Uneven Development Principles in Geo-Map Perspective: How Does Infrastructure Play a Role in Crushing the Poverty in the Special Region of Yogyakarta?

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Abstract

The purpose of this study is to determine the relationship between the existence of regional infrastructure and the number of poor people and to know the distribution of infrastructure in each district/city in the Special Region of Yogyakarta (DIY). The data used is a primary data crosssection derived from Village Potential Data Collection (Q-Podes). This study uses two methods, namely, Ordinary Least Square Regression, to determine the relationship between variables and Geo-Map Orange Data Mining to determine the distribution and equitable distribution of infrastructure. Empirical results show that areas with electricity sources from the State Electricity Company (PLN), Information and communication infrastructure, trade and service infrastructure, agricultural infrastructure, and good sanitation can reduce the number of poor people. However, drainage infrastructure, cultural and health education infrastructure, and transportation infrastructure have not been able to reduce the number of poor people in DIY. In addition, the occurrence of uneven development, which is seen in the uneven infrastructure in each region, is also an inhibiting factor in reducing the number of poor people in DIY.

1. INTRODUCTION

Poverty is one of the cliché problems that has not been resolved, especially in developing countries (Saefuddin et al., 2019). The increasing population, which is not accompanied by meeting needs, causes an increase in the number of people with unmet living needs or poor people (Purnomo, 2019). Indonesia is one of the developing countries with the 91st highest number of poor people in the world and 6th in Southeast Asia. According to the Indonesian Central Bureau of Statistics, the poor are people with an average monthly per capita expenditure below the poverty line (Husna, 2020;Karyono et al., 2020)). The population with these criteria in Indonesia in 2023 will reach 25.889 million people, a decrease from 26.161 million people in the previous year. According to World Bank analysis, Indonesia's economic growth over the past decade has succeeded in reducing the percentage of poverty from 11.3 per cent in 2014 to 9.36 per cent in 2023 (Aminda et al., 2024). In line with this, in the last two years, the decline in poverty has experienced a relatively stable pace, 18 per cent. This is a relatively good poverty reduction rate in the last ten years (Fitria, 2023)

The government has provided various poverty reduction programs that have proven to have a positive effect on the community, including family hope programs, school operational assistance, poor student assistance programs, and community health insurance programs (Machmud et al., 2020). In addition, the government also pays special attention to people who are poor, near-poor, and slightly above the poverty line in the form of providing poor certificates as economic support and poverty reduction efforts poverty (Agita & Sailesh, 2024). The number of poor people in Indonesia is spread almost all over the island. BPS data states that the provinces with the highest number of poor people in 2023 are West Java and Central Java, which reach 3.7 thousand people and 3.9 thousand people. However, when analyzed in terms of percentage, the Special Region of Yogyakarta or Daerah Istimewa Yogyakarta (DIY) is the province with the highest poverty rate in Java. Although DIY is famous as a major tourist destination in Indonesia, the problem of poverty remains an issue that cannot be ignored. The poverty rate in DIY is spread over five cities/regencies in the province, as shown in Figure 1 (Niswati, 2014)
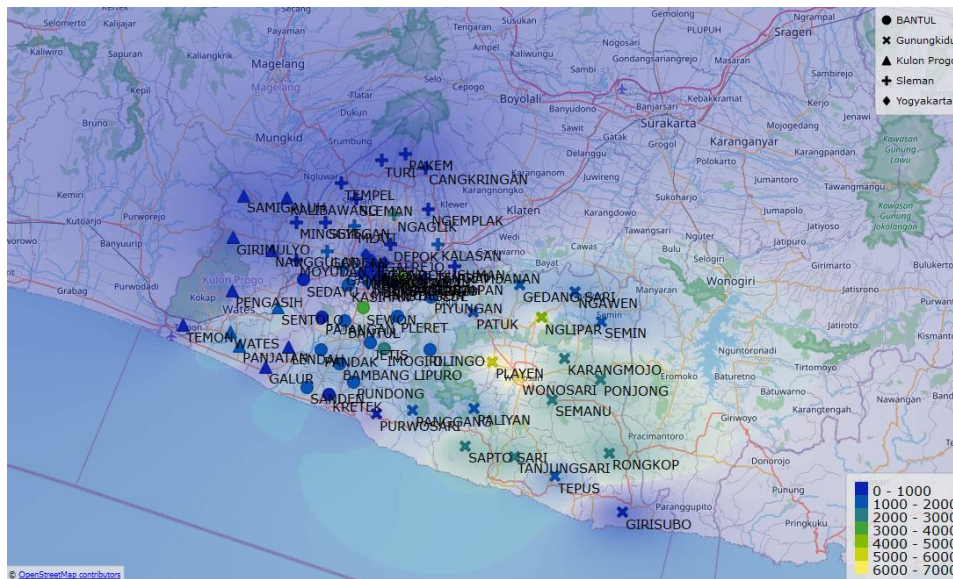
Figure 1. Map of the Distribution of the Number of Poverty in the Special Region of Yogyakarta
Source: BPS Indonesia analyzed using Geo-Map Orange Data Mining, 2024

