

Environmental Spending, Human Development, Regional Economy, and Environmental Quality: Evidence from the Provincial Regions in Indonesia

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Abstract

Indonesia has a great concern in maintaining environmental quality due to the high vulnerability from environmental degradation. Our paper investigates the determinants of environmental quality in Indonesian provincial regions. We collect secondary data from the Central Statistics Bureau that generates 204 observations from 34 Indonesian provincial regions during 2015-2020 research period analyzed with panel data regression. Our analysis find that the environmental quality in Indonesia during 2015-2020 is good enough. Despite having fluctuation trend during the research period, the environmental quality score in 2020 finally reaches the “good” category. Further, the empirical findings from panel data regression analysis demonstrate that better environmental quality is influenced by greater government environmental spending and higher regional human development quality. On the other hand, economic activity has negative effect on environmental quality while industrial activity and economic growth have no significant effect. The study provides implications for the policymakers in Indonesia specifically in environmental protection efforts. The government should have proper allocation for environmental spending in accordance with the environmental threat and circumstances faced by the regions. Meanwhile, the people should also participate in environmental protection that requires support and education from the related parties such as government agencies and NGOs. In addition, the effort to balance the economic activities and environmental protection is also essential especially to minimize the environmental threats that result from economic activities.

Keywords: *Indonesia, environmental quality, environmental spending, regional economy, human development*

Introduction

Indonesia has been regarded as one of the countries that suffer from the environmental threat. Therefore, Indonesia has put the environmental protection as one of the main focus in the national development plan. The country is committed to the realization of continuous improvement of environmental quality to support the sustainable development goals. However, the fact shows that Indonesia suffers from environmental issues indicated by several statistics. Indonesia is ranked 97th in the sustainable development report 2020 with the score of 66.3 (Sachs, et al., 2021). The data from Indonesia Central Statistics Bureau (BPS) also confirm that the environmental quality in Indonesia is still at medium level (BPS, 2021). Also, based on the data from IQAir report (2021), Indonesia is included in the top 10 of the countries with the worst air quality in the world. As compared to the other countries in the ASEAN region, Indonesia is the worst.

Indonesia has unique characteristics as the largest archipelago country in the world with considerably large population (Saragih, 2022). Indonesia has a great amount of natural resources and rich natural biodiversity that are subject to environmental exploitation (Kartiasih, 2020). Therefore, Indonesia faces significant environmental degradation threat. The environmental degradation issue in Indonesia appears in the form of pollution (Surya, et al., 2020), deforestation (Austin, et al., 2019), and waste management (Meidiana & Gamse, 2010) that threaten the environmental quality. Indeed, the data from the Central Statistics Bureau of Indonesia (BPS) also shows that the environmental quality in Indonesia is still within medium category for the past several years. Therefore, the environmental quality issues should be mitigated to preserve the environment to support the sustainable development goals so that the future generations can still have proper quality of living with a good and healthy environment.

The issues discussed above underlies the need for further studies that provide an insight for dealing with the environmental management in Indonesia supported by empirical evidences. There are several studies in the literature that examine environmental quality issues in Indonesia. However, there is still a gap in the literature. Firstly, there is limited studies in the literature that explores the environmental quality in the regional governments in Indonesia as the country has 34 provinces that have regional dynamics, characteristics, and experience different circumstances. Further, there are also several factors that remain less explored by previous studies such as the government's effort in managing the environment, people's characteristics, and regional economy.

The effort undertaken by the government in order to realize good life for the people is very crucial (Saragih, 2022), including the environmental quality. Based on the applicable Laws, the government is mandated to preserve the environment, both at the central government level through the ministry and the regional government level through the regional agency. However, this factor is not vastly explored in the previous studies in Indonesian context, specifically at the regional level in all Indonesian provinces. The government runs various programs for environmental protection and quality improvement using public money from the state budget (Azwardi, 2022). However, the effort of the government is often criticized following the low allocation of budget for important activities in environmental protection (Damanhuri, et al., 2020). Therefore, the government effort in environmental protection is important to be investigated further to see how it has contributed to environmental quality. It is also essential to ensure that public money is used properly by the government to accomplish the realization of good environmental quality for the people.

The characteristics of the people are also potential factors that may matter for environmental quality that are also less explored until the regional level in the whole Indonesian regions. The people are directly related to the activities that affect the environment quality (Parker, et al., 2018). Thus, the characteristics of the people must have supporting characteristics to help realize good environmental quality. Unfortunately, the people in Indonesia are considered to have bad behavior related to the environment (Dhahir, 2020). Therefore, the factor from the people becomes very interesting to investigate in relation with environmental quality, specifically in regional level in all Indonesian provinces.

