regency as the research location was based on its status as an archipelagic region. As an archipelagic region with scattered villages, spatial continuity

and connectivity between regions, including their relationship to the effectiveness of village fund utilization, poverty, and development performance, are relatively limited. Therefore, Belitung Regency is considered an appropriate choice to examine the extent of the relationship between the effectiveness of village fund utilization, rural development performance, and poverty. Belitung Regency consists of 98 large and small islands, which are divided into five sub-districts, seven urban areas, and 42 villages. The distribution of villages within sub-districts is based on data from the Central Statistics Agency (BPS) in 2023 (Hariyanto et al., 2023).

2.1 Analysis Method

2.1.1 Effectiveness Ratio Analysis

Effectiveness is the comparison between results and objectives. Therefore, to assess the effectiveness of village fund management, it is necessary to compare actual expenditures with budgeted expenditures. Therefore, analyzing the effectiveness of village fund utilization involves assessing the ratio of actual expenditures to budgeted expenditures (Arifin et al., 2020; Watts et al., 2019). The effectiveness of village fund utilization is measured using the following formula:

$$\text{Effectiveness} = \frac{\text{Spending Realization}}{\text{Spending Target}} \times 100\% \quad (1)$$

The resulting percentage is then assessed using the effectiveness standards stipulated in the Decree of the Minister of Home Affairs No. 690.900-327 of 1996 concerning assessment criteria and financial performance. According to these standards, a comparison result above 100% is classified as **very effective**, while a result between 90% and 99.9% is considered **effective**. A result between 80% and 89.9% is classified as **quite effective**, whereas a result between 60% and 79.9% is considered **less effective**. Finally, a result below 59.9% is classified as **not effective**.

2.1.2 Geographically Weighted Regression (GWR) Analysis

To examine the relationship between village fund utilization, poverty, and village development performance, researchers used Geographically Weighted Regression (GWR) analysis. The GWR analysis model is a global regression analysis model that is transformed into a weighted regression analysis model (Khedmati Morasae et al., 2024; Sifriyani et al., 2024). The fundamental difference between GWR analysis and global regression analysis is that GWR analysis produces local parameter estimates for each observation location. In contrast, global regression analysis provides general parameter estimates across all observation locations. In GWR analysis, because parameter values are determined at each geographic location, the regression parameter values vary across geographic locations. Consequently, the results of the GWR analysis describe the variation in regression parameter values across geographic regions. If the regression parameter values are constant across geographic regions, then the GWR model becomes a global model or ordinary least squares

(OLS) regression (Khedmati Morasae et al., 2024). This implies that each geographic region has the same model. One of the advantages of the GWR model is its ability to account for spatial heterogeneity, allowing relationships between variables to vary across geographic locations. This provides an advantage over global regression approaches, which assume that the estimated coefficients are constant across locations. In the GWR model, the regression coefficients are therefore allowed to vary geographically, capturing differences in the relationships between the predictor and response variables from one location to another. The basic GWR model can be expressed as follows:

$$Y_i = \beta_0(u_i, v_i) + \sum_{k=1}^{\rho} \beta_k(u_i, v_i)X_{ik} + \varepsilon_i \quad (2)$$

In Equation (2), Y_i represents the response variable at location i , where $i = 1, 2, \dots, n$, while X_{ik} denotes the k -th predictor variable at location i . The coordinates (u_i, v_i) represent the longitude and latitude of location i . The coefficient $\beta_k(u_i, v_i)$ represents the regression coefficient of predictor k at location i , allowing the effect of each predictor to vary across geographic locations. Finally, ε_i represents the error term, which is assumed to have a mean of zero and a constant variance of σ^2 , with the errors assumed to be independent and normally distributed.

In this study, GWR analysis was used to examine the relationship between the effectiveness of village funds, poverty and rural development, resulting in four quadrants, namely: Quadrant I (high-low), Quadrant II (high-high), Quadrant III (low-high) and Quadrant IV (low-low) (X. Chen et al., 2023; Wang et al., 2024).

2.1.3 Moran Index Analysis

One method for assessing spatial relationships is to use the Moran Index. The Moran test aims to determine spatial dependence or autocorrelation between observations or locations, meaning that the characteristics of a village will influence (or be influenced by) the characteristics of surrounding villages. The Moran Index is used to describe and explain spatial distribution, identify clusters, and determine outliers. Positive autocorrelation indicates similar values among adjacent locations and a tendency to cluster. Negative autocorrelation indicates that adjacent locations have different values and tend to be dissimilar. The formula for calculating spatial autocorrelation using the Moran Index is as follows: (Lee & Wong, 2001):

$$I = \frac{n \sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^n (x_i - \bar{x})^2} \quad (3)$$

In Equation (3), I represents the Moran Index, while n denotes the number of villages observed. The terms x_i and x_j represent the observed values for villages i and j , respectively, where village j is adjacent to village i . The term $\bar{x}$ represents the average value of the

observed variable across all villages, while w_{ij} represents the spatial weight between villages i and j .

