

Availability of Electricity, Clean Water and Sanitation towards Economic Growth in Indonesia with 500 Regencies and Cities

John Tampil Purba

Management Department of Faculty Economics and Business
Universitas Pelita Harapan
Tangerang-15811, Indonesia
e-mail: john.purba@uph.edu

Sidik Budiono

Management Department of Faculty Economics and Business
Universitas Pelita Harapan
Tangerang-15811, Indonesia
e-mail: sidik.budiono@uph.edu

Abstract

The need for clean water and electricity is an indicator of the quality of human life in terms of human health and well-being. That is because water and electricity are a combination of the most important needs of humanity. Therefore, the purpose of this study is to determine the effect of clean water, sanitation and electrical energy on economic growth in the Indonesian Territory. This study uses an econometric model with secondary data cross section from 500 districts and cities in Indonesia. The analytical method in this research is Multiple Regression: Ordinary Least Square (OLS). The results of the analysis of this study that significantly together household access to electricity with a coefficient of 0.027, access to clean household water with a coefficient of 0.009 and household access to sanitation water with a coefficient of 0.0089 affect economic growth in each district and city. This study provides advice on policies for clean water management, sanitation and electricity sufficiency to pursue economic growth for the new government in Indonesia.

Keywords: *clean water, sanitation, electricity, GDRP*

Introduction

Achieving the basic needs of the community is one of the strategic ways to improve the community's economy (Tan, Purba, & Widjaya, 2019). The basic needs include, among others: electricity, clean water, and others. Because clean water and electricity are meant to be the availability of primary needs for humans that are sufficient for all kinds of activities (Budiono and Purba, 2019, Purba and Budiono, 2019). Therefore, good management of clean water distribution is needed so that there is a match between the supply and the needs of the community (Pleik, 2000). In contrast to water, where electricity can be produced with hydroelectric power plants, geothermal, and sunlight, wind, steam, coal with the help of technology transformation services to be more effective and efficient (Purba and Panday, 2015, Purba, 2014). It has been proved that electricity has a very broad application as energy in a role for the economy and social development in any country over the world (Niu et al., 2013). Due to the fact that electricity and water are the main elements for the community, the central government and regional governments need to collaborate to create good and measurable services so that the availability of these two elements can be felt continuously by the people in the territory of the Republic of Indonesia (Purba, 2015,

Butarbutar & Purba, 2016). There are 5 main reasons that electricity has a basis for improving the quality of life and supporting social development (Niu et al., 2013). The use of electricity applied to the refrigerator can protect food and medicines for a long time remain in good health. Second, electric lighting has increased the level of adult literacy. The application of computers, TV and internet has been proven to improve people's ability to provide information & knowledge. As such, modern society is very dependent on communication technology and information networks. Third, electricity can be applied in various uses of household activities. The use of electricity is very environmentally friendly to obtain heat, cold room conditions, air circulation, sanitation, entertainment and engineering equipment. With this reason, electricity has been proven to improve the quality of life. Fourth, electrical energy can replace biomass and firewood to reduce air pollution in the home and improve environmental quality. Fifth, the use of electricity can help people to do heavy work and save a lot of time. Especially for villagers, electricity can provide employment opportunities and potential for progress. Therefore, electricity consumption improves the quality of human life, so does the country of Indonesia has many islands and residents spread over these islands, especially in remote areas and limited infrastructure (Budiono, 2009). Therefore, most people who live in remote areas in Indonesia still use fuel wood energy for domestic use.

Electricity consumption is an indicator that reflects the level of social development in a country (Niu et al., 2013). In the process of modernization, it is necessary to produce adequate amounts of electric energy to advance sustainable development. As is well known, as a kind of secondary energy, electric energy is transformed from primary energy such as hydro energy, fossil fuel and coal. The process of generating electricity, from resources development to end use, needs a series of links, such as production and transmission. In addition, supporting engineering facilities and a service system are required to guarantee electricity supplied sustainably and safely, especially to construct a perfect grid system.

