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Fluence of Investment Level, Environmental Index Work for Economic Growth in Indonesia Year 2011-2014

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Abstract:
The purpose of this study was to determine and analyze the influence of the level of investment, labor force, air pollution index, water pollution index and forest cover index on Indonesia's economic growth for the 2011-2014 period. The population in this study were all provinces in Indonesia as many as 33 provinces and at the same time became members of the sample. Data collection techniques are using documentation techniques. The data analysis technique using linear regression analysis is mixed with the data panel. The analysis shows that the level of investment and labor force have a positive and significant effect on Indonesia's economic growth and the index of air pollution and forest cover index has a negative and significant effect on Indonesia's economic growth, while the air pollution index has a negative and insignificant effect on Indonesia's economic growth. The labor force variable that predominantly influences Indonesia's economic growth

Keywords*: Economic growth, investment, labor force, water pollution, air pollution, forest cover*

1. Introduction

1.1. Background

Development is an effort or a series of growth and change efforts that are planned and carried out consciously by a nation, state, and government, towards modernity in the context of nation building, which covers all social, political, economic, infrastructure, defense, education and technology systems. institutional, and cultural. Development also includes changes in the level of economic growth, reducing income inequality, and eradicating poverty. One important indicator for knowing the economic conditions in a region in a certain period is indicated by the development of Gross Domestic Product (GDP), either on the basis of current prices or on the basis of constant prices he development of Indonesia's Gross Domestic Product from 2000 to 2014 has always increased every year. Indonesia's Gross Domestic Product in 2014 had reached IDR 2.9 trillion or almost double that of Indonesia's GDP in 2000. Indonesia's GDP growth rate in 2000 to 2014 grew by an average of 5.4 percent annually. Thus, it can be said that Indonesia's economic growth grew quite rapidly. However, in 2011 to 2014 Indonesia experienced a slowdown in growth to a decline of 0.67 percent in 2014 and Indonesia was also included in the lower middle income country or lower middle income country according to the World Bank. Therefore, the Indonesian government should further improve economic growth in Indonesia so that development can run well. The development of Indonesia's Gross Domestic Product in 2000-2014 is presented in Figure 1 below.

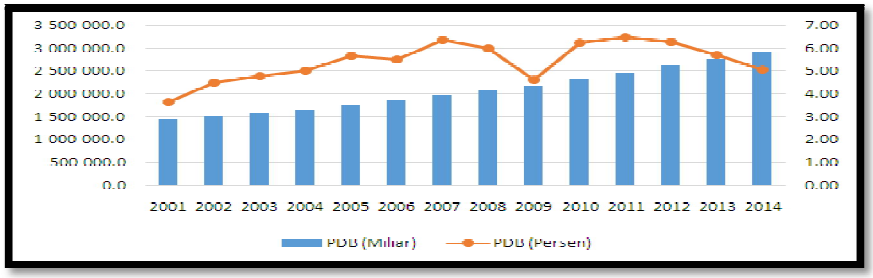

Figure 1: Development of Indonesia's Gross Domestic Product in 2000-2014
Source: Central Bureau of Statistics, Processed

Economic growth can be increased by making various efforts. One effort that can be done is to increase the flow of investment or investment into Indonesia, both domestic and foreign investment. This is in accordance with what was stated by Sukirno (2000) which states that investment activities carried out by the community will continuously increase economic activity and employment opportunities, increase national income and increase the level of prosperity of the community. In addition to increasing investment and labor through job creation, economic growth can also be increased through increased productivity. Productivity is a key vital driver in economic growth, namely as leverage for national economic growth in the long run. That is one reason why today many countries are competing to increase productivity because the higher the productivity of a country, the higher the country's economic growth will be.

The development of labor productivity in Indonesia from 1990 to 2013 seems to increase every year and experience the highest productivity in 2013 with an index of 1,577. This shows a very significant increase in terms of Indonesia's productivity which in 1990 was still at the index level of 0.783 and also when compared with Indonesia's neighboring countries such as Malaysia, Singapore and Thailand, Indonesia had the highest productivity index in the Southeast Asia region. However, when compared to countries like India and China, Indonesia is still very lagging behind the two countries.

However, Indonesia's efforts to increase economic growth, such as increasing the number of workers and capital as well as improving the quality of capital and labor, experience a trade-off between meeting the needs of development on the one hand and efforts to maintain environmental sustainability on the other. Natural resource-based economic development that does not pay attention to environmental sustainability aspects will ultimately have a negative impact on the environment itself, because basically natural resources and the environment have limited carrying capacity. In other words, economic development that does not pay attention to the capacity of natural resources and the environment will cause development problems in the future. This is in accordance with what was said by Todaro (2009) that economic development that is too oriented in pursuing economic growth tends to cause widespread environmental damage

One indicator of macro environmental damage is the level of carbon dioxide or CO2 emissions. High levels of carbon dioxide emissions indicate a high level of environmental damage in an area. Environmental damage that is described through the amount of CO2 emissions produced by Indonesia from 1990 to 2011 has increased very rapidly. In 1990 the amount of CO2 emissions produced by Indonesia was 150 thousand kilotons and in 2011 it had reached 563 thousand kilotons with an average growth of 7.3% annually. While the countries of China and India which in Figure 2 experienced more productivity improvements height from Indonesia only experiences growth of 5 and 6% of CO2 emissions every year.

Indonesia, in this case the Ministry of Environment and Forestry of the Republic of Indonesia and the Central Statistics Agency, developed an index called the Environmental Quality Index (IKLH) to provide a more comprehensive picture of environmental conditions in each province in Indonesia for a certain period. The Environmental Quality Index is an index that adopts Environmental Quality Index (EQI) to measure environmental conditions in Indonesia. The Environmental Quality Index aims to provide information as an evaluation of sustainable and environmentally sound development policies in Indonesia. The Environmental Quality Index consists of three indicators of environmental quality, namely water quality, air quality and forest cover.

The Indonesian Ministry of Environment has also succeeded in categorizing provinces in Indonesia into classifications based on the level of environmental quality. Which is where the 2014 Environmental Quality Index in Indonesia illustrates that West Papua and Papua Provinces are the provinces that get the highest index in the 2014 IKLH publication which means that the quality of the environment in these two provinces is still in the good category of 84.51 and 80 , 65 whereas, DKI Jakarta and Banten Provinces have an environmental index of 36.88 and 43.67 which means that the two provinces are in the "alert" category in accordance with the categories formulated by the Ministry of Environment and Forestry of the Republic of Indonesia.