In addition, Indonesia is also a country with a considerably high economic activities. It is generally accepted that economic activities have contributed to the development of a country. However, economic activities have a threatening effect on the environment if they are not counterbalanced with good environmental protection efforts (Farabi & Abdullah, 2020). In regard with this, Indonesia is fully committed to support sustainable development so that the economic activities is expected to run well without having significant harm to the environment. Therefore, economic factors are also interesting to be investigated in a deeper research that reaches regional level in the whole Indonesian regions.

The study contributes to the literature by extending the examination of environmental quality determinants in Indonesia up to the regional level. The study also brings more insights

related to the factors that are less explored in the previous Indonesian studies in environmental quality issues with empirical analysis. The factors consist of the regional government environmental spending that represents environmental protection efforts, human development that reflects people's characteristic, and several factors from the regional economy such as economic activity, growth, and industrial intensity. The remainder of the paper is presented as follows: review of literature, research method, results and discussion, and conclusion.

Review of Literature

Environmental Quality in Indonesia

The environment is one of the most important aspect for human well-being. Therefore, the environment has a great significance in the world and has establish itself as one of the main pillars of sustainability to achieve global sustainable development concepts of SDGs. There are four goals in the environmental pillars that are crucially important for other goals' realization under the economic and social pillars. In this regards, the realization of other goals cannot be achieved without good environmental quality. The awareness of people over environmental quality actually arises since they start to feel the effect of environmental degradation as a result of exploitation for economic purposes. Many issues start to change the quality of life such as climate change, global warming, biodiversity and natural resources degradation. This happens to a lot of countries, including Indonesia.

Indonesia is one of the richest country in the world in terms of natural resources thanks to being the largest archipelago country in the world. Indonesia is gifted with a lot of advantages in environmental point of view such as having one of the largest forest areas, vast biodeversities, and other various natural resources that have a great economic potential. Like many other countries, Indonesia also experiences significant issues related to environmental quality due to excessive economic activities and large population. Indonesia appears in the form of pollution, deforestation, and waste management. As many countries in the world have agenda to improve envrionmental quality (Lohnert & Geist, 2018), the government of Indonesia also concerns on the environmental quality as one of the top priorities for national development. This opens the opportunity for studies in the field of environmental quality in Indonesian context for the sake of supporting the development.

Research Framework

This research aims to analyze the determinants of environmental quality in Indonesia under the factors of regional government environmental spending, human development, and regional economy factors by providing empirical evidence. The research framework is presented in the following figure:

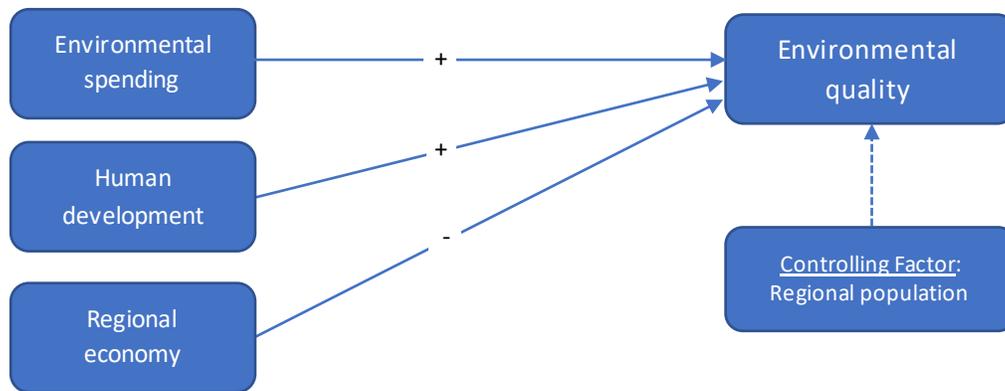


Figure 1. Research Framework

Hypothesis Development

Environmental spending and environmental quality

The government is undeniably inseparable party that is responsible for the circumstances environmental quality (Azwardi, et al., 2022). The government is a manifestation of a body entrusted by the public in public affairs (Amidjaya & Widagdo, 2019), including in dealing with environmental aspects. In Indonesia, the government from the central to regional level are mandated to implement environmental function through specific programs. Since the decentralization, the regional government holds significant role for regional development, including the environmental context mandated by the Law Number 23 of 2014 concerning regional government. The regional government manages the spending budget and set specific allocation for implementing environmental function (Azwardi, et al., 2022). The government spending can be seen as the government effort in performing its function (Saragih, 2022). Thus, the environmental spending manifests the effort of regional government to preserve the environment. The larger allocation of spending for environmental function is expected to support the environmental protection efforts by providing better funding for the implementation of environmental programs.

