Descriptive and Predictive Analysis of Village Fund Allocation in Bandung Regency in 2025 Integrating the Roles of Data Analysts and Data Scientists

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ABSTRACT

This study aims to analyze the allocation of Village Funds in Bandung Regency in 2025 by integrating descriptive and predictive approaches through the roles of Data Analyst and Data Scientist. Official data from the Ministry of Finance (2025), covering all villages in Bandung Regency, served as the primary dataset. The descriptive approach focused on identifying distribution patterns, inter-village disparities, and differences in performance-based allocations. Meanwhile, the predictive approach employed clustering techniques to uncover hidden structures within the allocation patterns. The findings reveal that a portion of villages received performance-based allocations with a fixed value of IDR 396.180.329.000, which increased their total allocation by approximately 25% compared to villages without such allocations. Cluster analysis identified three main distribution patterns, reflecting variations in fiscal characteristics and village capacities. Geographic visualization further highlighted disparities across sub-districts, with certain areas receiving relatively higher allocations than others. These results underscore the importance of integrating descriptive and predictive analytics in public policy studies, particularly in the management of Village Funds. Practically, the study provides empirical evidence to support local governments in formulating allocation policies that are more transparent, equitable, and data-driven. Furthermore, the findings demonstrate the potential of data analytics to enhance fiscal governance at the village level, contributing to more effective and accountable resource distribution.

Keywords: *Village Funds, Performance Allocation, Descriptive Analysis, Clustering, West Java*

INTRODUCTION

Village development is a strategic agenda within the framework of Indonesia's national development. Since the enactment of Law No. 6 of 2014 on Villages, the central government has distributed Village Funds (DD) as the main instrument to accelerate equitable development, reduce disparities between regions, and improve the welfare of rural communities. (Dwiyanti et al., 2025;

Fiskal Kemenkeu, 2021) Village Funds are allocated through three main components, namely basic allocation, formula allocation, and performance allocation. Basic allocations are distributed evenly to all villages; formula allocations take into account variables such as population size, poverty levels, land area, and geographical difficulties; while performance allocations are selectively given to villages that meet certain indicators, such as financial management, development achievements, and village innovation (Ministry of Finance of the Republic of Indonesia, 2024).

Although the Village Fund has become an important instrument in development, various studies show that its implementation still faces serious challenges, particularly regarding distribution disparities and transparency of performance allocation criteria (Hilmawan, 2023; Sutikno, 2025). The issues of distribution fairness and information transparency are crucial to ensuring that the Village Fund truly functions as a tool for equitable development. Research in the realm of public finance highlights that the effectiveness of decentralized funding is strongly tied to clear, fair, and objective resource distribution mechanisms (OECD, 2021) and the shift from mere transfers to achieving measurable outcomes (Isman et al., 2025).

Bandung Regency, with its large number of villages and diverse regional characteristics, is an interesting policy laboratory for analysis. The regency's heterogeneity—ranging from urban-periphery areas to remote, mountainous villages—creates significant variation in development needs and governance capacity, making it a microcosm of the allocation challenges faced nationwide (Yovita et al., 2023). The sheer volume of villages and the complexity of its geography mean that the allocation mechanism is thoroughly tested here, thus providing an ideal empirical setting to analyze whether the formula and performance-based criteria truly translate into proportional justice for highly diverse recipients. Based on data from the Ministry of Finance (2024), all villages in Bandung Regency receive Village Funds with variations in allocation influenced by demographic, geographic, and governance performance factors. Previous studies have confirmed that village institutional capacity has a significant influence on the effectiveness of Village Fund utilization (Adam et al., 2024) , while transparency and community participation are key factors in improving management accountability (Sukoco etol al., 2023).

However, the performance-based allocation received by only some villages raises a fundamental question: what factors determine which villages receive additional funds, while others do not? Are these factors more influenced by objective indicators such as financial governance and development achievements, or is there administrative bias in the assessment process? This question is relevant given that previous studies have found a relationship between village fiscal governance, institutional capacity, and development effectiveness (Harahap, 2025; Anam, 2023).

In terms of methodology, this study integrates two analytical approaches: descriptive analysis, which represents the role of data analysts, and clustering-based predictive analysis (specifically, Rule-Based Segmentation), which represents the role of data scientists. This approach aligns with the

global trend of GovTech and digital government transformation (World Bank, 2020) and the increasing need for data analytics in public sector accountability (Chaqiqi & Nugroho, 2021). Descriptive analysis is used to describe the distribution patterns of Village Funds, the proportion of basic allocations, formulas, and performance, as well as disparities between subdistricts in Bandung Regency. Meanwhile, segmentation analysis is used to identify performance allocation patterns based on village characteristics, thereby providing a more comprehensive picture of the factors that influence fund distribution. Thus, this study is expected to contribute academically to the development of data-based public policy analysis methodologies, as well as practically for local governments in formulating Village Fund allocation policies that are more transparent, fair, and accountable.

RESEARCH METHOD

This study employs official secondary data obtained from the Directorate General of Fiscal Balance, Ministry of Finance of the Republic of Indonesia, accessed via the website djpk.kemenkeu.go.id. The dataset comprises the 2025 Village Fund realization figures for all villages in Bandung Regency. The primary variables analyzed include basic allocation, formula-based allocation, performance-based allocation, and total allocation (denominated in thousands of rupiah). The utilization of government-sourced data aims to ensure the validity and reliability of research findings, adhering to principles of evidence-based public policy research utilizing secondary data (Lee, 2025; Yuliani et al., 2025).