The average poverty rate in the Special Region of Yogyakarta reaches 13.15 per cent of the total population. Until March 2013, the poverty rate of DIY residents reached 11.04 per cent of the total population in DIY. Of all regencies and cities in DIY, Kulon Progo Regency has the highest poverty rate in 2023 at 15.64 per cent, followed by Gunung Kidul Regency at 15.60 per cent, Bantul Regency at 11.95 per cent, Sleman Regency at 7.52 per cent, and Yogyakarta City at 6.49 per cent. The data can be seen in Figure 1, which shows the number of poor people in 4 districts and one city in DIY. As of March 2023, it was recorded that the percentage of poor people in urban areas reached 10.27 per cent, a decrease of 0.37 percentage points compared to September 2022. Meanwhile, the percentage of poor people in rural areas in March 2023 reached 13.36 per cent, a decrease of 0.64 percentage points compared to September 2022.
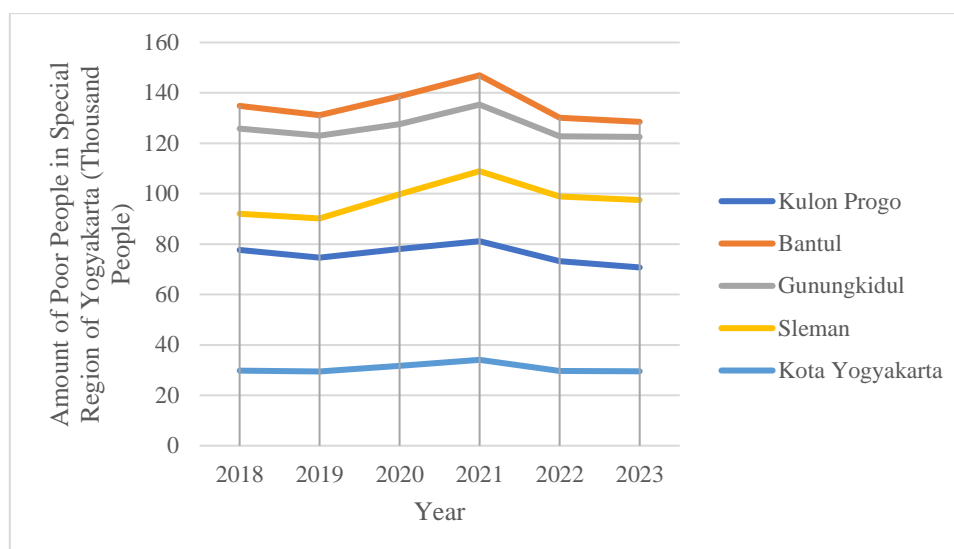
Figure 2. Number of Poor People in Regencies and Cities in the Special Region of Yogyakarta in 2018 – 2023
Source: BPS Indonesia, 2024

The high poverty rate in DIY is caused by several factors, both on a macro scale, such as inflation and unemployment, which are also influenced by the transition season, which causes many farmers to experience crop failure. In addition to these factors, rising fuel prices and high open unemployment rates are also suspected to be factors that play a major role in increasing the number of poor people in DIY(Salsabilla et al., 2022). Another cause that affects the amount of poverty in DIY is the side effects of uneven development(Samudro, 2015). Uneven development is one of the four principles in political economy, meaning that persistent differences in the level and development of the economy between different sectors of the economy characterize a state. This principle can be used as a perspective in assessing uneven development in a region. Development inequality is suspected to be one of the cliché factors that caused the increase in the number of poor people in DIY. The government has also provided several solutions to overcome the increasing number of poor people in DIY, one of which is the provision of facilities and infrastructure to support daily life. The infrastructure provided also varies according to the needs of the community. Some of the infrastructures provided by the government in DIY as shown in Figure 3 are electricity delivery by the State Electricity Company, Drainage Facilities and Infrastructure, Information and Communication Infrastructure, Health Culture Education Infrastructure, Trade and Services Infrastructure, Agricultural Infrastructure and small village industries, sanitation and clean water infrastructure, and transportation infrastructure.
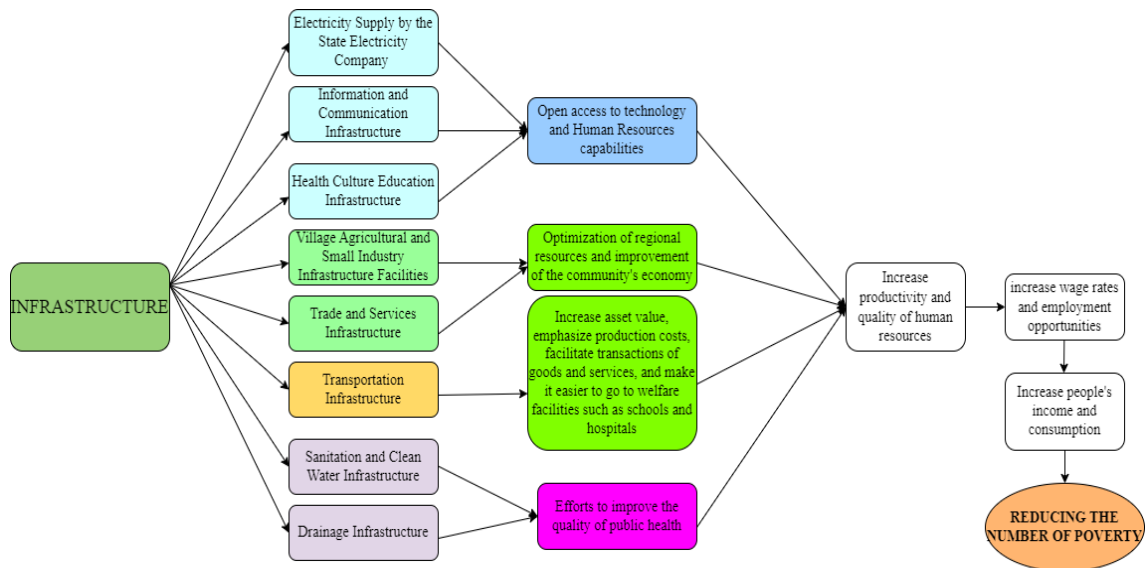
Figure 3. Mechanism of Flow of Infrastructure Influence on Reducing the Number of Poverty
Source: Authors's own work, 2024