The larger proportion of environmental spending has also been evidenced to support national development (Krajewski, 2016). Based on the explanation, we formulate the following hypothesis:
H1. Government environmental spending positively affects environmental quality

Human development and environmental quality

Human being also inseparable from the environment. The people who lived in a certain area interact directly with the environment. Thus, the characteristics of the people is an important factor for environmental quality. Good environmental quality can be accomplished together with people with good quality (Dhahir, 2020). People with better environmental awareness will have better behavior towards the environment and thus support the sustainability of the environment for today and future generations (Brotosusilo & Handayani, 2020). On the other hand, people with lower environmental awareness do not understand the importance of preserving the environment. Their behavior will be more likely to bring environmental damage and degradation (Zulham, et al., 2021) and thus threatens the sustainability of the environment. The people characteristic is represented by the human development quality that is measured comprehensively considering the economic, education, social, and other factors. Higher human development is expected to indicate good people with good behavior towards the environment. Therefore, human development is expected to have positive effect on environmental quality. In addition, previous study by Oktaviliana, et al. (2016) also demonstrates positive association between human development quality and environmental quality. Based on the explanation, we propose the following hypothesis:
H2. Human development positively affects environmental quality

Regional economy and environmental quality

The economy is also inseparable from the environment. Economy basically becomes the foundation of people's living to survive. Economy also gives the biggest support for people's welfare (Oktaviliana, et al., 2016). However, economic factors have been regarded to have negative consequences for environmental quality (Azwardi, et al. 2022), especially when the environmental capacity aspects are ignored to blindly boost the economic activities to gain profit. High level of economic activities will create larger amount of waste and emission that damage the environment. Subsequently, the growth of economy will also multiply the amount of waste and emission generated from business operation (Fitriyah, 2019). Higher economic growth should take

the environmental capacity into account, not just merely exploit the environment. To be more specific, environmental threat in the form of massive waste is more likely to happen from intensive industrial activities. Therefore, the intensity of industrial activities may bring higher environmental risks that results in lower environmental quality (Apresian, 2016). The arguments above are supported by previous studies. Farabi & Abdullah (2020) find that economic activity has significant impact on environmental degradation. Based on the explanation above, the hypotheses regarding the regional economy factors are formulated as follows.

H3a. Economic activity negatively affects environmental quality

H3b. Economic growth negatively affects environmental quality

H3c. Industrial activity negatively affects environmental quality

Methodology

Research Scope and Data

The scope of this study is Indonesian provincial regions. The population of our study is all Indonesian provinces with total of 34 provinces during 2015-2020 period. We employ all of the population as the research objects with total number of 2014 observations, expecting to cover all of the Indonesian regions. As for the research data, we use secondary data obtained from the BPS publication in the BPS website. Due to having observations from several provinces and six years of period, the nature of the data in this study is a balanced panel data.

Variables and Measurement

The dependent variable of this study is environmental quality. This variable is proxied by environmental quality index from BPS publication that assess the quality of the environment from many aspects from biotic and abiotic dimensions. The first independent variable is government environmental spending that is measured with the proportion of province government spending allocated for environmental functions. The second independent variable is regional human development measured by the regional human development index that represent the quality of human development from economic, education, social, and other aspects. Finally, the last independent variables are regional economy factors consisting of economic activity, economic growth, and industrial intensity. The student also use a control variable that is regional population.

All of the data are obtained from BPS publication available in the website. The details of variable measurement are presented as follows:

Table 1. Variable Measurement Summary

Variable	Notation	Measurement
<i>Dependent</i>		
Environmental quality	ENV_Q	Environmental quality index published by BPS
<i>Independent</i>		
Environmental spending	ENV_SPEND	Proportion of province government spending allocated for environmental functions
Human development	HDI	Province human development index
Regional economy: Economic activity	GDRP	Natural logarithm of Gross Domestic Regional Product (GDRP)
Economic growth	ECO_GROWTH	The percentage of GDRP growth compared to previous year
Industrial intensity	INDUSTRY	Natural logarithm of total labour in industry sector in a province
<i>Control</i>		
Regional population	REG_POP	Natural logarithm of total population in a province

