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Spatial Analysis of Population Structure Towards Demographic Bonus in Pesisir Barat Regency of Lampung

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Abstrak

Bonus demografi merupakan peluang strategis bagi pembangunan daerah yang hanya dapat dimanfaatkan apabila struktur penduduk didukung oleh kesiapan sosial, ekonomi, dan spasial. Di Kabupaten Pesisir Barat, masih terdapat ketimpangan distribusi penduduk usia produktif, tingginya angka ketergantungan, pengangguran, serta pertumbuhan penduduk. Penelitian ini bertujuan menganalisis struktur penduduk secara spasial berdasarkan indikator laju pertumbuhan penduduk, rasio ketergantungan, proporsi penduduk usia produktif, dan tingkat pengangguran terbuka. Pendekatan penelitian menggunakan metode kuantitatif dengan analisis spasial berbasis Sistem Informasi Geografis (SIG). Seluruh variabel dianalisis menggunakan klasifikasi jenjang nilai (range class analysis), divisualisasikan melalui peta tematik, dan digabungkan dalam indeks komposit kesiapan bonus demografi menggunakan metode pembobotan linier sederhana. Hasil penelitian menunjukkan bahwa laju pertumbuhan penduduk Kabupaten Pesisir Barat masih tergolong tinggi yaitu 2,19%, dengan angka kelahiran yang juga tinggi. Rasio ketergantungan mencapai 49,87%, sedangkan tingkat pengangguran terbuka berada pada 4,12%, dengan distribusi spasial yang bervariasi antar kecamatan. Meskipun demikian, proporsi penduduk usia produktif sebesar 69,5% menunjukkan potensi pemanfaatan bonus demografi, terutama apabila diarahkan melalui kebijakan pembangunan wilayah yang berbasis data spasial. Secara keseluruhan, hasil penelitian ini menegaskan pentingnya pemetaan spasial struktur penduduk sebagai dasar perencanaan pembangunan untuk memaksimalkan peluang bonus demografi dan meminimalkan risiko ketidakmerataan sosial ekonomi di masa mendatang.

Abstract

The demographic bonus represents a strategic development opportunity that can only be optimized when population structure is supported by adequate social, economic, and spatial readiness. In Pesisir Barat Regency, disparities in productive-age population distribution, high dependency ratios, unemployment rates, and rapid population growth remain key challenges in preparing for the demographic bonus. This study aims to spatially analyze the population structure based on key demographic indicators including population growth rate, dependency ratio, proportion of the productive-age population, and open unemployment rate. A quantitative approach was applied using spatial analysis techniques within a Geographic Information System (GIS) framework. All indicators were classified using range-based value categorization, visualized through thematic mapping, and integrated into a composite readiness index using a simple linear weighting method. The findings reveal that the population growth rate remains relatively high at 2.19%, driven by a persistently elevated birth rate. The dependency ratio reaches 49.87%, while the open unemployment rate is recorded at 4.12%, with spatial variation across districts. Despite these challenges, the productive-age population accounts for 69.5% of the total population, indicating substantial potential for harnessing the demographic bonus. These results emphasize that spatially informed population planning is essential for maximizing demographic potential while minimizing socio-economic disparities. Overall, this study highlights the significance of spatial demographic mapping as a scientific basis for formulating targeted development policies to ensure the demographic bonus translates into sustained regional progress.

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INTRODUCTION

Indonesia is in a strategic phase of population transition which is characterized by an increasing proportion of the productive age population (15–64 years) compared to the non-productive age group. This phenomenon is known as the demographic bonus, which is a condition that allows the acceleration of economic development if supported by the right policies and regional readiness. Parwodiwiyono & Witono (2022) stated that this moment is very important in national development, while Simanjuntak & Pasaribu (2023) emphasized the importance of the contribution of the younger generation in optimizing this potential. It is estimated that the peak of the demographic bonus in Indonesia will occur in 2045 (Qomariyah et al., 2023). In line with the national long-term development targets. However, the demographic bonus is not an automatic guarantee for economic growth and welfare. Its success is greatly influenced by the readiness of the region in providing adequate education, health services, and employment facilities for the working-age population. As stated by (Panggabean, 2022) the demographic bonus is an opportunity that does not come twice, and will only bring benefits if accompanied by the quality of productive and adaptive human resources. Thus, readiness to face the demographic bonus is a shared responsibility, both at the national and regional levels.

Each region in Indonesia has different demographic and geographical characteristics. Spatial inequalities in population structure and access to basic services are a real challenge in the process of human resource development. Setiawan (2015) emphasized that efforts to welcome the demographic bonus require careful planning and involve the participation of various parties, including the community. In this case, the spatial approach is very relevant because it is able to map in detail the distribution of the population, regional needs, and potential that can be developed to increase the capacity of the productive age population.

