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Analysis of the Effect of Industrial Sector and Socioeconomic Factors on Environmental Quality of Indonesia

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Abstract
The research aim was to study the influence of the industrial sector on GDP per capita, education, HDI, economic growth, poverty, and EQI in non-natural resource-based regions (Region 1) and natural resource-based regions (Region 2) using year panel data from 2017-2022 which covers 34 provinces in Indonesia. The analysis results show that the industrial sector influences GDP per capita, population density, HDI, poverty, and EQI, but does not influence economic growth in either Region 1 or Region 2. In contrast, it influences education in Region 2, but in Region 1, GDP per capita influences HDI and poverty in Region 1. Still, not in Region 2, conversely it has no influence on population density in either Region 1 or Region 2. Furthermore, economic growth has no influence on HDI and EQI in both regions, however, it affects population density in Region 1, not Region 2. HDI affects poverty in both regions, but has no impact in Region 1 but harmed EQI in Region 2. Furthermore, education did not affect poverty and EQI in Region 1, but had an effect in Region 2. Population density affects HDI and EQI in both regions. Then poverty affects EQI in Region 2, but not in Region 2.

Keywords: Education, Environmental Quality, GDP per capita, HDI, Industrial Development

JEL Classification: B55, C01, O14, O13, L60

1. Introduction

Indonesia, the largest archipelagic country in Southeast Asia, has a large population and is always increasing every year. Data from the Central Statistics Agency (BPS, 2023), shows that in 2020, Indonesia's population reached 270,203,917 people with a composition dominated by the 0–29 year age group. From these data it can be seen that the composition of the population in Indonesia is dominated by people of productive age, making it an attractive opportunity to carry out various economic activities, especially investment. Apart from its relatively high population, Indonesia also has abundant natural resources, thus attracting investors into the country to build and develop the manufacturing industrial sector which absorbs the workforce. Concerning the results of natural resources, Indonesia can be grouped into two parts, regions with a natural resources basis and regions with a non-natural resources basis. Regions with natural resource bases are the provinces: Riau, Riau Islands, Bangka Belitung, South Sumatra, Jambi, South Kalimantan, West Kalimantan, Central Kalimantan, East Kalimantan, Papua and West Papua. Those that are not based on natural resources are apart from the 12 provinces located on the islands of Java, Sulawesi, and the islands of Bali, Maluku, and Nusa Tenggara islands. These twelve areas have relatively lower environmental quality because they are mining areas (Figure 1).

Environmental quality is defined as an environmental condition that can provide optimal supporting capacity for human survival in an area. The decline in environmental quality is not only caused by excessive use of natural resources but also due to community activities and other factors (Rizal, 2017). Environmental Quality Index (IKLH) data confirms differences in environmental quality in provinces on the island of Sumatra. On average, IKLH data in the period 2012 – 2019 shows that Aceh Province has the highest average IKLH value of 74.8675 while the lowest average IKLH value on Sumatra Island is experienced by Lampung Province at 57.925 (Ministry of Environment and Forestry, 2019).

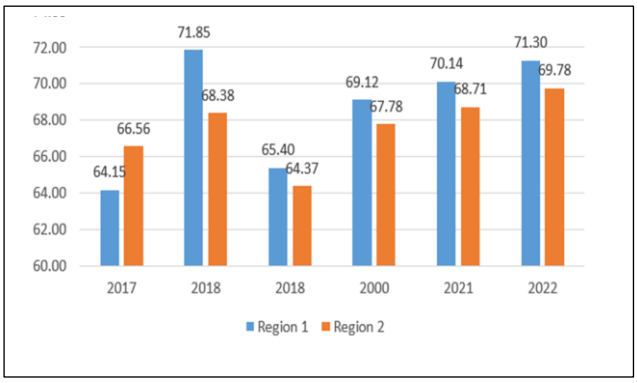


Figure 1. Development of the Environmental Quality Index in Region 1 and Region 2
Source: Central Bureau of Statistics (2023).

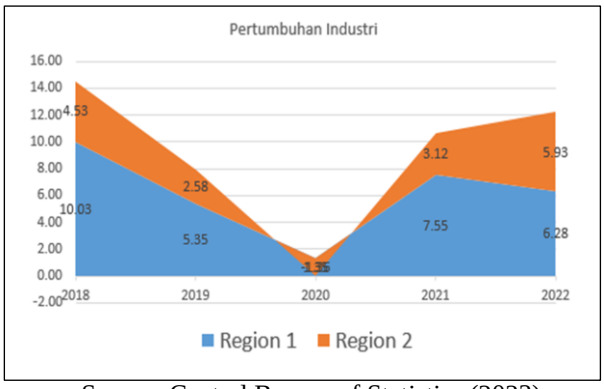
The Environmental Quality Index (EQI) is an environmental quality indicator developed by Virginia Commonwealth University in 2000, which provides a brief overview of the state of a multidimensional environment by combining several indicators into a single quantum. The basic purpose of environmental indices is to enable comparison of environmental conditions across time and/or space. This EQI is used on a local scale in the USA and stopped providing reports in 2010, (Ebert, 2004). Furthermore, Indonesia was ranked 164th out of 180 countries in the world, so it can be seen that Indonesia is still a country with the title of poor environmental quality in the world. It is stated that Thailand (rank 108), Singapore (rank 44), Malaysia (rank 130), Laos (rank 149), Cambodia (rank 154), Philippines (rank 158), Vietnam (rank 178), East-Leste (rank 129), Myanmar (179) So compared to these countries, Indonesia is still far behind in Southeast Asia, because only two countries in this region surpass Indonesia's score (EPI, 2022).