The hypotheses for the Moran Index are formulated as follows: $H_0: I = 0$, indicating no spatial autocorrelation among the villages, and $H_1: I \neq 0$, indicating the presence of spatial autocorrelation among the villages. The expected value of the Moran Index is given by:

$$E(I) = I_0 = \frac{-1}{N-1} \quad (4)$$

Spatial autocorrelation between locations occurs if:

$$Z_{score} = \frac{1 - I_0}{\sqrt{Var(1)}} \sim N(0,1) \quad (5)$$

where Var is the variance of Moran's I , I_0 is the expected value of Moran's I , and I is the Moran's I statistic. Three categories can be used to categorize the values or patterns seen in the Moran Index: clustered, random, and scattered. When $|Z\text{-score}| > Z_{\alpha/2}$, the null hypothesis (H_0) is rejected. The Moran's I statistic ranges from -1 to 1. A positive spatial autocorrelation indicates a clustered pattern when $I > I_0$, whereas a negative spatial autocorrelation indicates a dispersed pattern when $I < I_0$ (Weng et al., 2022).

3. RESULTS AND DISCUSSIONS

3.1 Results

3.1.1 Analysis of the Effectiveness of Village Fund Utilization

The effectiveness of village spending in Belitung Regency is measured by comparing the target and actual village spending in several areas, namely village governance, village development, community development, and village community empowerment. Overall, village fund management by village governments in Belitung Regency is considered quite effective, with an average effectiveness of 83 percent. By sector, the highest absorption is found in village governance, with an average of 91 percent, followed by village development at 86 percent. The lowest absorption is found in village community empowerment, which only reaches 46 percent.

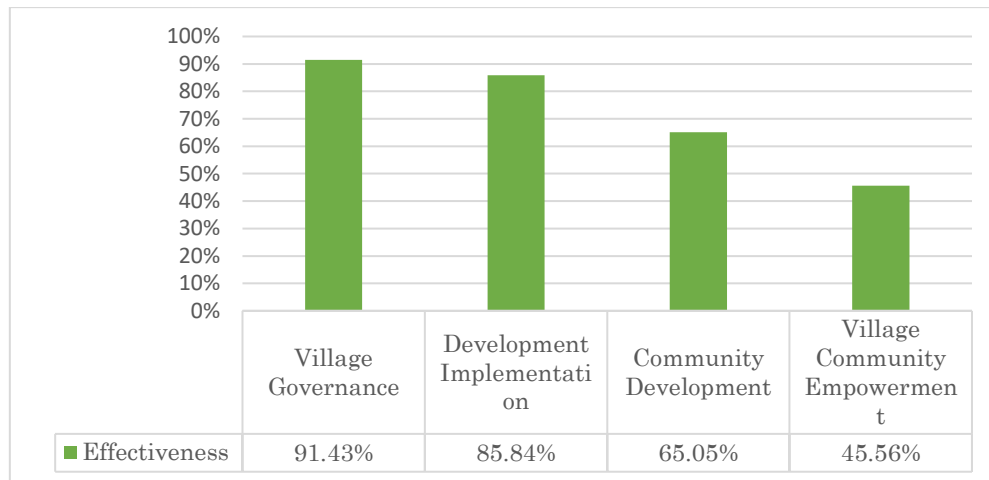


Figure 2. Effectiveness of Village Fund Use by Sector

Source: Data Processing and Analysis Results, 2023

3.1.2 Poverty Analysis

The number of poor households is used as the primary indicator to describe poverty levels in each region. This data is then analyzed using the Moran Index to determine whether there is a clustered, dispersed, or random spatial distribution of poverty. This information is then used to assess the effectiveness of village fund utilization in poverty reduction based on the spatial patterns identified.

