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ANALYZING REGIONAL LEADING ECONOMIC SECTORS FOR GRDP AND INVESTMENT PROJECTIONS : EVIDENCE FROM INDONESIA

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ABSTRACT

Sustainable economic growth can be maintained in part through integrated economic development planning to foster leading sectors. This is also necessary for Banten Province, which experienced a contraction in economic growth during the Covid-19 pandemic. Although Banten's economic growth rate has increased year by year—except in 2020—this does not diminish the potential of its leading sectors. This study aims to :1).Identify the leading economic sectors in Banten Province that meet the criteria of having competitive, comparative, and prospective advantages. 2).Project the Gross Regional Domestic Product (GRDP) of Banten Province for the years 2024 to 2026. 3).Calculate the amount of investment required by Banten Province to achieve the targeted/projected economic growth during the 2024–2026 period. The data used in this study are secondary time series data spanning ten years from 2014 to 2023, consisting of GRDP data for Banten Province, Indonesia's GDP, Banten Province's Regional Budget (APBD), and Gross Fixed Capital Formation (GFCF) data. These were obtained from the Central Bureau of Statistics (BPS) and BPS of Banten Province. Based on the calculations of Location Quotient (LQ), Dynamic Location Quotient (DLQ), and Shift-Share Analysis using 2014–2023 base data, the leading sector in Banten Province is the Water Supply, Waste Management, Waste and Recycling sector. This sector qualifies as a base sector according to the LQ, shows rapid growth as per DLQ, and is identified as a fast-growing, geographically advantageous sector with a positive National Share value.

The most suitable trend model for projecting the GRDP at constant prices for Banten Province is the quadratic/parabolic trend model, as it has the lowest mean absolute error. The GRDP projections at constant prices are as follows : 2024: IDR 510,576.42 billion; 2025: IDR 521,638.02 billion; 2026: IDR 531,801.37 billion. Based on ICOR calculations and GRDP projections, the required investment for Banten Province is: 2024: IDR 14,770.21 billion; 2025: IDR 51,880.84 billion; 2026: IDR 47,667.93 billion.

Keywords : : Leading Sector, Location Quotient (LQ), Dynamic Location Quotient (DLQ), Shift-Share Analysis, Incremental Capital Output Ratio (ICOR).

INTRODUCTION

Banten Province is a newly formed region that was previously part of West Java Province. Since 1963, the Banten Provincial Committee has been established with the aim of creating an autonomous region separate from West Java. Through Law Number 23 of 2000, Banten was officially declared an independent province with a total area of 9,160.70 km². According to Daryanto & Hafizrianda (2010), local governments have the authority to manage, explore, and develop the potential of their respective regions, as one of the main characteristics of regional autonomy is the authority and ability of a region to generate its own financial resources, manage them, and use them to fund regional development. Sustainable economic growth is a key condition for the continuity of regional economic development. Regional development is an integral part of national development. Given limited resources, development must be focused on base (leading) sectors. According to Adisasmita (2005), any change that occurs in a base sector will create a multiplier effect in the regional economy.

One of the indicators used to measure the level of a region's prosperity is the data on Gross Regional Domestic Product (GRDP), either at current prices or constant prices. A society is considered to have experienced an improvement in welfare if per capita income continues to increase. Based on the GRDP at constant 2010 prices by province in Indonesia from 2014 to 2023, it is evident that among the 38 provinces, Banten's GRDP is still relatively lower than several other provinces, particularly compared to West Java, its original region. However, based on Table 2, Banten Province has a relatively high growth rate compared to other regions in Indonesia, especially compared to West Java. This indicates that many of the seventeen sectors/business fields in Banten are classified as leading sectors that strongly support the province's economy.

In economic development planning, economic growth targets are typically determined, with investment serving as one of the key indicators, often measured using the Incremental Capital Output Ratio (ICOR), which represents the ratio of additional output to additional capital. One of the main determinants of output formation in a region's economy is the capital stock (Central Bureau of Statistics, 2022). Investment is a critical driver of growth, as it increases production capacity. It supports economic growth by supplying more inputs needed for the production process. Therefore, the levels of economic growth and investment are interrelated and inseparable. The greater the investment made to support economic activity, the higher the growth rate that can be achieved. Conversely, the higher the economic growth achieved, the greater the income available for savings and further investment (Todaro, 2015).