Data Analysis

Our analysis is started with descriptive statistics analysis to help understand the research data better for all variables. We also analyze the distribution of digital banking offered by Indonesian commercial banks to illustrates the mapping of digital products offered. Then, we conduct correlation analysis to understand the correlation and relationship tendency among our research variables. Finally, the main analysis of this study uses multiple regression analysis to test the hypothesis. The analysis with multiple regression analysis is performed with the following regression models:

$$ENV_Q_{it} = a + \beta_1 ENV_SPEND_{it} + \beta_2 HDI_{it} + \beta_3 GDRP_{it} + \beta_4 ECO_GROWTH_{it} + \beta_5 INDUSTRY_{it} + \beta_6 REG_POP_{it} + e \dots\dots\dots (1)$$

Information:

- ENV_Q : Environmental quality
- ENV_SPEND : Environmental spending
- HDI : Human development
- GDRP : Economic activity
- ECO_GROWTH : Economic growth
- INDUSTRY : Industrial intensity
- REG_POP : Regional population

Results and Discussion

Summary of Research Data

Summarizing the research data through descriptive statistics is important to obtain important points such as the distribution, mean, standard deviation, minimum and maximum value of research variables as well as the trend of data development. The result of descriptive statistics analysis is presented as follows:

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
IKL	204	67.663	9.323	35.78	85.69
ENV EXP PROP	204	0.814	1.201	0.03	0.492
LN PDRB BERLAKU	204	32.943	1.15	30.913	35.574
ECO GROWTH	204	4.231	3.823	-15.74	21.76
HDI	204	69.993	4.093	57.25	80.76
IDUSTRY LABOR	204	502738.07	1001959.1	10357	4349675
LN POP	204	15.269	1.016	13.376	17.719

Further, we also provided the correlation analysis of our variables using pearson correlation. The result is presented in Table 3 as follows:

Table 3. Variables' Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) IKL	1.000						
(2) ENV_SPEND	0.275	1.000					
(3) GDRP	-0.596	0.076	1.000				
(4) ECO_GROWTH	-0.064	-0.099	-0.129	1.000			
(5) HDI	0.530	0.353	0.459	-0.143	1.000		
(6) IDUSTRY_LABOR	-0.436	-0.052	0.667	-0.030	0.147	1.000	
(7) REG_POP	-0.597	-0.037	0.875	-0.057	0.255	0.783	1.000

Hypothesis Testing: Panel Data Regression Analysis

We use panel data regression analysis to test our research hypothesis. The best estimation is using fixed effect model. The analysis results, as reported in Table 4, demonstrate that most of the independent variables have significant effect on government environmental spending, human development quality, and regional economy factor that are economic activity and economic growth.

Table 4. Hypothesis Testing Result with Panel Data Regression Analysis

Dependent: ENV_Q	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ENV_SPEND	1.141	0.386	2.96	0.004	0.379	1.902	***
HDI	2.703	1.344	2.01	0.046	0.049	5.358	**
GDRP	-15.451	7.959	-1.94	0.054	-31.167	0.265	*
ECO_GROWTH	-0.179	0.106	-1.69	0.092	-0.388	0.03	*
INDUSTRY	0.001	0.001	-0.44	0.664	0.001	0.001	
REG_POP	-10.815	34.455	-0.31	0.754	-78.848	57.219	
Constant	553.498	487.066	1.14	0.257	-408.231	1515.227	
Mean dependent var		67.663	SD dependent var			9.323	
R-squared		0.135	Number of obs			204	
F-test		4.254	Prob > F			0.000	
Akaike crit. (AIC)		1141.005	Bayesian crit. (BIC)			1164.232	

*** $p < 0.01$, ** $p < .005$, * $p < 0.1$

Firstly, government environmental spending has positive effect on environmental quality that accepts hypothesis 1. The larger the allocation of government spending budget allocated to environmental function, the better the environmental quality in a province (Azwardi, et al., 2022). Based on this finding, it can be concluded that the regional government hold significant role in preserving the quality of the environment in their respective region. Indeed, the law in Indonesia also mandated the environmental function to regional government so that the contribution is indispensable. The environmental function mandated to the regional government is important to protect the environment from environmental threat so that significant environmental damages can be prevented. In practice, larger allocation of spending will support and facilitate various activities conducted by the regional government in implementing the government function (Saragih, 2022), including the environmental function. Besides the spending, regional government should also implement good environmental protection programs that are relevant to the circumstances in the respective region. Also, local government should have proper regulations concerning the environmental matters at regional level to achieve healthy environment development (Absori, et al., 2020). Therefore, the related parties such as the people in general, business companies, and other related parties will not do any damage to the environment or even contribute significantly to environmental protection together with the government.

