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Article

## Mapping the Regional Development Disparities in Western Indonesia: An Integrative Approach of Williamson Index and Klassen Typology

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**Abstract.** Disparities is one of the problems of economic development in developing countries. The Western Region of Indonesia tends to contribute to high economic growth but is accompanied by the problem of regional disparities which is also relatively high. Efforts to reduce regional disparities are aimed at accelerating equitable development. This study examines the development of inter-regional disparities mapping through the Klassen typology method, measuring disparities with the Williamson index in the Western Region of Indonesia in 2021-2023. The results show that most regions are still in the relatively underdeveloped and less developed category and the average regional disparities index is at moderate disparities, namely 0.465. This study provides suggestions to prioritize development based on regional equality, especially areas that are still underdeveloped.

**Keywords:** Regional Disparities, Williamson Index, Klassen typology, Western Indonesia.

### 1. Introduction

Indonesia is an archipelagic country that has great economic potential, both natural resources and human resources [1]. Economic growth in Indonesia tends to increase, except in 2020 when it contracted due to the impact of the COVID-19 pandemic [2]. However, some regions or areas still experience disparities even though economic growth tends to improve [3]. This is because economic growth does not represent a strategy for alleviating poverty and regional disparities but rather the distribution of income within a country [4]. Unequal distribution of income and economic development triggers disparities between regions [5][6][7]. In addition, regional disparities refers to differences in the level of development and welfare between regions within a country [8].

This disparities can be seen from various aspects, such as income levels, infrastructure availability, access to public services, and quality of human resources [9]. Regional disparities can be caused by several factors including human resources [10] or skilled labor [6], the availability of adequate regional infrastructure [11] and the geographical location of the region [12]. Regions that tend to be close to urban areas and real economic centers tend to have relatively low regional disparities, but areas that are far from urban areas and real economic centers tend to experience relatively high regional disparities [1].

The Western Region of Indonesia is a region that still dominates the structure of the Indonesian economy with a contribution to the Gross Regional Domestic Product (GRDP) of around 80 percent. However, the acceleration and contribution of economic growth in the Western Region of Indonesia is not followed by low disparities. The Western Region of Indonesia still has a higher level of disparities, namely with an average disparities index higher than the Eastern Region of Indonesia [12].

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Regional disparities in Indonesia, especially in the western region, is often caused by differences in access to resources, infrastructure, and economic opportunities. Previous studies have shown that this disparities can be measured and analyzed using various methods, including the Williamson Index and the Klassen typology, which allow researchers to classify regions based on their level of development and existing disparities [13] [14]. The Williamson Index, which measures income disparities between regions, provides a clear picture of economic disparities in the western region of Indonesia. Disparities between districts/cities in Jawa Barat can be analyzed in depth using the Williamson Index, which reveals significant differences in economic growth and per capita income [13]. In addition, the importance of this approach in identifying economic development disparities in Banten province, which shows (Figure 1) that different development policies in each region can exacerbate disparities [14].