Based on this context, the objective of this study is to identify which sectors in Banten Province possess comparative advantages using the Location Quotient (LQ) method, which sectors are considered prospective based on the Dynamic Location Quotient (DLQ) method, which sectors have competitive advantages and specialization using the Shift-Share method, and to project the GRDP of Banten Province for the period 2024 to 2026 using a trend analysis. Additionally, the study aims to calculate the amount of investment required in the leading sectors to achieve the targeted/projected economic growth for 2024–2026.

A study conducted by Sutanti, Azizatul, and Luqman (2022) found that, based on the LQ and Shift-Share methods, there are two leading sectors in Banten Province: the Water Supply, Waste Management, Waste and Recycling sector, and the Construction sector. Both sectors have an LQ value greater than 1, indicating they are base sectors. They also have positive Proportional Shift and Differential Shift values, suggesting rapid growth and locational

advantage. Among these two, the Construction sector has the highest National Share value at 7,067, making it the most prominent at the national level.

Another study by Suhandi and Nisrina Hakin (2021) revealed that Banten Province has seven leading sector categories, five of which are rapidly growing, while two are under pressure. The five fast-growing sectors include Water Supply, Waste Management, Waste and Recycling; Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles; Information and Communication; Real Estate; and Health Services and Social Activities. The two other key sectors are Manufacturing and Transportation and Warehousing.

Septi and Syarifah's (2020) study concluded that, in general, the service sector remains the dominant and leading sector in Banten's cities and regencies. This is followed by the agriculture and construction sectors.

Based on the above findings, further research is needed to identify and analyze the leading economic sectors in Banten Province to support development planning and implementation, aiming to enhance regional economic growth during the era of regional autonomy and ensure it keeps pace with national growth.

Given the variation in findings from previous studies, this research aims to identify sectors with competitive, comparative, and prospective advantages, as well as to project the GRDP of Banten Province for the years 2024 to 2026. Moreover, it seeks to estimate the amount of investment required in these leading sectors during that period.

This research is expected to enhance the understanding of key economic sectors and provide valuable input to the local government, particularly the provincial government of Banten, in setting development priorities and determining investment targets in strategic sectors.

LITERATURE REVIEW

a. Economic Base Theory

One of the simplest and most widely used theories is the Economic Base Theory. According to Harry W. Richardson, the primary determinant of regional economic growth is directly related to the external demand for goods and services (Arsyad, 2015). Basic sectors are those that serve as the backbone of a region's economy because they possess a relatively high competitive advantage. In contrast, non-basic sectors are considered less potential but function as supporting sectors or service industries (Sjafrizal, 2008). A region is said to have a leading sector if it can outperform other regions in the same sector, resulting in export opportunities (Suyatno, 2000).

b. Location Quotient (LQ)

The Location Quotient (LQ) technique essentially provides a relative comparison between the performance of a sector in a particular region and the performance of the same sector in a larger (typically national) context. LQ measures the contribution of a sector/industry in a region compared to the national level (Tarigan, 2012). The variables commonly used in this analysis include value added (income level) and employment figures.

c. Dynamic Location Quotient (DLQ)

To complement the LQ method, the Dynamic Location Quotient (DLQ) analysis is employed. This method allows researchers to better understand the role of priority sectors, as it provides more accurate results by incorporating the growth rate of economic sectors over time. According to Yuwono (2001), DLQ offers a dynamic perspective by assessing the sector's relative position across different time periods.

d. Shift-Share Analysis

Shift-share analysis compares sectoral (or industrial) growth rates in a region with those at the national level and provides explanations for changes in specific variables by isolating the factors driving changes in regional industrial structures over time. This method disaggregates

the sources of growth in various sectors within a region and relates them to national economic trends. It is also known as industrial mix analysis, as the composition of industries significantly affects a region's growth rate. The analysis reveals whether the industries located in a particular area belong to rapidly growing sectors at the national level and whether they are appropriately situated. This analysis may use either employment data or value-added/income level as variables.