The existence of infrastructure provided by the government and private sector (with government permission) is intended to reduce poverty in the Special Region of Yogyakarta. Moreover, DIY has been decentralized into five regional parts, namely four regencies and one municipality consisting of Sleman Regency, Kulon Progo Regency, Bantul Regency, Gunungkidul Regency, and Yogyakarta City. However, some of these problems arise due to uneven development. This is evidenced by the uneven distribution of regional infrastructure provided as can be seen in the figure 4.
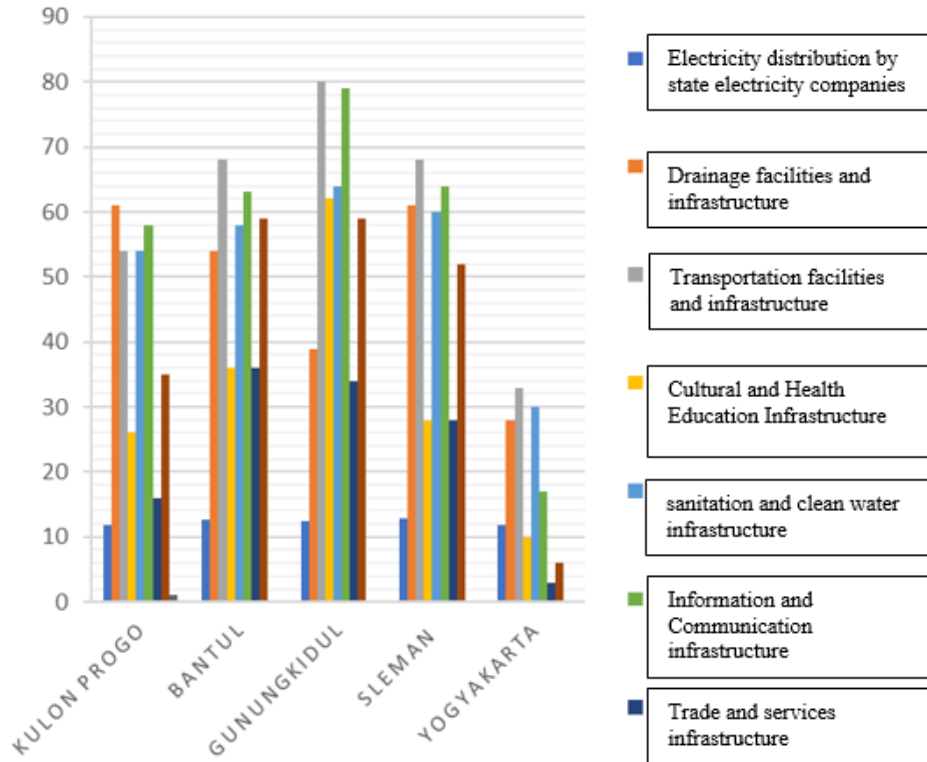
Figure 4. Distribution of Infrastructure in Regencies and Cities in Yogyakarta Regional Province
Source: BPS Indonesia, 2024

