Industrial Sector and Natural Resource Sharing: Analysis of Environmental Quality in Indonesia

by Priagus Priagus

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Priyagus [a]
[a]. *Faculty of Economics and Binsis, University of Mulawarman, Indonesia.*
*Email : priyagus@feb.unmul.ac.id**

Abstract.

This study aims to investigate the relationship between economic growth (GRDP), industrial sector (INDUS) and the transfer of natural resource revenue sharing (SHRNAT) to environmental quality (EQIT) or Degradation in Indonesia in the 2011-2015 period. The econometric analysis model was built using panel data on 33 provinces with a static squared regression method. The results of the investigation support the Environmental Kuznet Curve (EKC) hypothesis significantly, where economic growth and environmental quality (Degradation) are related to the inverse U pattern. It means, in the initial stages, economic growth will reduce the quality of the environment to a certain point then the quality of the environment will improve along with the increase in economic growth, while an increase in industrial sector as well as the transfer of funds for the production of natural resources will have an impact on the reduction of environmental quality. Growth strategies with industry and natural resource revenue sharing policies in Indonesia have an impact on reducing environmental quality

Keyword : GDRP, Industri, Natural resources revenue sharing and *EKC*

1.Introduction

Growth is a necessity in development, but growth originating from the exploitation of natural resources, in fact will be a threat to future generations and the continuation of development itself. Asici's findings [1] explain that currently, in countries with middle income in particular, there is a tendency to adopt unsustainable growth patterns. This means that there is a gap between the economy and the environment, an increase in production and income accompanied by a decrease in the quality of natural resources.

Capital intensive growth strategy through the development of the industrial sector has become a "brand mark" for developing countries to catch up, even Indonesia based on its economic structure is no longer an agrarian country like the 70s, but has become an industrial country, because the sector's contribution became dominant 23.69%, while the agricultural sector only contributed 13.27% ,BPS [2].

The shift in economic structure from agriculture (agrarian) to this industry has caused the island of Java, which was originally a food granary, to become the center of the processing industry (clothing, food and shelter) with contributions (28.80%), while the islands of Sumatra and Kalimantan became centers of industrial development based on natural resources, with contributions of 20.04% and 17.68% in 2015. Most provinces in Indonesia (21 provinces) are supported by the industrial sector with double digit contributions, with a minimum of 10.25% (Sumatra West) and a maximum of 38.63% (Riau Islands), while (13 provinces) other industrial sectors contributed less than 10% ,BPS[2]

The role of the industrial sector as an engine of growth and leading sector can be understood, because of the backward and forward linkages to the supporting sectors and its ability to produce quickly with a large capacity, so as to increase total economic growth. Indonesia's economic growth in 2011-2015 is relatively high, averaging 5.35% per year, with the growth of the industrial sector averaging 4.71% per year. This condition makes it clear that the industrial sector is a strategic sector in the Indonesian economy

Large industries on the islands of Sumatra and Kalimantan are generally based on natural resources and are non-renewable. Even though natural resources are the main production factor, the input prices are relatively cheap and tend to be considered free goods (commons good), so environmental damage is difficult to reduced.

The stigma of natural resources as free goods that lasted for decades has reduced the quality of the environment massively and often becomes a tragedy (tragedy of the commons), raising fears of threats to human life and natural ecosystems, encouraging systematic efforts from various countries and world institutions as well as social institutions (NGOs) to save the earth that is being threatened, such as the UN environmental agency (UNEB), the World Bank with Bruntland documents 1987

Indonesia as part of the international environmental community, has taken the role of forming a ministry (KLH) that specifically handles the environment, and includes an environmental improvement agenda in the medium and long-term development plans, where at the end of the third phase (RPJMN), Indonesia has environmental quality ranked quite well, as a form of shared responsibility to conserve natural resources and the environment.

The government as a regulator has an important role to overcome the gap between economic interests and the environment in the long run, so that both can symbiosis in mutualism. Several studies that use policy variables to explain the role of government towards environmental improvement have been carried out by: Bhattarai and Hammig [3], Asici [1] and Xu [4].