a. GRDP Projection Using Trend Method

The trend method, often referred to as secular trend, describes the average change (usually annually) over a long period. If the data shows a consistent increase, it is referred to as a positive trend; conversely, if it shows a decline, it is considered a negative trend (Pangestu Subagyo, 2000). This method is frequently used to project the future value of Gross Regional Domestic Product (GRDP) based on historical data.

b. Incremental Capital Output Ratio (ICOR)

The Incremental Capital Output Ratio (ICOR) is the ratio of investment to GDP and serves as a macroeconomic indicator of the efficiency of an economy. A lower ICOR indicates a higher level of investment efficiency (Arsyad, 2015). To estimate the financial requirements for economic growth, it is essential to project the volume of investment needed to achieve a targeted level of output (Jhingan, 2018).

This section describes related theories and previous relevant research, as well as hypothesis development (if any). Writing sources must clearly indicate the name of the author, year and source of citation included in the reference section.

METHODOLOGY

Analisis Location Quotient (LQ)

This technique is used to identify the internal potential of Banten Province, aiming to determine which sectors qualify as basic sectors and which are non-basic sectors. The LQ analysis highlights sectors with a comparative advantage by measuring their relative concentration in the regional economy compared to the national economy. The formula used to calculate the Location Quotient (LQ) in this study is:

$$LQ = \frac{x_i/vi}{X_i/Vi}$$

LQ : Location Quotient Value
xi : GRDP Value of Sector i in Banten Province
vi : Total GRDP in Banten Province
Xi : GDP Value of Sector i in Indonesia
Vi : Total GDP in Indonesia

The interpretation of LQ values is as follows : If LQ > 1, the sector's role in Banten Province is more prominent than at the national level, indicating that the sector is a basic sector or export-oriented sector. If LQ ≤ 1, the sector's role in Banten is less significant compared to its role at the national level, indicating that the sector is a non-basic sector.

Dynamic Location Quotient (DLQ) Analysis

This method is used to assess the role of priority sectors, as it provides more accurate results by incorporating the growth rate of economic sectors. The formulation of the DLQ analysis is based on Yuwono (2001:49) :

$$DLQ_{ij} = \left(\frac{(1+g_{ij})/(1+g_j)}{(1+G_i)/(1+G)}\right)^t = \frac{IPPS_{ij}}{IPPS_i}$$

DLQ ij : Dynamic Location Quotient index of sector i in Banten Province
gij : Growth rate of value added of sector i in Banten Province

gj : Average GRDP growth rate of Banten Province
Gi : Growth rate of value added of sector i at the national level (Indonesia)
G : Average GRDP growth rate of Indonesia
t : Time period (difference between end year and base year)
IPPS ij : Potential development index of sector i in Banten Province
IPPS i : Potential development index of sector i at the national level
Interpretation:

- If **$DLQ_{ij} > 1$**, it means the potential growth of sector *i* in Banten is **faster** than that at the national level.
- If **$DLQ_{ij} = 1$**, the sector's potential growth in Banten is **equal** to the national level.
- If **$DLQ_{ij} < 1$**, the sector's potential growth in Banten is **slower** than at the national level.

Combined LQ and DLQ Analysis

To determine the strategic positioning of economic sectors, a combined analysis using both LQ and DLQ is applied. The interpretation criteria are as follows:

Table 1. Criteria in LQ and DLQ Analysis

Criteria	DLQ > 1	DLQ <1
LQ > 1	Leading Sector	Prospective Sector
LQ < 1	Potential Sector	Lagging Sector

Source: (Saharuddin, 2006)

This combination enables policymakers to distinguish between sectors that are currently strong, those that are growing in potential, and those that require more strategic support.