Figure 4 shows that the existence of infrastructure in each district or city shows a different amount. The difference in availability results in differences in the number of poor people and poverty levels in each region, as can be seen in Figure 2. This is in accordance with Andrianus and Alfatih's (2023) research, which shows that the ability to produce proper electricity, sanitation, and road infrastructure has a significant negative relationship with poverty rates in Indonesia. In line with the results of this study, research conducted by Putra and Yasa (2023) said that infrastructure and education factors were proven to reduce the number of poor people—another study conducted by Widiyasari et al., (2021) found that good health infrastructure, trade, and drainage systems are considered to be able to cross poverty, especially in urban areas. Some other research related to infrastructure and regional poverty.
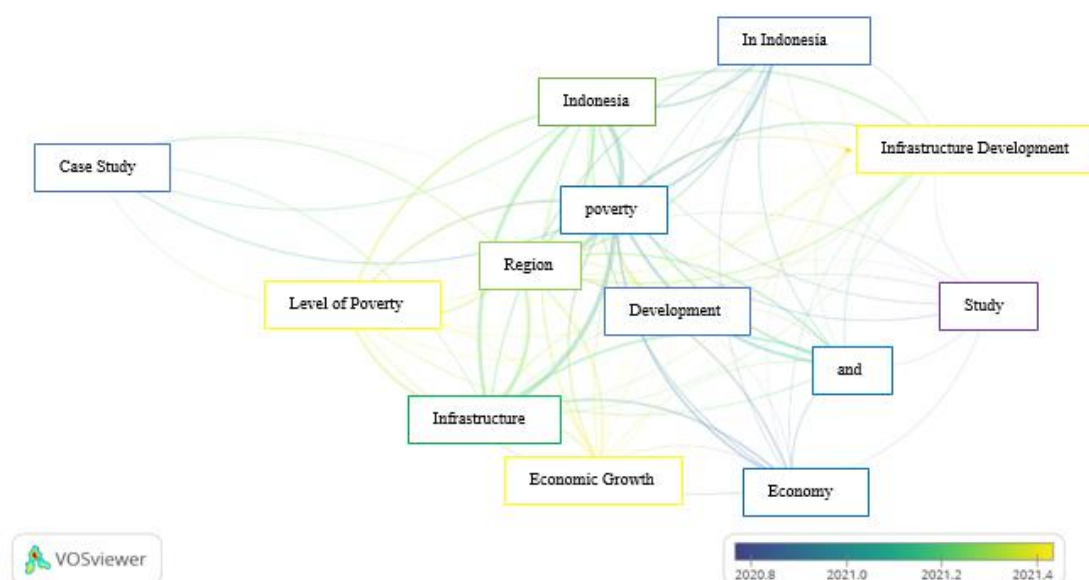
Figure 5. Previous Research on the Relationship Between Poverty and Infrastructure
Source: Authors' Own Work using VosViewer, 2024

Figure 5 shows that there have been many studies on the effect of poverty and infrastructure development in Indonesia. The results show that one of the direct influences, namely the existence of infrastructure, has a significant negative effect on poverty. The majority of these studies were conducted in the 2020-2021 period. However, no deeper studies have been carried out on the classification of infrastructure that directly affects and is able to reduce the number of poor people in the context of the principle of uneven development. In addition, research on the relationship between infrastructure and the number of poor people has rarely conducted in the Special Region of Yogyakarta. Therefore, this study aims to determine the relationship between regional infrastructure consisting of electricity delivery by the State Electricity Company, Drainage Facilities and Infrastructure, Information and Communication Infrastructure, Health Culture Education Infrastructure, Trade and Services Infrastructure, Agricultural Infrastructure and small village industries, sanitation and clean water infrastructure, and transportation infrastructure to the number of poor people in DIY. The indicator is taken based on the results of processing topics and keywords that have not appeared much in national and international articles. In addition, these indicators are influential indicators to reduce poverty rates based on the Sustainable Development Goals (Khamjalas, 2024; Ley, 2023; Okuputra, 2022)

2. RESEARCH METHOD

This research was conducted in 438 villages throughout the Special Region of Yogyakarta Province and was conducted through Village Potential Data Collection (Q-Podes) In the latest data period, namely the 2018 edition. The method used in this study is mixed,

namely quantitative using Ordinary Least Square Regression analysis and qualitative using description with spatial data collection Geo-Map Orange Data Mining. The use of Geo-Map using the Orange Data Mining tool helps to classify the spatial distribution in the analysis results. The advantage of this method is that it can be used flexibly by inputting analysis data, latitude, and longitude. This study uses eight independent variables consisting of electricity delivery by the State Electricity Company, Drainage Facilities and Infrastructure, Information and Communication Infrastructure, Health Culture Education Infrastructure, Trade and Services Infrastructure, Agricultural Infrastructure and small village industries, sanitation and clean water infrastructure, and transportation infrastructure. The dependent variable used is the number of poor people calculated from residents who have a poor certificate. The variables in this study were analyzed using the following equation:

$$lnPoverty_i = \alpha_i + \beta_1 \, PLN_i + \beta_2 \, Drainage_i + \beta_3 \, Information_i + \beta_4 \, Penbudkes_i +$$
$$\beta_5 \, Perdagjasa_i + \beta_6 \, agriculture_i + \beta_7 \, Sanitation_i + \beta_8 \, Transportation_i + e_i \qquad (1)$$