Preliminary data processing involved rigorous cleaning procedures. Missing values or hyphens ("–") in the performance-based allocation variable were replaced with zeros, as this component is discretionary and granted exclusively to villages meeting specific predefined criteria (Lee, 2025; Sun et al., 2023). Subsequently, data normalization was performed by removing the dot symbol (.) used as a thousand separator to ensure compatibility with Python-based analytical software. This step aligns with established quantitative data analysis practices, wherein numerical format consistency is critical to prevent computational errors (Sharma & Sethi, 2023).

The analytical framework integrates dual methodological perspectives: Data Analyst and Data Scientist roles. In the Data Analyst phase, descriptive statistics—comprising mean, median, minimum, maximum, standard deviation, and frequency distribution—were computed to delineate patterns in Village Fund distribution. This analysis aimed to identify inter-village disparities across basic, formula-based, and performance-based allocations. Exploratory visualizations, including histograms with Kernel Density Estimation (KDE), scatter plots, boxplots, and bar charts, were employed to enhance interpretability (Josyula et al., 2023; Sharma & Sethi, 2023).

In the Data Scientist phase, Rule-Based Segmentation was applied to identify meaningful allocation patterns. Segmentation criteria were defined using the ratio of basic allocation to formula-based allocation, yielding three distinct clusters: (1) Formula-Dominant (basic-to-formula ratio < 0.5),

(2) Balanced (0.5 ≤ basic-to-formula ratio ≤ 2), and (3) Basic-Dominant (basic-to-formula ratio > 2). This approach was selected for its transparency, stability, and accessibility to non-technical policymakers, ensuring actionable insights for policy design (Cui et al., 2021; Yuliani et al., 2025).

K-Means clustering was deliberately excluded due to inherent mathematical limitations in this context. The algorithm assumes clusters are isotropic (spherical) and uniform in size, while remaining highly sensitive to initial centroid placement. These constraints risk fragmenting large clusters and merging smaller ones, thereby obscuring policy-relevant patterns in Village Fund data. Furthermore, K-Means' inability to account for cluster density renders its outputs potentially misleading for equity-focused policy analysis (Nguyen et al., 2016; Ghosh & Kumar, 2019).

Correlation analysis was conducted using Pearson's coefficient to quantify relationships among basic allocation, formula-based allocation, performance-based allocation, and total allocation. Results were visualized via correlation heatmaps generated using the Seaborn library. This analysis identifies key drivers of total allocation, providing empirical grounding for equitable Village Fund distribution policies (Lee, 2025; Sharma & Sethi, 2023).

By synthesizing descriptive analytics with rule-based segmentation, this research not only elucidates the empirical distribution of Village Funds across Bandung Regency but also uncovers actionable allocation patterns critical for evidence-informed policy formulation (Yuliani et al., 2025).

RESULTS AND DISCUSSION

The Village Fund is a strategic policy instrument that plays a crucial role in empowering villages and improving the welfare of rural communities. This analysis of the 2025 Village Fund allocation was conducted to understand the pattern of fund allocation and identify trends that are relevant for future policy planning. With a total Village Fund ceiling of IDR 385.6 billion for 270 villages, this analysis provides critical insights into the distribution of funds that can be used as a basis for policy evaluation and allocation improvements in the future. A deep understanding of these allocation patterns is very important in the context of equitable development and strengthening villages as the smallest unit of government.

The analytical approach used in this study combines descriptive statistical methods with category segmentation based on allocation amounts. The data analyzed includes basic allocation components, formula allocations, and total allocations for each village. The techniques applied include descriptive statistical calculations, distribution analysis, and comparisons between allocation categories. This approach was deliberately chosen because it allows for interpretations directly related to policy without requiring complex statistical assumptions. In this analysis, total allocations are grouped into three main categories: Low, Medium, and High, which facilitates the identification of patterns and comparisons between village groups.

The main findings of this analysis show that Village Fund allocations are unevenly distributed among villages, with significant differences between allocation categories. Villages with high allocations (90 villages) received an average of IDR 1.7 billion, while villages with low allocations (90 villages) only received an average of IDR 1.2 billion. This difference reflects the policy considerations applied in the allocation of funds, with formula allocations being more dominant in villages with high allocations (52.8%) compared to basic allocations (47.2%). These findings indicate that the fund allocation policy has taken into account specific village factors that are reflected in the formula allocation component. However, a more in-depth analysis is needed to understand the criteria underlying these allocation differences, so as to ensure the fairness and effectiveness of fund allocation.