Shift – Share Analysis

This analysis is used to identify whether industries located in Banten Province belong to the group of industries that are growing rapidly at the national level, and whether these industries are suitably located in Banten or not. In this study, the shift-share analysis uses the variable value added (regional income level), represented by Gross Regional Domestic Product (GRDP) data at constant prices. The formula used in this analysis is as follows:

$$\Delta \text{ PDRB r, i, t} = (\text{NS i} + \text{P r, i} + \text{D r, i})$$

GRDP Projection Analysis

In this study, the projection of Gross Regional Domestic Product (GRDP) is carried out using trend analysis, applying three methods: linear trend, quadratic trend, and exponential trend. The trend calculations are performed using SPSS software version 22.

Among these three methods, the best forecasting model will be selected based on the Mean Absolute Error (MAE) value. MAE evaluates forecasting accuracy by averaging the absolute values of the prediction errors. A lower MAE indicates a more accurate forecasting model (Heizer & Render, 2009: 145).

$$MAE = \frac{\sum_{t=1}^{n} |d_t - d'_t|}{n}$$

MAE = Mean Absolute Error
dt = Actual data value at time t
d't = Forecasted data value at time t
n = Total number of observations (sample size)

The accuracy of the forecast will be higher if the MAE value is smaller. This is because a smaller MAE value means a smaller difference between the forecasting result and the actual value (Rangkuti, 2005: 70).

Calculation of Investment Needs

In this study, the investment needs, specifically Gross Fixed Capital Formation (PMTB), are calculated using the ICOR approach. Thus, the formula used is:

$$I = ICOR \times \Delta Y$$

Explanation:

I : Required investment (PMTB)
ICOR : Average value of the Incremental Capital Output Ratio
ΔY : Increase in GRDP

RESULTS

Location Quotient (LQ) Analysis

The Location Quotient (LQ) analysis is used to identify economic sectors within the Gross Regional Domestic Product (GRDP) that can be classified as either basic (leading) or non-basic sectors. LQ compares the significance of a sector in Banten Province relative to its role at the national level, represented here by Indonesia. The results indicate that from 2014 to 2023, six sectors in Banten Province qualify as basic sectors: Manufacturing Industry, Water Supply, Transportation and Warehousing, Information and Communication, Real Estate, and Health Services and Social Activities, with average LQ values of 1.593, 1.145, 1.445, 1.069, 2.857, and 1.021 respectively. Meanwhile, eleven sectors are classified as non-basic, including Agriculture, Forestry, and Fisheries; Mining and Quarrying; Electricity and Gas Supply; Construction; Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycles; Accommodation and Food and Beverage Services; Financial Services; Business Services; Public Administration, Defense, and Compulsory Social Security; Educational Services; and Other Services, with average LQ values ranging from 0.076 to 0.977. Among the basic sectors, Real Estate has the highest LQ value at 2.857, reflecting strong performance and growth in this sector. Supporting this, the Residential Property Price Survey (SHPR) by Bank Indonesia shows that residential property prices in the primary market grew moderately in the third quarter of 2024, with the Residential Property Price Index (IHPR) increasing by 1.46% year-on-year, which is slightly lower than the 1.76% growth in the previous quarter. However, sales of residential properties in the primary market declined across all housing types during this period, especially for smaller homes, with sales contracting by 7.14% year-on-year. On the financing side, the majority of residential property development is funded by developers' internal resources, accounting for 74.31% of financing, while most primary home purchases by consumers are financed through mortgage schemes (KPR), which make up 75.80% of total financing.

Table 2. Results of Location Quotient (LQ) Index Calculation for Banten Province, 2014 – 2023

No	Economic Sector	LQ = xi/vi : Xi/Vi										Average LQ	Classification
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
1	Agriculture, Forestry, and Fisheries	0.412	0.418	0.428	0.426	0.421	0.414	0.429	0.419	0.427	0.423	0.422	Non Basis
2	Mining and Quarrying	0.081	0.085	0.087	0.085	0.083	0.082	0.078	0.075	0.060	0.047	0.076	Non Basis
3	Manufacturing Industry	1.680	1.647	1.618	1.593	1.571	1.563	1.564	1.571	1.550	1.571	1.593	Basis
4	Electricity and Gas Supply	1.118	1.080	0.975	0.956	0.965	0.891	0.825	0.870	0.876	0.825	0.938	Non Basis
5	Water Supply, Waste Management, and Recycling	1.144	1.110	1.137	1.155	1.139	1.118	1.166	1.153	1.158	1.166	1.145	Basis
6	Construction	0.915	0.917	0.921	0.925	0.932	0.955	0.977	1.040	1.068	1.035	0.969	Non Basis

