

The Influence of Human Quality Index and Supporting Facilities through Electrical Supply in Humbang Hasundutan Regency

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Abstract— Humbang Hasundutan Regency is one of the regencies in North Sumatera, has 10 (Ten) subdistricts, 153 villages 1 (one) Urban Village. Total Population 176,429 inhabitants, 40,783 household heads, average Electrical Energy Supply 14, 7021 MW, Human Development Index an average of 71,353 points. The growth of Human Quality Index is a needed supporting facility of HDI, enormous energy, as for problem that as follows:

1. What is the effect of human quality index and supporting facilities trough electrical energy in Humbang Hasundutan Regency.
2. What model is suitable to measure the availability of electrical energy in Humbang Hasundutan Regency is seen from the human quality index and supporting facilities ten years later.

Supporting theories in this study are theories of human resources, especially theories relating to the index of human development, electrical energy. The effect of human resource quality index and supporting means on the availability of electrical energy in Humbang Hasundutan district with available data (10) ten years of regional autonomy can be used equation model $\bar{Y} = a + b\bar{X}$ and measuring the quantity of energy supply intake can use formula $(E) = f(t) = A \cdot e^{bt}$. The results of this study showed an increase in Human Development Index of 0.62%, improvement of supporting facilities 4, 24% and increased availability of electrical energy 34%, correlation of human energy index with 94.41% energy availability and electricity supply availability for the ten years later 242,281 MW the impact of human development index increase from 2004 to 2013.

Keywords—Human Quality Index, Supporting Facilities, Electrical Supply

I. INTRODUCTION

All districts increase that generates resources to promote life. At this time many countries are shaken by the energy and human resources crisis, the Indonesian government has not escaped.

Based on Law No. 34 in 2004 states that local governments have broad authority to manage the resources in their area.

Human Development is formulated as an extension of choice for the population (enlarning the choises of people) which can be seen as a process of effort towards expanding options (UNDP, 1990).

Human resources are very vital organizational assets, therefore their roles and functions cannot be replaced by other resources, however modern of technology used, how much funds are prepared, but without professional human resources, everything becomes meaningless (Prihantin Lumban Raja 2013 , p .; 1).

Supporting facilities that support human quality index such as hospital facilities; school, employment; housing and the environment, household spending and consumption are crucial in raising the human resource quality index.

The addition and improvement of facility buildings in quantity must be considered, Electrical energy is an inevitable global problem, the economy and human activities will be totally paralyzed without energy therefore demands the energy supply and planning as early as possible. Electrical energy supply can be seen from how much the demand by customers and how much the quality index of human resources and supporting facilities.

1.1 The problems of the Study

Based on the description above the problems of this study are:

- a. What is the effect of human quality index and supporting facilities through electrical energy in Humbang Hasundutan Regency
- b. What model is suitable to measure the availability of electrical energy in Humbang Hasundutan Regency is seen from the human quality index and supporting facilities ten years later.

1.2 The Objectives of the Study

In relation to the problems of the study, the objectives of this study are:

- a. To find out the effect of human quality index and supporting facilities of electricity energy that available in Humbang Hasundutan Regency.
- b. To find out how much the influence of human quality index and supporting facilities that available of electricity ten years later.

1.3 The Significances of the Study

The findings of the study are expected to be beneficial and give contribution theoretically and practically, as follows.

- a. For the Humbang hasundutan district government, they know how much the human quality index and supporting facilities increase that available of electricity and able to predict the availability of electricity in ten years later.
- b. Furthermore, the results of this study are useful to add academic value as a function of Tridarma Perguruan Tinggi and to add knowledge about the development of human resources and the availability of electricity.
- c. This research can be useful as a theoretical material to be developed in the area of knowledge.

II. REVIEW OF LITERATURE

2.1 Human Resources

Human resources one of the most vital sources. Humans are the creatures that have the highest nature have values that can manage resources, adaptability, make changes and are able to answer the challenges of every change. Human resources are very vital organizational assets, therefore their roles and functions cannot be replaced by other resources, however modern of technology used, how much funds are prepared, but without professional human resources, everything becomes meaningless (See Lumbanraja Hal; 1. MSDN 2013).