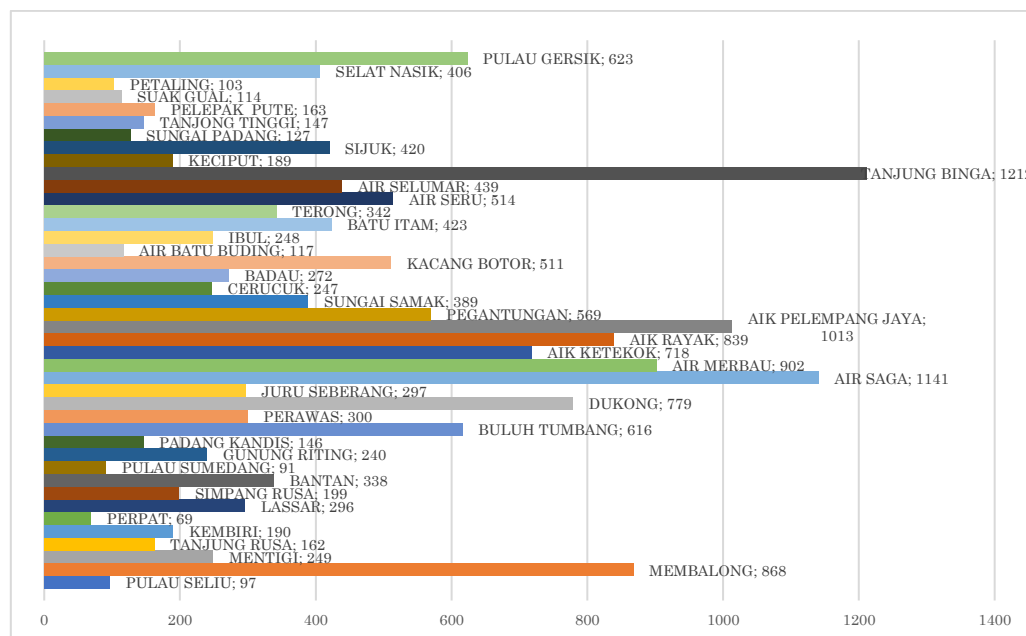


Figure 3. Number of Poor Households per Village in Belitung Regency

Source: Data Processing and Analysis Results, 2023

Based on an analysis conducted by Hariyanto et al. (2023), it is known that the Moran Index results indicate that the distribution of poverty levels in Belitung Regency is random, with a spatial autocorrelation value of -0.013404 and an expected index value of -0.024390. This indicates that there is no poverty clustering between adjacent villages. This condition is influenced by the characteristics of village areas that are scattered and not strongly connected to each other, so that spatial continuity and connectivity between regions are relatively low. Thus, the poverty level in a village in Belitung Regency is not directly influenced by the poverty conditions in neighboring villages.

3.1.3 Village Development Status

Based on 2022 data from the Ministry of Villages, Development of Disadvantaged Regions and Transmigration (Kemendes PDTT), the village development status based on the Village Development Index (IDM) in Belitung Regency is divided into three categories: 9 independent villages (21.43 percent), 28 developed villages (66.67 percent), and 5 developing villages (11.90 percent). This composition indicates that the government still needs to optimize the management and development of village resource potential to encourage a more equitable improvement in village status. Furthermore, strengthening various supporting components of village development, particularly economic, ecological, and social aspects, is needed to ensure sustainable village development achievements.

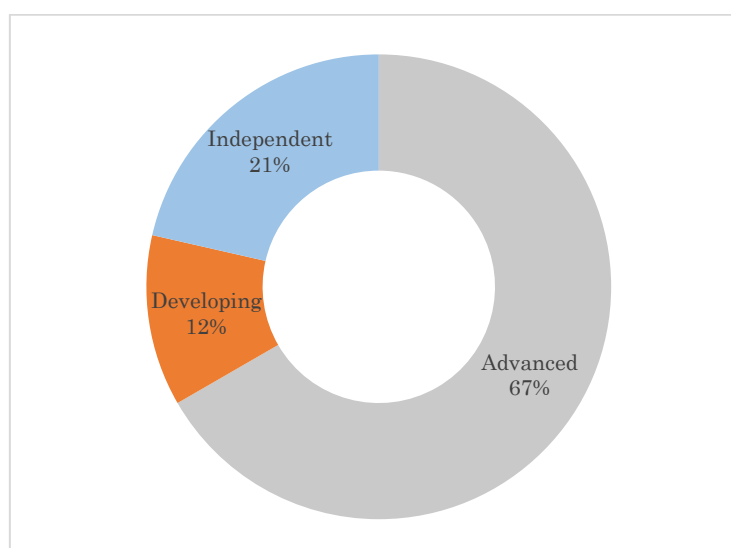


Figure 4. IDM Status of Belitung Regency in 2022

Source: Data Processing and Analysis Results, 2023

3.1.4 The Relationship between the Effectiveness of Village Fund Utilization and Poverty

From the results of the analysis above, an analysis of the relationship between the effectiveness of village fund utilization and poverty levels was then carried out, which was

divided into four quadrants, including: **Quadrant I** shows that high effectiveness in utilizing village funds is correlated with low poverty levels in the village. **Quadrant II** explains the high effectiveness in utilizing village funds, but also the high level of village poverty. **Quadrant III** shows low effectiveness in utilizing village funds, combined with high levels of village poverty. **Quadrant IV** explains the low effectiveness in utilizing village funds, but also the low level of poverty.

The average effectiveness of village fund utilization in Belitung Regency is 78.58%, while the average number of poor households per village is 407. Correlation analysis using EViews indicates a very weak positive relationship between the effectiveness of village fund utilization and the poverty rate, with a correlation coefficient of 0.02. This suggests that differences in the effectiveness of village fund utilization are only weakly associated with differences in poverty rates across villages, indicating that other factors also contribute to variations in poverty levels (Burke & Siyaranamual, 2019; Hariyanto et al., 2023). The spatial distribution of villages across the four quadrants reveals considerable variation in this relationship. **Quadrant I** comprises 16 villages (38.09%) where village fund utilization is relatively effective and poverty rates are low, suggesting a favorable development condition. **Quadrant II** includes 6 villages (14.29%) where village fund utilization is effective but poverty rates remain high, indicating that effective fund utilization has not necessarily translated into lower poverty. **Quadrant III** consists of 11 villages (26.19%) characterized by low effectiveness in village fund utilization and high poverty rates, representing villages that may require greater attention. Finally, **Quadrant IV** comprises 9 villages (21.43%) where fund utilization is less effective but poverty rates remain low. The classification of villages based on the effectiveness of village fund utilization and poverty levels is presented in Table 1 and Figure 5.