No	Economic Sector	LQ = xi/vi : Xi/Vi										Average LQ	Classification
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
7	Wholesale and Retail Trade; Repair of Motor Vehicles	0.959	0.970	0.962	0.968	0.982	0.995	1.022	0.983	0.968	0.962	0.977	Non Basis
8	Transportation and Warehousing	1.602	1.581	1.573	1.559	1.540	1.452	1.242	1.257	1.328	1.313	1.445	Basis
9	Accommodation and Food and Beverage Services	0.742	0.748	0.760	0.774	0.781	0.790	0.851	0.844	0.814	0.805	0,791	Non Basis
10	Information and Communication	1.127	1.108	1.092	1.070	1.070	1.063	1.068	1.043	1.022	1.026	1.069	Basis
11	Financial Services	0.699	0.689	0.719	0.701	0.714	0.682	0.691	0.710	0.728	0.692	0.702	Non Basis
12	Real Estate	2.582	2.626	2.686	2.772	2.867	2.940	2.990	2.961	3.037	3.106	2.857	Basis
13	Business Services	0.581	0.574	0.571	0.563	0.548	0.538	0.554	0.536	0.511	0.507	0.548	Non Basis
14	Public Administration, Defense, and Social Security	0.482	0.485	0.500	0.508	0.496	0.510	0.516	0.508	0.504	0.507	0.501	Non Basis
15	Educational Services	0.905	0.888	0.906	0.930	0.941	0.951	0.956	0.933	0.918	0.956	0.928	Non Basis
16	Health Services and Social Activities	1.052	1.025	1.040	1.043	1.032	1.028	1.009	0.992	0.983	1.009	1.021	Basis
17	Other Services	0.873	0.850	0.841	0.829	0.813	0.797	0.800	0.785	0.757	0.751	0.810	Non Basis

Source: BPS (Processed Data)

The second sector with the highest LQ value after the real estate sector is the manufacturing industry, with an LQ score of 1.593. Amid economic slowdown challenges, the manufacturing industry in Banten Province demonstrated positive performance in the second quarter of 2024. According to data released by Banten Province's Statistics Indonesia (BPS), several industrial sectors experienced a significant increase in activity. The growth of the manufacturing industry was driven by strong performance in several sub-sectors, including the food and beverage industry, the rubber and rubber/plastic products industry, and the transportation equipment industry. The food and beverage sector recorded notable growth, in line with increased demand during the Ramadan and Eid al-Fitr period. Additionally, the rubber and plastic product industries also showed solid improvement, supported by stable domestic and export demand.

According to the results of the Large and Medium Industrial Survey (IBS) conducted by BPS, the growth of the manufacturing sector was slower compared to the second quarter of 2023. Nevertheless, this sector continues to contribute significantly to Banten's Gross Regional Domestic Product (GRDP). The manufacturing sector's contribution to Banten's GRDP reached 30.01%. Furthermore, electricity consumption by industrial customers in Banten increased by approximately 8% year-on-year, indicating rising production activity in the industrial sector. This further supports the growth of the manufacturing industry. (Susanto, 2024)

Dynamic Location Quotient (DLQ) Analysis

Table 3. Results of Dynamic Location Quotient (DLQ) Calculation for Banten Province, 2014 to 2023

No	GRDP Business Field	Average DLQ	Description
1	Agriculture, Forestry, and Fisheries	1.01	Fast Growth Rate
2	Mining and Quarrying	1.30	Fast Growth Rate

