

Geographic Information System (GIS) of student and scholarship distribution in Jambi Province using QGIS

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Abstract: Education is one of the main pillars in developing quality human resources. To ensure equal access to education, the government has launched various scholarship programs. However, the management and distribution of scholarships often face challenges in terms of accurate data collection and spatial distribution analysis. This study aims to map the distribution of scholarship recipients in Jambi Province using a Geographic Information System (GIS) approach with QGIS software. The research uses spatial data in the form of administrative boundaries of Jambi Province and non-spatial data on the number of scholarship recipients per district/city obtained from the JDAC Jambi official website. The data were processed using attribute joining, classification with the Natural Breaks (Jenks) method, and visualization through a choropleth map. The results show that scholarship recipients are unevenly distributed, with higher concentrations in urban and densely populated areas such as Jambi City and Muaro Jambi Regency, while regions like Tebo and Sarolangun have relatively low numbers. This indicates the influence of population density, availability of higher education institutions, and information accessibility on scholarship distribution. The use of QGIS proved effective in presenting spatial data visually and supporting data-driven policymaking. The study recommends that local governments utilize spatial analysis in scholarship distribution planning to enhance equity and program effectiveness.

Keywords: learning management system; Moodle, gamification; vocational high school; leaderboard

1. Introduction

Education is one of the main pillars in developing high-quality human resources. To ensure equal access to education, both the central and regional governments have initiated various forms of educational assistance, one of which is scholarship programs ([Adam & Negara, 2015](#); [Perna et al., 2015](#)). In Jambi Province, the government has launched several scholarship initiatives aimed at improving the quality of human resources by targeting both high-achieving students from underprivileged families and civil servants who wish to pursue higher education.

However, the implementation of scholarship programs is not without challenges, particularly in terms of accurate data collection and targeted distribution ([Espiritu et al., 2024](#); [Mulyaningsih et al., 2022](#); [Seo et al., 2024](#)). Information on the geographical distribution of scholarship recipients is often poorly documented and still presented in tabular form, making further analysis difficult ([Riddell & Niño-Zarazúa, 2016](#); [Yeleliere et al., 2023](#)). In fact, spatial information about the locations of scholarship recipients can provide valuable insights for formulating educational policies and addressing disparities in educational access across regions ([AlKharouf et al., 2024](#); [Cai et al., 2024](#); [Campbell & Neff, 2020](#); [Irawan et al., 2024](#)). Geographic Information Systems (GIS) have proven to be effective tools for visualizing and analysing spatial data, including in the context of social policy programs such as scholarships ([Al-Homoud & Al-Zghoul, 2025](#); [Isbaex et al., 2025](#); [Wieczorek & Delmerico, 2009](#)). Through GIS, governments can map the distribution of recipients based on location, identify areas with the highest and lowest numbers of beneficiaries, and design location-based interventions more accurately.

This technology has been widely applied in various contexts, such as poverty mapping, distribution of social assistance, and equitable access to education. The use of GIS in managing data for Indonesia Card Scholarship recipients can enhance efficiency and transparency in the data collection process (Nurdin et al., 2021; Wijaya et al., 2024). Meanwhile, several studies have highlighted the importance of evaluating and distributing scholarships to support the development of high-quality human resources in Jambi Province. These studies indicate that integrating information systems with spatial approaches is highly relevant to optimizing scholarship programs (León-Romero et al., 2024; Liu et al., 2025; Mortaheb et al., 2025).

Based on these considerations, this study aims to map the distribution of scholarship recipients in Jambi Province by utilizing QGIS software as a spatial analysis tool. Through this approach, the research is expected not only to provide descriptive information regarding the number and locations of scholarship recipients but also to serve as a foundation for data-driven policy formulation to improve the accuracy and effectiveness of educational assistance programs in Jambi Province.

2. Methods

This research is a quantitative descriptive study with a spatial approach using a Geographic Information System (GIS). The data used consists of two types: spatial data and non-spatial data. The spatial data, in the form of administrative boundary maps of districts and cities in Jambi Province, were obtained from the official website of the Geospatial Information Agency through the portal (<https://tanahair.indonesia.go.id>). This data was used to map the administrative regions that serve as the objects of study. The non-spatial data, which consist of the number of scholarship recipients in each district or city, were obtained from the official website of JDAC Jambi Province (<https://jdac.jambiprov.go.id>). These are secondary data collected based on verified reports of scholarship recipients. Data collection was carried out using documentation techniques from two main sources:

1. Downloading digital maps of district/city administrative boundaries in shapefile (.shp) format from the Indonesia Geospatial website.
2. Recapitulating the number of scholarship recipients from each district/city in Jambi Province through the JDAC platform.