Human development also positively affects on environmental quality that is in line with hypothesis 2. Regions with better human development quality tend to have better environmental quality in Indonesia. The finding posits that the people as the ones that interact directly with the environment must participate in the environmental protection. This result further bring implication

that the government and NGOs must continuously attempt to build good understanding, intention, and initiatives in preserving the environment (Sumargo & Haida, 2020). It has a great urgency and must be one of the priorities because in fact the environmental awareness of Indonesian people still becomes an important issue that needs to be improved. There are still a lot of irresponsible acts committed by the people that damage the environment (Dhahir, 2020), such as massive littering, poor waste management, and the use of less environmentally friendly products. With good people attitude towards the environment, the government and the people can synergically realize sustainability (Brotosusilo & Handayani, 2020).

Regional economy factors specifically the economic activity and growth have negative effect on environmental quality that is in line with hypothesis 3a and 3b. Regions with higher level of economic activity tend to have lower environmental quality, confirming Farabi & Abdullah (2020). This proves that the economic activity has not been counterbalanced with the environmental protection efforts by the responsible parties such as the companies, the people, as well as the government. The negative effect of economic growth also indicates that the economic growth is not yet followed by the growth of environmental protection efforts by these related parties (Fitriah, 2019). Indeed, a large number of companies that intensify regional economic activities in Indonesia still do not implement proper operations in which the operation still bring damage to the environment. The people that runs the economic activities are also still relatively less careful about the environmental damage that results from their activities. In addition, the government may also have relatively weak law enforcement in implementing the environmental regulations.

Meanwhile, the industrial intensity as one of the regional economy factor demonstrate insignificant effect on environmental quality in which the result rejects hypothesis 3c. This insignificant result may be due to the differering characteristics of industrial profile that applies in specific regions. Further, the study is equipped with additional test in order to examine the effect of the independent variables on air quality with the following results:

Table 5. Hypothesis Testing Result with Panel Data Regression Analysis

Dependent: AIR Q	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ENV_SPEND	0.636	0.357	1.78	0.077	-0.069	1.341	*
HDI	0.286	1.227	0.23	0.816	-2.136	2.708	
GDRP	-1.718	7.39	-0.23	0.081	-16.31	12.873	*

Dependent: AIR Q	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ECO_GROWTH	0.146	0.099	1.47	0.143	-0.05	.341	
INDUSTRY	-1.424	2.172	-0.66	0.513	-5.713	2.864	
REG_POP	71.26	31.345	2.27	0.024	9.366	133.155	**
Constant	-958.35	449.125	-2.13	0.034	-1845.204	-71.496	**
Mean dependent var		86.602	SD dependent var			7.187	
R-squared		0.158	Number of obs			204	
F-test		4.361	Prob > F			0.000	
Akaike crit. (AIC)		1110.600	Bayesian crit. (BIC)			1137.145	

*** $p < 0.01$, ** $p < 0.005$, * $p < 0.1$

The result of the additional test revealed that among the independent variables in this study, only the government environmental spending that has significant positive effect on environmental quality at regional level. This positive effect emphasize the importance of government efforts at regional level in preserving the environment. Meanwhile, the economic activity also exhibit negative effect on air quality in Indonesian provinces. The finding also strengthen the fact that the economic activities in Indonesia is not yet followed with proper environmental protection efforts to mitigate the risk and threat of environmental damage that result from economic activities. In this additional test, the other independent variables exhibit insignificant effect.

Conclusion

In conclusion, the study reveals that the environmental quality in Indonesia during 2015-2020 is good enough with slight fluctuation in terms of the trend. Panel data regression analysis demonstrate that greater government environmental spending and higher regional human development support the better environmental quality. Meanwhile, economic activity and growth exhibit negative effect on environmental quality. The study provides implications for the related parties in Indonesia specifically in environmental protection efforts. The government should have proper allocation for environmental spending in accordance with the environmental threat and circumstances faced by the regions. The people should also participate in environmental protection that requires support and education from government agencies and NGOs. Finally, the level of economic activity must be counterbalanced with the environmental protection that is important to mitigate the environmental damages that result from economic activities.

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