Provincial GRDP data of Indonesia shows that Indonesia's economic growth is increasing from year to year, but does this economic growth improve the quality of the environment, or in certain conditions, does economic growth actually reduce the quality of the environment as stated by Kuznets (Panayouto, 2003). Economic growth is related to human quality as an important capital in economic development. Quality people will certainly better understand the importance of the quality of the environment/natural resources for economic growth and quality of life. The quality of life itself can be reflected in the HDI achieved by a region. HDI is calculated based on data that can describe the four components, namely life expectancy which measures success in the health sector, literacy rate and average length of schooling which measures success in education, and people's purchasing power for several basic needs seen from the average amount of expenditure per capita as an income approach that measures success in the field of developing a decent life. So the Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living (UNDP, 2024).

The economic progress of a nation can be seen from how much the industrial sector contributes to its economic growth. Industry and economic growth are like two sides of a coin because industry is synonymous with added value, technology transfer, and employment as a prerequisite for economic growth. This growth is created from the efficient working of production factors in the form of capital, labor, and technology in the production process. However, according to Neo Classics which was pioneered by Slow-Swam in 1956 with a discussion using the Cobb-Douglas function, labor and capital cannot always produce production or growth because it is also determined by the elasticity of the two production factors (Branson, 1992). Then in the long term it depends, this growth depends on capital accumulation which includes physical and human capital, and technological progress which includes new discoveries, increased productivity, and technological development.

As an illustration of the role or share of the industrial sector, it has fluctuated from time to time (Puspitawati, 2021, during the early phase of transformation, the increasing role of the manufacturing industry tended to strengthen into industrialization. Between 1971 and 1980, the share of industrial output more than doubled from 20% to be 43%. However, in 1990 the share had fallen back to 39%. It was at 40% in 2000, and then continued to decrease to reach 36% in 2010 and 21% in 2019 and in 2022, the contribution of the industrial sector will only reach 20.47. So the contribution of the industrial sector has decreased from

year to year, so that in Indonesia there is deindustrialization. However, this does not mean that the industry is unable or experiencing growth because this economic sector will grow 6.91% in 2021, although it has decreased compared to 2022 which reached 4.89% (BPS, 2023). Furthermore, economic growth every year from 2018-2022 in Region 1 and Region 2 can be seen in Figure 2.



Source: Central Bureau of Statistics (2023).

As an indicator of environmental management in Indonesia, IKLH is a combination of the Environmental Quality Index (EQI) concept and the Environmental Performance Index (EPI) concept. IKLH can be used to assess the performance of environmental quality improvement programs and as information material to support policy-making processes related to environmental protection and management. IKLH is used in Indonesia because it is considered more appropriate for assessing natural and environmental conditions in the region. EQI is an environmental quality indicator developed by Virginia Commonwealth University in 2000, which provides a brief overview of the state of a multidimensional environment by combining several indicators into a single quantum. The basic purpose of environmental indices is to enable comparison of environmental conditions across time and/or space. This EQI is used on a local scale, presenting data in five domains: air, water, land, buildings, and socio-demographic environment to provide a picture of overall environmental quality throughout the region, currently (Wendling at al., 2020).

Poverty in Indonesia has decreased from year to year. The number of poor people in March 2023 was 25.90 million people, a decrease of 0.46 million people compared to September 2022 and a decrease of 0.26 million people compared to March 2022. Furthermore, the percentage of poor people in March 2023 was 9.36 percent, decreasing 0.21 percentage points in September 2022 and decreasing 0.18 percentage points in March 2022 (BPS, 2023). The development of the poor population is in contrast to GDP per capita which always increases every year. Poverty is a fundamental problem for countries in the world, especially in developing countries, one of which is Indonesia. For Indonesia, problems related to poverty are not something new. Almost all periods of government in Indonesia stated that poverty was a development problem (Suhandi, N. et al., 2018). Poverty is a situation where a person or group is unable to meet their daily needs for food, clothing, and shelter. Poverty has an impact on the low standard of living of the population in meeting their limited needs. Many people live below the poverty line, and quite a few people's incomes are quite low

The industrial sector can attract residents in an area to get jobs, resulting in population density, due to migration from villages to cities. According to Myrdal's regional theory which was introduced in 1955, and explained in the book (Myrdal, 1971), a central region has the power of a spread effect and a backwash effect, where the center can have a developmental impact on the surrounding area, on the other hand back wash can occur effect, where the backwash effect is greater than the spread effect, resulting in cumulative economic power at the center. Meanwhile, Perroux in 1955 pioneered the polar theory of growth, stating that growth does not occur simultaneously, explaining that in a center two forces are sailing in conflict, namely centrifugal and centripetal (Higgins, 2017). The centripetal pull is always greater than the centrifugal pull, resulting in the population increasing faster and the central region becoming more developed. A larger population is like two sides of a coin, on the one hand, population is a production factor that can increase economic progress and economic growth, and on the other hand, it can cause environmental problems, due to air, water, air and noise pollution. Population density can also increase and worsen conditions of poverty,

due to social and economic disruption. The causal relationship between the industrial sector and several socio-economic variables and environmental quality is represented in Figure 3.