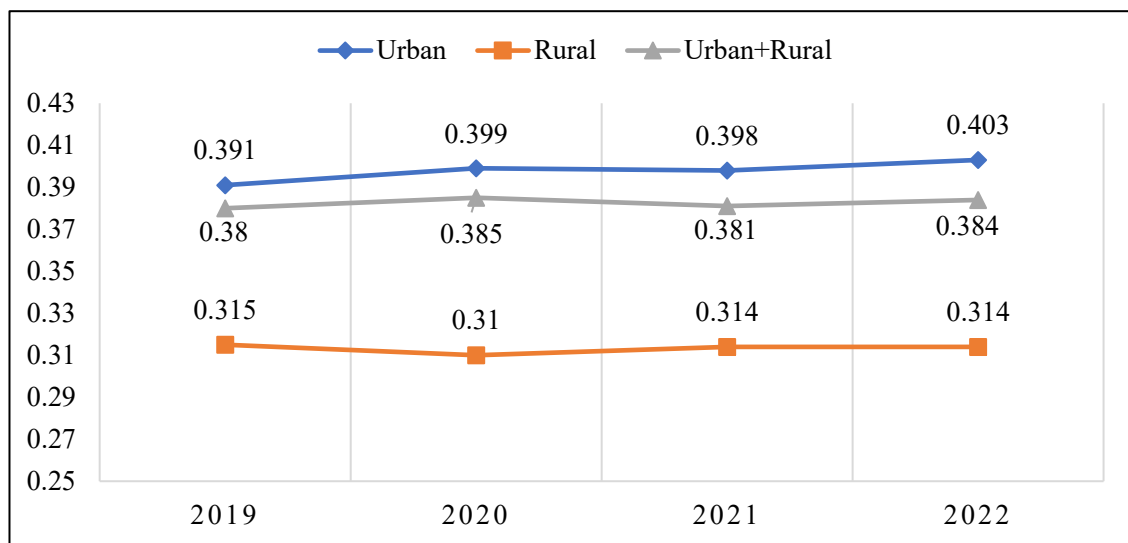


Figure 1.  
Development of Gini  
Ratio in Indonesia  
2019-2022

On the other hand, Klassen's typology helps in grouping regions based on certain criteria, such as poverty levels and economic growth. Research by [15] indicates that regional disparities in Nusa Tenggara Barat can be analyzed using Klassen's typology, which shows that regions with fluctuating economic growth tend to have higher disparities. This is in line with the findings of [16], which show that Klassen's typology analysis can provide better insight into economic disparities between regions in Jawa Timur. Furthermore, research by [17] compared regional disparities between western and eastern Indonesia, finding that the western region had a higher level of disparities. These findings indicate the need for more attention in planning and implementing development policies that can reduce disparities in the western region. Using a systematic and data-driven approach, this study aims to provide more effective policy recommendations to address regional disparities in Indonesia. Thus, this study not only contributes to the academic understanding of regional disparities, but also provides a basis for better decision-making in regional development planning in Indonesia.

## 2. Methods

This study uses quantitative and explanatory descriptive [18]. Therefore, this study will analyze in depth the mapping of disparities and its relationship to government spending with analysis units in the Western Region of Indonesia in 2021-2023. The research data source used is secondary data. Secondary data is data obtained indirectly (third party) or has been published by an agency/institution/agency that provides data. This research data uses two (2) publication sources, namely publication data from the Central Statistics Agency and the annual publication of the Directorate General of Balance

of the Ministry of Finance of the Republic of Indonesia Finance (DJP KEMENKEU RI). The total distribution of data used was 1915 data consisting of 153 districts/cities on the island of Sumatra, 118 districts/cities on the island of Java, and 56 districts/cities on the island of Kalimantan.

The analysis methods used consist of two (2), namely the Klassen typology method and the Williamson index method using Microsoft excel. First, the Klassen typology method is a grouping method (quadrant I - quadrant IV) which aims to obtain an overview of the economic growth structure of a region [19]. Then, a regional grouping is formed based on the Klassen typology as follows:

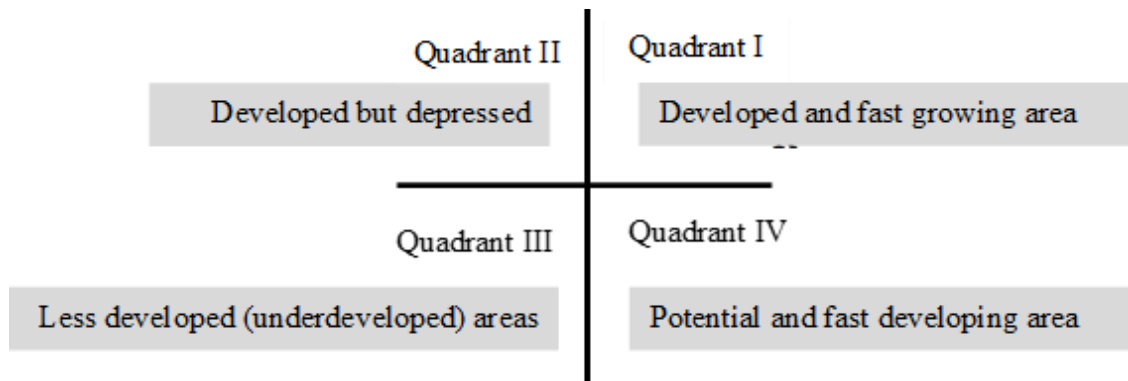


Figure 2. Mapping of Klassen typology quadrants

The four (4) quadrants are formulated as follows:

1. If  $Y_i > Y$  and  $R_i > R$ : quadrant I, namely a developed and rapidly growing region
2. If  $Y_i > Y$  and  $R_i < R$ : quadrant II, namely a developed but depressed region
3. If  $Y_i < Y$  and  $R_i < R$ : quadrant III, namely a less developed (underdeveloped) region
4. If  $Y_i < Y$  and  $R_i > R$ : quadrant IV, namely a potential and rapidly developing region