1.1. Problem Formulation

Based on the above background, the problem is formulated, namely:

- Does the labor force and investment have a positive effect on the growth of GRDP in Indonesia in 2011-2014?
- Are air indices, water indices and forest cover index negatively affecting the GRDP growth in Indonesia in 2011-2014?

2. Literature Review and Hypothesis

2.1. Economic Growth Theory

According to Boediono (1992) economic growth is the process of increasing output per capita in the long run. There are three aspects that are emphasized from economic growth, namely: process, output per capita and long-term. Economic growth is a "process", not an economic picture at a time. In this aspect see how an economy changes over time. The second aspect is economic growth associated with an increase in "per capita output". This theory must include theories regarding total GDP growth and population growth or labor. The last aspect is the definition of economic growth is a long-term perspective. Economic growth occurs when there is a tendency (output per capita rises) which originates from the internal process of the economy. The process of economic growth must also have selfgenerating properties, which means that the growth process itself generates strength or "momentum" for the continuation of the growth in the next period. More research is based on Neo classical growth theory, namely, Robert Solow-Trevor Swan Theory.

Neo classical growth theory was developed by Robert M. Solow (1970) from MIT and Trevor W.Swan (1956) from the Australian National University. The Solow growth model is the development of the Harrod-Domar formulation by adding a second factor, namely labor. The Solow model also introduces a third independent variable, namely technology into the equation equation (equation growth). The general framework of the Solow-Swan model according to Boediono (1992) although similar to the Harrod-Domar model, the Solow-Swan model is more "flexible" because of: (a) Avoiding the "instability" problem which is a warranted rate of growth in the Harrod-model Domar; (b) Can be more "flexible" used to explain income distribution problems.

Model Solow-Swan is more flexible than the Harrod-Domar model because it uses a form of production function that is more easily "manipulated" algebraically. The Solow-Swan model allows for substitution between capital inputs(K) and labor input (L). While the Harrod-Domar model, each input is connected by a production function with an unchanging coefficient.

2.2. Work Force and Economic Growth

According to Todaro (2000) population growth and the growth of the Labor Force (AK) have traditionally been regarded as one of the positive factors that spur economic growth. A greater amount of labor means increasing the level of production, while greater population growth means the size of the domestic market is greater. However, it is still questionable whether the rapid rate of population growth will really have a positive or negative impact on economic development. Furthermore, it is said that the positive or negative effects of population growth depend on the ability of the regional economic system to absorb and productively utilize the increase in labor. This ability is influenced by the level and type of capital accumulation and the availability of inputs and supporting factors such as managerial and administrative skills.

According to Nicholson W. (1991) that a production function of a particular item or service (Q) is Q = f (K, L) where K is capital and L is labor which shows the maximum number of goods / services that can be produced using alternative combination between K and L, if one input plus one additional unit and other input is deemed to be fixed, it will cause additional output to be produced. His additional output produced is called a marginal physical product. Furthermore, it is said that if the amount of labor is added continuously while other production factors are kept constant, then at first it will show an increase in productivity but at a certain level will show a decrease in productivity and after reaching the maximum output level every additional labor will reduce expenditure.

According to Simanjuntak (1985) that labor is covering residents who are already or are working, are looking for work and doing other activities, such as attending school and taking care of the household. According to the Central Statistics Agency (BPS) the population aged 15 years and over is divided into Labor Force (AK) and not AK. The Labor Force is said to work if they do work with the intention of obtaining or helping to obtain income or profits and the duration of work for at least 1 (one) hour continuously during the past week. While residents who do not work but are looking for work are called unemployed.

2.3. Investment and Economic Growth

According to Boediono (1992) that investment is expenditure by the producer sector (private) to purchase goods and services to add to the stock used or to expand the plant. The general requirements of a country's economic development according to Todaro (1981) are: (a) Capital accumulation, including new accumulations in the form of land, physical equipment and human resources; (b) Population development coupled with the growth of its workforce and expertise; and (c) technological progress.

Capital accumulation will succeed if several parts or proportions of existing income are saved and invested to increase the product (output) and income in the future. To build it should divert resources from the flow of consumption and then divert it to investment in the form of a "capital formation" to reach a greater level of production. Investment in the field of human resource development will improve the ability of human resources, so that they become skilled experts who can facilitate productive activities.

In Indonesia, investment or investment can be classified into two parts, namely:

2.3.1. Domestic Investment (PMDN)

PMDN is part of Indonesian people's wealth including rights and objects, both owned by the state and foreign private domiciled in Indonesia, which are set aside / provided in order to carry out a business as long as the capital is not regulated in the provisions of Article 2 of Law No . 1 of 1967 concerning PMA which regulates the definition of foreign capital (Widjaya, 2005: 23)

2.3.2. Foreign Investment (PMA)

Foreign investment covered is only direct FDI which is carried out based on the provisions of Act No.1 of 1967 and which is used to run a company in Indonesia, in the sense that the capital owner directly bears the risk of the capital investment (Widjaya, 2005). The definition of foreign capital is a foreign payment instrument which is not part of Indonesia's foreign exchange assets, which with the approval of the government is used for financing companies in Indonesia.

2.4. Relation of Environmental Quality to Economic Growth

According to Panayatou (2000), economic growth has an impact on environmental degradation. There are two reasons why this happened. First is limited environmental capacity to accommodate waste generated by economic

activities and the second is limited natural resources that cannot be renewed. This has implications for the choice between economic growth or the environment. If you want to preserve the environment, it must limit economic growth. Conversely, if you want to increase economic growth, the environment will bear the burden which in turn limits the economy to growth.

To clarify the balance between economic growth and environmental sustainability, environmental experts apply the term sustainability which refers to meeting the needs of the present generation without harming the needs of future generations. So for economists, a new development process can be said to be sustainable or sustainable if the total stock of capital remains or increases over time. In this case it can be said that economic growth in the future and the quality of human life as a whole is largely determined by the quality of the environment that exists today. To achieve sustained growth, comprehensive and sustainable action is needed, and not only depends on the government, including domestic policies and deregulation. To achieve this, three principles are needed.