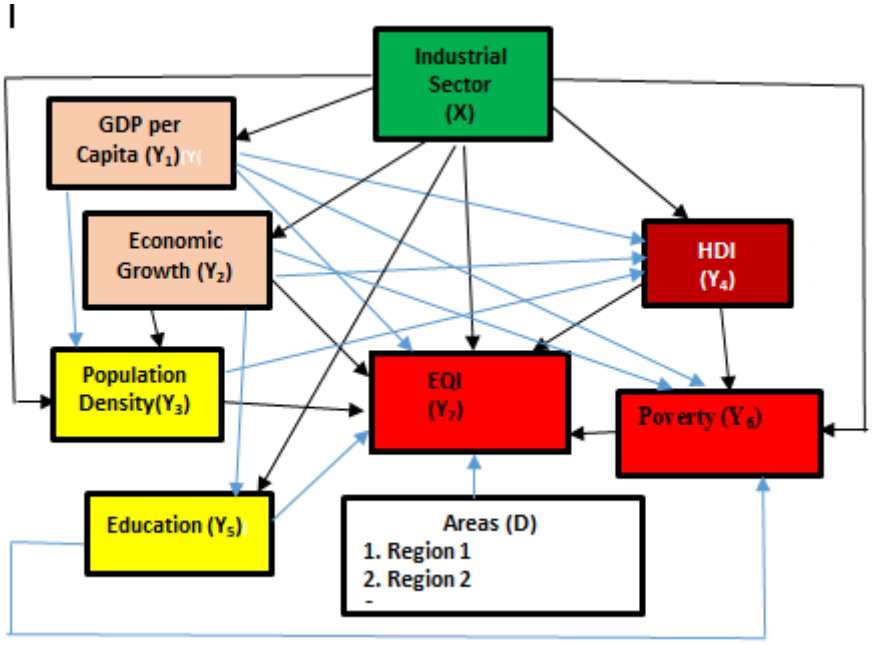


Figure 3. Framework

This research aims to analyze and examine the relationship between industrial sector growth and environmental quality in two regions through socio-economic factors in the form of:

1. Compare the relationship between industrial sector growth and poverty and environmental quality between the two regions
2. Assess the effect of population density on HDI and environmental quality
3. Examining the effect of GDP per capita on HDI and population density and environmental quality
4. Examining the effect of economic growth on HDI, population density, poverty, and environmental quality
5. Examining the effect of education on poverty and environmental quality
6. Examining the relationship between poverty and environmental quality

2. Literatur Review

2.1. Industrial Sectors, Environmental Quality and Regions

Industry is a sector that provides greater added value than other sectors, so its development is necessary to encourage other sectors. The role of the industrial sector is more dominant than other sectors, Industries are the main features of moderncivilization and they provide us the necessary materials and employment opportunities (Sunkand, 2021). Furthermore, it is said that indystries the main feeder of employment opportunities sector as an engine of economic development. It will have derivative impacts, namely increasing the value of capital capitalization, the ability to absorb a large workforce, and the ability to create added value (value added creation) from every input or basic material that is processed. In the modernization period, the role of industries is an integral part of our life and without the industries can not be assumed our life. So much the industries are an inevitable part of our life.

Industrial development can be directly related to GDP per capita and economic growth as indicators of economic development. However, industrial development can also have an impact on environmental damage which in turn will reduce EQI, as said (Ridwan, 2020) some of the impacts of industrialization include reducing unemployment rates, improving the welfare of communities around industrial areas, and so on. For social life, the industry tends to have a positive impact, but for the environment, industry has many negative impacts such as water pollution, air pollution and so on. Apart from what has been mentioned above, in the social environment industry usually faces social demands, like education. Furthermore, if education is higher, people will pay more attention to the environment, especially the negative impacts on humans. More firmly, the manufacturing and construction industries have contributed significantly to increasing carbon dioxide (CO2) emissions (Zhang et al., 2019). The industrial sector can attract

residents in an area to get jobs, resulting in population density, due to migration from villages to cities. According to Myrdal's regional theory which was introduced in 1955, and explained in the book (Myrdal, 1971), a central region has the power of a spread effect and a backwash effect, where the center can have a developmental impact on the surrounding area, on the other hand back wash can occur effect, where the backwash effect is greater than the spread effect, resulting in cumulative economic power at the center. Meanwhile, Perroux in 1955 pioneered the polar theory of growth, stating that growth does not occur simultaneously, explaining that in a center two forces are sailing in conflict, namely centrifugal and centripetal (Higgins, 2017). The centripetal pull is always greater than the centrifugal pull, resulting in the population increasing faster and the central region becoming more developed. A larger population is like two sides of a coin, on the one hand, population is a production factor that can increase economic progress and economic growth, and on the other hand, it can cause environmental problems, due to air, water, air, and noise pollution. Population density can also increase and worsen conditions of poverty, due to social and economic disruption.