Table 1. The Relationship between the Effectiveness of Village Fund Utilization and Poverty

Quadrant	Results	Villages
Quadrant I	High effectiveness, low poverty rate	1. Perpat 2. Lasar 3. Mentigi 4. Simpang Rusa 5. Air Batu Buding 6. Kembiri 7. Perawas 8. Pulau Selu 9. Tanjung Tinggi 10. Suak Gual 11. Cerucuk 12. Batan 13. Sungai Padang 14. Gunung Riting 15. Juru Seberang 16. Badau

Table 1. (continued)

Quadrant	Results	Villages	
Quadrant II	High effectiveness, high poverty rate	1. Air Seruk 2. Kacang Botor 3. Air Selumar 4. Membalong 5. Aik Pelempang Jaya 6. Air Saga	6 villages (14.29%)
Quadrant III	Low effectiveness, high poverty rate	1. Selat Nasik 2. Pulau Gersik 3. Dukong 4. Sijuk 5. Buluh Tumbang 6. Batu Itam 7. Pegantungan 8. Aik Ketekok 9. Aik Raya 10. Air Merbau 11. Tanjung Binga	11 villages (26.19%)
Quadrant IV	Low effectiveness, low poverty rate	1. Pelepak Pute 2. Padang Kandis 3. Tanjung Rusa 4. Keciput 5. Terong 6. Sungai Samak 7. Petaling 8. Ibul 9. Pulau Sumedang	9 villages (21.43%)

Source: Data Processing and Analysis Results, 2023

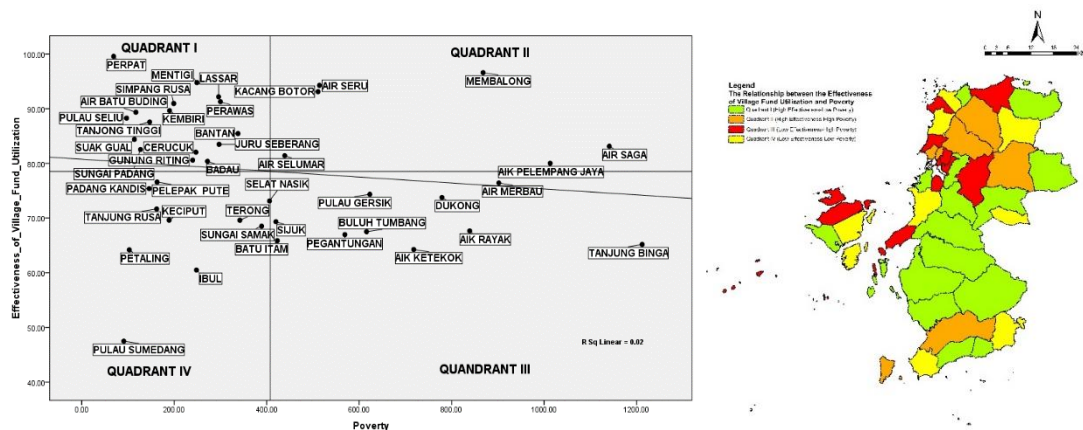


Figure 5. Relationship between the Effectiveness of Village Fund Utilization and Poverty

Source: Data Processing and Analysis Results, 2023

3.1.5 The Relationship between the Effectiveness of Village Fund Utilization and Rural Development Performance (IDM)

Based on the analysis, the relationship between the effectiveness of village fund utilization and rural development performance can be determined. The results indicate that this relationship falls into four quadrants: Quadrant I, Quadrant II, Quadrant III, and Quadrant IV. **Quadrant I** indicates that high effectiveness in village fund utilization is not followed by improved performance, due to low levels of rural development performance (IDM). **Quadrant II** describes high effectiveness in village fund utilization, followed by high levels of rural development performance (IDM). **Quadrant III** describes low effectiveness in village fund utilization but high levels of rural development performance (IDM). **Quadrant IV** indicates that low effectiveness in village fund utilization is also accompanied by low levels of rural development performance.

The average effectiveness of village fund utilization in Belitung Regency is 78.58%, while the average Village Development Index (IDM) is 0.7631. The correlation analysis indicates a very weak positive relationship between the effectiveness of village fund utilization and rural development performance, with a correlation coefficient of 0.003. This value is close to zero, suggesting that the effectiveness of village fund utilization is only weakly associated with variations in rural development performance across villages. The distribution of villages across the four quadrants further illustrates the variation in this relationship. **Quadrant I** comprises 12 villages (28.57%) where village fund utilization is highly effective but rural development performance remains low. **Quadrant II** includes 10 villages (23.81%) where both fund utilization effectiveness and rural development performance are high. **Quadrant III** consists of 11 villages (26.19%) where fund utilization effectiveness is low despite relatively high rural development performance. Finally, **Quadrant IV** comprises 9 villages (21.43%) where both fund utilization effectiveness and rural development performance are low. The classification of villages based on these two indicators is presented in Table 2 and Figure 6.