First, to achieve sustainable development, it is necessary to enlarge three important assets, namely, labor capital, natural resource capital, and physical and financial capital. Labor and natural resources are the main targets of development and physical and financial capital as a complement. But ironically it is often a country that focuses more on physical and financial capital than human capital and natural resources. By focusing more on physical and financial capital, a country is more likely to be more interested in public policy (tax deductions, direct subsidies, ease of obtaining a right) where physical and financial capital subsidies will lead to race to bottom, and with this policy will cause the existence of vested interests and it is very difficult to escape from the situation. Therefore it is very important to balance the accumulation of these three assets. The second is growth that aims to reduce poverty. And third, the structure of government institutions in addition to macroeconomic stability, this is the foundation of other actions. The real form of linkages between the economy and the environment that is widely used by economists is by looking at the level of pollution as the externality of industrialization which is used as an indicator of economic growth. Rapid economic growth and accompanied by population growth has increased pollution and environmental degradation at the end of this decade. When industrial expansion causes rapid economic growth, employment, increasing income and increasing exports, concentration of industrial waste in urban areas has a negative influence on environmental quality (Panayatou, 2000)

2.5. Environmental Degradation as Input of Production Function

Terly and Levine (2005) say that economists should add more form and substance to the term Total Factor Productivity which is more or less abstract. According to Brock (1973), the current theory of economic growth is biased because this theory ignores environmental damage which will have an impact on economic growth itself. Departing from the above thoughts, Xepapade as (2005) developed a theory that added elements of environmental damage as input elements to the production function as follows:

$Y = F (K, L, E)$ (20)

where Y is production output, K is capital or capital, L is labor and E is environmental damage.

2.5.1. Green Productivity

Based on APO (Asian Productivity Organization, 2003) green productivity is a strategy to increase business productivity and environmental performance at the same time in developing socio-economic as a whole. Green Productivity is part of an environmentally friendly productivity improvement program in order to answer global issues about sustainable development. The concept of Green Productivity is taken from the merger of two important things in the development strategy, namely: improving productivity and protecting the environment.

In this research, the green productivity measurement technique is using the green total factor productivity approach by using the green growth accounting method. G

2.5.2. Green Growth Accounting

Basically, green growth accounting is a method that is the development of growth accounting methods formulated by Solow. However, in the early 1970s a new dimension was developed in which environmental damage which is usually represented by the number of emissions that occurred began to be introduced in the theory of economic growth as an improvement in the method proposed by Solow which was considered "biased"."Xepapadeas (2007) successfully formulated the development of growth accounting by adding environmental elements as in the equation below:

$$\gamma = \left(\frac{\dot{A}}{A}\right) + \left(\frac{\dot{B}}{B}\right) = \left(\frac{\dot{Y}}{Y}\right) - S_L\left(\frac{\dot{L}}{L}\right) - S_K\left(\frac{\dot{K}}{K}\right) - S_E\left(\frac{\dot{E}}{E}\right)$$

Information:

A: *Total Factor Productivity*,

B: *Green Total Factor Productivity*,

S_L, S_K, S_E : Elastiscity of labor, capital and environment

L, K dan E: Variable labor, capital and environmental damage

2.6. Research Hypothesis

Based on the formulation of the problem, a hypothesis is formulated as follows:

- The workforce and investment have a positive effect on the growth of GDP in Indonesia in 2011-2014
- Air index, water index and forest cover index negatively affect GRDP growth in Indonesia in 2011-2014.

3. Methodology

3.1. Scope of Research

The scope of this research is 33 provinces in Indonesia. Meanwhile, the Province of North Kalimantan, which was only formed in 2012 based on Law No. 20 of 2012, was not included as a sample of the study because of constrained data availability.

The data period used in this study was from 2011 to 2014 because the derivative of the Environmental Quality Index, namely the Air Index, Water Index, and Forest Cover Index data were available starting in 2011. The variables used in this study amounted to seven variables, with six independent variables and one dependent variable. The dependent variable used is the value of the Business Field Gross Regional Domestic Product at the 2010 Constant Price (2010 ADHK GRDP). Independent variables used are the labor force, Foreign Investment (PMA), Domestic Investment (PMDN), Air Index, Water Index, and Forest Cover Index.

3.2. Method of Collecting Data

The data used in this study are panel data which is a combination of cross section data and time series data. Cross section data used is based on the number of provinces in Indonesia, namely 33 provinces. For time series data, the data used is the annual data and the period used from 2011 to 2014.

The data used in this study are secondary data obtained from the Central Bureau of Statistics (BPS), Bank Indonesia (BI), the Investment Coordinating Board (BKPM), and the Ministry of Environment and Forestry of the Republic of Indonesia. The data used are as follows

3.2.1. Gross Regional Domestic Product (GRDP)

Gross Regional Domestic Product is a GRDP calculation with a production approach obtained from the addition of added value from 17 business field classifications based on the System of National Accounts (SNA) 2008.

3.2.2. Foreign Investment (PMA)

Foreign Capital Recognition is the value of capital that has been invested by foreign investors, both those who use foreign capital as a whole, and those that are associated with domestic investors. PMA data is obtained from the Investment Coordinating Board.

3.2.3. Domestic Investment (PMDN)

Domestic Investment is the value of capital that has been planted and approved by domestic investors. Domestic investment data is obtained from the Investment Coordinating Board.

3.2.4. Work Force (AK)

Workforce in Indonesia is a population above the age of 15 years who have worked, have not worked, or are looking for work. Data on the workforce is obtained from the Central Bureau of Statistics (Publication of the State of the Indonesian Labor Force).

3.2.5. Air Pollution Index

Air Index or Air Pollution Index (IPU) is an index that describes air quality in an area. The parameters forming this index are SO2 and NO2 in an area. Air Index Data was obtained from the Ministry of Environment and Forestry of the Republic of Indonesia.

3.2.6. Water Pollution Index

Water Index or Water Pollution Index (IPA) is an index that describes the quality of water in an area. This index is formed by monitoring a number of rivers that flow through an area formed from the parameters DO, BOD, TSS, COD, Fecal Coli, Total Coliform, and Phosphate. Water Index Data is obtained from the Ministry of Environment and Forestry of the Republic of Indonesia.