Equation (1) shows that the variable lnPoverty is the number of inhabitants who have a certificate of poverty in one village, PLN is the number of households that have electricity sourced from the State Electricity Company, Drainage is dummy variables regarding the presence or absence of infrastructure facilities regarding drainage infrastructure in each village, Information is a dummy variable Regarding the presence or absence of Information and communication infrastructure in each village, Penbudkes dummy variabel regarding the availability of educational, cultural, and health infrastructure in each village/kelurahan, Perdagjasa dummy variables regarding the availability of trade infrastructure and services in each village, Agriculture Dummy variables related to the existence of infrastructure supporting agricultural activities and regional small industries, sanitation dummy variables regarding availability of sanitation and clean water infrastructure in each village, and transportation dummy variable of the availability of transportation infrastructure in villages. Each dummy variable in equation (1) indicates that the numbers 1 are for availability and 0 for unavailable.

The method for visualizing geospatial data regarding the distribution of maps of the number of poor people and infrastructure in each village in the Special Region of Yogyakarta Province is carried out using maps (Putri & Wijayanto, 2024; Saefuddin et al., 2019). This approach is effective for analyzing data containing latitude and longitude information in the WGS 84 format EPSG: 4326, which in this study is used to analyze infrastructure that has not had a significant effect on reducing the number of poor people in DIY (Sundari et al., 2019). The Information required includes geographical coordinate data for each village, the number of people registered as poor, and the amount of infrastructure in each village.

3. RESULTS AND DISCUSSION

The principle of uneven development is a complicated phenomenon. Several factors, such as geographical location, economic conditions, gender differences, and the history of a region, cause development inequality in the Special Region of Yogyakarta. The government has

made policy interventions in an effort to reduce development inequality in DIY. One of the outcomes of such policy interventions is the improvement of economic development, especially through infrastructure development. However, the success of such interventions still varies. Inequality in DIY is also related to the problem of poverty, namely the increase in the number of poor people, which can be seen from the existence of vulnerable and not vulnerable groups of poverty. Development in all fields, especially in the infrastructure sector, is one of the programs in the series of DIY Regional Long-Term Development Plans for 2022-2027. This is coupled with the government's focus on reducing the poverty rate in DIY. One way is to equalize infrastructure in various sectors. These sectors include electricity delivery by the State Electricity Company, Drainage Facilities and Infrastructure, Information and Communication Infrastructure, Health Culture Education Infrastructure, Trade and Services Infrastructure, Agricultural Infrastructure and small village industries, sanitation and clean water infrastructure, and transportation infrastructure.

The results of this study show that some infrastructures have shown results that can cross the number of poor people in districts/cities in DIY, as can be seen in Table 1.

Table 1. OLS Regression Results

Variable	Coefficient	Probability
C	0.469	0.391
PLN	-0.614	0.000
DRAINAGE	-0.193	0.043
INFORMATION	-0.134	0.170
PENBUDKES	-0.022	0.832
PERDAGJASA	-0.278	0.015
AGRICULTURE	-0.188	0.067
SANITATION	-0.412	0.000
TRANSPORTATION	-0.010	0.929
R-Squared	0.344	

Source: Primary Data processed, 2024

Table 1 shows that regional infrastructure consisting of electricity delivery by the State Electricity Company, Drainage Facilities and Infrastructure, Information and Communication Infrastructure, Trade and Services Infrastructure, Agricultural Infrastructure and small village industries, and sanitation and clean water infrastructure have a significant negative effect on the number of poor people in DIY, as seen from the probability values of less than 0.05 and 0.1. While the Information and Communication Infrastructure, Health Culture Education Infrastructure, and transportation infrastructure show negative and insignificant values. The results of Table 1 show that if the number of households that get access to electricity sources from the State Electricity Company (PLN) increases by 1%, it will reduce the number of poor people by 0.61%. Electricity resources are one of the primary needs that each individual must meet. The existence of electricity resources in Indonesia today is still mostly dependent on supplies provided by PLN. This is in accordance with Christiani and Nsinupu (2021), which shows that one of the

infrastructures that can cross the number of poor people is the electricity provider infrastructure. This fact is also supported by research by Saputri et al. (2019), which, according to SUSENAS data for 2015-2019, shows that economic development in Indonesia is influenced by the affordability of electricity in each region. The second influential infrastructure is the drainage infrastructure, which shows that areas with good drainage access will have 0.193 per cent fewer poor people than areas that do not have it.