Unfortunately, studies evaluating regional readiness for the demographic bonus are still dominated by a national approach that is aggregative, without highlighting variations in conditions between regions. This is an obstacle in the formulation of evidence-based development policies at the local level, especially in new areas such as Pesisir Barat Regency. This district is an expansion area that has coastal and rural geographical characteristics, with uneven social infrastructure conditions. The main challenges include the inequality of the distribution of the productive age population, the high dependency ratio in some sub-districts, and limited access to secondary education, vocational training, and reproductive health services.

Preliminary data show that the concentration of the working-age population only occurs in certain regions, while other regions experience gaps in terms of access to services and work participation. This condition raises fundamental questions related to the extent of the readiness of Pesisir Barat Regency in taking advantage of existing demographic opportunities. In addition, it is important to explore how spatial inequality between regions affects the ability of these regions to make maximum use of the productive age population.

Based on this, this study is directed to examine the population structure through a spatial approach, focusing on indicators such as dependency ratio, proportion of productive age, population growth, and work participations. By utilizing spatial data, this study aims to provide a comprehensive and contextual picture of regional readiness in the face of demographic bonuses. The results of this research are expected to be the basis for local governments in developing adaptive development strategies, based on regional potential, and supporting the national agenda towards a Golden Indonesia 2045. The urgency of this research is based on the real need of local governments to plan development policies based on spatial and contextual data. Without precise geographic information on the distribution and characteristics of the productive age population, development interventions such as job training, vocational education, or the provision of youth services risk being untargeted. On the other hand, a spatial approach through the use of Geographic Information Systems (GIS) allows for more effective, efficient, and evidence-based identification and visualization of priority areas. The novelty of this research lies in the combination of demographic analysis approaches with spatial mapping in one integrative framework. This research will produce an index of regional readiness towards the demographic bonus to the sub-district or village level, which has not been available in literature or regional planning documents. In addition, the focus on coastal and rural areas expands the scope of demographic bonus analysis which has been studied more in urban areas or industrial centers. The results of this study also have the potential to be a replication model for other regions with similar characteristics.

This research is targeted to produce two important findings that can provide a comprehensive picture of the population structure in Pesisir Barat Regency in the context of readiness towards a demographic bonus. First, this study will produce spatial distribution maps that describe the distribution of population structural indicators. These maps will serve as a basis for identifying differences in characteristics between regions and uncovering significant demographic spatial patterns. Second, this study will find the spatial characteristics of the population structure that can indicate potential and vulnerable areas in the face of the demographic bonus period. Scientifically, this research contributes to strengthening the population geography approach that integrates spatial analysis with socio-demographic indicators. The findings of the study are not only relevant to support local policies, but also to enrich the literature on regional preparedness in facing the demographic transition period in Indonesia. By providing a more measurable and visual picture of the region, the results of this research can be used as a basis for developing development policies that are more inclusive, equitable, and adaptive to future population challenges.

METHODS

This study applies a quantitative approach with a spatial descriptive design to analyze demographic patterns and regional readiness for the demographic bonus in Pesisir Barat Regency. A GIS-based method was selected because it enables visualization of demographic variation across administrative areas and supports spatial decision-making that cannot be captured through numerical tables alone.

The analysis uses secondary data from 2020–2024, sourced from Statistics Indonesia (BPS), the Population and Civil Registration Office. The unit of analysis is districts and villages. The demographic indicators analyzed include: population growth rate, dependency ratio, percentage of productive-age population, open unemployment rate, fertility and mortality rates, and education level. Standard demographic formulas were applied, such as:

$$\text{PGR} = \frac{P_t - P_0}{P_0} \times 100, \quad \text{DR} = \frac{\text{Population } (0\text{–}14 + 65+)}{\text{Population } (15\text{–}64)} \times 100$$

Spatial processing was performed using QGIS 3.28 and ArcGIS 10.8. Indicator values were classified using the Natural Breaks method and visualized in the form of thematic maps.

Data analysis consists of: 1) Descriptive statistics to summarize indicator values, 2) Spatial mapping and overlay analysis to examine distribution patterns, and 3) Interpretation to identify potential and vulnerable regional categories in facing the demographic bonus.