Table 2. The Relationship between the Effectiveness of Village Fund Utilization and Rural Development Performance

Quadrant	Results	Villages
Quadrant I	High effectiveness, low IDM	1. Perpat 2. Mentigi 3. Kacang Botor 4. Lassar 5. Simpang Rusa 6. Tanjung Tinggi 7. Batan 8. Air Saga 9. Cerucuk 10. Air Selumar 11. Juru Seberang 12. Aik Pelempang Jaya

Table 2. (continued)

Quadrant	Results	Villages
Quadrant II	High effectiveness, high IDM	1. Membalong 2. Air Seruk 3. Perawas 4. Pulau Selu 5. Kembiri 6. Air Batu Buding 7. Sungai Padang 8. Suak Gual 9. Badau 10. Gunung Riting 10 villages (23.81%)
Quadrant III	Low effectiveness, high IDM	1. Selat Nasik 2. Air Merbau 3. Padang Kandis 4. Tanjung Rusa 5. Batu Itam 6. Aik Ketekok 7. Petaling 8. Aik Rayak 9. Sungai Samak 10. Sijuk 11. Tanjung Binga 11 villages (26.19%)
Quadrant IV	Low effectiveness, low IDM	1. Pelepak Pute 2. Dukong 3. Keciput 4. Terong 5. Buluh Tumbang 6. Ibul 7. Pegantungan 8. Pulau Gersik 9. Pulau Sumedang 9 villages (21.43%)

Source: Data Processing and Analysis Results, 2023

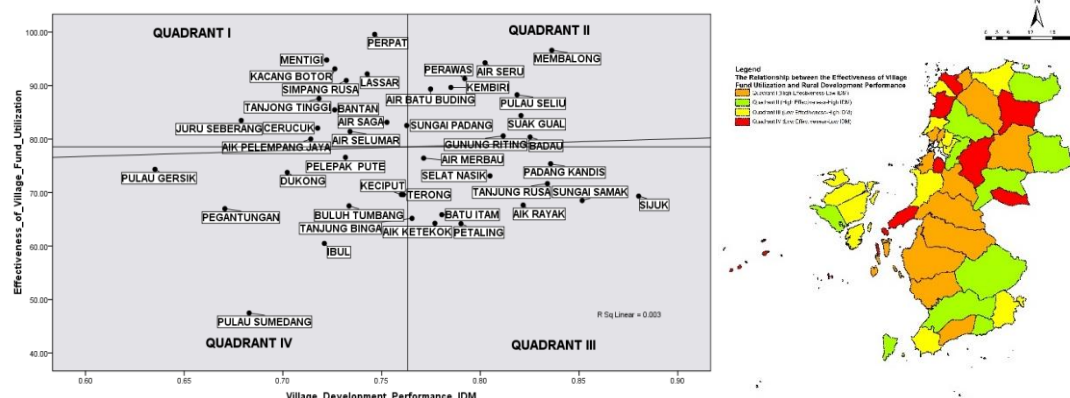


Figure 6. Relationship between the Effectiveness of Village Fund Utilization and Rural Development Performance (IDM)

Source: Data Processing and Analysis Results, 2023

3.1.6 The Relationship between Rural Development Performance (IDM) and Poverty

From the analysis, it is clear that the relationship between rural development performance and poverty levels in Belitung Regency is spread across all quadrants: Quadrant I, Quadrant II, Quadrant III, and Quadrant IV (Chen et al., 2022; Nugroho, 2010). **Quadrant I** shows that high or good rural development performance has an impact on reducing poverty levels in villages. **Quadrant II** explains high rural development performance (IDM) but also high poverty levels in villages. **Quadrant III** describes low rural development performance, followed by high levels of rural poverty. In **Quadrant IV**, it is described that low rural development performance is accompanied by low levels of poverty in villages.

The average rural development performance (IDM) in Belitung Regency is 0.7631, while the average number of poor households per village is 407. The analysis of the relationship between rural development performance and poverty indicates a very weak positive correlation, with a correlation coefficient of 0.007. The reported coefficient is close to zero, suggesting that rural development performance is only weakly associated with differences in poverty levels across villages. The distribution of villages across the four quadrants further illustrates the variation in this relationship. **Quadrant I** comprises 12 villages (28.57%) with high rural development performance and low poverty levels. **Quadrant II** includes 8 villages (19.05%) with both high rural development performance and high poverty levels, indicating that relatively strong development performance does not necessarily coincide with low poverty. **Quadrant III** consists of 8 villages (19.05%) characterized by low rural development performance and high poverty levels. Finally, **Quadrant IV** comprises 14 villages (33.33%) with low rural development performance and low poverty levels. The classification of villages based on rural development performance and poverty levels is presented in Table 3 and Figure 7.