3.2.7.Forest Cover Index

The Forest Cover Index is a comparison between the area of a forest area in an area with an administrative area. Forest Cover Index data was obtained from the Ministry of Environment and Forestry of the Republic of Indonesia

3.3. Analysis Method

The analysis model used is the panel data regression model which is used with the following equation

$$LnPDRB_{it} = (\beta_0 + U_i) + \beta_1 LnInvetment_{it} + \beta_2 LnLaborForce_{it} + \beta_3 InIndexWaterPollution_{it} + \beta_4 IndexAirPollution_{it} + \beta_5 IndexForestCover_{it} + W_{it}$$

Information:
i : Province i (province in Indonesia)
t : t-time (year)
Investment = PMA Realization + PMDN Realization (billion rupiah)
Work Force = Work Force (people)

Air Index = Air quality
Water Index = Water Quality
Forest Cover Index = Quality of forest cover
$\beta 0$ = Constants
$\beta 1, \beta 2, \beta 3, \beta 4, \beta 5$ = Regression Coefficient
εit = Component Error
After getting the regression coefficients of each independent variable, then calculating the Green Total Factor Productivity usesGreen Growth Accounting:

$$LnGTFP_{it} = LnPDRB_{it} - (\beta_0 + \beta_1 LnInvestment_{it} + \beta_2 LnLaborForce_{it} + \beta_3 IndeksWater_{it} + \beta_4 IndeksAir_{it} + \beta_5 IndeksForestCover_{it})$$

3.3.1. Cluster Analysis

In this study, cluster analysis is used to classify 33 provinces in Indonesia according to Total Factor Productivity (TFP) and Green Total Factor Productivity (GTFP) owned. With cluster analysis, TFP and GTFP will be categorized into three categories, namely TFP, which is relatively low, medium, and high.

4. Results and Discussion

4.1. General Overview of Economic Growth in Indonesia

During the period 2010 to 2014 economic growth in Indonesia has always experienced an average increase of 5.82 percent per year. The highest GDP increase occurred in 2011 (6.15 percent), and the lowest was in 2014 (5.20 percent). So, economic growth in Indonesia starting in 2013 experienced a slowdown in growth compared to previous years. This condition is due to a decrease in the contribution of the industrial and mining sectors, each of which only experienced growth of 0.2 and 0.05 percent in 2014. This is a setback compared to 2011, both sectors experienced growth of 6.26 and 4.29 percent.

In Figure 2, the province that has the highest number of GRDP in Indonesia is DKI Jakarta Province in 2014. The economic structure of DKI Jakarta is highly dominated by the tertiary sector economy (services) or also known as the non-trade able sector. Tertiary economic groups of DKI Jakarta Province accounted for 72.39% of the total GRDP of DKI Jakarta Province in 2014. During 2010 to 2014 the average GRDP generated per year in DKI Jakarta was 1,395.5 trillion rupiahs. DKI Jakarta's economic growth in the last decade has always been higher at 6.33 percent from the national growth of 5.8 percent which has made DKI Jakarta Province as the driving force of the national economy. The Gross Regional Domestic Product in 33 Provinces of Indonesia in 2014 (Billion Rupiah) is presented in Figure 2 below.

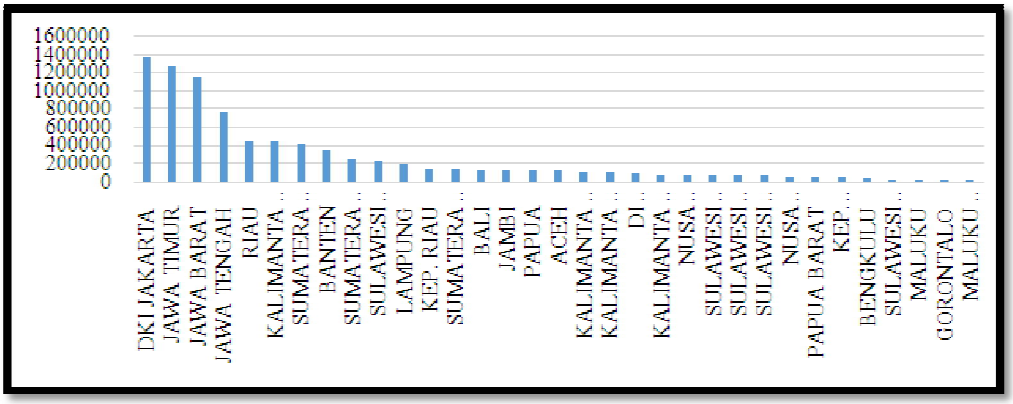

Figure 2: Gross Regional Domestic Product in 33 Provinces of Indonesia in 2014 (Billion Rupiah) Central Bureau of Statistics, Processed

The province that had the lowest Gross Regional Domestic Product in 2014 was North Maluku Province. This is due to the reduced value of metal ore mining in North Maluku in 2014 of 13.05 percent. This is the impact of the enactment of the Minerba Act, namely the prohibition of the export of raw mineral materials. However, when viewed from the average GDP growth in North Maluku Province from 2010 to 2014 it was 6.41 percent higher than GDP growth nationally.

4.2. General Overview of Investment Development in Indonesia

Investment development in Indonesia from 2010 to 2014 has always increased. The highest investment was achieved in 2014 with a total of 493,081 billion rupiah. This is very good considering how important the role of investment is in helping to improve national development. The state of investment in Indonesia cannot be separated from the role of foreign investment and domestic investment. The rate of growth of domestic investment in Indonesia is always higher than the growth rate of FDI in Indonesia. The rate of growth of Indonesian FDI in 2014 was 21.83 percent while Indonesian FDI was only 13.07 percent.

Indonesia consists of several provinces with relatively different geographical and natural conditions and potential. This causes the value of realization of domestic investment in each province to vary. The development of domestic investment in most provinces tends to fluctuate. There are only three provinces in Indonesia that have realized domestic investment which continues to increase from 2010 to 2014. The three provinces are East Java, Central Java, and Bangka Belitung. Among the three provinces, East Java Province is the province that has the most rapid development of domestic investment realization every year. The average realization of domestic investment generated by each province in Indonesia is shown in Figure 3 below.

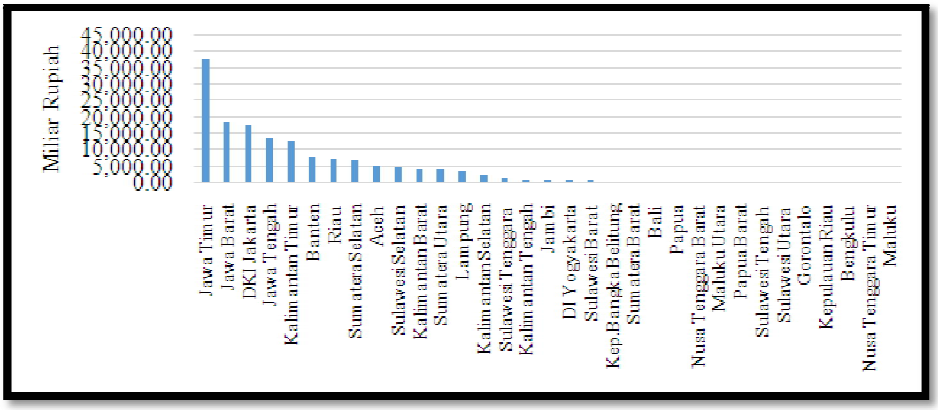

Figure 3: Domestic Investment in Indonesia 2014
Source: Investment Coordinating Board, Processed

It can be seen in Figure 10, that the provinces that have the highest average domestic investment realization in Indonesia in the period 2010 to 2014 are East Java Province. This was supported by the East Java One-Stop Integrated Service (PTSP) facility which was awarded as the first best PTSP organizer in Indonesia which competed with 130 PTSP in other investment fields.