The concept of human development by UNDP (1995: 12) defines human development is a process to expand choices for the population in the concept that the population is placed as the ultimate and development efforts

are seen as a principal means to achieve goals. The quality index of human resources is the amount of value that is formed by the human development process. To ensure the achievement of human development objectives, there are 4 (four) main things that need to be considered, namely:

- a. Productivity
- b. Equalization Continuity
- c. Empowerment
- d. Productivity

a. Productivity

Productivity of the population must be empowered to participate fully in the process of income generation and employment.

b. Equalization

Residents must have the same opportunity to gain access to all economic and social resources. All obstacles that minimize the opportunity to gain access must be removed so that residents take advantage of the opportunities that exist and participate in productive activities that can improve the quality of life.

c. Continuity

To Access economic and social resources must be addressed not only for future generations. All physical, human and environmental resources must always be replenished.

d. Empowerment

Residents must participate fully in decisions and processes that will determine the shape or direction of their lives and participate in benefiting from the development process.

2.2 Human Quality Index

Human quality index is the value of the human development process that is formed Life Expectancy Index (eo), school average, and literacy and purchasing power. According to the Republic of Indonesia government regulation No.8 in 2008 concerning guidelines for evaluating the administration of local government, it is stated that Evaluation of the Implementation of Regional Autonomy (EKPOD) is a systematic process of collecting and analyzing data on the performance of regional autonomy covering aspects of community welfare, public services and power regional competitiveness. In this case the human development index is used to measure the end result of regional autonomy.

The analogy of the availability of electricity rises exponentially, and then slowly decreases after consumption.

The value as a function of time follows a logistic curve, namely the curve S, and the reserve decreases with the end of the energy source. The consumption curve K on its

principle follows the curve S but lags behind time compared to the curve A. (Abdul Kadir: Energi, 1989).

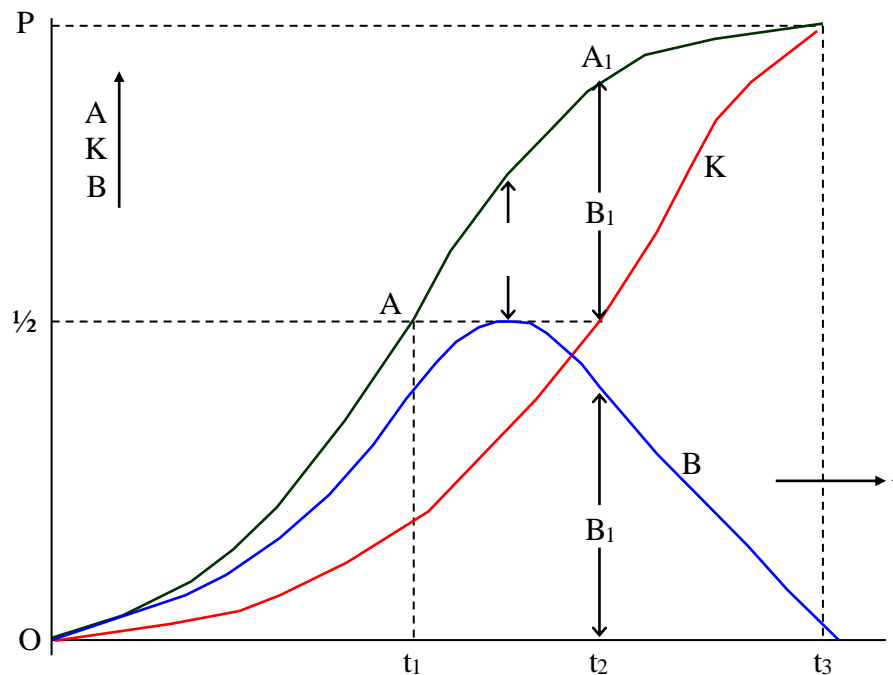


Fig.2.1: Energy Supply and Consumption

The use of electrical energy (E) for many years ago is recorded as a function rather than time, then generally seen the growth of E is greater than the function E is linear. Mathematically, the curve is expressed in the form of an exponential function formulated: $E = f(t)$ in $E = A \cdot e^{bt}$