One of the government regulations related to environmental control is the tax on natural resources, in which part of the acquisition will be given to producing regions (Law Number 33 Year 2004). Thus, the natural resource tax can be an instrument to reduce environmental damage by providing a proportional load (internalizing cost) to users of natural resources and at the same time a source of investment for environmental improvement.

The main objective of this research is to investigate the relationship between economic growth and the impact of the industrial sector and the transfer of natural resource revenue-sharing funds to environmental quality in Indonesia in the 2011-2015 period. The results of this study are expected to be a substance of the growth strategy adopted by the Indonesian government. Therefore this research is important because it will make three environmental-related contributions: First; Explain the relationship of economic growth with environmental quality in order to explain the enactment of the Environmental Kuznet Curve (EKC) hypothesis in Indonesia. Second; Explain the impact of the role of the industrial sector on environmental quality and finally; explain the role of the transfer of natural resources revenue-sharing funds to environmental quality.

This research is arranged in the following format: first part; introduction, part 2; literature review, section; 3 methodology, section; 4 Analysis and discussion, finally Conclusions.

2.Review of Literature

2.1.Economic Growth and Sustainable Development.

Economic growth is very necessary for the continuity of development because it illustrates the total increase in GNP as a source to drive the economy both in terms of consumption and production. Barro's [5] empirical findings explain that economic growth in 100 countries from 1960-1990 increased because several inputs were used in the production process such as: education, life expectancy, low government consumption, legal improvements and inflation and trade. On the other hand the existence of the role of technology which was originally considered exogenous, turned out to be very important and able to provide high productivity. Furthermore Capolupo [6] explained, the variable of economic growth is a combination of institutions, geography, socio-culture so that it can take place in the long run.

Growth has become a strategy for developing countries including Indonesia which is rich in natural resources to make progress, but it is realized that to obtain targeted economic growth, many interrelated factors (inputs) and technological support are needed. Therefore, the exploitation of natural resources through the development of capital-intensive industrial sectors (technology) is inevitable and has contributed relatively high growth, although accompanied by a decrease in the quality of natural resources due to weak institutional factors.

Sustainable development (Sutainable Development) was first introduced by the Brundtland commission in 1987. Although it is very difficult to conceptualize, the World Bank [7] explains, Sustainable development is a development activity to meet the needs of the present generation without compromising the interests of future generations. Furthermore, he explained, during 1990-2030 the autput of developing countries increased 4-5 times, causing several environmental indicators to deteriorate. This statement confirms the position of Indonesia as a developing country with a relatively high growth rate (5.35% / year) with the driver of the industrial sector causing environmental degradation.

Environmental degradation or degradation does not occur if healthy and strict policies are applied to users who harm the environment. According to the Central Statistics Agency BPS [2] sourced from the UN sustainable development commission. Sustainable development consists of 4 dimensions, namely social, economic, environmental and institutional aspects. This means

that sustainable development is a system of synergy of several aspects in harmony and consistently. In this study the socioeconomic aspects are represented by economic growth and the role of the industrial sector. The environmental aspects with integration and institutions are reflected by the role of the government to collect taxes and transfer funds from the sharing of natural resources to the regions.

The relationship between the economy and the environment is explained by the EKC (Environmental Kuznet Curve) hypothesis. That is, in the early stages of development, environmental degradation tends to increase along with the increase in income to a certain point (the peak point), then decrease with the increase in income. This relationship resembles the inverted U.

Coondoo and Dinda [8] divide three types of causal relationships between income and the environment. First, for developed countries. Causality occurs from emissions to income. Secondly, for the Central and South American countries and Japan. Causality occurs from income to emissions. Third, for Asian and African countries. Bidirectional causality. The form of the relationship curve between income and the environment is not only the U-shaped inverse, but varies for each country and type of pollutant, then Panayotou [9] questions some related to EKC. Does EKC really exist, what is the role of environmental policy and what is the role of factors other than income. Therefore this study will investigate the existence of EKC in Indonesia with the causality of income to emissions as is the case in Asian and African countries, Coondoo and Dinda [8]. The existence of the variable GRDP in the industrial sector and the transfer of profit-sharing funds used in the model to explain the existence of other factors outside income and the role of government (policies) related to environmental quality as questioned by Panayotou [9].