This makes domestic investors more inclined to invest in East Java, considering PTSP's policy is to facilitate the investment process. While the provinces that have the lowest average domestic investment realization in Indonesia in the period 2010 to 2014 are Maluku Province. This is due to the still low infrastructure in the province which causes domestic investors not to invest in Maluku Province

Foreign Investment (PMA) has always experienced an increase from 2010 to 2014. In 2014, Foreign Investment in Indonesia reached 28,421.20 million US $. In 2014, Indonesia also recorded the highest growth of foreign investment in the Southeastern region. The sectors most in demand by foreign investors include mining, transportation and telecommunications, metals, basic chemicals and pharmaceuticals. But when compared with neighboring countries, Singapore as an example, Indonesia is still far behind from Foreign Investment in Singapore which has reached US $ 67,500 million. So, Indonesia still has to make improvements in the country so that investors invest in Indonesia.

It can be seen in Figure 4, that in the period of 2010 to 2014, the average dominance of FDI was in four provinces, namely DKI Jakarta, West Java, Banten and East Java. On average from 2010 to 2014, the highest PMA was obtained by the Province of West Java amounting to 4685.8 million US $. The types of business sectors that are most interested in PMA investors are still around the Metal, Machine and Electronic Industry with a total of 18 projects. This investment interest is based on market segments that tend to move dynamically in the sector, such as supporting telecommunications equipment and information products and increasing consumer needs. The 2014 Foreign Investment in Indonesia (million US $) is presented in Figure 4 below.

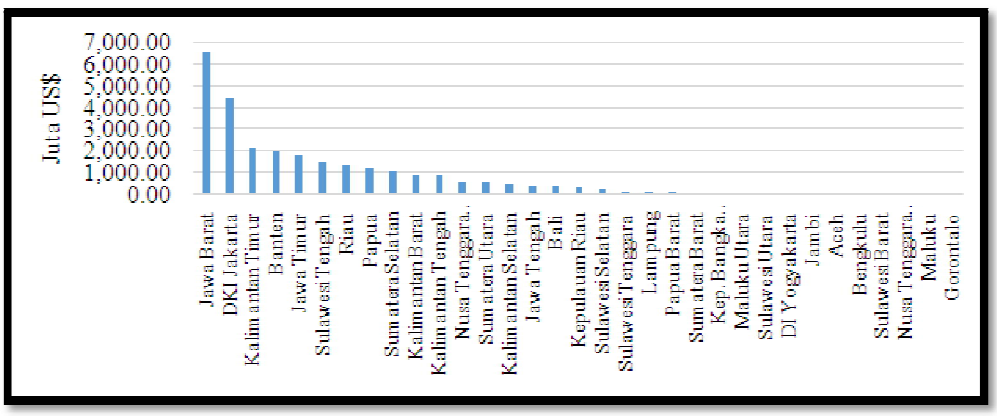

Figure 4: Foreign Investment in Indonesia in 2014 (US $ Million)
Source: Investment Coordinating Board, Processed

4.3. General Description of Labor in Indonesia

The development of the workforce in Indonesia during the period 2010 to 2014 can be said to increase, except in 2011, it decreased from the previous year. However, it increased again from 2012 to 2014. On average, the total workforce grew by 1.13 percent annually and reached the highest growth in 2014 of 1.41 percent. The Work Force Development in Indonesia 2011-2014 is presented in Figure 5 below.

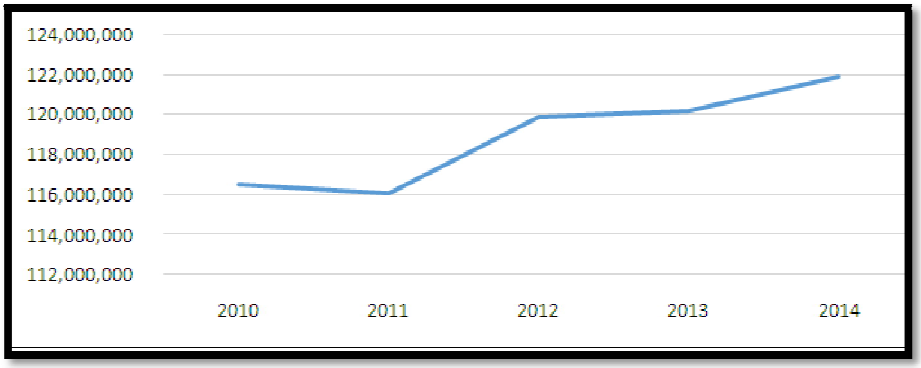

Figure 5: Development of the Labor Force in Indonesia 2011-2014
Source: Central Bureau of Statistics, Processed

Slightly different from the conditions of the labor force in Indonesia in the aggregate, the labor force in each Indonesian province has fluctuated. Most provinces in Indonesia always experience an increase in the workforce. Only a few provinces experienced a decline in the number of workforce in 2014, such as North Sumatra Province, DKI Jakarta and East Java. However, when viewed on average, the Province of West Java on average has the highest number of workforce in Indonesia for the period 2010 to 2014 of 20 million. This is reasonable considering the large number of labor-intensive industries that are established in West Java Province so that this absorbs more labor in the province. The Average Amount of Labor Force 2010-2014 is presented in Figure 6 below.