Table 1. Statistical Summary

Statistics	Value
Total Allocation	Rp 385.58 billion
Average Allocation	Rp 1.43 billion
Median Allocation	Rp 1.39 billion
Lowest Allocation	Rp 898.52 million
Highest Allocation	Rp 2.65 billion
Number of Villages	270 village

Analysis of Table 1 shows that the total allocation of Village Funds amounting to IDR 385.6 billion for 270 villages resulted in an average allocation per village of IDR 1.4 billion. The similarity between the average and median allocations (both IDR 1.4 billion) indicates a relatively symmetrical distribution without significant extreme outliers. The fairly wide allocation range, from IDR 898.5 million to IDR 2.6 billion, shows significant variation between villages. These differences reflect different policy considerations according to village characteristics, such as population size, area size, and level of underdevelopment. This variation in allocation is in line with the objective of the Village Fund, which aims to accommodate the specific needs of each village. With a relatively symmetrical distribution, the fund allocation policy can be said to have taken into account the principles of fairness and proportionality in fund allocation. However, the significant variation in allocation also indicates the need for further evaluation of the allocation criteria to ensure that the fund allocation is in line with the actual needs of each village.

Table 2. 10 Villages with the Highest Total Allocation

No	Village Name	Total Allocation IDR
1	Cinunuk	2.65 Billion
2	Cimekar	2.34 Billion
3	Rancamanyar	2.32 Billion

No	Village Name	Total Allocation IDR
4	Cileunyi Wetan	2.29 Billion
5	Nagrak	2.22 Billion
6	Sukamanah	2.18 Billion
7	Mekarrahayu	2.14 Billion
8	Cangkuang Kulon	2.10 Billion
9	Margamulya	2.08 Billion
10	Pangauban	2.06 Billion

Table 2 identifies the 10 villages with the highest Village Fund allocations, with Cinunuk receiving the largest amount at IDR 2.65 billion. These villages tend to be concentrated in areas with greater development needs or specific characteristics that meet the criteria for higher formula allocations. Among the top 10 villages, 8 villages have allocations above IDR 2.1 billion, indicating that some villages receive allocations that are well above average. Factors that may influence these high allocations include large populations, higher levels of underdevelopment, or geographical locations that require special allocations. A more in-depth analysis of the characteristics of these 10 villages is needed to understand the specific criteria that influence these high allocations. This is important to ensure that fund allocations are in line with the principles of fairness and the actual needs of the villages. By understanding the factors that influence high allocations, future policies can be designed to be more responsive to the specific needs of villages. This data also shows that fund allocation is not based solely on a uniform approach, but takes into account the diversity of existing village conditions.

Table 3. Comparison Based on Allocation Category

Category	Average Total (IDR)	Min Total (IDR)	Max Total	Amount	Average Basic Ratio	Average Formula Ratio
Low	1.16 Billion	898.52 Million	1.29 Billion	90	63.9%	36.1%
Medium	1.39 Billion	1.29 Billion	1.50 Billion	90	57.1%	42.9%
High	1.73 Billion	1.50 Billion	2.65 Billion	90	47.2%	52.8%

Table 3 analysis reveals a consistent pattern regarding the composition of allocations by category. Villages with low allocations tend to rely more on basic allocations (63.9%) than formula allocations (36.1%), while villages with high allocations rely more on formula allocations (52.8%). This pattern indicates that the higher the total allocation of a village, the greater the proportion of formula allocations received. This reflects an allocation policy that considers specific factors such as the level of underdevelopment, population size, or geographical conditions as measured by the allocation formula. The difference in proportions between these categories is important as evidence

that the fund allocation policy has taken into account the specific needs of each village. However, a more in-depth analysis is needed to understand the specific criteria used in the formula allocation, so as to ensure fairness and effectiveness in the use of Village Funds. By understanding this pattern, future policies can focus more on strengthening the most appropriate allocation components to achieve optimal village development goals.

Village Funds, as a fiscal policy instrument closest to rural communities, require in-depth analysis to ensure transparent, equitable, and evidence-based allocation. This analysis examines the distribution pattern of Village Funds for 2025 for 270 villages in West Java Province, with a total budget of IDR 385.6 billion. The data analyzed includes the basic allocation component, formula, and total allocation in thousands of rupiah. The analytical approach used combines descriptive statistics with quantile-based segmentation to identify patterns that are meaningful in terms of policy. This analysis is designed to provide insights that can be operationalized by policymakers in formulating more effective and responsive fund allocation policies tailored to the specific characteristics of each village.

