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Econometric Model of Supply and Demand for Mining Construction Materials in the Jeneberang River, Gowa Regency, South Sulawesi

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***Abstract*— Gowa Regency is traversed by the Jeneberang River with the largest area of flow in Gowa Regency, which is also becoming an area of construction material mining which is conducted by a number of mining companies. Gowa Regency is bordered by Makassar City, Maros Regency, Sinjai Regency, and Takalar Regency so that many of infrastructure development is done, such as roads, buildings and bridge construction. The construction of this infrastructure requires the supply of construction materials, thus it is encouraging the construction material mining companies to increase the supply of construction materials, but there are several factors that can influence supply and demand, so based on that, this study aims to (1) analyze the factors that influence the supply and demand of construction materials, (2) identify models of supply and demand for construction materials. Data collection was carried out at the Central Bureau of Statistics of Gowa Regency, and the Department of Energy and Mineral Resources of South Sulawesi for a period of 19 years (2000-2018). The correlation of supply and demand for construction materials and the influencing factors is modeled using multiple regression methods. The results of this study indicate that the supply of construction materials has a weak relationship with the influencing factors. Meanwhile, the demand for construction materials types of sand and gravel has a strong relationship with the influencing factors, but the type of sand, river rock, red land, and crush stone has a weak relationship with influencing factors.**

Keywords*— *Material Construction, Jeneberang River, Suply-Demand,

I. INTRODUCTION

The Jeneberang River is the main river that flows in the Jeneberang watershed which provides multipurpose benefits to the community, including as a source of raw water for irrigation and power plant. In addition, the Jeneberang River is also used as a location for mining construction materials. Mining activities are carried out in addition to controlling the debris flow in the Jeneberang river, as well as to fulfil construction material needs [1]. Gowa Regency is traversed by many large rivers, which is there are 15 rivers. The river with the largest area of flow is the Jeneberang River, which is 881 km² with a length of 90 km² [2].

Construction material is excavation that consist of sand, stone, gravel and crush stone which is very much needed in the construction industry [3]. The three principal activities in river mining are extraction the raw material, processing and transportation. The materials are produced from natural sources and directly removal from their natural configuration on riverbeds, quarries and gravel pits and used either in their natural state of after crushing, washing, and sizing and used either in their natural state or after crushing, washing, and sizing. After processing, the materials keep in stockpile or can be transported directly to the market location that is generally using dump trucks [4].

Mining of construction materials in Gowa Regency is able to fulfil construction material needs in Gowa Regency for more than 19 years. However, there have been major changes in the Jeneberang River due to the large number of mining activities that have an impact on the environment and the ability to over-supply construction materials due to the large number of mining companies and the extent of the mining area. Gowa Regency is an area that is densely populated and is bordered by Makassar City and 4 other districts, so that many infrastructure developments such as roads, buildings and bridge construction. The construction of the infrastructure requires the supply of construction materials. Economic growth in Gowa Regency is also will affecting the demand for construction materials.

The large amount of infrastructure development in Gowa Regency is a driving force for construction material companies to conduct mining. However, infrastructure development is not the only thing that influences the supply and demand of construction materials, so this research aims to, (1) determine what factors influence the supply and demand of construction materials, (2) identify material supply and demand models construction using multiple regression tests.

II. LITERATURE

A. Supply and Demand

In economic theory, the law of supply and demand is one of the basic principles governing the economy. This is illustrated in the statement that if prices increase then supply will increase and reverse causality applies. Basically, this is the principle that is understood by the general society regarding the relationship between goods and services with the supply and demand for goods and services, including

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construction materials, where one of the source of supply of construction materials to fulfil the demand in Gowa Regency and Makassar City is the Jeneberang River [3].

Economic growth will increase the demand for construction materials, so that structural changes in the regional / state economy are illustrated by the intensity of material use. Therefore, the demand for construction materials is directly related to the rate of development, income and population growth [5].

Supply and Demand can be predicted based on the variables that influence it using the econometric model, which is multiple regression analysis. Multiple regression analysis is an analysis relating to the study of the dependence of one variable (dependent variable) with more than one other variable (independent variable) with the intention of estimating and or predicting the value of independent variables based on known values of the explaining variables (independent variables). Regression models that consist of more than one independent variable are called multiple regression models [6].