Where  $Y_i$  is the growth rate of GRDP in a region;  $Y$  is the average GRDP growth. While  $R_i$  is the per capita income of a region; and  $R$  is the average per capita income. After obtaining the results of the calculation of the comparison of  $Y_i$  to  $Y$  and  $R_i$  to  $R$ . The second method is the calculation of the Williamson index, which is a measurement method to determine the disparities of a region based on the index value obtained and categorized based on the standard value of the Williamson index disparities. The Williamson Index is calculated with basic data from gross domestic regional growth and population, which will then obtain the index number. The calculation of the Williamson Index is written as follows **Equation 1** [1] [19]:

$$IW = \frac{\sqrt{\sum(Y_i - Y)^2 \cdot \frac{f_i}{n}}}{Y} \quad (1)$$

With the following information:

$Y_i$  = Gross regional domestic product (GRDP per capita of province  $i$ )

$Y$  = Gross regional domestic product (GRDP) per capita national average

$f_i$  = population of province  $i$

$n$  = national population

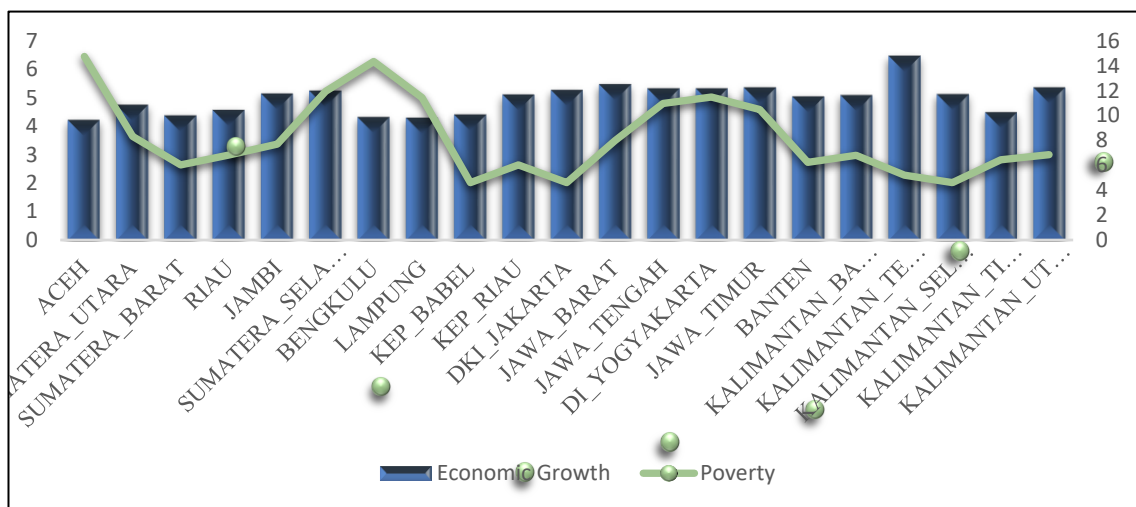
With the Williamson index number indicator, a value of 0 to 1 is obtained. If the index value approaches 0, then the disparities between regions is lower, conversely, if the index value approaches 1, then the regional disparities will be higher. The Williamson index number is interpreted as follows:

1. If the Williamson index  $< 0.35$ , then the region is said to have low regional disparities.
2. If the Williamson index is  $0.35 < IW < 0.5$ , then the region is said to have moderate regional disparities.
3. If the Williamson index  $> 0.5$ , then the region is said to have high regional disparities.

### 3. Result and Discussion

#### 3.1 Result

**Figure 3.** illustrates the Percentage of Economic Growth and Poverty in 2022 in the Western Region of Indonesia. It can be seen in **Figure 3** that economic growth and poverty in the Western Region of Indonesia in 2022 experienced a fluctuating trend. The province with the highest percentage of economic growth in the Western Region of Indonesia is Kalimantan Tengah with a percentage of 6.45%, while the lowest is Lampung Province with a percentage of 4.28%. In terms of the percentage of poverty levels, the area with the highest poverty rate in the Western Region of Indonesia is Aceh Province at 14.75%. Meanwhile, the areas with low poverty rates are the provinces of the Kepulauan Bangka Belitung, DKI Jakarta, and Kalimantan Selatan which have the same percentage Figure of 4.61%.