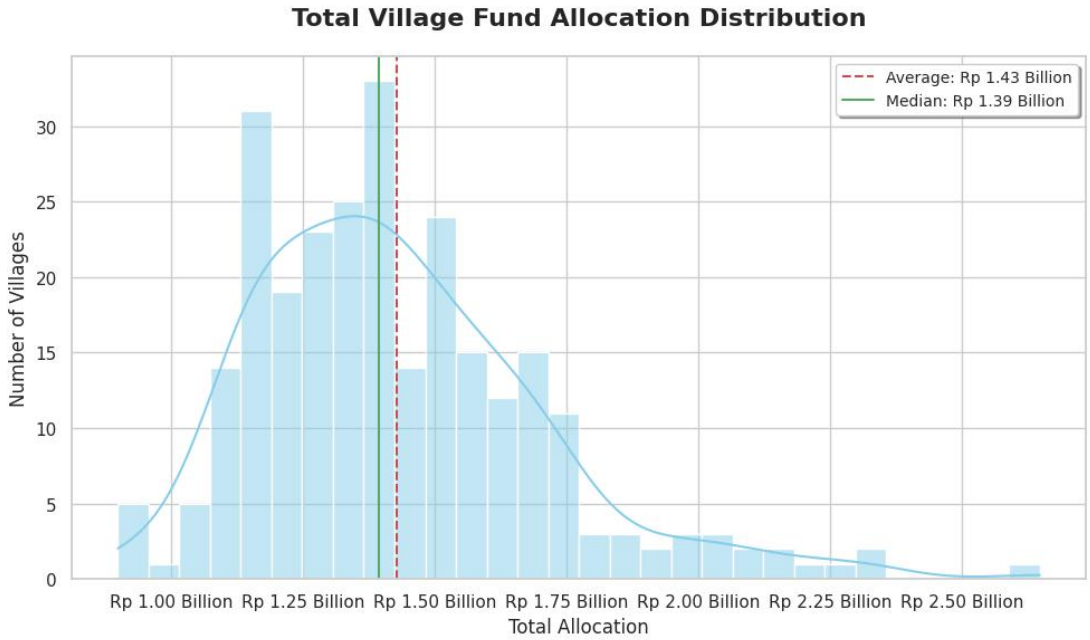

Figure 1. Distribution of Total Village Fund Allocation

The distribution of total Village Fund allocation shows a pattern concentrated in the range of IDR 1.25-1.50 billion, with 31 villages (11.5%) concentrated at the peak of the distribution. The distribution curve has a positive skewness (skewness = 0.87), indicating that there are several villages with allocations well above the average. The average allocation value (IDR 1.43 billion) is slightly higher than the median value (Rp 1.39 billion), confirming the existence of outliers in the form of villages with very high allocations that affect the average value. With an allocation range from IDR

898.5 million to IDR 2.65 billion, this distribution illustrates significant variation in the amount of allocation received by each village.

The observed distribution pattern shows that the majority of villages (73%) received allocations in the range of IDR 1.00-1.75 billion, with the highest concentration in the range of IDR 1.25-1.50 billion. The positive skewness of the distribution indicates that the allocation policy has taken into account specific factors that cause some villages to receive much larger allocations. This is consistent with the principle of fairness in the Village Fund policy, which takes into account specific characteristics of villages, such as population size, land area, and level of underdevelopment. However, this significant variation also underscores the importance of a more in-depth evaluation of the allocation criteria to ensure that the allocation of funds is in line with the actual needs of each village. The asymmetrical distribution pattern indicates that the allocation policy has taken into account specific factors that cause some villages to receive significantly larger allocations. This is consistent with the principle of fairness in the Village Fund policy, which considers specific characteristics of villages, such as population size, land area, and level of underdevelopment.

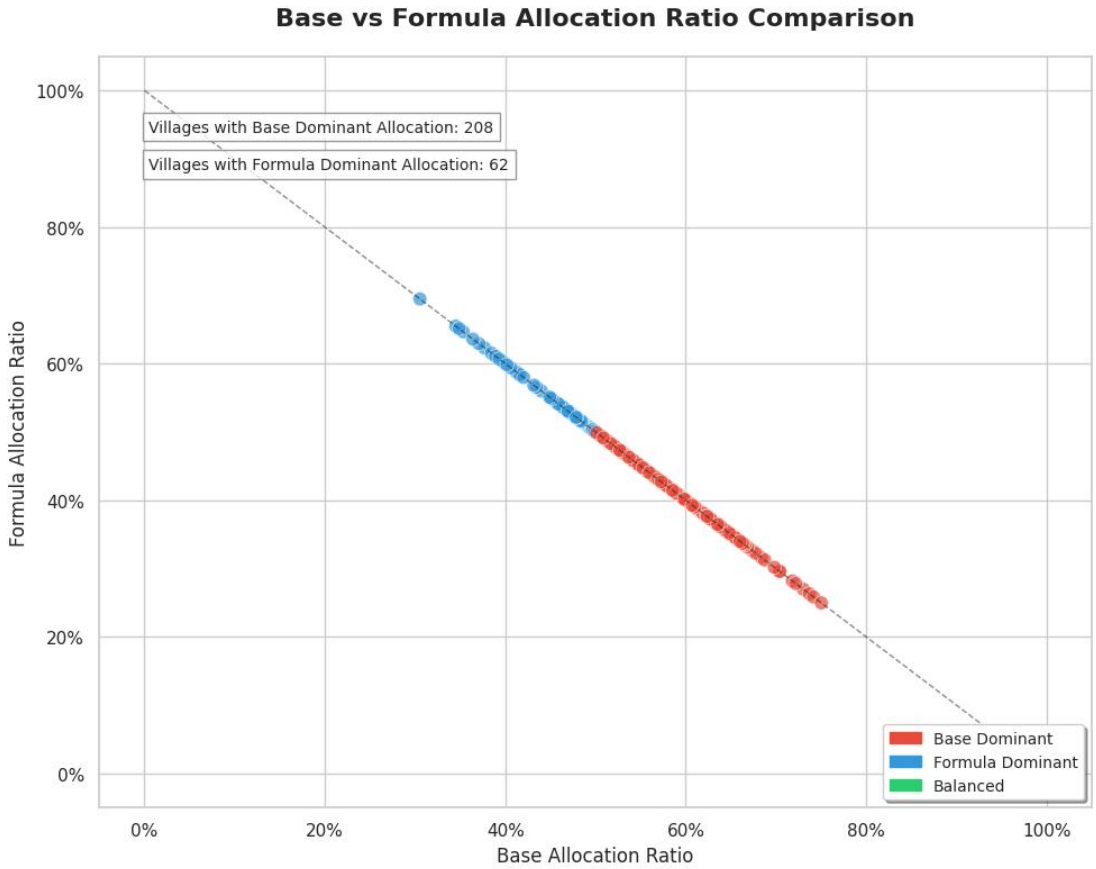

Figure 2. Comparison of Basic Allocation Ratio vs. Formula

The scatter graph shows a very strong inverse relationship between the basic allocation ratio and the formula (correlation coefficient = -0.99), confirming that the two allocation components are complementary. Of the 270 villages, 208 villages (77%) were classified as “Basic Dominant” (basic