As we all know that water is a basic need for mankind, the characteristics in its management and use can be said to be unique for each region. Implicitly in the phrase basic needs are the minimum requirements for certain human and ecological functions and the allocation of sufficient resources to meet those needs (Gleick, 1998). By adopting biological science, the basic human needs for clean water are as follows: a standard of 5 liters of clean water per person per day for drinking and 20 liters per person per day for sanitation and hygiene, so the basic requirement for clean water is 25 liters per day per person to meet basic needs with an additional 15 liters for bathing, washing, toilet and 10 liters per day for cooking, so the need for clean water per individual per day is estimated at 50 liters (Gleick, 1998; Grey & Sadoff, 2007). Overall, humans need fresh water for 3 broad uses, domestic use including for drinking, washing, preparing food, and hygiene, also the use of agriculture to produce food as well and the needs of running industrial business and commercial activities (Chenoweth, 2008). The main principles became generally clear on the new approach. The basic needs for drinking water and sanitation services must be met (Pleik, 2000). Basic ecosystem needs for water must be met so that the presence of great leaders is needed both structurally and non-government leaders to achieve sustainability according to their respective priorities (Panday & Purba, 2015, Butarbutar & Purba, 2016; Nadeak & Purba, 2014). Therefore, economic principles must be applied more intensively and reliably for water use and its management. The new water supply system must be maximally flexible and efficient; NGOs, individuals, independent research organizations, and other users must be included in water management decisions.

Water cycle systems in urban areas that well managed in an integrated manner have contributed to the improvement of public services such; electricity, telecommunication, health as well as cleanliness will give better consequences to public and environment around (Purba, 2015, Purba & Panday, 2015). The integrated system improves water quality for drinking water by allocating high quality water dam to fundamentally the drinking water demand system, while the low quality river water allocations for industrial use demand system. The results of Lim, Suh, Kim, & Park's (2010) research that water network restructuring has the potential to reduce the average pollution in drinking water use, thus improving human and hygienic health and from decreasing the overall volume of water sources and electricity

consumption through water infrastructure (Lim et al., 2010). Based on the description above, there is an allegation that the existence of electricity and clean water has an influence on the progress of the economy in country wide area of Indonesia. Thus this paper wants to find out how far the availability of electricity and clean water affects economic growth in districts across Indonesia.

Methodological Approach

This study uses aggregate data that includes cross sections in 500 residences & municipalities in 2016 (Purba, Rajagukguk, & Meranga, 2016). The purpose of this study is to determine the extent to which economic growth is influenced by the presence of electricity, and clean water, so that the dependent variable is the growth of Gross Domestic Regional Product (Ln_GDRP_N) without oil.

Furthermore, the presence of electricity and water is described in 3 independent variables household access capability, i.e Household electricity access (HH_Elt), House hold water access (HH_W), and Household sanitation access (HH_S).

The basic framework for analyzing the data is a regression model of the formula (Greene, 2018):

$$Ln_GDRP_N_i = \alpha_0 + \alpha_1 HH_Elt + \alpha_2 HH_W + \alpha_3 HH_S + \epsilon_i \quad (1)$$

The use of GDRP excluding oil is intended to show that the economic activities of individuals in all regions of Indonesia are more reflected in GDRP excluding oil compared to petroleum mines. The following is an explanation of the variables used in the analysis of this study.

Table 1. Variables Description

Variable	Indicator	Description	Label
Gross Domestic Regional Product without Oil	Log natural GDRP excluding Oil	GDRP growth without oil in each district and city.	Ln_GDRP_N
Electricity	Household Electricity Access	Energy electricity that can be used by the public (public) in each district and city.	HH_Elt
Waters	House Hold Water Access	Clean water that can be used by the public/ households for drinking water, bathing, and cleaning in each district and city.	HH_W
	Household Sanitation Access	Clean water that can be used by the public/ households for sanitation and the environment (ecosystem) in each district and city.	HH_S

The partial and joint analysis of this model is as follows:

The effect hypothesis of household electricity access on economic growth is explained as follows:

H_0 : household electricity access does not affect economic growth

H_1 : household electricity access affects economic growth

The effect hypothesis of household water access on economic growth is explained as follows:

H_0 : household water access does not affect economic growth

H_1 : household water access affects economic growth

The effect hypothesis of household sanitation access on economic growth is explained as follows:

H_0 : household sanitation access does not affect economic growth

H_1 : household sanitation access affects economic growth

Data analysis was performed by following the Ordinary Least Square econometric model framework. The data collected for this study were processed by the STATA Application Release 15 version.