III. RESEARCH METHODOLOGY

Data collection was carried out at the Department of Energy and Mineral Resources of South Sulawesi and also obtained from the Central Bureau of Statistics of Gowa Regency. The data collected is chronological data from 2000-2018 which consists of dependent variables (construction material production; sand, river rock, red land**,** stone sand, and crush stone), and independent variables (population, number of buildings, income / capita), price, length of road, mining business permit area, number of companies), and data processing using multiple linear regression methods.

The dependent variable of supply is production and the dependent variable of demand is consumption. The assumption that production is equal to consumption is under the reason of there are no available and accurate data sources to find out how much material is sent to consumers. The assumption was made because there were still illegal mines that did not convey how much production they had to the Department of Energy and Mineral Resources of South Sulawesi. Independent variables of demand are population, number of buildings, income per capita, price, and length of road. The independent variable of supply is the price and area of the mining business permit.

IV. DISCUSS OF THE RESULT

Construction materials supply was affected by some influencing factors namely price, number of trucks, number of companies and mining permit area. Demand of construction materials was influenced by price, length of road, number of buildings, GDP, income per capita, and economic growth [7].

The research on the supply and demand for construction materials uses production as the dependent variable and mining business permit area, and the price of construction materials as independent variables for the demand for construction materials. Whereas, for the demand for construction materials which are the independent variables are prices, road length, number of buildings, population and income per capita. The independent variable equation and the dependent variable for the construction material supply (Qs) and the construction material demand (Qd) are as follows:

$$Qs = f(P,MPA) \quad (1)$$

where:
P = Price
MPA = Mining Permit Area

$$Od = f(P,LR,NI,NB,IC) \quad (2)$$

where:
P = Price
LR = Length of Road
NI = Number of Inhabitants
NB = Number of Buildings
IC = Income per Capita

The results of the statistical test of supply and demand for construction materials also show the strength or absence of the relationship between independent variables and the dependent variable by calculating the correlation coefficient.

The partial determination coefficient is calculated to determine the effect of the independent variables partially on the dependent variable, used criteria from Guilford (1956), with the correlation coefficients as follows [8]:

TABLE I. TABLE OF CORRELATION COEFFICIENT BY GUILFORD

Correlation Coefficient	Category
< 0,20	Very weak and negligible
0,20 – 0,40	Low/ weak/ not tight
0,40 – 0,70	Average (quite tight)
0,70 – 0,90	High/ strong / tight
0,90 – 1,00	Very high / very strong / very tight

A. Construction Material Supply

a. Supply of Sand

The supply of sand with construction material types has an equation that shows the relationship between the independent variable and the dependent variable as below:

$$Qs = 16.822-0.4893P-0.099MPA \quad (3)$$

The statistical test for the supply of sand shows the value of R, which is 0.534 so that it can be said that the supply of sand has a fairly tight relationship with the influencing factors, with the value of F α> 0.05, which is 0.068.

b. Supply of River rock

The equation for the supply of construction materials for river rock types can be shown in the following equation.

$$Qs = 8.804+0.18P-0.2MPA \quad (4)$$

For supply of river rock type, show the results of statistical tests with an R value of 0.19 so that it can be said that stone offers have a weak relationship with influencing factors and have a value of sig. F α> 0.05 which is 0.745.

c. Supply of Red Land

The supply of construction materials of the red land type has an equation that shows the relationship between the independent variable and the dependent variable as below.

$$Qs = 17.841-0.468P-0.32MPA \quad (5)$$

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For the supply of red land**,** it shows the results of statistical tests with an R value of 0.683 so that it can be said that the supply of red land has a fairly tight relationship with influencing factors and have a sig value. F α <0.05 which is 0.007.

d. Supply of Sand and Gravel

The equation for the supply of construction materials for sand and gravel types can be shown in the following equation.

$$Qs = 14.815-0.234P-0.392MPA \quad (6)$$

The statistical test for the supply of sand and gravel shows an R with value of 0.673 so that it can be said that the supply of sand and gravel has a fairly tight relationship with the factors that influence the value of F α <0.05 which is 0.008.