2.2. Education and Environmental Quality

The relationship between education and the environment can be reciprocal, either directly or indirectly. It can be directly explained as education is the result or asset of the results of several years of struggle through formal education, more or less, which has led a person to become a superior human being because he has knowledge, attitude, and character which are his main capital. The higher the level of education, the more sensitive an individual is to himself and his environment, including the cleanliness of his environment. Indirectly, it can be explained through the findings (Xin, 2022) which show that the importance of human capital shows that variables such as literacy levels and average years of schooling curb CO2 emissions in the long term. Moreover, empirical findings reveal that unemployment significantly increases CO2 emissions in the long run. However, short-run estimates that the education and unemployment coefficients provide similar results.

Education is associated with a wide range of benefits to both individuals and society and contributes to greater productivity and economic growth. Moreover, education has spillover effects: human capital is at the heart of innovation, and a more educated workforce fosters innovative ideas leading to more and better jobs (OECD, 2024). Next, environmental education in schools plays an important role in forming students' attitudes to care about the environment, and human relations with nature and its surroundings which includes population relations, pollution, resource allocation, transportation technology, and urban and rural planning toward the human environment as a whole (Dhara, 2022). Apart from education being directly related to the environment, it also has an important role in reducing poverty. Higher education can make it easier to get a job which ultimately results in an increase in income as a condition for poverty alleviation

2.3. Poverty and the Environment

The environment is closely related to human welfare and is a space for economic and social activity. In the circular economy proposed by Pearce and Tunner in 1990, one of the functions of the environment is as an input in the production process which can later increase utility, namely social welfare (Andersen, 2007). Furthermore, it is known that welfare is not only an increase in income, and expansion of employment opportunities but also a reduction in poverty and unemployment. Poverty refers to the number of people who are unable to obtain adequate resources to meet their basic needs (Todaro and Smith, 2011). Poverty is one of the main causes of environmental degradation in poor countries and degradation will continue if poverty cannot be reduced (Koçak et al., 2019). This is in line with Khan (2019), his research conducted in ASEAN countries in 2007-2017 found that poor people tend to increase environmental degradation such as increasing CO2 emissions. Sedwivia Ridena (2021) found that poor urban residents and significant income inequality reduce environmental quality. Poor people who live in urban areas have more potential to damage the quality of the environment compared to poor people in rural areas. It is clear that poor people in urban areas generally live in slum environments that do not or pay little attention to environmental damage, while in rural areas poor people have many alternatives regarding housing, even though environmental damage occurs due to the extraction of natural resources because they are generally agricultural areas.

3. Methodology

This type of research is quantitative, taking the type of study of comparative causality that processes numerical data that can be calculated using statistical formulas. The data analysis technique used in this study is path analysis which estimates the direct and indirect influence of exogenous variables on endogenous variables although in this study we only look at and discuss the direct effect, both effects are available in the statistical program used for estimation in this study.

This study uses secondary data, namely data that is already available and collected by other parties and it was panel data. The data was taken from the Indonesia Central Statistics Agency (BPS) and the Ministry of Environment and Forestry (MEF) which covers 34 provinces in Indonesia, where since the end of 2022 there have been 38 provinces, but the necessary data is not yet available. The data used which is divided into two groups, Region 1 and Region 2. The statistical analysis technique used is path analysis using the Amos 18 statistical application program.

Based on the conceptual relationship in the framework of thinking, mathematically functional relationships can be written as

$Y_1 = f(X)$
$Y_2 = f(X)$
$Y_3 = f(X, Y_1, Y_2)$
$Y_4 = f(X, Y_1, Y_2, Y_3)$
$Y_5 = f(X, Y_2)$
$Y_6 = f(X, Y_1, Y_2, Y_4, Y_5)$
$Y_7 = f(X, Y_1, Y_2, Y_3, Y_4, Y_5, Y_6, D, DX)$

Whereas:

X = Industrial sector (growth of the manufacturing industry sector)
Y_1 = GDP per capita (ratio of GDP to number of population)
Y_2 = Economic Growth (increase in production per year, percentage)
Y_3 = Population density (ratio of population to area)
Y_4 = HDI (Index score from HDI)
Y_5 = Education (the average length of schooling of the population aged 15 years and over)
Y_6 = Poverty (Ratio of poor people to population, percentage)
Y_7 = EQI (Index score from EQI which indicates the level of environmental quality)
D = Dummy variable, D = 0, non-SDA base region (Region 1); D=1, Natural Resources based Region (Region 2)

Based on this mathematical relationship, it can be rewritten in the form of non-linear regression equations which are linearized as

$$lnY_1 = \alpha_0 + \alpha_1 lnX + \mu_1 \ldots..(3.1)$$

$$Y_2 = \beta_0 + \beta_1 lnX + \mu_2 \ldots.. (3.2)$$

$$lnY_3 = \delta_{0+}\delta_1 lnX + \delta_2 Y_1 + \delta_3 Y_2 + \mu_3 \ldots.. (3.3)$$

$$lnY_4 = \theta_{0+}\theta_1 lnX + \theta_2 lnY_1 + \theta_3 lnY_2 + \theta_4 lnY_3 + \mu_4 \ldots.. (3.4)$$

$$Y_5 = \vartheta_0 + \vartheta_1 lnX + \vartheta_2 Y_2 + \mu_5 \ldots.. (3.5)$$

$$Y_6 = \rho_0 + \rho_1 lnX + \rho_2 lnY_1 + \rho_3 lnY_3 + \rho_4 lnY_4 + \rho_5 lnY_5 + \mu_6 \ldots.. (3.6)$$

$$lnY_7 = \sigma_0 + \sigma_1 lnX + \sigma_2 lnY_1 + \sigma_3 lnY_2 + \sigma_4 lnY_3 + \sigma_5 lnY_4 + \sigma_6 Y_5 + \sigma_7 Y_6 + \sigma_8 D + \sigma_9 DlnX + \mu_7 \ldots.. (3.7)$$