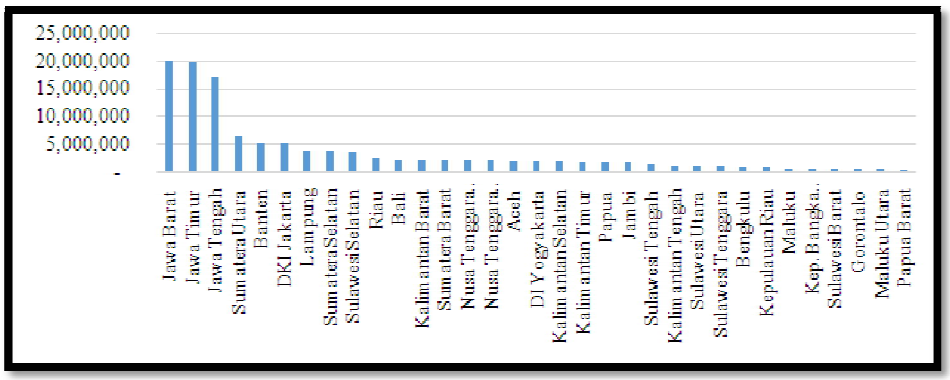

Figure 6: Average Number of Labor Forces in 2010-2014
Central Bureau of Statistics, Processed

4.4. Development of Environmental Quality in Indonesia

Indicator for measuring environmental damage that occurs in Indonesia using the Environmental Quality Index (IKLH). The smaller the index number means that the quality of the environment in the area decreases. As seen in Table 1., the development of environmental quality in Indonesia from 2011 to 2013 has always decreased to 63.20 and in 2014 it has improved again but not too far apart by 63.42. If we refer to the categories made by the Ministry of Environment and Forestry, Indonesia's environmental conditions as a whole are categorized as "lacking".

Years	Environmental Quality Index (IKLH)
(1)	(2)
2011	65,76
2012	63,96
2013	63,20
2014	63,42

Table 1: Development of Indonesia's Environmental Quality Index (IKLH) in 2011-2014
Sumber: Environmental Quality Index (IKLH) 2014

The condition of the quality of the environment in each province is very volatile. There is only one province that always experiences an increase in the quality of the environment every year in the study period, namely Riau Islands Province. Figure 13 shows that the Environmental Quality Index in 2014 was achieved by the Province of West Papua and the lowest was achieved by DKI Jakarta Province. We can note that all provinces in Java Island occupy the 6 provinces that have the lowest IKLH. This is very reasonable considering that Java Island is the focus of the development of the government and Java Island is used as an industrial center in Indonesia. The Environmental Quality Index of 33 Provinces in Indonesia 2014 is presented in Figure 7 below.

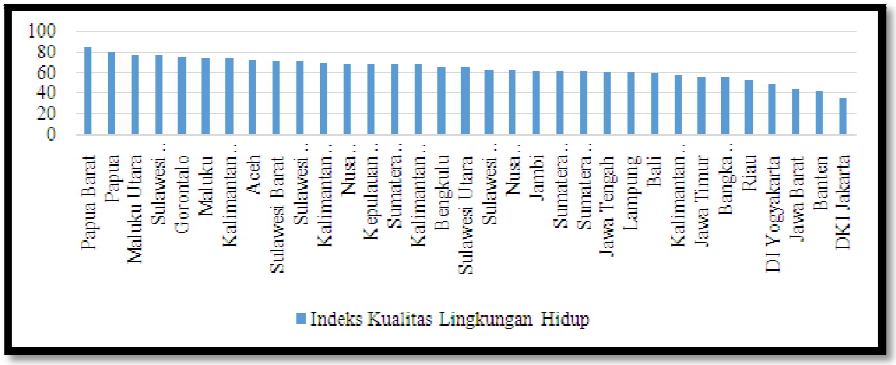

Figure 7: Environmental Quality Index of 33 Provinces in Indonesia 2014
Indonesian Air Pollution Index 2-14
Source: IKLH 2014 Publication Ministry of Environment and Forestry Indonesia

Figure 16 shows the air pollution index of 33 provinces in Indonesia. DKI Jakarta Province is a province that has the lowest air pollution index which makes DKI Jakarta the province that has the lowest air quality in Indonesia. This is very reasonable considering the large number of vehicles and the number of industries in DKI Jakarta Province. The five provinces that have the lowest air quality are provinces that have industrial sectors as the main sectors that sustain the economy in the province, such as East Java, Banten, West Java and Riau because the SO2 element reflects the high level of industrial activity in a region. The 2014 Indonesian Air Pollution Index is presented in Figure 8 below.

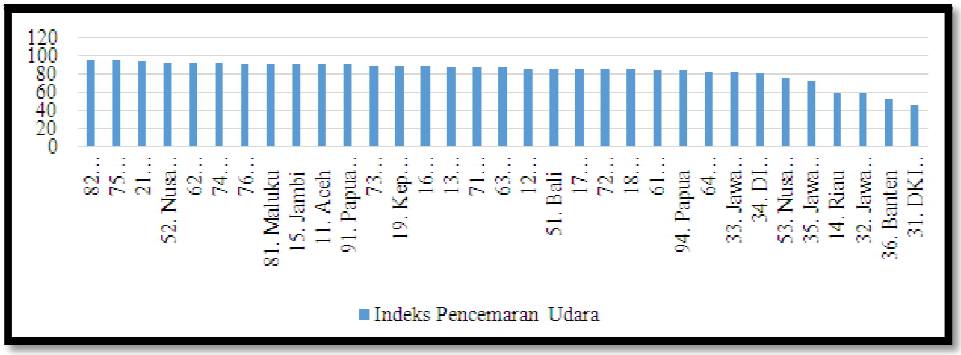

Figure 8: Indonesian Air Pollution Index 2014

4.5. Estimation of Economic Growth Models

4.5.1. Chow Significance Test

The test was conducted to find out whether panel data regression techniques use fixed effects better than the common effects. Based on the results of processing using Eviews 8.0, the P-Value value is 0.0000 in both models of economic growth. This value is smaller than the alpha significance level of 5 percent, so the null hypothesis can be rejected. This means that the intercept of each province is different or it can be said that the fixed effects model is better than the common effects

4.5.2. Hausman Significance Test

Based on the results of processing using E views 8.0, the P-Value value is 0.0000 in both models of economic growth. This value is smaller than the alpha significance level of 5 percent, so the null hypothesis can be rejected which means that the fixed effects model is better than random effects. From the results of the model selection, it can be concluded that the best model of economic growth both with and without environmental variables is the fixed effect model.

4.5.2.1. Testing Structure of Residual Variance-Covarians Homosedastic Assumptions

Based on the results of the calculation, LM-statistics value is 47.45 for the model of economic growth without environmental variables and 61.006 for the model with environmental variables greater than the value of $\chi 2\ (0.05;\ 32)$ of

46.19 so that it can be concluded that the null hypothesis can be rejected at an alpha significance level of 5 percent. That is, fixed effects models with heteroscedastic variance-covariance structures are better used than homoskedastic variance-covariance structures.