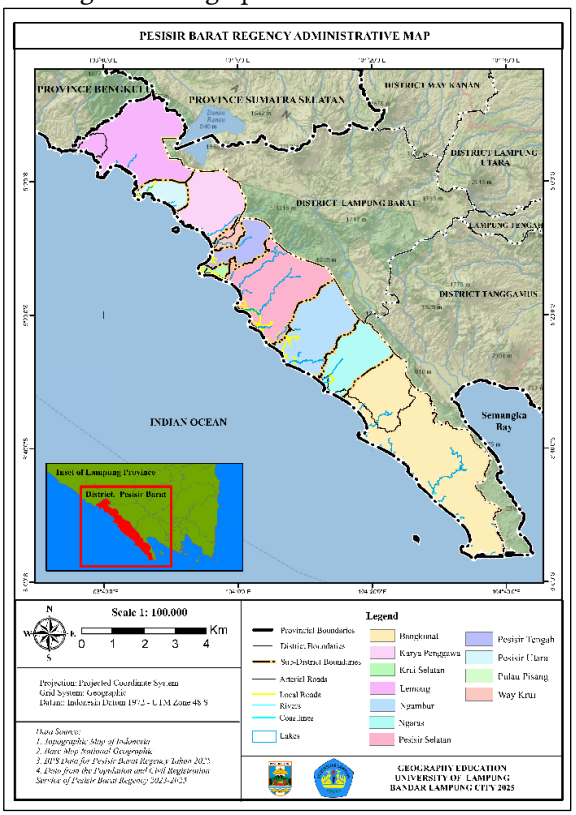

Figure 1. Administration Map of Pesisir Barat

Data Collection and Processing Stage

1. Data Collection: Collect demographic and socio-economic data from various official sources.
2. Spatial Analysis: Process data using ArcGIS or QGIS software to produce thematic maps based on predetermined

Data Analysis Stage

1. Descriptive Analysis: Explain trends and distribution of indicators numerically.
2. Spatial Analysis: Use mapping and overlay techniques to examine spatial relationships between indicators.
3. Interpretation of Results: Draw conclusions about the region's readiness for the demographic bonus based on the distribution of indicators. .

RESULTS AND DISCUSSION

a. Population Growth

Population growth is the change in the number of people in an area over a certain period of time that is influenced by three main components: birth (fertility), death (mortality), and migration (exit or entry) Preston & Stokes, (2024). Population growth is an important indicator in development planning, because it has an impact on the needs of facilities and infrastructure, public services, education, health, and job opportunities (Lan et al.,

2020). Therefore, population growth is one of the factors for the demographic bonus of a region, because in facing the demographic bonus, qualified facilities and the availability of space for business and service activities are needed (Achmad et al., 2024; Yang et al., 2024; and I Gede Putu Dharma Yusa & Beta Yulianita Gitaharie, 2024).

The close link between population growth and demographic bonus is essentially a long-term process. Population growth in the past through a high birth rate gave birth to "demographic capital" in the form of many productive ages today. Meanwhile, current population growth control policies through family planning programs, improving reproductive health, and strengthening family resilience will determine the sustainability of future demographic bonus opportunities.

The demographic bonus arises when the proportion of the population of productive age is higher than the non-productive age. The productive age can increase if births and migration are large enough to result in a dominant and larger working-age cohort. This increase is included in the population growth in a region.

Data shows in BPS Pesisir Barat that some sub-districts in the Pesisir Barat have positive population growth in both men and women, while there are also sub-districts where population growth is negative or close to zero. The population growth of the Pesisir Barat has an interesting pattern, there are sub-districts with positive growth, sub-districts with balanced but moderate growth, and sub-districts with negative growth. Births, deaths, and migration play an important role in shaping population structures that are directly related to demographic bonuses. The population structure is visualized in the map as follows:

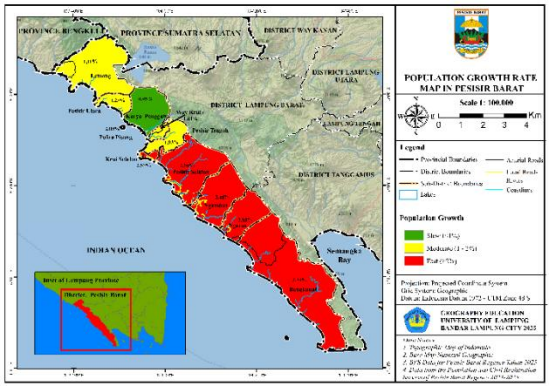

Figure 2. Population Growth Rate Map in Pesisir Barat

Through the map listed in figure 1, it can be seen that the population growth rate on the Pesisir Barat varies from one region to another. The map shows a clear spatial pattern, the southern to Pesisir Tengahal areas, namely the Pesisir Selatan, Ngambur, Ngaras, Bengkunat, Krui Selatan which are red with a > rate of 2% and record a relatively high growth rate with the following details, Ngaras with a growth rate of 3.03%, Krui Selatan with a growth rate of 2.57%, Pesisir Selatan with a growth rate of 2.55%, Ngambur with a growth rate of 2.48%, Bengkunat with a growth rate of 2.34%, while the northern part and part of the coastal interior of the Lemoto area, Pesisir Utara, Karya Penggawa, Pesisir Tengah partly show a moderate (1–2%) or slow (<1%) rate in several locations. For more details, see the following table.