Table 3. The Relationship between Village Development Performance (IDM) and Poverty

Quadrant	Results	Villages
Quadrant I	High IDM, low poverty rate	1. Sungai Samak 2. Tanjung Rusa 3. Padang Kandis 4. Badau 5. Suak Gual 6. Pulau Seliu 7. Gunung Riting 8. Petaling 9. Perawas 10. Selat Nasik 11. Air Batu Buding 12. Kembiri 12 villages (28.57%)
Quadrant II	High IDM, high poverty rate	1. Sujuk 2. Membalong 3. Air Rayak 4. Tanjung Binga 5. Air Merbau 6. Aik Ketekok 7. Air Seruk 8. Batu Itam 8 villages (19.05%)
Quadrant III	Low IDM, high poverty rate	1. Air Saga 2. Aik Pelempang Jaya 3. Dukong 4. Buluh Tumbang 5. Pulau Gersik 6. Pegantungan 7. Kacang Botor 8. Air Selumar 8 villages (19.05%)
Quadrant IV	Low IDM, low poverty rate	1. Sungai Padang 2. Keciput 3. Terong 4. Perpat 5. Simpang Rusa 6. Lassar 7. Pelepak Pute 8. Mentigi 9. Batan 10. Tanjung Tinggi 11. Cerucuk 12. Ibul 13. Pulau Sumedang 14. Juru Seberang 14 villages (33.33%)

Source: Data Processing and Analysis Results, 2023

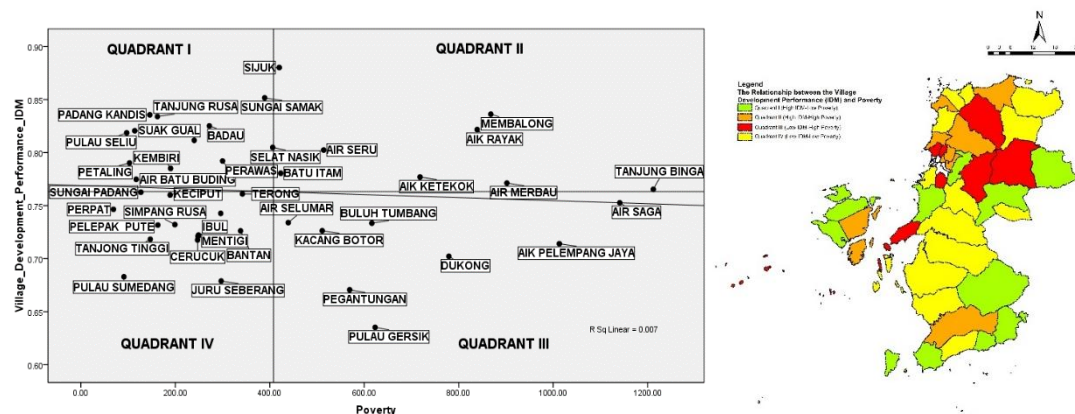


Figure 7. Relationship between Village Development Performance (IDM) and Poverty
Source: Data Processing and Analysis Results, 2023

3.1.7 Village Typology Based on the Relationship between Effectiveness, Poverty, and Rural Development Performance (IDM)

Based on the relationships among village fund utilization effectiveness, poverty, and rural development performance (IDM), eight village typologies were identified in Belitung Regency. These typologies reflect different combinations of development conditions and corresponding development priorities. The results of this typological classification can serve as a basis for recommending the development of priority villages (Anser et al., 2023; Li et al., 2023; Stasi et al., 2024; Ullah et al., 2024).

Typology A comprises villages with low village fund utilization effectiveness, high poverty rates, and low rural development performance. These villages are assigned the **highest development priority**. **Typology B** consists of villages with low fund utilization effectiveness and high poverty rates and is assigned the **second-highest priority**. **Typology C** includes villages with low fund utilization effectiveness and low rural development performance, corresponding to the **third-highest priority**. **Typology D**, assigned the **fourth-highest priority**, comprises villages with high poverty rates and low rural development performance. **Typology E** consists of villages with low fund utilization effectiveness and is assigned the **fifth-highest priority**, while **Typology F**, characterized by high poverty rates, is assigned the **sixth-highest priority**. **Typology G** comprises villages with low rural development performance and is considered a **lower development priority**. Finally, **Typology H** consists of villages in relatively stable conditions, for which development efforts should focus on maintaining and improving their current conditions. The characteristics and distribution of the eight village typologies are presented in Table 4 and Figure 8.