Substituting the value of the dummy variable**,** D=0 in the equation (3.7), a new equation is obtained

$$lnY_{71} = \sigma_0 + \sigma_1 lnX + \sigma_2 lnY_1 + \sigma_3 lnY_2 + \sigma_4 lnY_3 + \sigma_5 lnY_4 + \sigma_6 Y_5 + \sigma_7 Y_6 + \mu_7 \ldots.(3.8)$$

Regression Equation for Region 2, D=1, a new equation is also obtained

$$lnY_{71} = (\sigma_0 + \sigma_8) + (\sigma_1 + \sigma_9) lnX + \sigma_2 lnY_1 + \sigma_3 lnY_2 + \sigma_4 lnY_3 + \sigma_5 lnY_4 + \sigma_6 Y_5 + \sigma_7 Y_6 + \mu_7 \ldots.(3.9)$$

4. Result and Discussion

4.1. Model Fit Test

Chi-square statistic, as stated earlier, is the most fundamental test to measure overall fit, it is very sensitive to the size of the sample used and the relation of exogenous variables, almost the same as the model Regresi Linear Berganda. The model is considered good if the Chi-square value is small. The smaller the value, the more feasible the research, meaning that the more it describes the match between the variance of the sample taken and the research population. The results of data processing that have been carried out using the AMOS 18 program are as shown in Table 1.

Tabel 1. Goodness of Fit Index

No.	Goodness of fit Measure	Cut-off Criteria	Estimation (cut off Value)	Fit Situation
1	Chi-Square (χ^2) Significance Probability (p)	smaller the better $\geq$ 0.05	3.367 0.454	Fit
2	RMSEA (the Root Mean Square Error of Approximation)	$\leq$ 0.05	0.000	Fit
3	NFI (Normed of Fit Index)	$\geq$ 0.95	0.997	Fit
4	IFI (Incremental Fit Indices)	$\geq$ 0.95	1.000	Fit
`5	CMIN/DF (the minimum Sample Discrepancy Function)	$\leq$ 2	0.914	Fit
6	TLI (Tuckler Lewis Index)	$\geq$ 0,95	1.005	Fit
7	CFI (Comparative Fit Index)	$\geq$ 0,95	1.000	Fit
8	Hoelter's Index	$\geq$ 200	526	Fit

Sumber: Malkanthie, 2015; Wan, 2022 and Research Finding (2024).

4.2. Research Findings

As is known, this research divides Indonesia's provinces into 2 regions, so the estimation results consist of two components. The estimation results for Region 1, which is called Non-Natural Resource Base Areas, D=0, can be seen in Figure 4

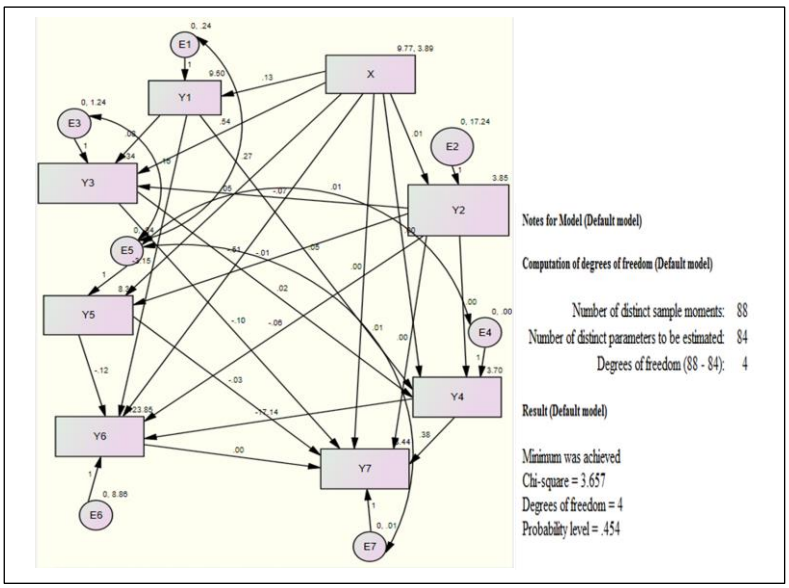


Figure 4. Variable Coefficients untuk Region 1and Result of Default Model
Recourse: Research Finding (2024).

As can be seen in Figure 2, where there is no level of confidence or probability for each coefficient or path, the estimation results are also displayed as a scalar estimate for Region 1 (Group 1), which describes the level of significance of each path, Figure 5.