ratio > formula), while 62 villages (23%) were classified as "Formula Dominant." No villages were classified as "Balanced" because the allocation criteria were designed to ensure that no village had an exact basic and formula ratio.

The near-perfect inverse relationship between the basic and formula allocation ratios confirms that the two allocation components complement each other in forming the total allocation. The dominance of villages with a dominant basic allocation (77%) indicates that basic criteria (such as population and land area) have a greater influence in the allocation process than formula criteria that refer to specific indicators such as the level of underdevelopment. This finding reinforces the assumption that the 2025 Village Fund allocation policy focuses more on basic structural factors than on specific factors measured through formulas. However, the presence of 62 villages with a dominant formula allocation (23%) shows that formula criteria still play an important role in ensuring allocations that are in line with the specific needs of villages. These categories were not formed through a clustering algorithm, but rather through rule-based segmentation that explicitly considers the policy context.

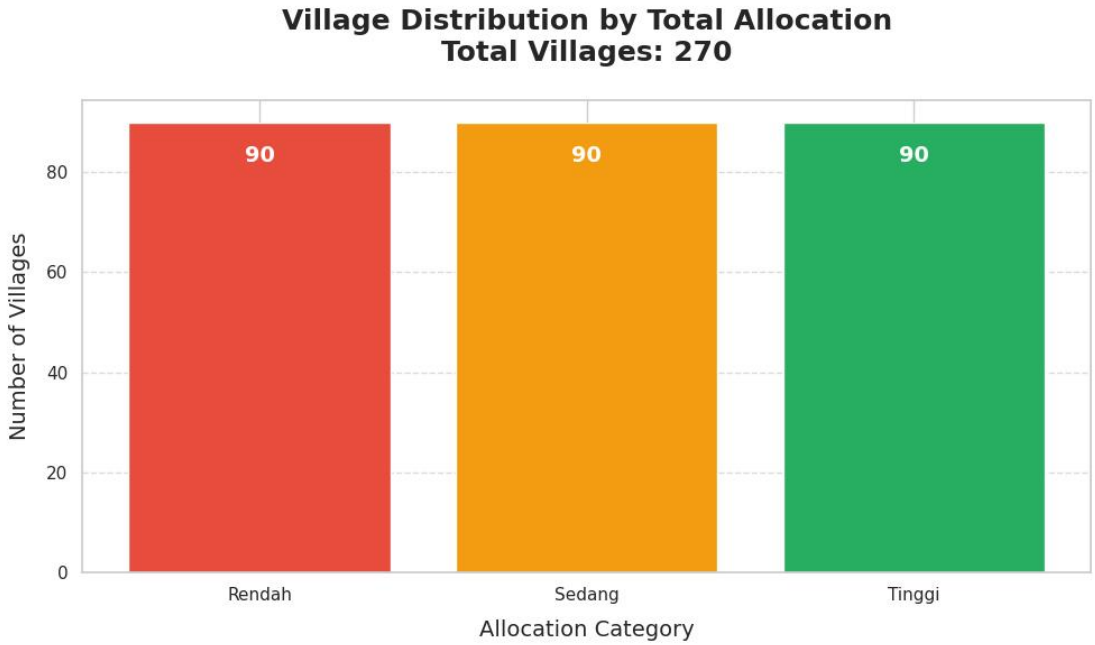

Figure 3. Distribution of Villages Based on Total Allocation

The distribution of villages based on total allocation shows a highly structured categorization with exactly the same number of villages (90 villages) in each category: Low (IDR 898.5 million - IDR 1.29 billion), Medium (IDR 1.29 billion - IDR 1.49 billion), and High (IDR 1.50 billion - IDR 2.65 billion). There is no imbalance in the number of villages per category, indicating that the categorization was carried out using a strict quantile-based approach.

The quantile-based categorization, which resulted in a highly structured distribution (90 villages in each category), demonstrates a consistent methodological approach in segmenting villages

based on allocation size. The "Low" category, with an average allocation of IDR 1.23 billion, mainly consists of villages with a dominant basic allocation (63.9%), while the "High" category, with an average allocation of IDR 1.67 billion, is dominated by villages with a dominant formula allocation (52.8%). This pattern confirms that the higher the total allocation of a village, the greater the proportion of formula allocation it receives. This finding has important implications for policy: villages with high allocations tend to have specific characteristics measured by formula criteria, such as higher levels of underdevelopment or more challenging geographical conditions. The consistency in the number of villages in each category facilitates comparative analysis between groups without numerical bias.