**Figure 3. Percentage of Economic Growth and Poverty in 2022 in the Western Region of Indonesia**

Furthermore, to describe the economic structure in each region, classification analysis or mapping with the Klassen typology is used. Mapping the structure per region in this case, namely the provinces in the Western Region of Indonesia, shows the economic structure in 2023 divided into four (4) quadrants. In addition, the results of mapping the economic structure in the Western Region of Indonesia are based on calculations between economic growth and per capita income. Based on **Figure 4**, the Klassen typology shows that the economic structure is still dominated by areas that are quite a lot in quadrant III, namely relatively underdeveloped and less developed areas consisting of Kalimantan Tengah, Aceh, Bengkulu, Kalimantan Barat, Sumatra Barat, Kepulauan Bangka Belitung, Banten, Kalimantan Selatan, Jambi and Lampung.

Quadrant IV shows the classification of potential and developing areas consisting of Sumatra Selatan, Sumatra Utara, Jawa Barat, D.I.Yogyakarta, and Jawa Tengah. Meanwhile, Riau and Kalimantan Utara Provinces are included in the classification of developed areas but are depressed in quadrant II. The areas that are in the classification of developed and fast-growing areas are DKI Jakarta (outlier), Kalimantan Timur, and the Kepulauan Riau. In addition, regional disparities in the Western Region of Indonesia was also identified through the results of the Williamson index in 2021-2022. From **Table 1**, regional disparities is classified into 3 parts, namely low regional disparities, moderate regional disparities, and high regional disparities based on the classification calculation in the established method.

The results show that high regional disparities is in the provinces of Sumatera Utara, Sumatera Selatan, Jawa Barat, Jawa Tengah, Banten, Jawa Timur, and Kalimantan Selatan. This is also what causes these regions to be classified as relatively underdeveloped and

less developed regions (quadrant III). The provinces of Aceh, Jambi, Bengkulu, Kepulauan Riau, Jakarta, Yogyakarta, and Kalimantan Timur are in the category with moderate regional disparities. Meanwhile, low regional disparities is in Sumatra Barat, Riau, Lampung, Kepulauan Bangka Belitung, Kalimantan Barat, Kalimantan Tengah, and Kalimantan Utara.