4.5.3. Selection of Heteroscedastic Structure Estimator and Absence of Cross Sectional Correlation or Seemingly Unrelated Regression (SUR)

Based on the calculation results obtained the value of λLM-statistics is 1379,776 for the model of economic growth without environmental variables and 1073,285 for the model with environmental variables greater than the value of $\chi 2\ (0{,}05;\ 528)$ equal to 582,56. The conclusion is that the null hypothesis is rejected at 5 percent alpha significance, meaning that the fixed effects model is chosen with heteroskedastic variance-covariance structure and there are cross sectional correlation or seemingly unrelated regression (SUR).

4.5.4. Classic Assumption Testing

4.5.4.1. Assumption of Nonmulticolinearity

Correlation matrix values as presented in Table 2 below shows that the correlation value in the correlation matrix between independent variables is 0.64 (less than 0.80) which indicates the absence of mulicolinearity, or the non-multicollinearity assumption has been fulfilled.

	LnAK	LnInvestasi	LnUdara	LnAir	LnTutupanHutan
LnAK	1				
LnInvestasi	0.64	1			
LnUdara	-0.52	-0.51			
LnAir	-0.29	-0.19	0.57		
LnTutupanHutan	-0.55	-0.29	0.51	0.22	1

Table 2: Correlation Tables between Independent Variables

Based on the results of the best model selection, the model used is fixed effect with variance-covariance structure heteroscedastic and cross sectional correlation or seemingly unrelated regression (SUR).

After all model assumption tests have been fulfilled, it can be concluded that the model used is Best Linear Unbiased Estimator (BLUE). Then the interpretation of the results of the ditas. Adjusted R-square value of 0.999937 shows that 99.993 percent of the output variable is explained by the investment and labor force variables while the rest is explained by other variables outside the model.

From the explanation above, the elasticity of the workforce is greater than the elasticity of investment. We can conclude that the addition of labor is more effective in increasing economic growth in Indonesia than increasing investment in Indonesia. This is very reasonable because the production process in Indonesia is still labor intensive compared to capital intensive.

Variabel	Koefisien	t-Statistic	Prob.	Adj.R^2
(1)	(2)	(3)	(4)	(5)
C	1,401696	0,608252	0,2722	0,999543
LNINVESTASI	0,0119967	8,187022	0,0000	
LNAK	1,390626	56,87482	0,0000	
LNUDARA	-0,045631	-0,729347	0,2338	
LNAIR	-0,319721	-6,321630	0,0000	
LNHUTAN	-0,450648	-6,367327	0,0000	

Table 3: Summary of Panel Data Regression Estimates of Fixed Effects Models with Heteroscedastic Structures and There are Cross Sectional Correlation (SUR)
Source: The Results of Processing Eviews 8.0

After all model assumption tests have been fulfilled, it can be concluded that the model used is Best Linear Unbiased Estimator (BLUE). Adjusted R-square value of 0.999364 shows that 99.93 percent of the output variables are explained by the independent variables in the model while the rest is explained by other variables outside the model. Based on the results of choosing the best model, the following models are obtained:

$$\widehat{LNPDRB} = (1{,}401 + u_i) + 0{,}019967\ LNIVESMENT + 1{,}390626\ LNLF - 0{,}045631\ LNAIR - 0{,}319721\ LNWATER - 0{,}450648\ LNFOREST$$

The coefficient for investment or the so-called investment elasticity of 0.01967, meaning that each increase in capital input is 1 percent, with cateris paribus assumed, the GRDP value will increase by 0.01967 percent. The labor force coefficient which is called labor elasticity is 1.390626 which means that each increase in labor input by 1 percent, with cateris paribus assumed, will increase the value of production output by 1.39 percent.

The three variables that describe environmental degradation, namely air pollution index, water pollution index and forest cover index have a negative sign. This shows a trade off faced by the government whether to increase economic

growth or preserve the environment. However, for air pollution variables are not significant in influencing economic growth, this is due to the calculation of the air pollution index only incorporating elements of NO2 and SO2 in the calculation process while in the Environmental Quality Index consider the element of carbon (CO) which is the most abundant element very inherent in economic activity and also for SO2 elements that are difficult to detect due to gas diffusion.

4.6. Growth Analysis of Total Factor Productivity (TFP) With Growth Accounting Method and Green Total Factor Productivity (GTFP) With Green Growth Accounting Method

The growth of Total Factor Productivity (TFP) is calculated as the remaining amount of growth (residual) after deducting the measured growth of each input (production factor). The growth of capital and investment inputs was multiplied beforehand with their respective coefficients obtained from the estimation results using panel data regression of fixed effects models with heteroscedastic structures and there were Cross Sectional Correlation (SUR).

TFP growth analysis is used to see the role of factors of production other than capital and labor, which can be called technological advances that show organizational competence, the amount of research and development and managerial abilities (Felipe, 1997). In this study, TFP growth was calculated using the Growth Accounting method.

Green Total Factor Productivity is a method of calculating productivity that takes into account or takes into account environmental aspects. The growth of Total Factor Productivity (TFP) is calculated as the amount of remaining growth (residual) after deducting the growth of each input (production factor) measured by environmental quality. So, Green Total Factor Productivity has the meaning of how efficient an area is in using input factors in increasing production in this case economic growth and balancing the environmental quality of the area simultaneously.

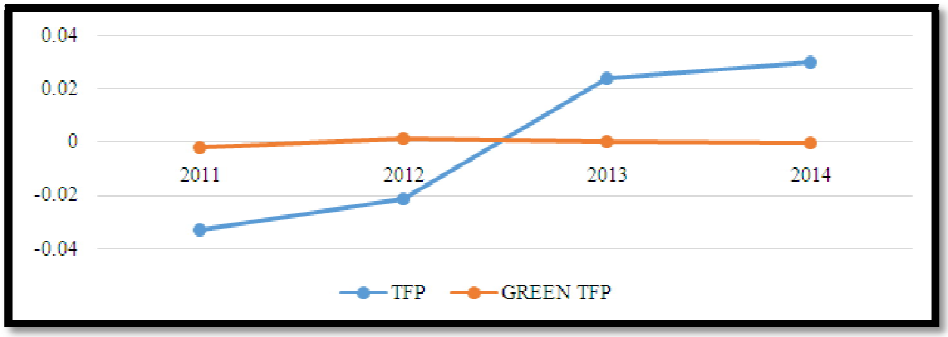

Figure 9: Development of Total Factor Productivity and Indonesia's Green Total Factor Productivity 2011-2014

It was seen that during the study period (2011-2014), the average growth of Total Factor Productivity in Indonesia experienced a significant increase, especially in 2013. In 2011 and 2012 TFP in Indonesia amounted to -0.03 and -0.02 while in 2013 and 2014 increased to 0.02 and 0.03. This shows that Indonesia on average is more efficient in using its economic growth inputs, namely capital and labor in increasing economic growth in Indonesia.