Table 4. Village Typology Based on Effectiveness, Poverty, and Development Performance

Quadrant	Results	Villages
Typology A	Low effectiveness, high poverty rate, low IDM	1. Pulau Gersik 2. Pegantungan 3. Dukong 4. Buluh Tumbang 5. Batu Itam 5 villages (11.90%)
Typology B	Low effectiveness, high poverty rate, high IDM	1. Tanjung Binga 2. Selat Nasik 3. Sijuk 4. Aik Ketekok 5. Aik Rayak 6. Air Merbau 6 villages (14.30%)
Typology C	Low effectiveness, low poverty rate, low IDM	1. Pulau Sumedang 2. Pelepak Pute 3. Keciput 4. Terong 5. Ibul 5 villages (11.90%)
Typology D	High effectiveness, high poverty rate, low IDM	1. Air Saga 2. Air Pelempang Jaya 3. Kacang Botor 4. Air Selumar 4 villages (9.52%)
Typology E	Low effectiveness, low poverty rate, high IDM	1. Sungai Samak 2. Padang Kandis 3. Tanjung Rusa 4. Petaling 4 villages (9.52%)
Typology F	High effectiveness, high poverty rate, high IDM	1. Air Seruk 2. Membalong 2 villages (4.76%)
Typology G	High effectiveness, low poverty rate, low IDM	1. Perpat 2. Lassar 3. Mentigi 4. Simpang Rusa 5. Tanjung Tinggi 6. Cerucuk 7. Batan 8. Juru Seberang 8 villages (19.05%)
Typology H	High effectiveness, low poverty rate, high IDM	1. Air Batu Buding 2. Kembiri 3. Perawas 4. Pulau Seliau 5. Suak Gual 6. Sungai Padang 7. Gunung Riting 8. Badau 8 villages (19.05%)

Source: Data Processing and Analysis Results, 2023.

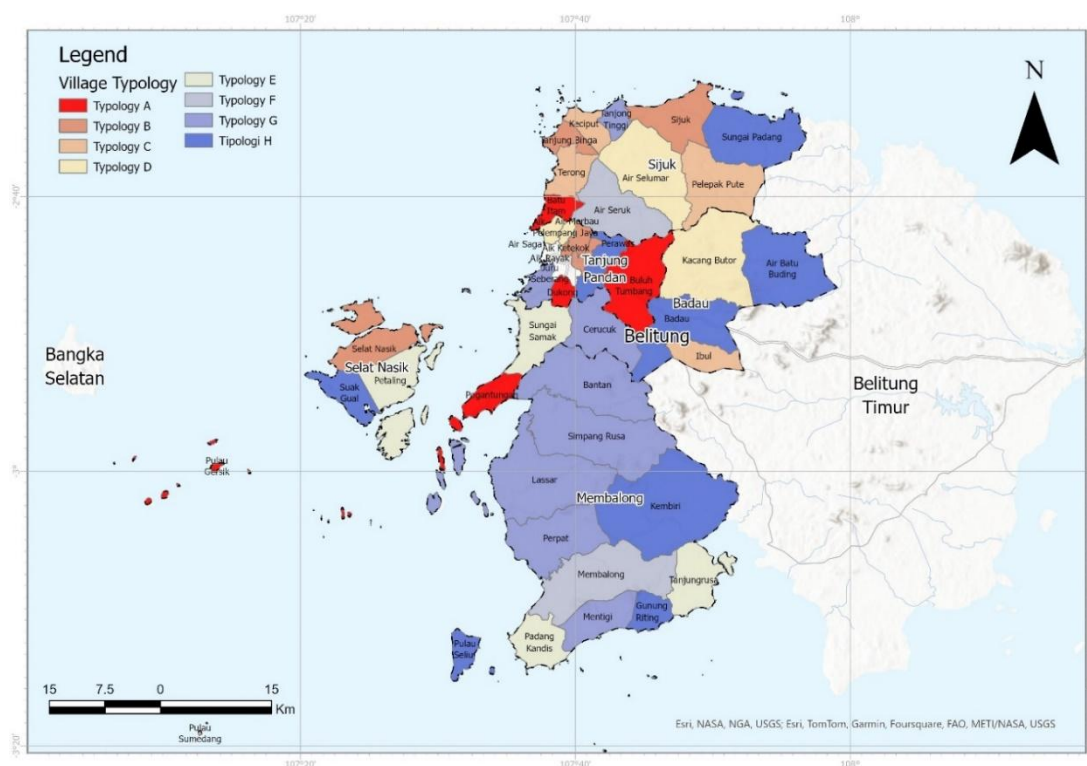


Figure 8. Village Typology Based on the Effectiveness of Village Fund Utilization, Poverty, and Development Performance

Source: Data Processing and Analysis Results, 2023

3.2 Discussion

The findings presented in sub-section 3.1 show a complex set of relationships between village fund effectiveness, poverty, and rural development performance (IDM) in Belitung Regency. The relationship between the effectiveness of village fund utilization and poverty is closely related; more effective village funds utilization results in lower poverty levels (Hariyanto et al., 2023; Weng et al., 2022). However, the correlation analysis of this study found a weak positive relationship of 0.02. This indicates that high effectiveness in utilizing village funds does not have a significant impact on reducing poverty levels in each village in Belitung Regency. This is supported by the distribution of villages: while 38.09 percent of villages in Quadrant I indicate that more effective utilization of village funds has the potential to reduce poverty levels, Quadrant III (26.19% of villages) indicates that lower effectiveness tends to increase poverty, highlighting that these villages require serious attention from the government.