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
EconomicGrowth	<---	IndustrialSector	.014	.184	.079	.937
GDPperCapita	<---	IndustrialSector	.129	.022	5.911	***
PopulDensity	<---	IndustrialSector	.536	.056	9.653	***
PopulDensity	<---	EconomicGrowth	-.072	.023	-3.053	.002
PopulDensity	<---	GDPperCapita	.077	.198	.389	.697
HDI	<---	EconomicGrowth	-.001	.001	-1.219	.223
HDI	<---	IndustrialSector	-.005	.002	-2.329	.020
HDI	<---	GDPperCapita	.047	.006	8.504	***
HDI	<---	PopulDensity	.020	.002	8.161	***
Education	<---	EconomicGrowth	-.015	.015	-.961	.337
Education	<---	IndustrialSector	.052	.041	1.287	.198
Poverty	<---	IndustrialSector	-.505	.172	-2.934	.003
Poverty	<---	Education	-.119	.463	-.256	.798
Poverty	<---	GDPperCapita	-3.148	.674	-4.669	***
Poverty	<---	EconomicGrowth	-.062	.065	-.963	.336
Poverty	<---	HDI	-17.142	8.893	-1.928	.054
EQI	<---	EconomicGrowth	.000	.002	.170	.865
EQI	<---	PopulDensity	-.098	.013	-7.686	***
EQI	<---	HDI	.385	.846	.455	.649
EQI	<---	IndustrialSector	-.004	.006	-.651	.515
EQI	<---	Poverty	-.003	.002	-1.125	.261
EQI	<---	Education	-.030	.047	-.636	.524

Figure 5. Scalar Estimates Region1
Resource: Research Finding (2024).

Further illustrating the estimation results for Region 2, Natural Resource Based Areas, D=1 or Region 2, as carried out in Region 1, can be seen in Figure 6.

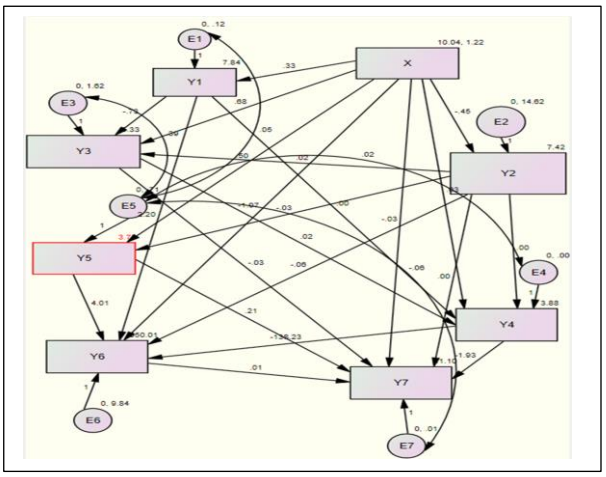


Figure 6. Variabel Coefficients in Region 2
Resource: Research Finding (2024).

Next, in Region 2, the estimation results are presented, variable coefficients with confidence level or probability (P), RegressionWeights for Region 2, can be seen in Figure 7.

Regression Weights: (Group number 2 - Default model)

			Estimate	S.E.	C.R.	P
EconomicGrowth	<---	IndustrialSector	-.454	.411	-1.105	.269
GDPperCapita	<---	IndustrialSector	.325	.037	8.799	***
PopulDensity	<---	IndustrialSector	.677	.198	3.412	***
PopulDensity	<---	EconomicGrowth	.020	.039	.508	.611
PopulDensity	<---	GDPperCapita	-.734	.439	-1.673	.094
HDI	<---	EconomicGrowth	-.002	.001	-1.340	.180
HDI	<---	IndustrialSector	.028	.007	4.017	***
HDI	<---	GDPperCapita	.002	.015	.133	.894
HDI	<---	PopulDensity	.018	.004	4.723	***
Education	<---	EconomicGrowth	-.033	.026	-1.289	.197
Education	<---	IndustrialSector	.501	.091	5.498	***
Poverty	<---	IndustrialSector	-1.067	.589	-1.812	.070
Poverty	<---	Education	4.010	.642	6.249	***
Poverty	<---	GDPperCapita	2.205	1.150	1.917	.055
Poverty	<---	EconomicGrowth	-.064	.098	-.653	.514
Poverty	<---	HDI	-138.226	11.204	-12.337	***
EQI	<---	EconomicGrowth	.005	.004	1.382	.167
EQI	<---	PopulDensity	-.034	.011	-3.005	.003
EQI	<---	HDI	-1.934	.893	-2.165	.030
EQI	<---	IndustrialSector	-.030	.016	-1.921	.055
EQI	<---	Poverty	.006	.002	3.316	***
EQI	<---	Education	.207	.064	3.253	.001

Figure 7. Scalar Estimates Region 2
Resource: Research Finding (2024).

The results of the analysis show the influence of one variable on another variable according to the research objectives so based on Figure 3 and Figure 4, a summary of the influence of independent variables on dependent variables can be represented in Table 2. The table also shows that Region 1 and Region 2 each have a coefficient and probability according to the relationship between variables.