The non-spatial data were then used to calculate the total number of scholarship recipients in each administrative area as the basis for analysis. The data obtained were analyzed using QGIS software through the following stages:

1. Data Integration (Attribute Join)
The data on the number of scholarship recipients were joined to the administrative boundary map using the *attribute join* function based on the matching names of districts/cities (Nurdin et al., 2021).
2. Classification of Scholarship Recipients
The number of scholarship recipients was classified into several groups based on the number of recipients, using the Natural Breaks (Jenks) method to produce a more representative classification (Wang et al., 2024).
3. Thematic Map Visualization (Choropleth Map)
Each class of recipient numbers was assigned a different color using the *symbolology* feature in QGIS. The resulting map illustrates the distribution of scholarship recipients based on their intensity in each district or city. This visualization aims to assist in interpreting the spatial distribution patterns of scholarship recipients and serve as a foundation for region-based policy recommendations.

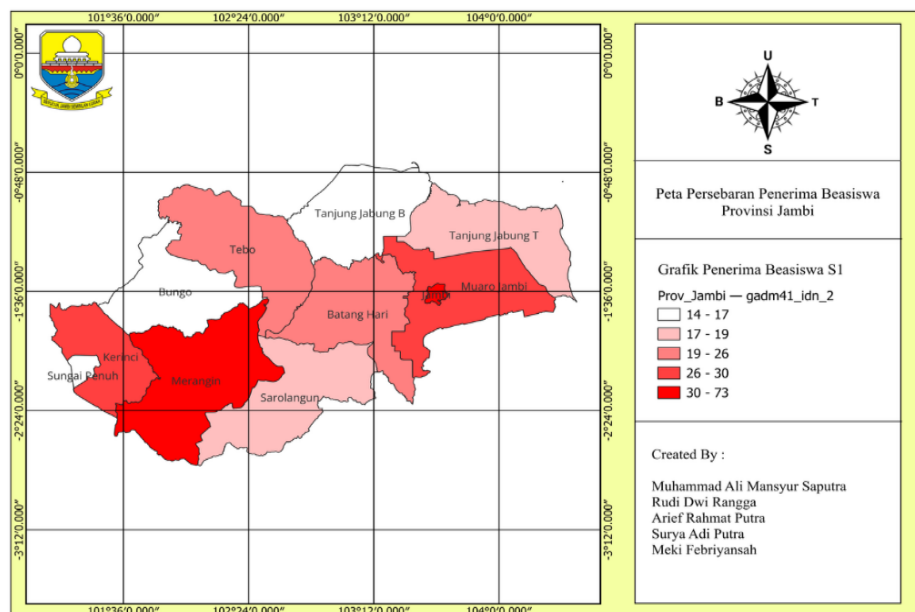
3. Results and discussion

Based on the data processing results using the QGIS application, a map of scholarship recipient distribution across 11 districts and cities in Jambi Province was produced. The data on the number of scholarship recipients obtained from the JDAC website were integrated into the administrative boundary map and classified into five groups based on the number of recipients. The classification was carried out using the Natural Breaks (Jenks) method to create group divisions that naturally represent the data distribution.

3.1 Image

The Figure 1 shows the results of image processing using the clustering method. The goal of this process is to group image pixels based on similar characteristics, such as color values (RGB), intensity, or texture features, so that areas with similar characteristics are grouped into a single cluster. The image shows that the original image has been divided into several segments or areas of different colors, each representing the results of a single group (cluster). Each color in the clustering result does not represent the original color of the image, but rather a randomly assigned cluster label to distinguish each group of pixels.

Figure 1.
Map of scholarship
recipient
distribution in
Jambi Province



3.2 Classification results of scholarship recipient numbers

Like figures, tables must follow a one-column layout or occupy the full width of the page and should be The following table presents data on the number of scholarship recipients based on an analysis of districts and cities in Jambi Province, which serves as a spatial basis using QGIS. The visualization results show a clear distinction between urban and rural areas, where areas with high population density and the presence of higher education institutions, such as Jambi City and Muaro Jambi Regency, have a very high number of scholarship recipients, while areas such as Tebo Regency and Sarolangun Regency tend to have a low number. This distribution pattern indicates a relationship between the number of scholarship recipients and factors such as population density, access to higher education, and the dissemination of program information. This finding aligns with research by [Kosasih et al. \(2023\)](#) and [Zickafoose et al. \(2024\)](#), which states that educational infrastructure and the effectiveness of program implementation influence scholarship equity. This, this table not only presents statistical data but also supports an understanding of the distribution patterns of scholarship recipients as a basis for formulating policies for equal access to education in the future.