No	GRDP Business Field	Average DLQ	Description
3	Manufacturing Industry	1.01	Fast Growth Rate
4	Electricity and Gas Supply	1.10	Fast Growth Rate
5	Water Supply, Waste Management, Waste, and Recycling	1.01	Fast Growth Rate
6	Construction	1.03	Fast Growth Rate
7	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	1.01	Fast Growth Rate
8	Transportation and Warehousing	1.06	Fast Growth Rate
9	Accommodation and Food Service Activities	1.03	Fast Growth Rate
10	Information and Communication	1.03	Fast Growth Rate
11	Financial Services	1.04	Fast Growth Rate
12	Real Estate	1.01	Fast Growth Rate
13	Business Services	1.01	Fast Growth Rate
14	Public Administration, Defense, and Compulsory Social Security	1.02	Fast Growth Rate
15	Education Services	1.01	Fast Growth Rate
16	Health Services and Social Activities	1.01	Fast Growth Rate
17	Other Services	1.00	Comparable Growth Rate

Source: BPS (Processed Data)

Based on the DLQ analysis, there is one sector with a comparable growth rate, namely the other services sector, with a DLQ value of 1. The other 16 sectors have fast growth rates; however, 8 sectors have relatively low DLQ values of 1.01. These eight sectors are: 1).Agriculture, Forestry, and Fisheries; 2).Manufacturing Industry; 3).Water Supply; 4).Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles; 5).Real Estate; 6).Business Services; 7).Education Services; 8).Health Services and Social Activities. The sector with the highest DLQ value is Mining and Quarrying with a DLQ of 1.30.

Combined Analysis of Location Quotient (LQ) and Dynamic Location Quotient (DLQ)

Based on the combined analysis of Location Quotient (LQ) and Dynamic Location Quotient (DLQ), six sectors are identified as leading sectors in Banten Province. These sectors are the manufacturing industry, water supply, transportation and warehousing, information and communication, real estate, and health services and social activities. These sectors are considered leading because they not only have a strong regional base (LQ > 1) but also demonstrate rapid growth (DLQ > 1), indicating both current strength and future development potential.

Table 4: LQ and DLQ Analysis of Banten Province

No	GRDP Business Field	Average DLQ	Desc	Rerata DLQ	Description	Simpulan
1	Agriculture, Forestry, and Fisheries	0.42	Non Basis	1.01	Fast Growth Rate	Potential Sector
2	Mining and Quarrying	0.08	Non Basis	1.30	Fast Growth Rate	Potential Sector
3	Manufacturing Industry	1.59	Basis	1.01	Fast Growth Rate	Leading Sector
4	Electricity and Gas Supply	0.94	Non Basis	1.10	Fast Growth Rate	Potential Sector
5	Water Supply, Waste Management, Waste, and Recycling	1.14	Basis	1.01	Fast Growth Rate	Leading Sector
6	Construction	0.97	Non Basis	1.03	Fast Growth Rate	Potential Sector

No	GRDP Business Field	Average DLQ	Desc	Rerata DLQ	Description	Simpulan
7	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	0.98	Non Basis	1.01	Fast Growth Rate	Potential Sector
8	Transportation and Warehousing	1.44	Basis	1.06	Fast Growth Rate	Leading Sector
9	Accommodation and Food Service Activities	0.79	Non Basis	1.03	Fast Growth Rate	Potential Sector
10	Information and Communication	1.07	Basis	1.03	Fast Growth Rate	Leading Sector
11	Financial Services	0.70	Non Basis	1.04	Fast Growth Rate	Potential Sector
12	Real Estate	2.86	Basis	1.01	Fast Growth Rate	Leading Sector
13	Business Services	0.55	Non Basis	1.01	Fast Growth Rate	Potential Sector
14	Public Administration, Defense, and Compulsory Social Security	0.50	Non Basis	1.02	Fast Growth Rate	Potential Sector
15	Education Services	0.93	Non Basis	1.01	Fast Growth Rate	Potential Sector
16	Health Services and Social Activities	1.02	Basis	1.01	Fast Growth Rate	Leading Sector
17	Other Services	0.81	Non Basis	1.00	Fast Growth Rate	Lagging Sector

Source: BPS (Processed Data)

Meanwhile, there are 10 sectors categorized as *potential sectors* (LQ < 1 and DLQ > 1), namely: the agriculture, forestry, and fisheries sector; the mining and quarrying sector; the electricity and gas procurement sector; the construction sector; the wholesale and retail trade and repair of motor vehicles and motorcycles sector; the accommodation and food service sector; the financial services sector; the business services sector; the public administration, defense, and compulsory social security sector; and the education services sector. There is one sector categorized as *lagging* (LQ < 1 and DLQ < 1), namely the other services sector.