B. Demand for Construction Materials

a. Demand for Sand

The equation for the demand for sand type construction material can be shown in the following equation.

$$Qd= 88.283-0.443P-0.272LR+18.615NB -24.350NI+2.055IC \quad (7)$$

The statistical test for demand for sand shows an R value of 0.618 so that it can be said that the demand for sand has a fairly tight relationship with the influencing factors, with the value of F α> 0.05 which is 0.226.

b. Demand for River Rock

The equation for the demand for construction materials for river rock can be shown in the following equation.

$$Qd= -56.840+0.254P-3.136LR-23.98NB +29.767NI-1.4478IC \quad (8)$$

The demand for river rock shows the results of statistical tests with an R value of 0.389 so that it can be said that the demand for river rocks has a weak relationship with the factors that influence and have a sig value. F α> 0.05 which is 0.797.

c. Demand for Red Land

The demand for red land construction materials has an equation that shows the relationship between the independent variable and the dependent variable as below.

$$Qd= 65.71-0.394P+1.040LR+12.564NB -13.38567NI-1.788IC \quad (9)$$

The demand for the red land type shows the results of a statistical test with an R value of 0.675 so that it can be said that the demand for red land has a fairly tight relationship with the factors that influence and have a sig value. F α> 0.05 which is 0.121.

d. Demand for Sand and Gravel

The equation for the demand for construction materials of sand and gravel type can be shown in the following equation.

$$Qd= 78.975-0.233P-0.960LR+11.165NB -12.239NI-1.279IC \quad (10)$$

The statistical test for the demand for sand and gravel shows an R value of 0.815 so that it can be said that the demand for rock sand has a strong relationship with the influencing factors with the value of F α <0.05 which is 0.008.

e. Demand for Crush Stone

The demand for construction material for crush stone types has an equation that shows the relationship between the independent variable and the dependent variable as below.

$$Qd= 39.610+ 0.052P-0.081LR-4.431NB -6.342NI+6.748IC \quad (11)$$

The demand for crush stone type shows the results of statistical tests with an R value of 0.629 so that it can be said that the demand for crush stones has a fairly tight relationship with the influencing factors and have a sig value. F α> 0.05 which is 0.203.

V. CONCLUSIONS

The Supply and Demand for construction materials in Gowa Regency is influenced by several factors. The mining business permit area and price affect the supply of construction materials, while the demand for construction materials is influenced by price, road length, number of buildings, population and income per capita. Statistical tests show that the supply of construction material have a weak relationship with influencing factors while the demand for construction material types of sand and gravel has a strong relationship with the influencing factors, but the type of sand, river rock, red land, and crush stone has a weak relationship with influencing factors.

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VII. REFERENCES

[1] Main Office of Pompengan Jeneberang River Basin. 2010. “Water Resources Management in Jeneberang River Basin. Makassar, South Sulawesi”.

[2] Badan Pusat Statistik Kabupaten Gowa. 2018. “Kabupaten Gowa dalam Angka 2018”. Gowa: Badan Pusat Statistik.

[3] Anas, A.V., Zubair, H., Suriamihardja, D.A., Massinai, M.A., Assegaf, M.A.A., Lias, S.A., Paharuddin, Arif, S., Nurkin, B., Sakka, Demmalino, E.B. 2018. “Daerah Aliran Sungai Jeneberang Dari Kecemasan Menuju Ketahanan”. Makassar: UPT Hasanuddin University Press.

[4] Langer, W.H., Drew, L.J. and Sachs, J.S. 2004. “Aggregate and the Environment”. American Geological Institute-US Geological Survey ISBN: 0-922152-71-3

[5] Tiess, G. and Kriz, A. 2011. “Aggregates Resources Policies in Europe Development of IT Solutions for the Enhancement of Planning and Permitting Procedures”. International Journal of Environmental Protection Vol. 1 No. 3 pp. 54-61

[6] Gujarati, D.N. 2006. “Dasar-Dasar Ekonometrika Jilid I Edisi Ketiga”. Erlangga. Jakarta.

[7] Anas, A.V., Suriamihardja, D.A., Pallu, M.S., dan Irfan, U.R. 2016. “Model Prediksi Penawaran dan Permintaan Material Konstruksi Sungai Jeneberang Provinsi Sulawesi Selatan”. *Prosiding TPT XXV PERHAPI*. hal 262-271. Bandung.

[8] Tiswiyanti, Wiwik. 2011. “Pengaruh Economic Value Added (EVA), Residual Income, Earning dan Arus Kas Operasi terhadap Return yang Diterima Pemegang Saham pada Perusahaan LQ 45 (2008-2009)”. Jurnal Penelitian Universitas Jambi Seri Humanior, Vol. 13, No. 1.