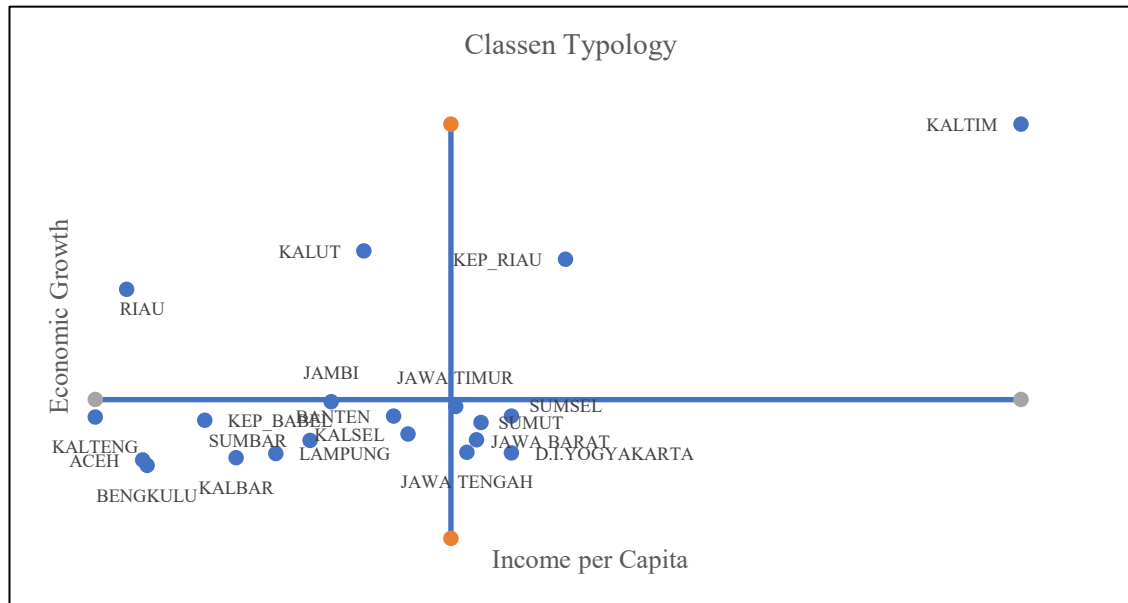


Figure 4. Classen Typology of Western Indonesia Region in 2023

\* Note: DKI Jakarta is used as outlier data

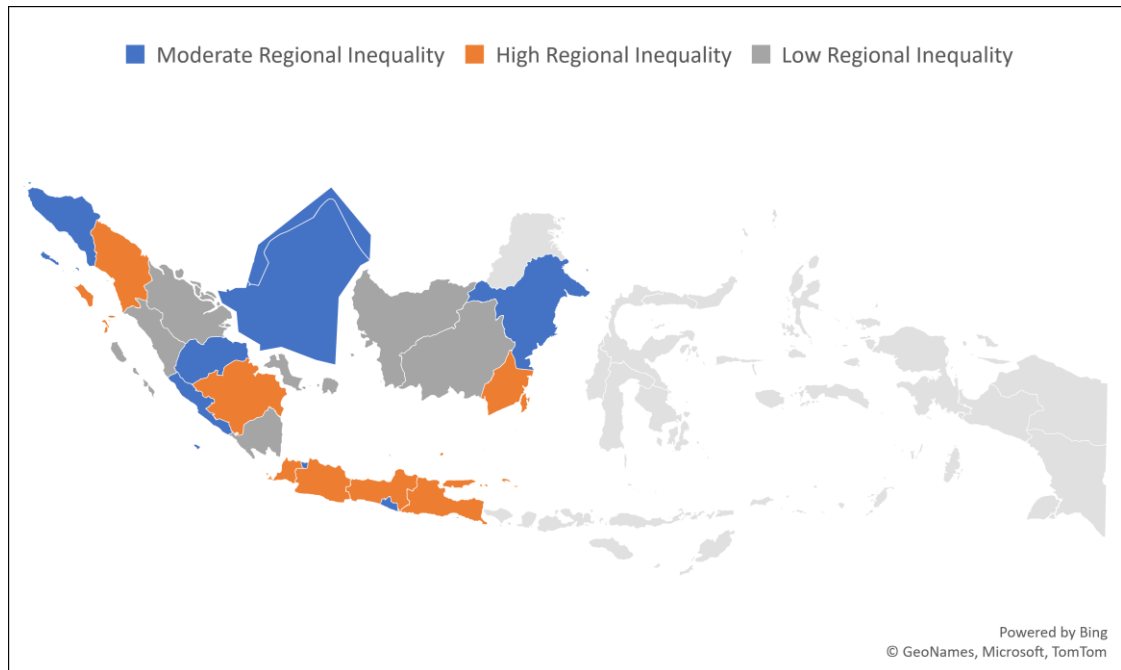
Table 1. Regional Disparities Based on the Williamson Index in Western Indonesia by Province in 2021-2022

| Province             | Williamson Index  |                   | Classification of Regional Disparities |
|----------------------|-------------------|-------------------|--|
|                      | 2021              | 2022              |  |
| Aceh                 | 0.41491378        | 0.46893133        | Medium                                 |
| Sumatera Utara       | <b>0.55646841</b> | <b>0.56032198</b> | High                                   |
| Sumatera Barat       | 0.30521415        | 0.30757079        | Low                                    |
| Riau                 | 0.28348959        | 0.27469036        | Low                                    |
| Jambi                | 0.47380648        | 0.453898          | Medium                                 |
| Sumatera Selatan     | <b>0.7381671</b>  | <b>0.74350146</b> | High                                   |
| Bengkulu             | 0.40532854        | 0.41568727        | Medium                                 |
| Lampung              | 0.23793655        | 0.25290672        | Low                                    |
| Kep. Bangka Belitung | 0.18617366        | 0.17922543        | Low                                    |
| Kep. Riau            | 0.43043951        | 0.41231083        | Medium                                 |
| DKI Jakarta          | 0.48350718        | 0.48234794        | Medium                                 |
| Jawa Barat           | <b>0.86550724</b> | <b>0.86673952</b> | High                                   |
| Jawa Tengah          | <b>0.65376446</b> | <b>0.78298164</b> | High                                   |
| D.I.Yogyakarta       | 0.47135982        | 0.47000449        | Medium                                 |
| Jawa Timur           | <b>0.98204606</b> | <b>0.99394633</b> | High                                   |
| Banten               | <b>0.63423101</b> | <b>0.63283976</b> | High                                   |
| Kalimantan Barat     | 0.2787347         | 0.2808887         | Low                                    |
| Kalimantan Tengah    | 0.21799375        | 0.22109645        | Low                                    |
| Kalimantan Selatan   | <b>0.43386878</b> | <b>0.53430556</b> | High                                   |
| Kalimantan Timur     | 0.45091298        | 0.44721901        | Medium                                 |
| Kalimantan Utara     | 0.16972337        | 0.1664305         | Low                                    |

Description: Williamson index (IW) indicator, namely  $IW < 0.35$  "Low regional disparities";  $0.35 < IW < 0.5$  "Moderate regional disparities";  $IW > 0.5$  "High regional disparities".