Shift-Share Analysis

Shift-share analysis is similar to the Location Quotient (LQ) method in that it also compares the growth rates of various sectors in Banten Province with those in Indonesia as a whole. However, shift-share analysis is more detailed because it explains whether the sectors in Banten Province are part of nationally fast-growing sectors and whether those sectors are suitable for development in Banten.

Based on the calculation of the Proportional Shift, eight sectors in Banten Province had negative proportional shift values, namely : 1).Agriculture, forestry, and fisheries; 2).Manufacturing; 3).Construction; 4).Wholesale and retail trade and repair of motor vehicles and motorcycles; 5).Financial services; 6).Real estate; 7).Public administration, defense, and compulsory social security; 8).Education services. Their respective Proportional Shift values are: -1134.387; -2928.920; -2573.327; -412.600; -6.692; -1432.920; -678.353; -972.044. This indicates that these eight sectors do not have structural advantages, meaning they are specialized in sectors that are growing slowly at the national level.

In contrast, there are nine sectors with structural advantages in Indonesia: 1).Mining and quarrying; 2).Electricity and gas procurement; 3).Water supply, waste management, and recycling; 4).Transportation and warehousing; 5).Accommodation and food service; 6).Information and communication; 7).Business services; 8).Health services and social work; 9).Other services. These sectors have positive Proportional Shift values as follows: 26.335; 139.552; 31.706; 2270.804; 316.850; 6782.260; 5.028; 1165.821; 456.858.

This suggests that these sectors are specialized in fast-growing sectors at the national level. Among them, the information and communication sector shows the strongest structural advantage, with the highest Proportional Shift value of 6782.260, indicating it is the fastest-growing sector in Indonesia.

Differential Shift

According to the Differential Shift calculation, 11 sectors in Banten Province have no locational advantage. These are: 1).Mining and quarrying; 2).Manufacturing; 3).Electricity and gas procurement; 4).Wholesale and retail trade and repair of motor vehicles and motorcycles; 5).Transportation and warehousing; 6).Information and communication; 7).Business services; 8).Public administration, defense, and compulsory social security; 9).Education services; 10).Health services and social work; 11).Other services. Their Differential Shift values are: -1411; -516.307; -407.250; -2810.918; -3625.823; -1574.762; -349.266; -120.997; -38.121; -194.792; -541.238. This means these sectors are not geographically advantageous in Banten Province.

On the other hand, there are six sectors with locational advantages in Banten: 1).Agriculture, forestry, and fisheries; 2).Water supply, waste management, and recycling; 3).Construction; 4).Accommodation and food service; 5).Financial services; 6).Real estate. Their Differential Shift values are: 310.154; 17.650; 3676.389; 137.306; 100.490; 2100.479. This indicates that these six sectors benefit from being located in Banten.

Combined Analysis of LQ, DLQ, and Shift-Share

Overall, based on the LQ, DLQ, and Shift-Share analyses, the Water Supply, Waste Management, and Recycling sector is the leading sector in Banten Province. It is considered a leading sector because it has an LQ > 1, DLQ > 1, and both Proportional Share and Differential Shift values are positive.

The condition of the water supply sector in Banten generally shows improved access to safe water, although there are still challenges in distribution and availability—particularly in densely populated areas such as Tangerang Regency, Tangerang City, and South Tangerang, where water demand is high. The growing industrial and agricultural sectors also affect the availability and demand for water.

Banten Province has relatively high wet months, especially in the southern and central areas, while the northern parts experience fewer wet months. This suggests that Banten has abundant water resources. In 2021, access to safe drinking water reached 93.51% of households, increasing from 92.87% in 2020 and 91.64% in 2019 (according to the Legal Documentation and Information Network of the Banten Provincial DPRD). While Banten has good water resource potential, its utilization still needs to be optimized. The Banten Provincial Government has made various efforts to improve the water supply sector, including infrastructure development and water resource management.