Table 1. Population growth rate of Pesisir Barat 2025

District	Population Growth Rate	
	Male	Female
Lemong	0,27	0,43
Pesisir Utara	0,34	0,5
Pulau Pisang	-0,39	-0,36
Karya Penggawa	0,01	-0,6
Way Krui	-0,16	-0,27
Pesisir Tengah	0,38	0,34
Krui Selatan	0,56	0,28
Pesisir Selatan	0,4	0,45
Ngambur	0,19	0,17
Ngaras	0,49	0,48
Bangkunat	0,44	0,6
Pesisir Barat	0,31	0,32

The difference in population growth rate between sub-districts is greatly influenced by geographical, socio-economic, migration, and infrastructure quality. Judging from its geographical situation, archipelago areas such as Pulau Pisang experienced negative growth due to limited access to transportation and basic services, thus encouraging outward migration, especially the younger generation. This phenomenon is in accordance with the population mobility theory of Ravenstein's Laws of Migration, which states that areas with limited access tend to be sources of emigration (Ravenstein, E. G.,1876). Economic activities and opportunities also greatly affect life so that sub-districts with a strong economic base such as the Pesisir Selatan, Bangkunat, and Pesisir Tengah show positive growth because they are able to provide jobs in the plantation, fisheries, and trade sectors. According to Adioetomo (2022), regions with economic diversification are better able to withstand outward migration flows. Looking at accessibility and infrastructure, the Pesisir Tengah as the center of the district has higher growth due to the existence of education, health, and government facilities. The Central Place theory (Christaller) asserts that the administrative center always attracts the concentration of the population (Mulligan, G. F., Partridge, M. D., and Carruthers, J. I., 2012). In addition, there is a gender factor of migration,

several sub-districts such as Karya Penggawa and Way Krui show negative growth, especially in women. Anastasiadou et al., (2024) found that women's migration to cities is higher for educational and formal employment purposes, while men tend to stay in the local agriculture and fisheries sectors.

The higher growth rate in the south-central strip can usually be explained by a combination of economic and accessibility factors. The migration push-pull theory Lee (2011) explains that areas that provide job opportunities, markets, and public services will attract migrants from less developed areas, this appears on the map as a concentration of growth in a region that is more connected and economically active. Empirically, regional studies in Indonesia have found a strong link between job availability, transportation access, and internal migration that increase the population in the centers of economic activity (Rahmadana, M. F., 2020). Reviewing from the aspect of spatial development, this includes the concept of cumulative causation or the center effect, explaining how more developed places tend to accumulate facilities and investments so as to strengthen their demographic growth. Pesisir Barat, the area in red on the map adjacent to arterial routes and market access and more productive plantation and fishery areas, this combination facilitates the influx of labour and lowers the incentive for outward migration.

Looking at population growth in an area such as the Pesisir Barat, there are areas with low or even negative population growth. This phenomenon can occur because some areas in the Pesisir Barat actually have factors that inhibit growth such as low accessibility and stagnant economic conditions. Small islands and remote locations show low or even negative growth rates due to access barriers such as transportation, cost of living, lack of health and education facilities, and limited employment opportunities. The literature on small islands and peripherality shows that outward migration especially the younger generation is a common response to these limitations, some islands are even experiencing demographic pressure due to climate change and the eyes of fragmentation are uncertain. Based on the map, areas that are green or yellow in the north and small islands off the coast can be interpreted as areas at risk of out-migration if there is no policy intervention.

Based on the perspective of demographic transition and demographic dividend theory, the demographic bonus arises when the proportion of productive age increases relative to the non-productive age Mason, A., Lee, R., and Jiang, J. X.,2016). The map shows strong growth in several sub-districts, indicating that it has the potential to be a source of productive age labor and has the potential to become demographic capital. But it's important to note that demographic bonuses don't automatically become profits. The literature of Bloom & Canning (2004) and colleagues emphasizes that for the demographic bonus to be realized, investment in health facilities, education, and job creation is needed, without which the productive age cohort can actually generate unemployment and social pressure. Looking at the uneven spatial pattern where some sub-districts experience a high population growth rate, and some are stagnant and even negative, the Pesisir Barat faces the challenge of equitable distribution of demographic bonus benefits, if policies only accumulate in sub-districts that have developed, other areas can be further left behind so that the economic benefits of the district become uneven.

Through the maps, data, and theories above, there are policy directions that can be applied such as, strengthening labor absorption in fast sub-districts with vocational training, downstream investment in fishery and agricultural products so that productive labor is not unemployed, interventions for stagnant or declining sub-districts are improving regular transportation, basic services, MSME incentives and sustainable tourism to contain outward migration, then cross-sectoral policies on education, reproductive health, and infrastructure facilities that are coordinated in accordance with the recommendations of Bappenas and the World Bank regarding strategies to utilize the demographic bonus in a fair and sustainable manner. Spatially-targeted interventions that adjust policy packages according to the conditions of each sub-district are key to ensuring that the demographic bonus becomes a development opportunity, not a source of inequality.

b. Dependency Ratio

Dependency ratio is a demographic indicator that measures the relative burden of the non-productive population (dependents) on the productive population (productive population). This ratio expresses how many non-productive people are "covered" by every 100 working-age people; The higher the number, the greater the economic and social burden on the productive population (World Bank, 2022). The dependency ratio is closely related to the demographic bonus because the demographic bonus occurs when the proportion of working age is relatively large so that the dependency ratio decreases, therefore, the decrease in the dependency ratio is a key indicator that the region is entering the demographic bonus phase (Foley, 2022).