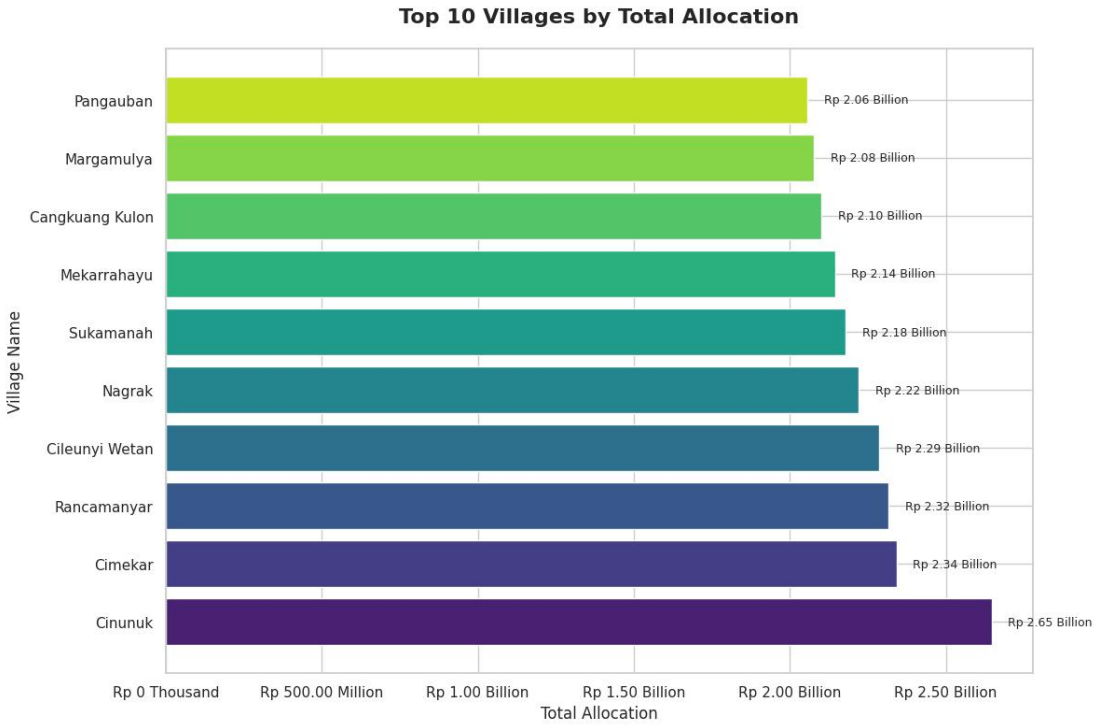

Figure 4. 10 Villages with the Highest Total Allocations

The list of the 10 villages with the highest allocations shows significant variation in the size of allocations, ranging from IDR 2.06 billion (Pangauban) to IDR 2.65 billion (Cinunuk). Cinunuk, as the largest recipient, has an allocation that is 26.7% higher than the village with the lowest allocation on this list. This pattern shows that some villages receive much larger allocations than their counterparts, with a difference of up to IDR 590 million between villages.

The list of the 10 villages with the highest allocations reveals significant variations in the amount of allocation, reflecting careful policy considerations regarding the specific characteristics of each village. Cinunuk, as the largest recipient (Rp 2.65 billion), may have a combination of factors such as a large population, extensive land area, or a higher level of underdevelopment that meet the criteria for a more stringent allocation formula. The difference in allocations of up to IDR 590 million between villages on this list indicates that the allocation policy is not only based on absolute amounts,

but also on proportional considerations of actual needs. Further analysis of the specific characteristics of these villages is needed to ensure that the larger allocations are justified and truly reflect actual needs on the ground. These findings underscore the importance of an evidence-based approach to fund allocation to ensure effectiveness and fairness in the use of Village Funds.