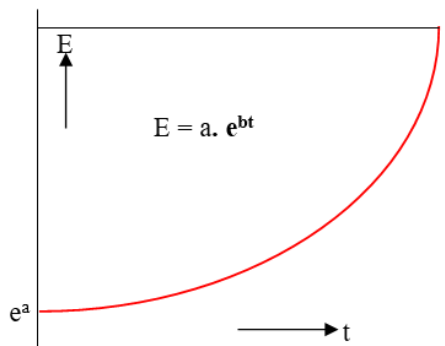


Fig.2.2: Electric Energy Demand with Logarithmic Scale

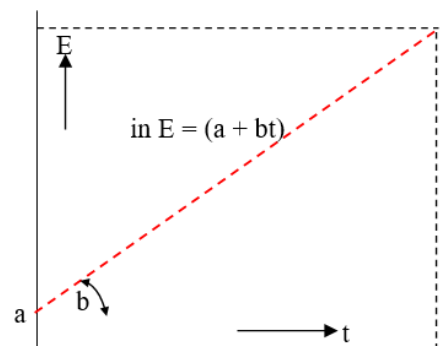


Fig.2.3: Availability of Electric Energy with Linear Scale

By using the magnitude of the energy in this logarithmic scale the curve is a straight line, and then the quantity "a" can be found in the early years, whereas "b" is the growth coefficient to determine the required function of the data as thoroughly as possible and the time period needs to be noted as parameter limitation.

III. RESEARCH METHODOLOGY

3.1 Research Design

This study aims to measure the influence of human quality index and supporting facilities on the availability of electrical energy therefore the research method used by researchers is quantitative method, which is explanatory research. According to Pontas H. Pardede Operations and Production Management CHAPTER IV (2007, p.129) when the sequence shows the relationship between a particular

element and the time points the explanatory method involves measuring the relationship between the elements. Because it is an estimate, it is certain that forecasting results can and usually always deviate from the actual numbers will be realized. The first step in predicting the value of an element to be a future being is to recognize as much as possible the element that influences it, especially its change. The second step is to measure the level and shape of each determinant's influence of the number that is forecasted. Regression analysis is a statistical technique that measures the level of dependence between one magnitude and one or several other quantities. Since it can determine the relationship between the quantities then this analysis can be used to estimate the value of the magnitudes and parameters contained in an equation or function such as a demand function.

3.2 Population and Sample

According Sudjana (2005: 6) suggests that the population is the totality of all possible values, the results of calculating or quantitative or qualitative measurements of certain characteristics of all collected data that are complete and clear source.

According to Sugiono (2010: 72) the population is an area of generalization consisting of objects or subjects that have certain qualities and characteristics set by the

researcher. In this case the data population is the index of human quality, supporting facilities, energy availability in Humbang Hasundutan regency.

Research Sample is part of the number and characteristics possessed by the population. In this case the sample is taken from the human quality index, supporting facilities, energy availability for ten years later in Humbang Hasundutan District. An important step in educational research is to define the study population, researchers make research samples are data for ten years the human quality index and supporting facilities and electrical energy installed, the sample taken in the study is data in the form of numbers for ten years according to the title of research in the district Humbang Hasundutan. To obtain data regarding the presence or absence of the influence of the Index of Human Quality and Supporting Facilities on Electricity Supply, researchers conducted observations in several departments, offices, BPS offices, PLN Offices in the Humbang Hasundutan Area.

3.3 Source of Data

Data sources are obtained from Agencies, Health, Education, Economy, Housing and Environment, Bappeda, Central Statistics Agency, PLN Rayon Dolok Sanggul and Siborongborong and, as well as the Office of Natural Resources and Energy in Humbang Hasundutan District.

IV. RESULT AND DISCUSSION

4.1 Research Data

The Data of Human Development Index (HDI)

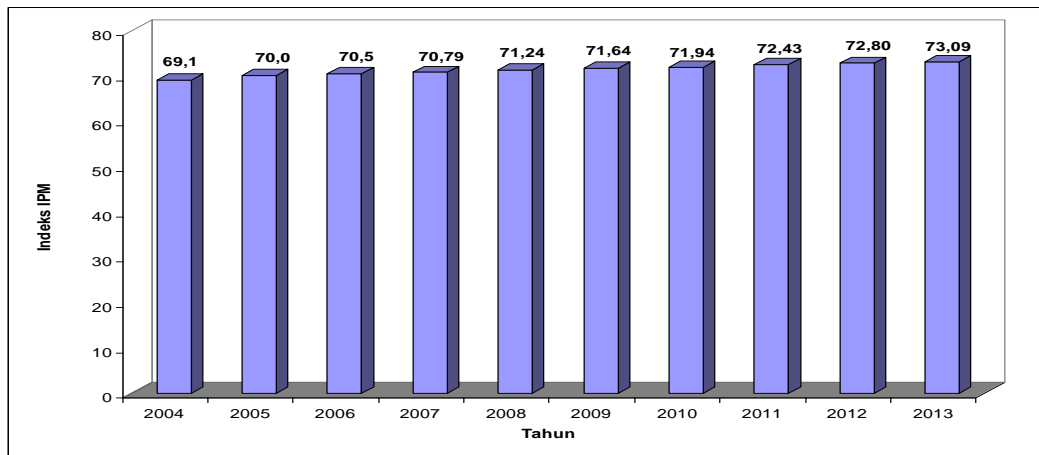
Table.4.1: The Data of HDI Kabupaten Humbang Hasundutan in 2004-2013