Increased productivity in Indonesia is illustrated by an increase in Total Factor Productivty in line with economic growth in Indonesia. However, Indonesia itself is still very much dominated by the amount of investment and labor available compared to Total Factor Productivity. Supposedly, Indonesia is more dependent on TFP because the economic growth that depends on Total Factor Productivity will prioritize economic activities that rely on increasing productivity, competitiveness, and innovation (Xepapedas, 2007).

In contrast to the development of Total Factor Productivity which is always increasing, the development of TFP Green in Indonesia from 2012 has always experienced a decline until 2014. The sharpest decline occurred in 2013, reaching 83 percent. This is very natural where Indonesia's Environmental Quality Index in 2013 experienced a decline from 2012 with an index of 63.96 to 63.20 in 2013. This is in line with the Indonesian Environmental Quality Index data which in the period of 2011 experienced an increase while from 2012 to 2014 decrease. This shows a close relationship between Indonesia's environmental quality and Indonesia's Green Total Factor Productivity.

4.7. Classification of Provinces in Indonesia According to the Level of Total Factor Productivity (TFP) and Green Total Factor Productivity

4.7.1. Grouping of Provinces According to the Level of Total Factor Productivity

It has been explained in Chapter 3 that to classify 33 provinces in Indonesia according to the TFP level cluster analysis is used. The TFP growth rate is reflected from the TFP of each province in the last year, namely in 2014. The TFP growth obtained previously presented shows that the TFP value in the 33 provinces studied is actually still absolute (less than 1).

However, for spatial policy objectives by utilizing the characteristics of each province, researchers divided the provinces in Indonesia into three categories of regions based on TFP levels. The categories used are relatively low TFP, relatively moderate TFP, and relatively high TFP. The grouping of provinces into these three categories is done using K-Means Cluster. It is known that there are 4 provinces in Indonesia that have relatively low TFP levels. The provinces are

Aceh, Riau, East Kalimantan and West Papua Provinces. Then, there are 16 provinces that have relatively moderate TFP levels and there are 13 provinces that have relatively high TFP levels in Indonesia. The grouping of the province also shows the level of provincial efficiency compared to other provinces. Provinces that have TFP are in the category of more efficient in using their input factors, namely investment and labor in increasing their economic growth, as well as TFP category which is relatively high in the relatively moderate category TFP.

Mapping of Provinces in Indonesia according to the Level of Total Factor Productivity

Economic development is an activity that needs to pay attention to the characteristics of each region or province in Indonesia. Differences in provincial characteristics indicate different treatment to obtain optimal productivity improvements in the development goals of each province. The provincial map in Indonesia is based on the TFP level owned in 2014. Provinces with relatively low, medium, or high TFP levels appear to be slightly random or do not have spatial patterns. However, if we pay attention to the provinces the medium and high categories are dominated by large provinces in Indonesia such as DKI Jakarta, North Sumatra and South Kalimantan. For Java and Bali alone, none of the provinces have a relatively low TFP level. This is indeed very reasonable considering that Java Island is the center of the economy in Indonesia

On every island in Indonesia the provinces have relatively high TFP levels such as North Sumatra on Sumatra Island, DKI Jakarta and East Java on Java, South Kalimantan on Kalimantan Island, North Sulawesi and Gorontalo on Sulawesi Island and Maluku and North Maluku. Each province that has a high relatinf TFP level can be used as a reference for learning activities to increase productivity, especially for provinces that still have relatively low TFP levels. These provinces can be used as a center for the development of TFP levels in every island in Indonesia so that it does not have to make DKI Jakarta a reference considering that the more contiguous provinces have similar characteristics. However, for Papua Island itself, there are no provinces that have relatively high TFP levels. This is a task for the local government to increase their productivity in managing their resources.

Provincial Mapping according to the Level of Green Total Factor Productivity

Just like the grouping carried out on Total Factor Productivity, researchers divided the provinces in Indonesia into three regional categories based on Green TFP levels. The categories used are relatively low TFP Green, relatively moderate TFP Green, and relatively high TFP Green. The grouping of provinces into these three categories is done using K-Means Cluster. Grouping is also based on the Green Total Factor Productivity in 2014.

It is known that there are 6 provinces in Indonesia that have relatively low Green TFP levels. The provinces are DKI Jakarta, West Java, DI Yogyakarta, Banten, South Kalimantan, and West Papua. If we pay attention, the TFP Green level is relatively low in part in the provinces in Java. The provinces of DKI Jakarta, Banten, West Java and DI Yogyakarta are provinces with the majority of the industrial sector being the main sectors supporting the economy in the province. Because, regions or provinces that have high industrial activity will show high SO2 concentrations compared to other regions. SO2 is one indicator of the air damage index in IKLH.

Then, there are 25 provinces that have relatively moderate TFP Green levels and there are 2 provinces that have relatively high Green TFP levels in Indonesia. The grouping of the province also shows the level of provincial efficiency compared to others. Provinces that have TFP Green category are being more efficient in using input factors, namely investment and labor and are able to control environmental degradation that occurs efficiently in increasing their economic growth, as well as the relatively high TFP Green category against relatively moderate category Green TFP.

In fact, it is very important, provinces that have a low category of total green productivity factor to immediately repair environmental damage that occurs in the area can increase productivity in the province in line with the decline in environmental degradation.

5. Conclusions and Recommendations

5.1. Conclusion

Based on the results of the research and discussion, the following conclusions are obtained:

- Factors that have the highest elastic level in economic growth are labor variables. So if you want to increase economic growth quickly by giving treatment to this variable. The influential environmental variables are the Forest Cover Index and the Water Index while the Air Index has no effect and has a negative sign that describes the trade-off between increasing economic growth and environmental degradation.
- Indonesia's Total Factor Productivity has always been increasing every year but on the contrary Green Total Factor Productivity has decreased since 2012 every year, so that Total Factor Productivity is no longer relevant as a policy-making tool because the resulting productivity conditions are false because we compare it with Green Total Factor Productivity.
- In 2014, the province with the highest total Productivty Factor was the lowest Green Productivty Total Factor was DKI Jakarta Province, because this province had the lowest environmental quality of all provinces in Indonesia. This shows how closely the relationship between green productivity and conditions of environmental damage.

5.2. Suggestions

- The government is expected to increase both the quantity and quality of the workforce by providing counseling and training
- Conduct reforestation and normalization of river water.

- GreenTotal Factor Productivity began to be developed as a tool for productivity decision-making because the productivity described by TFP proved to be false

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