Drainage refers to a water management system or process that aims to regulate the flow of water from a certain area or surface. This approach is used to control rainwater, surface water, and groundwater so as not to interfere with human activities, infrastructure, or the environment (Arjosari et al., 2019). Drainage systems are important to maintain ecosystem balance and prevent flooding and environmental damage due to waterlogging (Paramita et al., 2018). Infrastructure that supports a good drainage system will lead to improved quality of public health. This can affect productivity and have an impact on the economic condition of the community (Agita & Sailesh, 2024; Febrian & Burhanudin, 2023). The majority of DIY areas are used to dump household waste in manholes or drainage streams before it is drained into nearby rivers (Paseru et al., 2022). Therefore, good drainage channels that are not clogged with garbage or wild plants will make the flow of water smoother so as to minimize puddles that can cause disease (Ghosh et al., 2023; Gonçalves et al., 2024). The third factor is the existence of trade and service infrastructure, which shows that village or kelurahan areas in DIY with access to trade and services facilities have a relatively smaller number of poor people, as much as 0.278 percent.

Trade, both goods and services, is one of the sectors that is able to support the economy in Indonesia, especially the regional economy (Saefuddin et al., 2019). Yogyakarta Special Region is one of the provinces with high and diverse natural and human resources (Noviyanti, 2019). This is one of the advantages or potential benefits of the region. One of them is through the procurement of infrastructure facilities for access to trade in goods and services. Several government programs related to trade have begun to be built evenly, one of which is revitalizing traditional markets into more hygienic and visitor-friendly markets (Bayu, 2018). Other programs have succeeded in improving the economy of the community, especially the regions, one of which is the procurement of tourism villages through the role of the local tourism office (Ariyani et al., 2020; Utami et al., 2023; Widhianingsih et al., 2023). Tourism Villages are proven to be able to explore the potential of the area to be used as jobs by the local community (Savitri et al., 2023). Related to previous infrastructure factors, agricultural infrastructure and small rural industries also contribute to the reduction of the number of poor people in DIY. Areas with access to infrastructure for agriculture and small industries have a lower number of poor people, 0.412 per cent.

Data from the Central Bureau of Statistics DIY in 2023 states that the number of farmers in DIY in 2023 will reach 495,781, with 37,141 of them being farmers aged 19-39 years or millennial farmers (Wiradhani et al., 2023). This proves that some districts in DIY still rely on the agricultural sector as one of the main livelihoods (Obeidat & Hamadneh, 2022). The agricultural products are then sold in the city. Still, due to the infrastructure related to agriculture and small industries of villages or villages, these results can increase

through efforts to provide fertilizer and technology subsidies. In addition, the role of tourism villages and the creation of online sales facilities are also able to expand the market in small industries with regional potential (Heliany, 2019). The last influential infrastructure to reduce the number of poor people in DIY is sanitation and clean water infrastructure (Yesi & Juairiyah, 2021). Sanitation and clean water are important factors in supporting the quality of life of human resources in the region (Purwaningsih et al., 2021). The majority of villages in DIY already have access to sanitation and clean water. This is supported by facilities provided by the government in the form of clean water flow from the Regional Drinking Water Company (Monoarfa et al., 2022). Table 1 shows that villages with adequate infrastructure have 0.41 per cent fewer poor people compared to areas that do not have.

In addition to infrastructure that has been proven to be able to reduce the number of poor people in DIY, several infrastructures in this study have not been able to affect the number of poor people in DIY, namely Information and communication infrastructure, cultural and health education infrastructure, and transportation infrastructure. This is evidenced by the probability value of the variable Penbudkes,\ Information,\ dan\ Transportation has significance values above 0.05 and 0.1.Information and communication infrastructure has a negative but not significant influence, which means that many villages or villages in DIY do not yet have Information and communication infrastructure in the form of telephone access, internet, radio and television frequencies, and the availability of newspapers/magazines/bulletins.
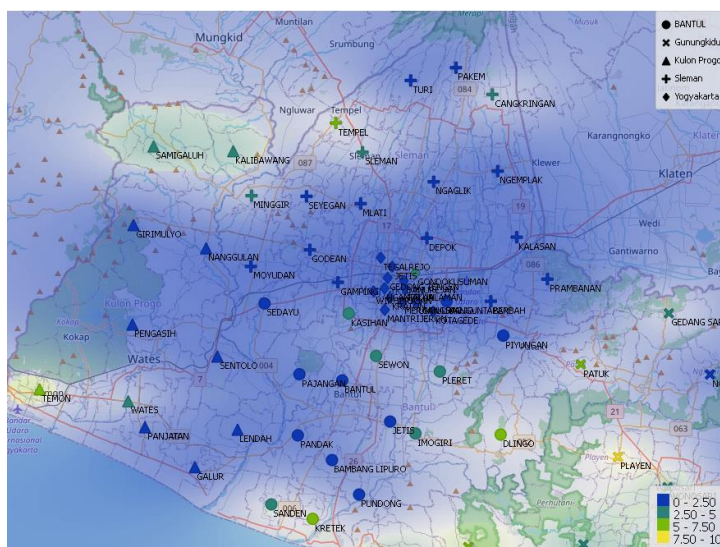