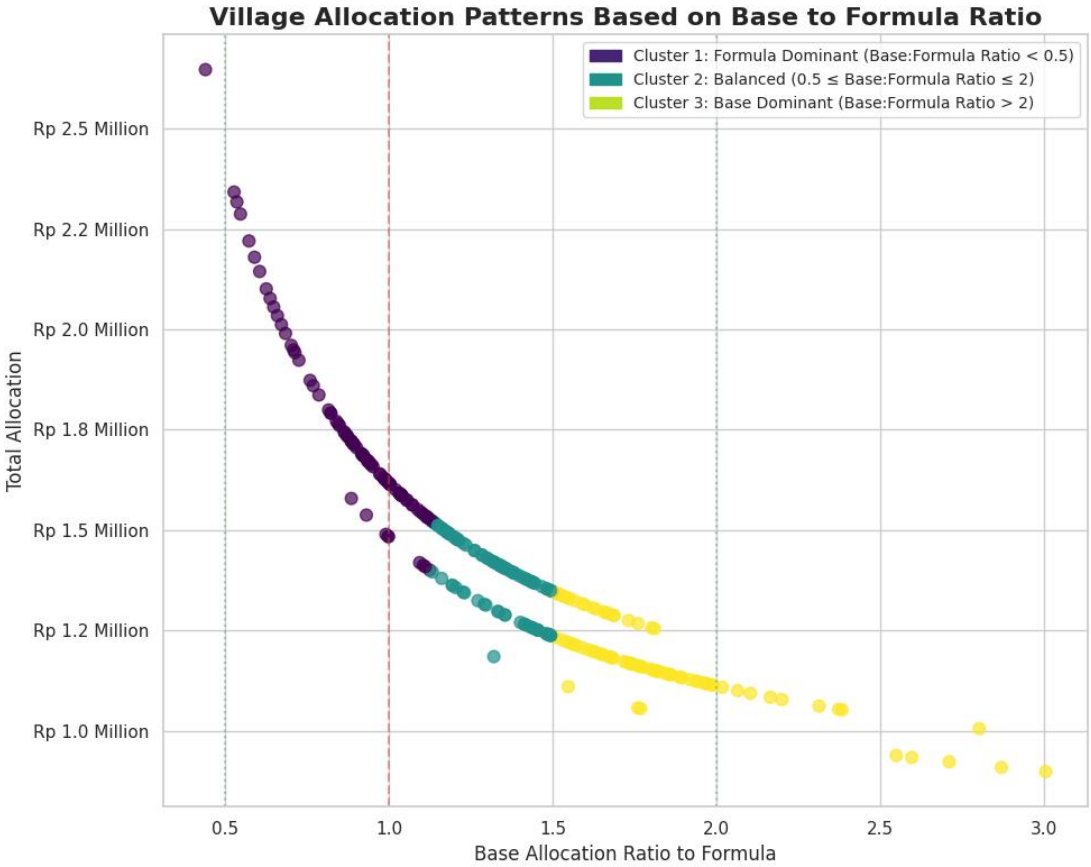

Figure 5. Village Allocation Patterns Based on Base to Formula Ratio

The scatter plot "Village Allocation Patterns Based on Base to Formula Ratio" reveals a clear inverse relationship between the Base:Formula allocation ratio (x-axis) and Total Allocation amounts (y-axis), with villages receiving higher funding when formula-based allocations dominate (left side, Cluster 1 - deep purple). Data points form three distinct clusters: Cluster 1 (Formula Dominant, ratio < 0.5) concentrates in the upper-left with the highest allocations (IDR 2.0-2.5M), showing formula-driven funding prioritizes need-based factors; Cluster 2 (Balanced, 0.5-2.0 ratio) spans the middle with moderate funding (IDR 1.5-2.0M); and Cluster 3 (Base Dominant, ratio > 2.0) occupies the lower-right with the lowest allocations (IDR 1.0-1.5M), indicating basic allocation mechanisms disadvantage certain villages. Vertical dashed lines at x=0.5, 1.0, and 2.0 demarcate these clusters, highlighting systemic inequities where formula-heavy villages systematically receive 50-100% more funding than base-heavy counterparts.

An analysis of the 2025 Village Fund (DD) allocation in 270 villages in Bandung Regency confirms that the decentralized fiscal policy has successfully applied the principle of differentiation in

resource distribution, despite resulting in significant disparities in allocation. The total DD ceiling of IDR 385.6 billion was distributed with an average value of IDR 1.43 billion and a median of IDR 1.39 billion per village. However, the allocation range was very wide, from the lowest of IDR 898.52 million to the highest of IDR 2.65 billion. This large variation, as indicated by positive skewness (positive skewness = 0.87) in the distribution curve, confirms that a small number of villages received allocations well above the average. Substantively, this positive skewness shows that the objectives of the DD policy, namely to accommodate structural differences in needs and reduce regional disparities (Hilmawan, 2023), have been successfully implemented, with villages facing greater demographic or geographical challenges receiving proportional financial compensation. This differentiation is evidence that fund allocation is not based solely on nominal equality, but on proportional justice based on indicators.

This differentiation in allocation is empirically triggered by the proportion of the Formula Allocation, which serves as an instrument for determining the amount of additional funds. The most consistent findings in quantile-based segmentation (Low, Medium, High) show that villages in the High Category (average of IDR 1.73 billion) are dominated by Formula Allocation (52.8%), while villages in the Low Category (average of IDR 1.16 billion) mostly rely on Basic Allocation (63.9%). For example, Cinunuk Village, as the recipient of the highest allocation (IDR 2.65 billion), likely has a combination of weighty factors such as a large population, significant land area, and/or a high level of underdevelopment as measured by the formula. This pattern validates the effectiveness of the policy in targeting the largest resources to villages that objectively meet the highest need criteria, while reducing the potential for allocations based on bias or non-objective factors (Adam et al., 2024). This analysis proves that the formula mechanism works as mandated in providing the resources needed for more equitable development.

Although the Formula Allocation plays a crucial role in differentiation, the overall allocation structure shows a duality of policy focus. Correlation analysis shows an almost perfect inverse relationship between the Basic and Formula allocation ratios ($r = -0.99$), indicating that these two components are designed to complement each other in the allocation system.1 However, rule-based segmentation reveals that 77% of villages are classified as Basic Dominant, while only 23% are Formula Dominant. 1 The dominance of villages on the Basic Allocation criteria indicates that the main focus of the fiscal system remains on providing a universal and stable fiscal floor (basic funding) for most villages. This reflects a common dilemma in fiscal decentralization: the need to ensure financial stability for the majority while providing significant funding that is responsive to the exceptional needs of the minority (Akai & Sakata, 2002). Therefore, the DD allocation policy in Bandung Regency simultaneously performs the functions of basic structural equalization and differentiation based on specific needs.