3. Analysis Method

3.1. Types and data sources

The data in this study use secondary data, in the form of a combination of time series data and cross data or panel data, covering 33 provinces throughout Indonesia, in the period 2011-2015. Sourced from the Ministry of Environment and Forestry [10] and the Indonesian Central Statistics Agency (BPS).

The relationship between income and environmental degradation can be in the form of linear, quadratic and cubic with several control variables such as Wu's research [11], whereas Uchiyama (2016) categorizes into state-based, data-based and estimation methods. This study uses a quadratic model in a static and added a number of variables (industrial sector GRDP and transfer of natural resource revenue sharing) as questioned by Panayotou [9] to explain the existence of the EKC hypothesis in Indonesia.

The model used in this study adopted the study of Shaw et al [13], which is a quadratic model in a static form. The estimation method used is Fixed Effect (FE) and Random Effect (RE) with the assumption that the intercepts of each different province will have different values, even with the same slope, Widarjono [14], Juanda and Junaidi [15] . Some studies that use the quadratic model in a static form with several control variables are: Kahutu [16] and Tan et all [17].

The analysis model is formulated :

$EQIT1,2 = f(PDRBK1, PDRBK2^2, \beta 3)$

In the natural logarithmic form the equation :

$$\text{Ln (EQIT)1} = \beta o + \beta 1 \ln (\text{PDRBK1}) + \beta 2 (\ln \text{PDRBK2})^2 + \beta 3 \ln (\text{INDUS}) + e \quad ...(1)$$

$$\text{Ln (EQIT)2} = \beta o + \beta 1 \ln (\text{PDRBK1}) + \beta 2 (\ln \text{PDRBK2})^2 + \beta 3 \ln (\text{SHRNAT}) + e \quad ... (2)$$

U inverse relationship pattern will be obtained if:

if $\beta 1 > 0, \beta 2 < 0$

The EQIT variable is environmental degradation, representing environmental quality measured by indices that are valued from 0 to 100, the higher the index value, environmental degradation is getting worse or environmental quality decreases and vice versa. PDRB1 and PDRB2 are GDP per capita constant prices in 2010 rank 1 and rank 2, represent economic growth and are measured in Million Rupiah. INDUS is the GRDP of the industrial sector, represents the size of the industrial sector measured in Million Rupiahs and SHRNAT is a transfer of natural resource revenue sharing funds, represents the value transferred to the region as funds for natural resource revenue sharing and is measured in Million Rupiahs.

Table 1. Definition and expectations of variable relationships

No	Nama Variable Nama	Simbol	Unit	Expected Sign
1	Environment Degradation	EQIT1,2	Indexs	Dependent variabel
2	GRDP capita linier	PDRBK1	Million Rp	+
3	GRDP capita kuadrat	PDRBK2	Million Rp	-
4	GRDP industial sector	INDUS	Million Rp	+
5	Transfer Natural Resource Revenue	SHRNAT	Million Rp	-

4. Analysis and Discussion Results

4.1.Description of Variable Statistics

Overall the secondary data used for estimation is quite good, because the residuals obtained are close to normal with the characteristics of the standard deviation that are relatively smaller than the average, the degree of inclination does not differ greatly as is the case with normal curve rattles, finally the Jarque-Bera test (JB) is not real for the EQI variable, so the expected estimation results are not biased and the partial test is valid. Widarjono [14]. Descriptive estimation results for all variables are presented in Table 2.

Table 2. Estimated Descriptive Value of Variables.