Figure 6. Map of Distribution of Information and Communication Infrastructure Facilities of the Special Region of Yogyakarta.
Source: Primary Data processed using Geo-Map Orange Data Mining, 2024

Regional infrastructure consisting of electricity delivery by the State Electricity Company, Drainage Facilities and Infrastructure, Information and Communication Infrastructure, Health Culture Education Infrastructure, Trade and Services Infrastructure,

Agricultural Infrastructure and small village industries, sanitation and clean water infrastructure, and transportation infrastructure

Figure 6 is a map of the distribution of each sub-district in DIY on Information and communication infrastructure facilities, which shows that areas with a high number of poor people, such as Bantul Regency and Kulon Progo Regency, have not been met by the need for Information and communication infrastructure (Masjhoer et al., 2022; Nilawati, 2019; Warsito, 2020). This is one of the impacts of uneven Development or uneven regional Development, which has side effects on the level of community productivity. Variable coefficients Information shows a value of -0.134, which means that if Information and communication infrastructure are fulfilled in each region, the number of poor people can be reduced by 0.134 per cent. The majority of information and communication infrastructure facilities that have not been reached are internet service access and cellular operators. The same is true of education, culture, and health infrastructure, which have not shown efforts to contribute to the reduction of people experiencing poverty.

Similarly, with information and communication infrastructure, the amount of educational, cultural, and health infrastructure infrastructure is not evenly distributed in every region in DIY. These infrastructure facilities include access to proper schools, cultural support facilities, and nearby health places. Variable Penbudkes which represents the number of villages that have educational, cultural, and health infrastructure has a coefficient of -0.022 which means that if the infrastructure is fulfilled it can reduce the number of poor people by 0.022 in each region. However, the facts show that the infrastructure is not yet available evenly.
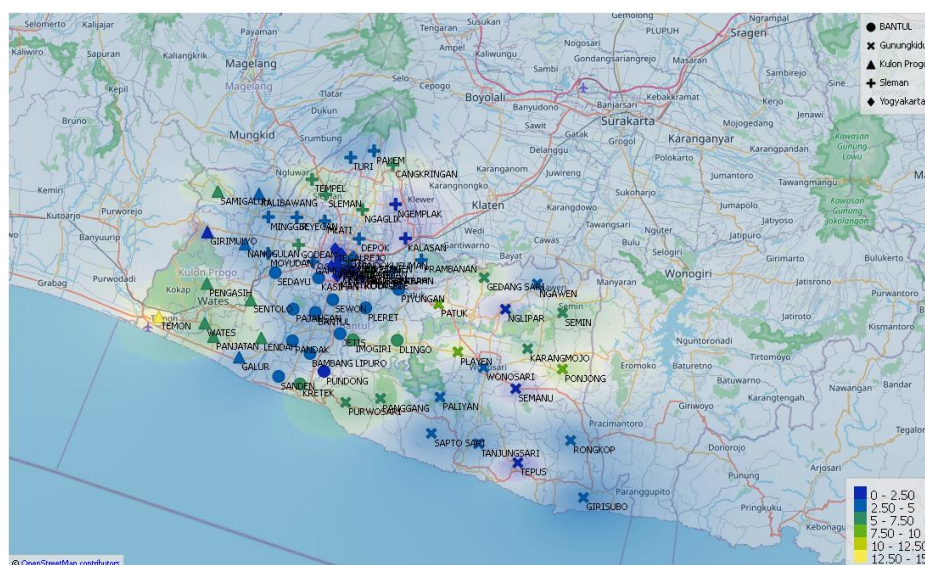

Figure 7 Map of Infrastructure Distribution of Education, Culture, and Health Infrastructure in the Special Region of Yogyakarta.
Source: Primary data processed using Geo-Map Orange Data Mining, 2024