Table 2. Coefficients of the variables in Region 1 and Region 2,

No	The Relation of the variables		Region 1		Region 2	
	Independent variables	Dependent variables	Coefficient	Probability	Coefficient	Probability.
1	Industrial Sector	1. GDP per capita 2. Economic Growth 3. Population Density 4. HDI 5. Education 6. Poverty 7. EQI	**0.129** **0.014** **0.536** **-0.005** **0.052** **-0.053** **-0.004**	**0.000** **0.937** **0.000** **0.020** **0.198** **0.003** **0.515**	**0.325** **-0.454** **0.677** **0.028** **0.501** **-1.067** **-0.030**	**0.000** **0.269** **0.000** **0.000** **0.000** **0.070** **0.055**
2	GDP per Capita	8.HD1 9.Poverty 10.Population Density	**0.047** **-3.148** **0.077**	**0.000** **0.000** **0.697**	**0.002** **2.205** **-0.734**	**0.894** **0.055** **0.094**
3	Economic Growth	11.HDI 12.EQI 13. Population Density	**-0.001** **0.000** **-0.072**	**0.223** **0.865** **0.002**	**-0.002** **0.065** **0.020**	**0.180** **0.167** **0.611**
4	HDI	14.Poverty 15. EQI	**-17.142** **0.385**	**0.054** **0.649**	**-138.22** **-1.934**	**0.000** **0.030**
5	Education	16.Poverty 17. EQI	**-0.119** **-0.030**	**0.798** **0.524**	**4.010** **0.207**	**0.000** **0.001**
6	Population density	19. HDI 20. EQI	**0.020** **-0.098**	**0.000** **0.000**	**0.018** **-0.034**	**0.000** **0.003**
7	Poverty	21.EQI	**-0.003**	**0,261**	**0.006**	**0.000**

Source: Research finding from Figures 5 and 7

Based on Table 2 the industrial sector has a positive and significant influence on GDP per capita and population density in both regions at the confidence level α= 0.05%. If the industrial sector increases by 1% then GDP per capita increases by 0.13% in Region 1 and 0.33% in Region 2. Furthermore, if the industrial sector increases by 1% then population density increases by 0.54% in Region 1 while in Region 2, it is 0.68% . Then this variable has no influence on economic growth in either Region 1 or Region 2. In the same table, the industrial sector has a significant negative effect on HDI in Region 1 and Region 2 at the confidence level α=0.05%. If the industrial sector increases by 1%, the HDI decreases by 0.01% in Region 1, it should increase by 0.03% in Region 2. Looking at education, the industrial sector has no influence on education at a confidence level of α= 0.05% in Region 1 but it has a positive effect in Region 2. If the industrial sector increases by 1% then education increases by 0.50 years in Region 2. In the same table, it can be seen that the industrial sector has a significant negative influence on poverty both in Region 1 and

Region 2. If the industrial sector increased by 1%, so poverty decreased by 0.05% in Region 1 and at the same time 1.07% in Region 2.

Meanwhile, the industrial sector has a negative influence on EQI in both regions, but it is not significant α=0.05% in Region 1. If the industrial sector rises by 1% in Region 2 then environmental quality falls by 0.03% while in Region 1 it falls by close to 0 % . This fact is in accordance with research conducted (Mire, et al., 2024; Ummi, I., at al., 2019; and Febrianti and Atmanti, 2020) which states that EQI is worsened by the industrial sector. Likewise (I Qa A'yun and Tiyaningsih, 2022) show that the GRDP of the mining and quarrying sector has a negative and significant relationship with environmental quality in Indonesia. This fact shows that there is a decreasing trend in environmental scores, which is caused by a decrease in company activity, and reduced activity in the production process in general, as is generally known, marked by a decrease in national output, including manufacturing industry output.

Furthermore, the estimation results state that GDP per capita has a significant positive influence on the α=0.05% confidence level on HDI in Region 1 while in Region 2 it has no influence. If GDP per capita increases by 1%, it will cause HDI to increase by 0.05% in Region 1. Furthermore, in Table 2, it is also known that GDP per capita has a significant influence on poverty in both regions. If GDP per capita increases by 1% then poverty will decrease by 3.15% in Region 1, but in Region 2 the opposite happens, namely if GDP per capita increases by 1% then poverty will also increase by 2.21%. Apart from relatively lagging human resources, this is also caused by migration. As explained, the reason for the high poverty rate in Bumi Cenderawasih is that almost every week hundreds or even thousands of poor people from outside the region enter and look for work in Papua. So, so far the poverty rate in Papua is very high, so Papua's HDI is also low (Karma, 2024).

Population density affects HDI positively and significantly in Region 1, as well as in Region 2 at the confidence level α= 0.05. If population density is less than 10%, HDI also increases by 0.20% in Region 1 and 0.18 in Region 2. Then EQI is influenced by population density negatively and significantly, α= 0.05 in both regions. If population density is less than 1% then EQI decreases by 0.10% in Region 1 and 0.03% in Region 2. This fact is in accordance with research which states that population density and land transportation have an influence on IKLH (the first of the two elements of KLH) in Indonesia in 2017-2019 and the biggest influence is Population Density (Hidayati, A. Z. 2022). This is confirmed by research which states that population density has a significant negative impact on environmental quality (Wafiq, et. al., 2021).