GRDP Projection Analysis

Based on the trend calculation, the model used for projection is a parabolic trend model, with the equation:

$\dot{Y} = 329{,}614.881 + 21{,}391.380\ X - 449.121\ X^2$

Using this equation, the projected GRDP (Gross Regional Domestic Product) values for Banten Province are as follows:

Table 5. GRDP Projection

Year	GRDP (Billion Rupiah)
2024	510576.42
2025	521638.017

Year	GRDP (Billion Rupiah)
2026	531801.372

Source: BPS (Processed Data)

ICOR Analysis

Based on the ICOR value, it can be concluded that the lower the ICOR value, the more efficient the investment; conversely, the higher the ICOR value, the less efficient the investment is considered, meaning more funds are needed to produce a small amount of output. In 2020, the ICOR value was negative at -9.29, caused by a contraction due to the COVID-19 pandemic. This condition indicates that even though investment increased, the output actually decreased. During the study period, the lowest positive ICOR value occurred in 2014 at 5.65, meaning to achieve an output increase of 1 billion rupiah, only an investment of 5.65 billion rupiah was needed. The highest positive ICOR value was in 2021 at 7.57, meaning to achieve an output increase of 1 billion rupiah, an investment of 7.57 billion rupiah was required. This period was after the pandemic. The average ICOR value during the study period was 4.69.

Table 6. ICOR Calculation

Year	Banten GRDP (Billion Rupiah)	Δ Banten GRDP	Banten Gross Fixed Capital	ICOR
2014	349351.22	18252.11	103115.31	5.65
2015	368377.20	19025.98	109012.81	5.73
2016	387835.08	19457.88	115877.26	5.96
2017	410137.00	22301.92	126304.24	5.66
2018	433782.71	23645.71	135166.36	5.72
2019	456620.05	22837.34	143667.51	6.29
2020	441148.57	-15471.48	143572.83	-9.28
2021	460952.75	19804.18	149908.85	7.57
2022	484131.21	23178.46	155430.59	6.71
2023	507427.24	23296.03	160769.56	6.90
		Average ICOR Value		**4.69**

Source: BPS (Processed Data)

Investment Needs Analysis

The calculation of investment needs uses the average ICOR value and the projected GRDP values as previously computed. The total investment required by Banten Province from 2024 to 2026 is presented in Table 7.

Table 7. Investment Needs Calculation

Year	Projected GRDP of Banten (Billion Rupiah)	ΔPDRB Banten	ΔGRDP Banten	Investment (PMTB) (Billion Rupiah)
		(a)	**(b)**	**(c) = b x a**
2024	510576.42	3149.18	4.69	14770.21
2025	521638.017	11061.597	4.69	51880.84
2026	531801.372	10163.355	4.69	47667.93

Source: BPS (Processed Data)

CONCLUSIONS

Based on the analysis and discussion, the following conclusions can be drawn:

a. Based on the calculation of Location Quotient (LQ), Dynamic Location Quotient (DLQ), and Shift–Share using base year data from 2014 to 2023, the leading sector in Banten Province is the Water Supply, Waste Management, Waste, and Recycling sector. This sector is identified as a leading sector because it is a base sector according to LQ analysis, has a high growth rate based on DLQ, demonstrates rapid growth, is location-advantaged, and has a positive National Share value.

b. The best trend model to be used for projecting Banten Province's GRDP at constant prices is the quadratic/parabolic trend model, as it has the smallest mean absolute error. The projected GRDP for Banten Province at constant prices is Rp 510,576.42 billion in 2024, Rp 521,638.02 billion in 2025, and Rp 531,801.37 billion in 2026.

c. Based on the ICOR calculation and the projected GRDP, the amount of investment needed by Banten Province is Rp 14,770.21 billion in 2024, Rp 51,880.84 billion in 2025, and Rp 47,667.93 billion in 2026.

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