Conducting Research and Results

Application of Regression with Ordinary Least Square (OLS) method is as follow,

Table 1. Results of Regression Analysis

Ordinary Least Squared Model				
Ln_GDRP_N		Number of observation = 500		
		F (3,496) = 70.40		
		Prob. > F = 0.0000		
		R-squared = 0.2986		
		Adj R-squared = 0.2944		
		Root MSE = 1.2013		
Variables	Coefficient	Standard Error	t-test	P> t
HH_Elt	0.0269824	0.003675	7.34	0.000
HH_W	0.0089318	0.003509	2.55	0.000
HH_S	0.0088735	0.003779	2.35	0.019
Constant	11.21009	0.240741	46.56	0.000

Source: data processing

From the results equation it is clear that the existence of electricity and clean water is important for economic growth. In summary, the results of the regression analysis are as follows:

$$Ln_GDRP_N_i = 11.21 + 0.027 HH_Elt + 0.009 HH_W + 0.009 HH_S$$

Results of the analysis of the F test of 70.40 and probability > F of 0.0000 show that all independent variables of household electricity access, household water access, and household sanitation access collectively significantly influence the independent variables of economic growth.

From the results of this regression, the household electricity access variable significantly affects economic growth. A yearly increase in household electricity access will increase economic growth by 0.027%. From the results of this regression, the HH_W variable significantly affects economic growth. Thus every percentage increase in household water access will increase economic growth by 0.009%. Likewise, the partial effect on household sanitation access is significant. Every increase of 1 household can access sanitation, resulting in an increase in economic growth of 0.009% in every district & city of Indonesia contained in this data.

From the results of this regression, the coefficient of electricity access parameters by households is the largest value compared to the parameters of access to clean water and sanitation. It can be said that electricity is more needed to improve the economy than water. The supply and distribution of electricity has reached every district and city in Indonesia. Because of the nature of electrical energy itself, electrical energy is easier and cheaper to distribute than water distribution. The possibility is caused by electricity distributed by wire / metal media which is lightweight and inexpensive compared to water with large and expensive pipes. Electricity is distributed without knowing the height between the power stations (power stations) to the destination, while the water distribution must consider the height between the source and the destination. In general there is no difference in the effect of access to clean water with access to sanitation water. There is a temporary suspicion that the quality of clean water for drinks & daily needs is not different from sanitation water. The same coefficient shows that every household that can access clean water for drinks and daily needs can also access water for sanitation. With the provision of electricity and water is not only to meet basic needs, but also to overcome the problem of population density, and other social problems. Government policies in providing electricity and water infrastructure to support economic activities and open new jobs (Budiono, 2001). In the end, these policies not only accelerate economic growth but also address disparities between regions inside the country.

Conclusion

1. Based on the findings and analysis above it is proven that an increase in household electricity access will increase economic growth by 0.027%.
2. Every increase of 1 household that has sanitation causes an increase in economic growth of 0.009% in every district & city of Indonesia.
3. The findings and analysis above prove that electrical energy is more needed to improve the economy than water.
4. In general there is no difference in the effect of access to clean water with access to sanitation water, meaning that the two elements are equally important.
5. It is proven that the provision of electricity and water infrastructure to support economic activities and open new jobs. Thus automatically the presence of these two elements influences economic growth.
6. The availability of electricity and water; not only to fulfill basic needs but also to overcome problems of population density, and other social problems.
7. Herewith, through this research, the suggestions and recommendation for central government as well local government to avail and to develop the new electricity especially the remote areas over the country. The sustainable and good management of those variables become the benefit of the people of this country that will improve the competitiveness of the national economy growth over other countries and will contribute the equitable development.