Figure 7 shows that Bantul Regency and Gunungkidul Regency have an uneven distribution of educational, cultural, and health infrastructure compared to other regions in DIY. Areas with severe inequality conditions are mostly located in the southern area of DIY or along the southern seafront. Another case with one of the sub-districts in Kulon Progo Regency that has good infrastructure, namely Temon District, one of them is due to the effect of the existence of the new airport, New Yogyakarta International Airport in Temon, Kulon Progo (Nurkholidah &; Pratiwi, 2017). The existence of the airport can lead to better affordability of infrastructure facilities compared to other regions in the same district (Fatimah & Rahayu, 2023). The last infrastructure that is considered unevenly distributed so that it has not been able to reduce the number of poor people in DIY is transportation infrastructure. The infrastructure of transportation facilities in equation (2) is shown through variables Transportation with a coefficient of -0.01 with the meaning that if transportation infrastructure is fulfilled, it will reduce the number of poor people in DIY by 0.01 per cent. Figure 8 shows a map of equitable distribution of transportation infrastructure in DIY.
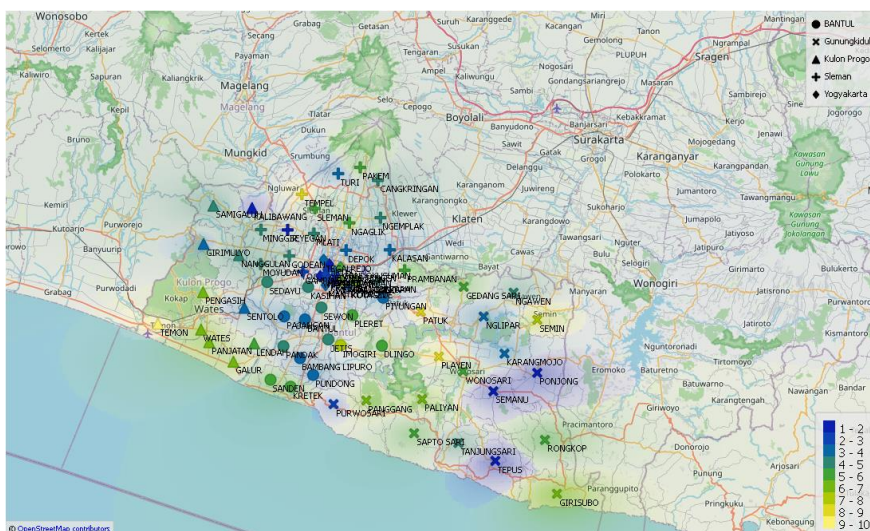

Figure 8 Map of Distribution of Transportation Infrastructure Facilities in the Special Region of Yogyakarta.
Source: Primary data processed using Geo-Map Orange Data Mining, 2024

Transportation infrastructure in DIY has begun to be evenly distributed, one of which is in the area of New Yogyakarta International Airport (NYIA). Various accessibility began to be provided by the government in the form of procurement of airport fire flats and also the Prambanan Express train line with the final destination of Kutoarjo Station (Fatimah & Rahayu, 2023). The facilitation has only been inaugurated in line with the inauguration of the airport so that the community cannot feel the impact. However, areas with a high number of poor people, such as the Bantul Regency, have not received equitable transportation infrastructure from the government. Third, infrastructure that has not been able to reduce

the number of poor people in DIY is one of them caused by uneven development. The inequality of development affects the quality of human resources and has an impact on the lack of productivity, reducing the level of income and consumption of the community.

The development of infrastructure is essential for fostering economic growth; however, it does not invariably lead to a reduction in poverty levels. Several factors contribute to the inadequacy of infrastructure alone in alleviating poverty (Hangli & Xinnan, 2024). First, there is often inequitable access to infrastructure projects, which may fail to reach the most disadvantaged or remote communities, thereby excluding vulnerable populations from the advantages of enhanced transportation, electricity, and water services. Furthermore, for infrastructure to yield significant benefits, it must be integrated with essential services such as education, healthcare, and social safety nets; without these complementary services, the positive impacts of infrastructure can be severely constrained (Mangal et al., 2024). Additionally, large-scale infrastructure initiatives can inadvertently displace local communities, disrupt existing economic activities, and result in the loss of livelihoods if not implemented with an inclusive approach. Moreover, such projects may pose environmental risks, including deforestation and pollution, which can adversely affect local communities and their means of subsistence (Yin et al., 2024). It is also noteworthy that infrastructure development often prioritizes urban areas, thereby overlooking rural regions where poverty is more acute. To effectively combat poverty, infrastructure development must be incorporated into a comprehensive strategy that encompasses social policies, economic opportunities, and a commitment to environmental sustainability (Wan et al., 2024).

4. CONCLUSION

Infrastructure is one of the means of supporting the economy of an area characterized by a decrease in the number of poor people. The high number of poor people in Yogyakarta Special Region (DIY) Province can be reduced, one of which is through equity and alleviation of uneven development. The results obtained are infrastructure in the form of electricity by the State Electricity Company, Drainage Facilities and Infrastructure, Trade and Services Infrastructure, Agricultural Infrastructure Facilities and small village industries, and sanitation and clean water infrastructure facilities proven to be able to reduce the number of poor people in DIY. However, the information and communication infrastructure, health culture education infrastructure, and transportation infrastructure have not shown an influence on overcoming poverty.

Thus, this requires better synergy from the DIY Government through related agencies and Regional Apparatus Organizations such as educational supporting facilities and cultural stages to be able to flatten the infrastructure of the area. Improving quality and adequate infrastructure has a very important role in overcoming the problem of poverty. One of the steps that can be taken is to provide a public transportation fleet that can cover DIY areas, especially areas adjacent to the coast that are still difficult to reach, such as Gunungkidul Regency and Bantul Regency. In addition, it is also important to improve accessibility to health facilities, as this will help improve people's welfare and reduce the burden of poverty.

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