Regarding the relationship between village fund effectiveness and rural development performance, the analysis found a positive relationship of 0.003. This indicates that effective utilization of village funds tends to have a positive but very weak relationship with improving rural development performance. As many as 28.57 percent of villages in Quadrant I indicate that high effectiveness is not always able to improve rural development performance (IDM)

(Khedmati, Morasae et al., 2024; Sifriyani et al., 2024). Conversely, 23.81 percent of villages in Quadrant II indicate that effective utilization of village funds has the potential to improve rural development performance.

Furthermore, it is well understood that there is a strong relationship between rural development performance and poverty levels, where good or high rural development performance impacts poverty reduction (Hariyanto et al., 2023). However, the analysis only found a positive relationship of 0.007. This indicates that high rural development performance (HDI) is not significantly related to poverty reduction in every village in Belitung Regency. This is evidenced by 28.57 percent of villages located in Quadrant I, where a higher HDI has the potential to reduce poverty, but also by 19.05 percent of villages located in Quadrant II, indicating that high rural development performance has not been able to reduce poverty levels.

The village typology developed based on fund utilization effectiveness, poverty, and rural development performance provides a basis for prioritizing rural development interventions according to the specific conditions and challenges faced by each village. The typology can support the planning and implementation of more effective and efficient development programs by helping policymakers identify key issues, including inefficient use of village funds, high poverty rates, and low rural development performance. Accordingly, development priorities can be tailored to the characteristics and needs of individual villages (Handayani et al., 2023; Manurung et al., 2024).

Spatial grouping of the effectiveness of village fund utilization, poverty, and rural development will facilitate the selection of strategies or efforts in designing programs to increase the effectiveness of village fund utilization, reduce poverty, and improve rural development. The formulation of alternative policies or strategies is only aimed at villages with low effectiveness in utilizing village funds, high poverty rates, and low rural development performance (Hilmawan et al., 2023; Liu et al., 2023; Purnamasari et al., 2024). This is because these villages have the highest poverty rates compared to other villages and low rural development performance, so they require more serious attention than other villages.

This study is expected to provide insights into improving the effectiveness and efficiency of village fund utilization, poverty alleviation, and rural development performance in Belitung Regency, particularly in the areas of governance, physical infrastructure, community development, and community empowerment. These targeted interventions are expected to contribute to more effective rural development and accelerate the development process in the region.

4. CONCLUSION

The application of spatial analysis to the effectiveness of village fund utilization, poverty, and rural development in a particular region produces more precise and complete knowledge about the variables that influence these three areas. Four quadrants were identified from the findings of the analysis of the geographic distribution patterns of poverty, rural development, and the effectiveness of village fund utilization: quadrant I (high-low), quadrant II (high-high), quadrant III (low-high), and quadrant IV (low-low). In developing development policies or strategies, the classification of villages based on the efficiency of village fund utilization, poverty,

and rural development, along with the shared elements of villages that influence poverty and rural development, can be used as alternatives.

Spatial grouping enables targeted interventions, prioritizing villages with low village fund utilization effectiveness, high poverty, and low rural development performance. Villages with low effectiveness in village fund absorption, high poverty rates, and low rural development performance are recommended as top priority villages for various poverty alleviation efforts tailored to factors that can specifically reduce poverty in that location. This also applies to villages with low effectiveness and low rural development performance. Efforts to improve the effectiveness of village fund utilization, reduce poverty, and improve rural development are prioritized. For villages included in Typology A, namely Pulau Gersik Village, Pegantungan Village, Dukong Village, Buluh Tumbang Village, and Batu Itam Village, where this typology shows the condition of low utilization of village funds, high poverty rates and low rural development performance.

Given the challenges faced by villages in Typology A, several strategies can be considered to improve their development conditions. First, village funds should be optimized to support community development, particularly by improving access to public education and health services, including scholarships for residents in need who demonstrate academic potential. Greater effectiveness in village fund utilization can also be pursued through community empowerment initiatives, such as strengthening food security, establishing and developing innovative Village-Owned Enterprises (BUMDesa), providing financial management training for village administrators, expanding training and extension programs, increasing food crop production, and supporting farmer groups. In addition, village funds can be directed toward developing local economic potential in areas such as tourism, fisheries, agriculture, and plantations, as well as supporting BUMDesa, the creative economy, and micro and small enterprises.

Improvements in health services should also be prioritized by expanding health facilities, particularly maternal and child health posts (Polindes), to address issues such as stunting, improve maternal health, ensure adequate nutrition for infants, and reduce vulnerability to disease. Similarly, improving the quality of education through greater access to educational facilities can contribute to human resource development. Finally, improving physical accessibility is particularly important for villages located on islands separate from Belitung Island, where transportation is more challenging. This includes improving road networks and sea-crossing infrastructure, particularly in villages such as Pulau Gersik.

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