Table 1.
Chart of undergraduate scholarship distribution map

No.	Number of recipients interval	Category	Map colors
1	14 – 17	Very low	White
2	17 – 19	Low	Cream
3	19 – 26	Moderate	Pink
4	26 – 30	High	Light red
5	30 - 73	Very high	Dark red

Based on the map visualization results, it was found that districts and cities with a very high number of scholarship recipients are in urban and densely populated areas such as Jambi City and Muaro Jambi Regency. In contrast, regions such as Tebo Regency and Sarolangun Regency tend to have a low to very low number of recipients. This distribution pattern indicates a correlation between the number of scholarship recipients and factors such as population density, the availability of higher education institutions, and access to scholarship program information. Areas that have universities and serve as administrative centres tend to have more scholarship recipients due to better access to facilities and more extensive program outreach. These findings are consistent with the study by [Zickafoose et al. \(2024\)](#), which stated that the distribution of scholarship recipients is strongly influenced by educational infrastructure conditions and information accessibility. Furthermore, according to [Kosasih et al. \(2023\)](#), scholarship distribution equality is not only affected by population quantity but also by the effectiveness of regular program evaluation and implementation. From a technological standpoint, the use of QGIS has proven effective in providing clearer and more informative visualizations compared to conventional tabular data presentations. The resulting thematic maps can serve as a foundation for future policymaking aimed at achieving more equitable scholarship distribution.

4. Conclusion

This study aims to map the distribution of scholarship recipients in Jambi Province using a Geographic Information System (GIS) approach based on the QGIS application. Based on the results of data analysis and visualization. Spatial mapping of scholarship recipients was successfully carried out by combining data on the number of scholarship recipients per district/city with administrative map data of Jambi Province obtained from the Indonesia Geospatial website. The integrated data were visualized in the form of a thematic map (choropleth map), which provides a geographical overview of the distribution of scholarship recipients. The classification results of scholarship recipient numbers show disparities in distribution across regions. Several districts/cities, such as Jambi City and Muaro Jambi Regency, fall into the category of very high recipient numbers, while other regions, such as Tebo Regency and Sarolangun Regency, are categorized as very low. This indicates the need for a more equitable distribution of scholarships. The use of QGIS as an analytical tool has proven effective in presenting scholarship recipient data in a visual and informative manner. The resulting maps not only enhance understanding of the data distribution but also support spatial-based decision-making by relevant institutions. Based on these results, it is recommended that local governments consider spatial analysis outcomes in formulating future scholarship distribution policies. Regular evaluation and data updates are also essential to ensure the accuracy and targeting effectiveness of educational assistance programs in Jambi Province.

Author's Declaration

Author contribution

Aulia Rachmawati: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing – original draft, Visualization, Project administration. **Hamzah Alghifari:** Conceptualization, Methodology, Validation, Resources, Writing – review & editing, Supervision. **Yandi Anzari:** Validation, Investigation, Data curation, Writing – review & editing. **Renaldi Yulvianda:** Validation, Formal analysis, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that there are no conflicts of interest related to the research, authorship, or publication of this article. All authors have approved the content of the manuscript and have made significant contributions to the conduct of the study. This declaration of interest is provided as a form of transparency and scientific integrity, and it serves as a requirement before the article is reviewed and accepted for publication.

Ethical clearance

Not Applicable.

Data availability

The data used in this study are publicly available and accessible. The spatial data on the administrative boundaries of districts and cities in Jambi Province were obtained from the official portal of the Geospatial Information Agency (<https://tanahair.indonesia.go.id>), while the non-spatial data on the number of scholarship recipients in each administrative area were collected from the official JDAC Jambi Province website (<https://jdac.jambiprov.go.id>). All these data can be reused as references and informational resources for further research related to spatial analysis, scholarship distribution equity, and education policy in Jambi Province.

AI Statement

This article's grammar was improved with assistance from ChatGPT. The author confirmed that all revisions align with the topic and research data, and an English-language specialist validated both the data and wording. The manuscript contains no AI-generated sentences.

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