Estimasi	PDRBK1	PDRBK2	SHRNAT	INDUS	EQIT
Mean	3.348600	11.52752	10.55543	16.13103	3.524570
Median	3.257436	10.61089	10.83212	13.07000	3.538928
Maximum	4.962090	24.62234	15.47729	44.14000	4.223129
Minimum	2.269638	5.151258	0.000000	1.250000	2.740195
Std. Dev.	0.562420	4.152961	2.983766	11.49110	0.305740
Skewness	1.148355	1.589993	-1.273273	0.843514	-0.306829
Kurtosis	4.332468	5.271493	5.745040	2.663763	2.897002
Jarque-Bera	48.47116	104.9949	96.38846	20.34392	2.661891
Probability	0.000000	0.000000	0.000000	0.000038	0.264227
Sum	552.5189	1902.041	1741.645	2661.620	581.5541
Sum Sq. Dev.	51.87585	2828.521	1460.069	21655.44	15.33018
Observations	165	165	165	165	165
Cross sections	33	33	33	33	33

Data processing .

4.2. Analysis Results and Discussion

a. Results of equation 1 : (EQIT) 1

Ln (EQIT)1 $= \beta o + \beta 1 \ln (PDRBK1) + \beta 2 (\ln PDRBK2)^2 + \beta 3 \ln (INDUS) + e$ .....(1)

EQIT1 (FE) = -2.516369 + 3.137892 PDRBK1 – 0.406950 PDRBK2 + 0.013918 INDUS

EQIT1 (RE) = 0.377575 + 1.625925 PDRBK1 – 0.602311 PDRBK2 + 0.057356 INDUS

b. Results of equation 2 : (EQIT)2

Ln (EQIT)2 $= \beta o + \beta 1 \ln (PDRBK1) + \beta 2 (\ln PDRBK2)^2 + \beta 3 \ln (SHRNAT) + e$ ..... (2)

EQIT1 (FE) = -1.982809 + 2.914139 PDRBK1 – 0.371485 PDRBK2 + 0.002975 SHRNAT

EQIT1 (RE) = 0.098343 + 1.794544 PDRBK1 – 0.225824 PDRBK2 + 0.001914 SHRNAT

Tabel 3. Result of Estimated Equation EQIT1 and EQIT2

Equation : EQIT1					**Equation : EQIT2**				
Variabel	FE	Prob	RE	Prob	Variabel	FE	Prob	RE	Prob
Constanta	-2.5164	0.1019	0.3776	0.7069	Constanta	-1.9828	0.1879	0.0983	0.9245
PDRBK1	3.1379	0.0009***	1.6259	0.0049** *	PDRBK1	2.9141	0.0018***	1.7945	0.0027***
PDRBK2	-0.4070	0.0043***	-0.6023	0.0095***	PDRBK2	-0.3715	0.0085***	-0.2258	0.0069***
INDUS	0.0139	0.1297	0.05736	0.1372	SHRNAT	0.0030	0.6505	0.0019	0.7614
R Square	0.9061	0.0881	R Square			0.9045		0.0812	
F test	35.55580	0000***	5.1824	0.0019***	F test	34.9226	0.0000***	4.7411	0.0033***
RFET	368.4772	0.0000***			RFET	384.8861	0.0000***		
HSMT			12.7543	0.0052***	HSMT			7.7434	0.0516

Note :

FE : Fixed Effect

RE : Random Effect.

Prob : Probabilitas nilai p

RFET : Redundant Fixed Effects Tests

HSMT : Hausman Test

*** : Signifikan 1%

To obtain the recommended EQIT 1 model, a Redundant Fixed Effects Test was performed with a Chi-square probability (0,000) less than 1% or significant and a Hausman Test with a Chi-square probability value (0.0052) less than 1% or significant . Thus, the recommended model is the Fixed Effect for the EQIT1 equation, Widarjono [14], Juanda and Junaidi [15].

To obtain the recommended EQIT 2 model, a Redundant Fixed Effects Test was performed with a Chi-square probability (0,000) less than 1% or significant and Hausman Test with a Chi-square probability value (0.0516) of more than 5% or not significant. Thus, the recommended models are Random Effect, Widarjono [14], Juanda and Junaidi [15].