Figure 5. shows the division of regional disparities classification in the Western Region of Indonesia based on the calculation of the Williamson index in 2022. Figure 5 explains results similar to Table 1, but is represented in the form of a map distribution

visualization. The distribution of blue shading indicates areas that have a moderate regional disparities classification. The classification of areas with high disparities is visualized with orange shading. Furthermore, low regional disparities is represented by dark gray shading. While light gray shading is an outlier area or an area that is not used as a unit of analysis in the study.



### 3.2 Discussion

The Klassen typology divides regions based on the level of economic and social development, while the Williamson Index measures income disparities between regions. One of the factors that contributes to regional disparities is infrastructure development. Research by [20] revealed that infrastructure development, such as roads and sanitation, has a significant impact on economic growth and income disparities in Indonesia. Good infrastructure can improve accessibility and connectivity between regions, which in turn can reduce disparities. This is in line with the findings of [21] [22], which state that the approach that only relies on Gross Regional Domestic Product (GRDP) to measure disparities has limitations, because it does not consider other dimensions such as infrastructure and natural resources.

Furthermore, research by [15] shows that variables such as Growth Rate, Investment, and Human Development Index (HDI) affect regional disparities in West Nusa Tenggara. Using the Williamson Index, this study highlights the importance of non-economic factors in understanding disparities. This shows that disparities is not only influenced by economic aspects, but also by social and environmental factors. Regional disparities in western Indonesia is also seen in the context of urbanization and regional expansion. Studies from [23] analyzed the disparities between the northern and southern regions in Medan City, which showed that social and economic disparities became important issues in discussions about regional expansion.

Based on the result, regional disparities in Indonesia, especially in the provinces of Sumatera Utara, Sumatera Selatan, Jawa Tengah, Yogyakarta, Banten, Kalimantan Barat, dan Kalimantan Selatan, is a complex and multifaceted issue. Several factors contributing to the high disparities in these regions can be analyzed from various perspectives, including economic, social, and infrastructure [24]. In Sumatera Utara, despite the abundant natural resource potential, economic growth is uneven [25]. This is also seen



in Kalimantan Selatan and Kalimantan Barat, where the income disparities between urban and rural areas is very striking, with urban areas such as Banjarmasin and Pontianak being more advanced than rural areas [26]. Although Banten is a province close to Jakarta, the disparities between industrial and agricultural areas is still high [27].

In addition, in Kalimantan Barat, access to quality education is still a challenge, thus hampering the development of competitive human resources [26]. Using descriptive statistical analysis, this study provides insight into how disparities can influence public policy and regional planning. In a broader context, study from [28] examined indicators of disparities in development and the spread of the COVID-19 pandemic in Jawa Barat and Banten. This study shows that development disparities between cities and districts can exacerbate the impact of the pandemic, highlighting the importance of inclusive policies to reduce disparities.

#### 4. Conclusion

Based on the result shows that there is significant disparities in several provinces, including Sumatera Utara, Sumatera Selatan, Jawa Tengah, Yogyakarta, Banten, Kalimantan Barat and Kalimantan Selatan. This disparities is caused by various factors, including differences in economic growth, access to infrastructure, education, and uneven decentralization policies. These provinces experience high disparities in terms of income and development, indicating the need for more attention in planning and implementing inclusive and sustainable development policies. Furthermore, the Klassen typology identifies that Kalimantan Tengah, Aceh, Bengkulu, Kalimantan Barat, Sumatera Barat, Kepulauan Bangka Belitung, Banten, Kalimantan Selatan, Jambi and Lampung are in quadrant 3. This indicates that these regions have relatively low economic growth and high poverty rates. This placement emphasizes the need for stronger policy interventions to increase economic growth and reduce disparities in these regions.

Overall, this study emphasizes the importance of a holistic and integrated approach to addressing regional disparities. Policies that focus on improving infrastructure, access to education, and local economic development are essential to creating a better balance of development in western Indonesia. Thus, efforts to reduce disparities will not only improve people's welfare but also support more inclusive and sustainable economic growth across the region.

#### 5. Declaration

**Author contributions and responsibilities** - The authors made major contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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**Availability of data and materials** - All data is available from the author.

**Competing interests** - The authors declare no competing interests.

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