References

- Budiono, S. (2009). Investment and Economic Growth in Indonesia. *Journal Economics Studies*, 4 (Atma Jaya Yogyakarta University).
- Budiono, S. and Purba, J. T. (2019). Data Panel Model: Solution in Forecasting Investments through Energy Electricity and Government Policy in Indonesia. *Proceedings of the International Conference on Industrial Engineering and Operations Management Toronto, Canada, October 23-25, 2019*
- Butarbutar, F., & Purba, J. T. (2016). Towards educational great and strong leaders: an empirical investigation in indonesia, 1–12.
- Chenoweth, J. (2008). Minimum water requirement for social and economic development. *Desalination*, 229(1–3), 245–256. <https://doi.org/10.1016/j.desal.2007.09.011>
- Gleick, P. H. (1998). The Human Right to Water. *Water Policy*, 1(1998), 487–503.
- Greene, W. H. (2018). *Econometric Analysis* (8th ed.). New York: Pearson Education.
- Grey, D., & Sadoff, C. W. (2007). Sink or Swim? Water security for growth and development. *Water Policy*, 9(6), 545–571. <https://doi.org/10.2166/wp.2007.021>
- Lim, S., Suh, S., Kim, J., & Suck, H. (2010). Urban water infrastructure optimization to reduce environmental impacts and costs. *Journal of Environmental Management*, 91(3), 630–637. <https://doi.org/10.1016/j.jenvman.2009.09.026>
- Nadeak, B., & Purba, J. T. (2014). Applied Management Strategy on Human Capital in Higher Education for Faculty Development in the Dynamic Service Industry : A case study, (Scbtii).
- Niu, S., Jia, Y., Wang, W., He, R., Hu, L., & Liu, Y. (2013). Electricity consumption and human development level: A comparative analysis based on panel data for 50 countries. *International Journal of Electrical Power and Energy Systems*. <https://doi.org/10.1016/j.ijepes.2013.05.024>

- Panday, R., & Purba, J. T. (2015). Lecturers and students technology readiness in implementing services delivery of academic information system in higher education institution: A case study. In *Communications in Computer and Information Science* (Vol. 516, pp. 539–550).
https://doi.org/10.1007/978-3-662-46742-8_49
- Pleik, P. (2000). The changing water paradigm: a look at twenty-first century water resource development. *Water International*, 25(1), 127–138. <https://doi.org/10.1080/02508060008686804>
- Purba, J. T. and Budiono, S. (2019). Towards Educational Participation and Clean Water on Economic Growth: The Case of 500 Districts and Cities in Indonesia. Proceeding. Presented in International Conference on Global Innovation and Trend in Economy.
- Purba, J. T. (2015). J. T. Purba, “Strategic Innovation Through Technology Readiness and Acceptance in Implementing ICT for Corporate Sustainability,” in the 12th International Annual Symposium on Management, 2015.
- Purba, J. T. and Panday, R. (2015). Innovation Strategy Services Delivery: An Empirical Case Study of Academic Information Systems in Higher Education Institution. *Communications in Computer and Information Science* 516, 514-525
- Purba, J., Rajagukguk, W., & Meranga, I. (2016). Strategic Planning and Foresight on National Development Trough Education: Nusantara Nationwide Evidence.
- Tan, J. D., Purba, J. T., & Widjaya, A. E. (2019). Financial Technology as an Innovation Strategy for Digital Payment Services in the Millennial Generation, 292(Agc), 364–373.
<https://doi.org/10.2991/agc-18.2019.58>

Biographies

John Tampil Purba, obtained a degree Doctor (S3) majoring Management from De La Salle University Systems Manila, Philippines in 2002. Dr. Purba also has several certifications international competition in management information systems and technology, among others; MCP, MCSA, MCSE, MCSES, MCSAS, MCDL and MCT from Microsoft Technologies, USA and CSE from Cisco System USA. He has a number of managerial experiences in the Service Industries more than 25 years. He is currently a lecturer at the Faculty of Economics and Business Pelita Harapan University, Karawaci Banten, Indonesia.

Sidik Budiono is an Associate Professor in Economics at Department of Management Faculty of Economics and Business Universitas Pelita Harapan. Dr. Budiono graduated Master and Doctor in Economics in the year (2012) from Universitas Indonesia, Jakarta. He ever served as Vice Rector for Academics in Universitas Ottow Geissler, Papua (2013 - 2017). He interests in research around national, regional development and industrial economics.