The estimation results show that economic growth has no influence on HDI and EQI in both Region 1 and Region 2. This fact contradicts research conducted in Ethiopia which states that the relationship between economic growth and environmental quality is asymmetric and economic growth negatively affects environmental quality (Abate, 2024). Furthermore, from the same table, it is also known that economic growth has a significant negative influence at α= 0.05 on population density in Region 1, but the opposite happens in Region 2 or economic growth did not affect population density. This is understandable as it is known that the population density of the provinces in Region 2 is very small compared to Region 2, in terms of experiencing relatively large economic growth, so it does not influence population density.

HDI has a real influence at the confidence level α= 0.05 on poverty in both regions. If HDI increases by 1%, poverty will decrease by 17.14% in Region 1, while in Region 2 it will decrease by 138.84%. The impact of this decline is due to the sharp decline in poverty in Region 2, especially in the provinces of Papua and West Papua after 2020. This fact is relatively the same as the fact stated by (Tipayalai, K., 2023), which states that tertiary education can poverty reduction, while the negligible effects of primary and secondary education could be due to the significant disparities in education quality. Likewise, the facts state that there is a significant negative relationship between education and poverty reduction (Abaidoo, 2021)

Education does not have an influence on EQI at α= 0.05 in Region 1, however in Region 2 education has a real influence on environmental qualities in Region 2. If education increases by 10 years it will cause an increase in environmental quality of 21%. The level of education influences the quality of the environment in Indonesia, this is because of the increasing number of people who are highly educated, the actions taken will protect the environment, such as knowing the factors that cause environmental degradation and knowing the methods and policies that must be implemented (Pujianti, 2015).

Poverty did not influence environmental quality in Region 1, but it had a significant positive influence on Region 2, namely that the higher the poverty, the higher the environmental quality. This fact is because Region 2 has a high income or GRDP, but the poverty rate is also relatively high, as is the case in Papua

province, the poverty rate reached 27.53% in 2019, whereas in Indonesia it was only 9.12%, but it has decreased every year, so it is contrary to the government's expectations where poverty has decreased just as environmental qualities have increased, according to research which states that there is a negative relationship between poverty and environmental qualities, if poverty rises by 1% then EQI falls by 0.04% (Pribadi W., 2020). However, because these 12 provinces (Region 2) are mining areas or rely a lot on income from natural resources, this has an impact on environmental conditions by causing a decrease in EQI in line with a decrease in poverty.

Based on the explanation that has been put forward, there are striking differences between Region 1 and Region 2, such as the impact of GDP per capita on HDI in Region 2 is very significant while in Region 1, these variables have no effect. Likewise, for example, poverty in Region 2 has a very significant positive effect on EQI, but in Region 1 the opposite occurs both in terms of probability and coefficient size. Meanwhile, education had a very significant influence on poverty and EQI in Region 2, but in Region 1 it has no influence at all. Then HDI had a negative influence on EQI in Region 2, but in Region 1, it had no effect. This explanation can be seen in Table 2 as confirmation of the findings of this research.

5. Conclusion and Recommendation

5.1. Conclusions

Based on the analysis and the results of the previous discussion, the following conclusions are drawn:

1. The results of the analysis show that the growth of the industrial sector has a real positive influence on GDP per capita both in regions with a natural resource base (Region 1) and non-natural resource base regions (Region 2)
2. The rate of industrial growth has no influence on economic growth in Region 1 or Region 2
3. The industrial sector has a real negative influence on HDI in Region 1, but in Region 2 it has a positive influence, then it has a positive influence on population density in both regions.
4. The industrial sector has a significant negative influence on poverty in both regions, but has no influence on environmental quality in Region 1, but in Region 2 it has a negative influence on EQI
5. GDP per capita has a positive influence on HDI in Region 1, but has no effect in Region 2. Furthermore, this variable has a negative influence on poverty in Region 1, whereas in Region 2 it has a positive influence on poverty
6. GDP per capita has no effect on population density in Region 1, but has a negative effect on population density in Region 2
7. Economic growth has no influence on HDI in either Region 1 or Region 2, then it has a negative influence on population density in Region 1, but has no effect in Region 2, then this variable has no effect on EQI in both regions.
8. HDI has a negative effect on poverty in both regions, conversely it has no effect on EQI in Region 1, but has a negative effect in Region 2
9. Education has no effect on poverty and EQI in Region 1, but has a positive effect in Region 2
10. 10. Population density has a positive effect on HDI in both regions. On the other hand, it has a negative influence on EQI in both regions
11. Poverty has no effect on EQI in Region 1, but has a positive effect in Region 2.

5.2. Recommendations

The suggestions to be put forward based on the discussion and conclusions that have been stated, among others:

1. The government continues to monitor waste disposal and tighten licensing, especially for large industries because it turns out that the industrial sector harms the environment
2. The government should be more intensive in its efforts to increase poverty alleviation through various programs, especially in Region 2, because poverty is running in line with environmental quality
3. GDP per capita should receive the government's main attention with efforts to achieve higher economic growth through industrial development, especially the digital industry
4. It is hoped that there will be more training to improve skills and abilities through increasing the capacity and frequency of training in all regions or provinces in Indonesia
5. Success in improving the quality of the environment from year to year should be maintained and maintained for future environmental improvement and comfort.

6. Disparity between the two regions should be reduced through greater investment increases including developing infrastructure and industry in Region 2

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