According to Todaro & Smith (2020), the higher the dependency ratio, the greater the economic burden that must be borne by the productive age population. Emphasized that this ratio is an important indicator to see the extent to

which a region can take advantage of demographic bonus opportunities. Research by the United Nations Population Fund Adioetomo (2010), a low dependency ratio (40–50) shows that a country or region is in a "demographic window of opportunity". Table 4 shows the young dependency ratio (0–14) ranges from 36 to 42% and the old dependency ratio ≥60 to 65 is about 8.5–15%. The total dependency ratio per sub-district ranges from 46 to 52%. In aggregate, the districts (48.61) placed the Pesisir Barat in the category of moderate to low enough ratios to consider the opportunity of demographic bonuses, but not so low that the challenge disappeared. The data in table 4 is then visualized in the dependency ratio map as follows:

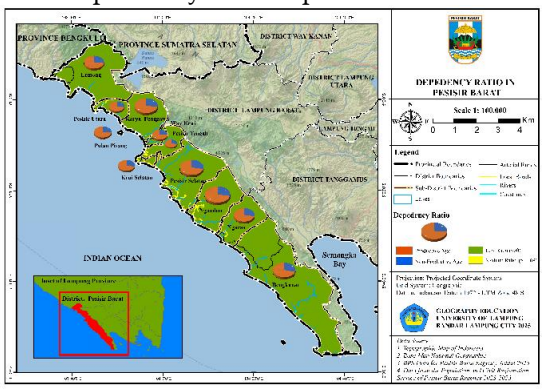

Figure 3. Dependency Ratio Map in Pesisir Barat

Based on BPS data and distribution maps, the dependency ratio in Pesisir Barat Regency in 2025 shows variations between sub-districts. Overall, the total dependency ratio is at 48.61, which belongs to the medium category. This means that every 100 productive age residents bear about 49 non-productive age residents. This figure is relatively lower than some rural areas in Indonesia that are still above 55, so the Pesisir Barat has the potential to enter a demographic dividend period.

Spatially, there are differences between sub-districts, first the sub-districts with the lowest ratio, namely Way Krui (46.48), Lemong (46.40), and Pesisir Tengah (46.94), indicating a fairly dominant proportion of productive age, so that the burden of dependency is relatively lighter, this shows a greater opportunity to take advantage of the demographic bonus because the burden of dependents is relatively light. Second, the sub-districts with the highest ratio, namely Pulau Pisang (51.94) and Bangkunat (50.21), show a heavier burden of dependence, which is influenced by the high proportion of the elderly population and the isolation of the area, this causes Pulau Pisang and Bangkunat to face the risk of being left behind due to the burden of old age and large young age, so that if there is no intervention, the potential demographic bonus in this area can be lost because most of the productive age is burdened by dependents

Table 2. Dependency Ratio of Pesisir Barat 2025

Region	Dependency Ratio		
	Young	Old	Total
Pesisir Tengah	37.58	9.36	46.94
Pesisir Selatan	40.06	8.93	49
Lemong	36.01	10.39	46.4
Pesisir Utara	37.44	11.76	49.2
Karya Penggawa	38.72	11.09	49.82
Pulau Pisang	36.97	14.96	51.94
Way Krui	35.2	11.28	46.48
Krui Selatan	40.74	8.58	49.33
Ngambur	39.04	9.28	48.31
Ngaras	39.62	8.7	48.32
Bangkunat	41.68	8.53	50.21
Pesisir Barat	39.05	9.56	48.61

The variation in dependence is influenced by various factors both from outside and from within each sub-district in the Pesisir Barat. First, fertility and mortality, sub-districts with higher youth dependency ratios, such as Krui Selatan (40.74) and Bangkunat (41.68), indicate that large family norms are still strong and limited access to family planning programs. In contrast, areas with declining fertility rates tend to have a greater proportion of productive age. The second is migration, selective migration of working age also plays an important role in the dependency ratio, Pulau Pisang sub-district has the highest old dependency ratio (14.96), due to the high migration out of the productive age population to mainland or urban areas. The push-pull migration theory from Lee & Mason (2010), who explains that limited access and employment opportunities encourage the migration of the younger generation from small islands reinforces this factor. Third, namely economic conditions, sub-districts with relatively strong economic bases, such as the Pesisir Tengah and the Pesisir Selatan, tend to have a lower dependency ratio because they are able to attract and maintain productive age.

On the other hand, areas with geographical isolation and infrastructure limitations have a greater burden of dependency McKay & Lawson (2020). The high ratio of old dependency in several sub-districts indicates the initial process of population ageing which, if not managed properly, can increase the burden of health services and social security in the future.