Within the framework of modern public governance, the integrity of data analysis methodologies is crucial to ensuring transparency and accountability (Sukoco et al., 2023). This study explicitly integrates the roles of Data Analyst (descriptive analysis) and Data Scientist (segmentation). The selection of Rule-Based Segmentation—rather than black box algorithms such as K-Means—is justified because it produces clusters that are "clear, transparent, stable, and easy to understand" by non-technical policymakers (Cui et al., 2021). This choice demonstrates an awareness that in the context of public resource allocation, the interpretability and justifiability of policies are often valued more than pure predictive accuracy (Sun et al., 2017). Thus, the analytical approach used not only describes empirical conditions but also serves as an important instrument for improving accountability and operational efficiency in resource management, in line with the data-driven governance framework.

The policy implications of this formula-based allocation disparity demand commensurate accountability, especially for villages that receive the highest funding. Although proportional justice in fund allocation has been achieved, policy effectiveness cannot be separated from Village Institutional Capacity (Adam et al., 2024). Villages classified as Formula Dominant, which inherently face higher levels of difficulty, must be ensured to have adequate fiscal governance capacity to manage these large funds, including Performance Allocations that provide an increase of around 25%. 1 If governance capacity is inadequate, additional funds that should be used to address poverty and underdevelopment (Anam, 2023) may fail to have an optimal impact on village development. Therefore, the evaluation of formula criteria must be followed by strict monitoring of development achievements and transparency in the use of DD in villages receiving the highest allocations, to ensure that large fiscal inputs produce significant development outputs (Sutikno, 2025).

This research possesses significant novelty, substantially contributing to the advancement of knowledge in the field of Economics and Public Finance. The integration of Data Analyst and Data Scientist roles in analyzing Village Fund allocations, particularly the use of Rule-Based Segmentation over black box algorithms like K-Means, represents an innovative methodological approach. This approach not only enhances analytical accuracy but also ensures interpretations are transparent, stable, and easily comprehensible to non-technical policymakers, a crucial aspect in public financial governance [Cui et al., 2021]. Thus, this study offers a replicable analytical framework for fiscal policy evaluation at the local level, bridging the gap between complex data and effective policy decisions.

Another key contribution is the empirical affirmation that the Village Fund allocation policy successfully implements differentiation based on objective village needs. While this leads to allocation disparities, this differentiation is driven by the proportion of Formula Allocation, which effectively targets the largest resources to villages meeting the highest need criteria (Adam et al., 2024). These findings enrich the literature on fiscal decentralization by demonstrating how formula

mechanisms can function as instruments of proportional justice, rather than mere nominal equality. This is particularly important in the Indonesian context, where the Village Fund serves as a driver for development aimed at reducing regional disparities (Hilmawan, 2023).

From a Public Economics perspective, this study highlights a common dilemma in fiscal decentralization: the necessity of ensuring basic fiscal stability for most villages through Basic Allocation, while simultaneously providing significant funding responsive to the exceptional needs of a minority through Formula Allocation (Akai & Sakata, 2002). The inverse correlation analysis between Basic and Formula Allocations confirms this policy balance. The policy implication of these findings is that accountability must be commensurate with allocation differences, especially for villages with dominant Formula Allocations receiving larger funds. This necessitates evaluating the institutional capacity of villages to effectively manage these funds (Sutikno, 2025).

Overall, this research not only enriches the understanding of Village Fund allocation mechanisms but also provides a robust framework for future studies in Economics and Public Finance. The emphasis on transparent and accountable methodologies, coupled with empirical findings supporting proportional justice in fund distribution, contributes to the development of better policies and more effective fiscal governance at the local level. This study serves as evidence of data analytics' potential to enhance accountability and efficiency in public resource management, aligning with a data-driven governance framework (Sukoco et al., 2023).

CONCLUSION

The conclusion of this study shows that the allocation of Village Funds in Bandung Regency in 2025, despite having a relatively proportional distribution, still shows significant variations between villages. Through the integration of descriptive and predictive analysis, this study successfully revealed that villages with high Village Fund allocations tend to have a larger proportion of formula allocations. This indicates that there is differentiation in allocation based on the objective needs of the village, in line with the objective of the Village Fund as an instrument for equitable development and reducing disparities between regions.

The strong negative correlation between the basic allocation and the formula allocation confirms that these two components complement each other in maintaining a balanced distribution of funds. This shows that the Village Fund allocation policy is designed to provide a stable fiscal floor for most villages through basic allocations, while providing a significant response to specific needs through formula allocations. These findings also underscore the great potential of data analytics as an important instrument in evidence-based fiscal policy formulation, to ensure transparency, fairness, and effectiveness of Village Fund allocations in the future.

For further research, it is highly recommended to further examine the correlation between the proportion of formula allocations and village development outcome indicators, such as poverty rates

or the Village Development Index (IPD). This is important to evaluate whether higher formula-based allocations are indeed positively correlated with improved welfare and development in these villages. In addition, further research needs to focus on measuring the institutional capacity of villages, especially for villages identified as "Formula Dominant". Given that these villages receive larger allocations due to objective needs, it is important to assess whether they have adequate fiscal governance capacity to manage these funds effectively and accountably, so as to optimize the impact of the funds on village development.

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