Based on the RFE and Hausman test, the estimated EQIT1 equation uses the Fixed Effect (FE) method and the estimated EQIT2 equation uses the Random Effect (RE) method. To obtain an inverse U-relationship between economic growth and environmental degradation or the Environmental Kuznet Curve (EKC) hypothesis, then, in the EQIT1 equation, the coefficient value $\beta 1 > 0$, or equal to 3.137892 and value $\beta 2 < 0$ or equal to - 0.406950 and both are significant at the 1% level. Whereas in the EQIT2 equation, coeficien v $\beta 1 > 0$, or 1.794544 and the value $\beta 2 < 0$, or equal to - 0.225824 both are significant level of 1%.

Thus, the relationship between economic growth and degradation (deterioration in environmental quality) in Indonesia in the U-shaped form actually occurs or accepts the EKC hypothesis.The results of this study once answered Panayotou's [9] question about the existence of U-shaped inverse relationship patterns between economic growth and environmental degradation. This means that between economic growth and environmental degradation in Indonesia, the initial positive up to a certain point (peak), then

continued with the decline in degradation in line with the increase in income. In other words, the EKC hypothesis does exist and actually occurs in Indonesia in the period 2011-2015.

The positive relationship between economic growth and environmental degradation in the initial stages is consistent with the explanation of the World Bank [7] that developing country output increased 4-5 times and Indonesia itself has experienced relatively high growth of 5.35% with low environmental quality due to increased sectors industry, especially based on non-renewable natural resources, but with increasing world attention including Indonesia on the environment, efforts to improve the environment continue to be carried out with various policies including the national development plan (RPJMN)

Some previous studies that support the inverse U hypothesis (EKC) significantly such as: Shaw et al. [13] for SO2 pollutants and Deposite Particles, Kahutu [16], Andreoni and Levinson [18], Wu [11] for WE (Water Examination) pollutants

Industry sector GRDP coefficient (INDUS) is positive (0.013918) and not significant (p = 0.1297> 5%), meaning that an increase in industrial sector GRDP will increase environmental degradation with low probability, this positive sign supports Hakimi and Hamdi's research [19] for Co2 pollutants. The increased production of the industrial sector is inseparable from the decline in environmental quality, especially in industries on the islands of Sumatra and Kalimantan which are based on non-renewable natural resources, such as oil and gas, but industries with FDI investment generally have relatively high attention and environmental standards for maintain the reputation and continuity of the industry so that the degradation that occurs is relatively controlled.

The natural resource revenue-sharing coefficient (SHRNAT) is positive (0.001914) and not significant (p = 0.7614> 5%), meaning that an increase in the transfer of funds sharing natural resources to the producing area actually increases degradation even though with a low probability. This means that even though the government imposes a tax as compensation for the use of natural resources but that is relatively small for investment in environmental improvement and used to build basic infrastructure.

The SHRNAT coefficient results in the study do not support the research ,Asici [1] Institutional negative and significant impact on environmental pressures, but support Taguchi's study [20] for Asian countries, including Japan, becouse internalizing cost of environmental are not proposional.

5. Conclusions

Based on the analysis and discussion, several conclusions are formulated: First; The relationship of economic growth and environmental degradation in Indonesia is inverted U or supports the existence of the Environmental Kuznrt Curve (EKC) Hypothesis. Second, an increase in the GRDP of the INDUSTRY sector will increase environmental degradation, because Indonesia has implemented a growth strategy with the driving force of the industrial sector, but because industries with FDI capital have high environmental standards, degradation does not occur significantly. Third; Increased transfer of natural resource revenue sharing funds (SHRNAT) to producing regions will add to environmental degradation, because the value is relatively small and not all of the revenue sharing funds for investment in environmental improvement. the growth strategy with the industrial sector motor will increase degradation in the beginning of development and will decrease along with the increase in income while the institutional factor (government policy) has not yet had a real impact on environmental improvement.

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