Looking at the total dependency ratio data of 48.61, Pesisir Barat Regency has the potential to take advantage of the demographic bonus. However, these bonuses do not automatically result in economic benefits. Pradhan et al., (2022) emphasized that dividends can only be realized if there are supportive policies, such as improving the quality of education, job creation, and access to health. Without these policies, demographic superiority can actually become a burden (demographic burden). Spatial variation also shows that not all sub-districts are equally prepared. Pulau Pisang and Bangkunat, for example, require special

policies related to the provision of elderly services and the creation of local economic opportunities so as not to be left behind in the development process. In general, the population structure of Pesisir Barat Regency shows positive signs towards a demographic bonus, with a dependency ratio in the medium category. However, significant differences between sub-districts demand a region-based policy approach. Areas with high ratios require special interventions, both in terms of family planning programs, job creation, and social protection for the elderly. An inclusive and spatially-targeted human development strategy is the key to optimizing the demographic bonus in the Pesisir Barat.

c. Productive Age Population

Penduduk di suatu daerah memiliki tiga kategori yaitu: penduduk usia belum produktif (0-14 tahun), usia produktif (15-64 tahun) dan tidak produktif (lebih dari 64 tahun). The existence of the productive age is closely related to the existence or absence of a demographic bonus in an area. The existence of a productive age population has an impact on the potential of a region to get a demographic bonus. The existence of the productive age population has a considerable impact on the availability of labor, but on the other hand, the existence of the productive age population can also be a problem if it is not equipped with qualified quality. Data BPS is visualized by pyramid and analise by map:

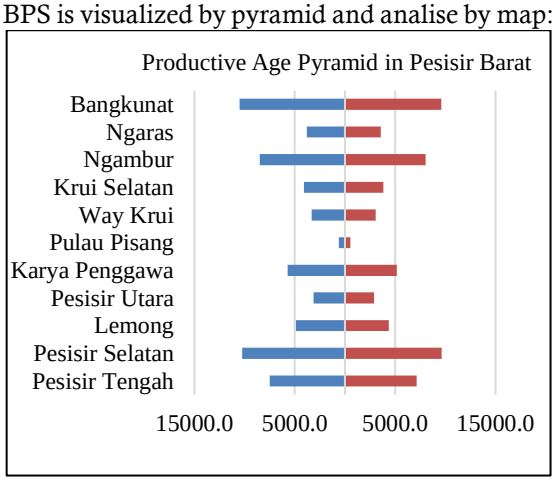

Figure 4. Productive Age Population Pyramid

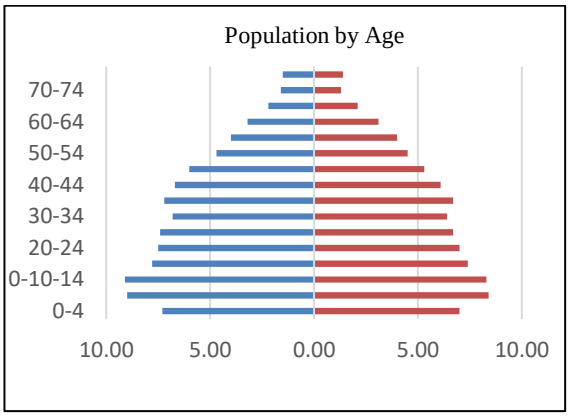

Figure 5. Population by Age Pyramid

The data are then visualized in the map as follows:

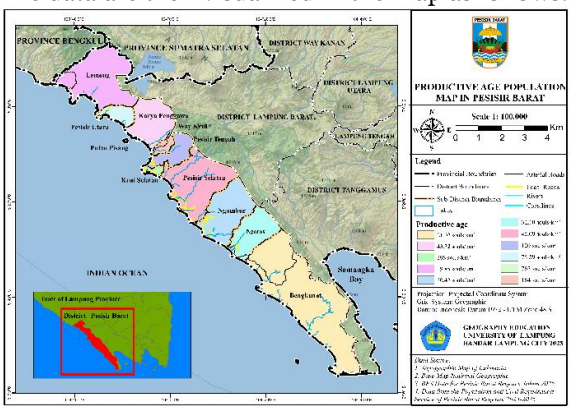

Figure 6. Productive Age Population Map in Pesisir Barat

Referring to figure 6 The number of productive age in aggregate in Pesisir Barat Regency is 120,143 people, divided into 62,306 males and 57,837 females. The spatial distribution shows a clear concentration, namely the two largest sub-districts as the main source of labor are Bangkunat with 20,088 people with a percentage of 16.7% of the total productive age and the Pesisir Selatan with 19,861 people with a percentage of 16.5%. The middle group is occupied by Ngambur with 16,525 people and a percentage of 13.7% and the Pesisir Tengah with 14,661 and a percentage of 12.2%. On the other hand, Pulau Pisang accounts for less than 1% of the total productive age of 1,136 people, marking a very marginal position in the district's workforce structure.

The ratio between men and women throughout the productive age group is slightly tilted towards men in all sub-districts. Some sub-districts show a relatively larger male ratio than other areas such as Lemong which is 1.12, Karya Penggawa which is 1.11. This trend is consistent with the local economic structure which is dominated by the primary sectors, namely agriculture, fisheries, and plantations which traditionally absorb more male workers. However, looking at the gender ratio difference opens up important questions about female labour force participation both in terms of access to education,

gender norms, and the availability of women-friendly formal jobs. Referring to the theoretical perspective of demographic transition and demographic dividend Bloom et al., (2003), large concentrations of productive age in Bangkunat, Pesisir Selatan, Ngambur and Pesisir Tengah indicate the availability of potential "demographic capital". These regions can be the engine of growth if the workforce can be absorbed productively. Central place theory and spatial development studies Weeks, (2021) explain why administrative centers and areas with market access tend to accumulate working-age populations so that infrastructure, labor markets, and public services are needed to reduce outward migration incentives and attract migrants in.

The distribution of the productive-age population in Pesisir Barat Regency shows significant spatial variation between sub-districts. Areas such as South Krui, Central Pesisir, and Karya Penggawa have high productive population densities due to their location on major west coast transportation routes and their proximity to the center of government and economic activity in Krui. Conversely, sub-districts such as Pulau Pisang and Bengkunat exhibit lower densities due to limited accessibility and steeper topography. Pesisir Barat Regency is part of the western Lampung region complex, which serves as a connecting zone between Lampung and Bengkulu Provinces. The distribution pattern of the productive population in this region reflects the functional relationships between the regions. For example, Lemong and North Pesisir Regencies interact economically with South Bengkulu, while Ngambur and Bengkunat orientate toward Tanggamus and Semangka Bay, which serve as trade and tourism routes. The physiographic conditions of Pesisir Barat, dominated by hills, the Bukit Barisan protected forest, and a long coastline, influence the distribution and economic activities of the productive population. Areas with gentle topography, such as the Central and South Coasts, are denser because they are suitable for settlements, agriculture, and the service sector. Conversely, areas with steep slopes and risks of landslides or coastal erosion tend to have a mores parse population distribution. The relationship between environmental carrying capacity and productive age density requires further analysis through GIS-based spatial mapping to demonstrate the balance between natural resource potential and human capacity for sustainable regional management.

This analysis confirms that the Pesisir Barat has quantitative demographic capital relevant to the demographic bonus, but the transition from potential to outcome requires simultaneous interventions by strengthening the quality of human resources, market connectivity and accessibility, economic structures that absorb labor, and women's empowerment (gender frameworks). Policies that do not consider the theoretical dimensions and the latest empirical evidence are more likely to result in unrealized dividends or benefits that are concentrated in only a few areas.

d. Open Unemployment Rate

The Open Unemployment Rate is an important indicator that describes the percentage of the workforce that is actively looking for work but has not yet found a job opportunity. According to BPS (2024), TPT is a direct measure of the effectiveness of the labor market in absorbing the productive age population. The higher the unemployment rate, the greater the potential for wasting human resources that should be able to contribute to economic growth. The ILO (2022) emphasizes that high open unemployment conditions in developing countries are often caused by misalignment between labor skills and labor market needs.

Table 3. Open Unemployment Rate of Pesisir Barat 2025

District	Open Unemployment Rate
Pesisir Tengah	19.02%
Pesisir Selatan	22.39%
Lemong	18.65%
Pesisir Utara	22.39%
Karya Penggawa	15.25%
Pulau Pisang	17,32%
Way Krui	23.41%
Krui Selatan	21.77%
Ngambur	20.61%
Ngaras	22.42%
Bangkunat	18.94%

The demographic bonus can only provide economic benefits if the productive age workforce can be absorbed optimally in the formal and informal job market. Sánchez-Romero et al., (2018) explained that the success of the demographic bonus is determined by the low unemployment rate and increased labor productivity. TPT that is left high, demographic momentum has the potential to become a burden because the high number of productive age who are not working will add to social and economic problems. Research from Holder (1984) and Sabrina Mutmainah (2025) confirms that demographic transitions in many developing countries have failed to be optimally utilized due to limited capacity to absorb employment and lack of investment in skills development.

The open unemployment rate is calculated by the number of unemployed people divided by the number of labor force then multiplied by 100%.

Through this formula, we can know how much the unemployment rate is open in a region, including on the Pesisir Barat. The open unemployment rate on the Pesisir Barat is open in BPS Pesisir Barat. The data is then visualized in the form of map as follows:

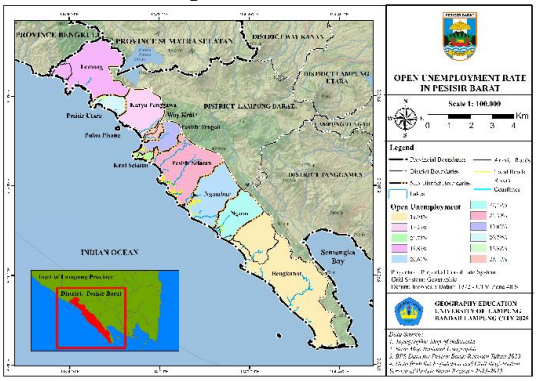

Figure 7. Open Unemployment Rate Map in Pesisir Barat

The Unemployment Rate in Pesisir Barat Regency shows quite significant variation between sub-districts, with a percentage range between 15.25% to 23.41%. Way Krui District occupies the highest position with an Open Unemployment Rate of 23.41%, followed by the Pesisir Selatan and Pesisir Utara which both recorded 22.39%. This figure is far above the national average which in 2023 was recorded at around 5.45% World Health Organization, (2023), indicating that the Pesisir Barat faces serious problems in the provision of jobs. These differences show that there is a spatial disparity in the local economic structure that is not able to absorb the labor force evenly.

Karya Penggawa District with an Open Unemployment Rate of 15.25% recorded the lowest figure in this region, although it was still high when compared to the average of Lampung province. According to research by Febriani & Nugroho (2022), the low Open Unemployment Rate in a rural area is often caused by the dominance of the agriculture- and fishery-based informal sector which is still able to accommodate the workforce even though it is low productivity. This can explain the condition of Karya Penggawa which is relatively more stable than other sub-districts. On the other hand, Way Krui and Krui Selatan as centers of economic activity and services actually show a higher Unemployment Rate, in line with the findings of Sari et al., (2023) that semi-urban areas face a mismatch between the availability of educated labor and the needs of the local market.

The distribution of open poverty levels in Pesisir Barat Regency shows an uneven spatial pattern. Areas with high unemployment rates, such as Karya Penggawa, Pesisir Selatan, and Lemong, are generally centers of social and economic activity with high population concentrations. This situation indicates labor market pressure, where the number of job seekers exceeds the number of available jobs. Conversely, areas like Ngambur and Bengkunat have lower poverty rates because the majority of their residents work in the natural resource-based agriculture, fisheries, and plantation sectors. Poverty patterns in these areas indicate functional linkages across administrative boundaries, with some workers from Pesisir Utara, Lemong, and Karya Penggawa moving to South Bengkulu, while residents from Pesisir Selatan and Ngambur have economic ties to the coastal area of Tanggamus. This situation indicates that poverty in Pesisir Barat is influenced not only by internal factors but also by interregional labor flows and limited regional economic integration.

The physical conditions of Pesisir Barat Regency, dominated by hilly topography, protected forests, and a long coastline, also influence the distribution of poverty. Areas with significant natural resource potential, such as Ngambur and Bengkunat, exhibit lower poverty rates due to their active primary sectors, such as wetland agriculture and fisheries. Conversely, areas with limited productive land or frequent disasters, such as Pesisir Tengah and Lemong, experience constraints on local economic development. These environmental conditions emphasize that land carrying capacity, disaster risk, and resource availability are important factors determining labor absorption. Integrating land cover maps with topographic and ecological land use maps can strengthen understanding of the relationship between these conditions and employment.

The phenomenon of a high Unemployment Rate in almost all sub-districts indicates a structural challenge. The gap between the growth of the labor force and the absorption capacity of the local labor market is the main cause. Recent research by Raharjo & Putri (2023) confirms that coastal areas in Indonesia tend to have limited economic diversification so that new job creation is slow. This condition is further exacerbated by the low participation of women in the formal labor market, which is reflected in the gender gap in the Labor Force Participation Rate.

The implications of this high Unemployment Rate are closely related to the potential demographic bonus. The population structure of the Pesisir Barat is currently dominated by the productive age, but without adequate employment provision, the potential for demographic gains can turn into economic and social burdens. Research by Mutiarasari & Handayani (2024) shows that failure to reduce the Open Unemployment Rate in regions with a high proportion of the productive age population will lead to increased poverty vulnerability, migration out of the region, and high dependence on the informal sector.

Spatial analysis of the Unemployment Rate data on the Pesisir Barat is important to understand the pattern of the distribution of open unemployment between sub-districts. This understanding will help local governments in designing development strategies based on local potential. Districts with high Open Unemployment Rates need intervention through skills development programs, economic diversification, and investment in labor-intensive sectors such as fisheries, agroindustry, and coastal tourism. Through a more targeted approach, the ongoing demographic bonus can be optimized into sustainable development capital, not just statistical figures.

CONCLUSION

The results of the study show that Pesisir Barat Regency is in a phase of demographic transition marked by the dominance of the productive age population. This condition has the potential to present a demographic bonus, but these opportunities are faced with structural challenges in the form of a high Open Unemployment Rate in almost all sub-districts. Spatial analysis shows a concentration of unemployment in certain regions that reflects a misalignment between labor force growth and local job absorption capacity. The phenomenon of mismatch of labor skills with market needs and low participation of women in the formal sector further worsens this condition. Without strategic intervention, the demographic advantage of the Pesisir Barat risks turning into a serious socio-economic burden.

Suggestion:

1. Formulate development policies based on local potential by emphasizing economic diversification, especially the fisheries, agro-industry, and coastal tourism sectors.
2. Develop a workforce skills improvement program according to market needs to minimize the mismatch between labor competencies and business demand.
3. Encourage women's participation in the formal workforce through policies that support equal access to employment and training.
4. Implement development strategies with a spatial approach so that interventions can be focused on areas with the highest unemployment rates.
5. Optimizing demographic bonus opportunities through the creation of quality jobs, strengthening human resources, and policies that are inclusive and adaptive to regional dynamics.

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