Description	Years									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Life expectancy	62,2	67,2	67,5	67,8	67,69	67,78	67,87	67,96	68,08	68,09
Literacy	97,7	98,2	98,2	98,2	98,22	98,21	98,21	98,22	97,59	98,23
Average old school	8,5	8,6	8,6	8,6	8,74	9,05	9,05	9,31	9,34	9,38
Purchasing Power	597,2	598,5	602,4	604,99	609,62	611,20	614,37	617,64	621,32	624,50
IPM	69,1	70,0	70,5	70,79	71,24	71,64	71,94	72,43	72,80	73,09

Data: BPS Humbang Hasundutan

From the above data can be illustrated the growth chart of the Human Quality Index for 10 years in the Humbang Hasundutan District from 2004-2013.

Picture.4.1: Graph of Human Development Index (HDI) Population of Humbang Hasundutan Regency Ten Years



Source: Data BPS Humbang Hasundutan

4.1.1 Supporting facilities

Supporting Facilities the Human Quality Index can be described, namely health, education, employment, housing and environmental facilities, as well as expenditure and consumption.

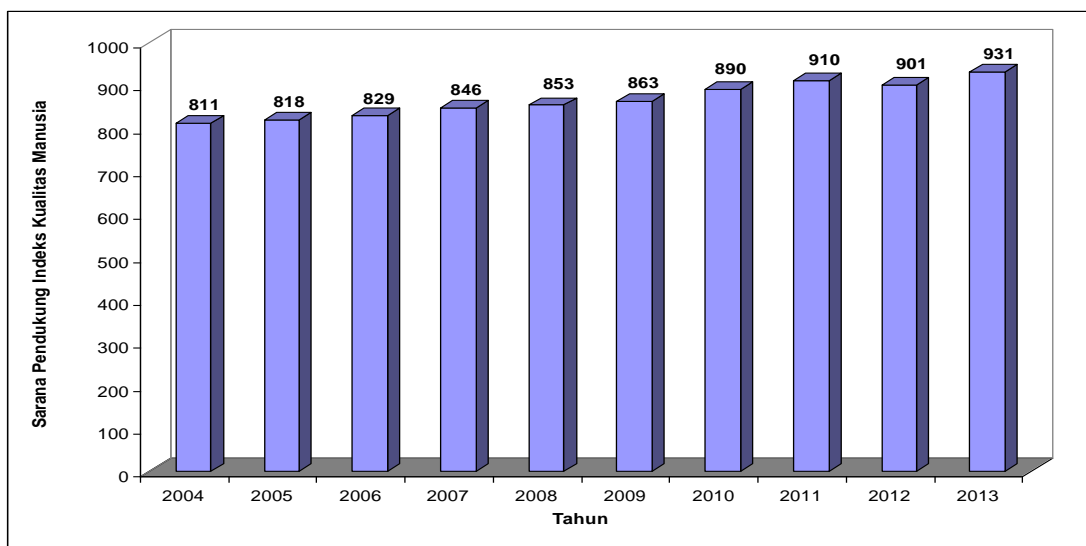
Table.4.2: Supporting Facilities Human Quality Index in 2004-2013

Description	Year									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Educational facilities	282	287	291	295	297	299	301	303	305	307
Health facility	435	436	439	451	452	458	479	489	471	490
Employment Facilities	16	16	19	19	20	22	23	24	28	31
Housing and Environmental Facilities	10	11	11	11	11	11	13	16	17	19
Spending and Consumption Facilities	68	68	70	70	73	73	74	78	80	84
Supporting facilities	811	818	829	846	853	863	890	910	901	931

Source: Data BPS Humbang Hasundutan

From the temporary data above, the average Support Facility for 10 years = 427.1 units

Picture.4.2: Chart of Supporting Facilities Human quality index Population of Hasundutan District in Tenth Years



Source: Data BPS Humbang Hasundutan

4.1.2 Electrical Energy Supply

Below will be described on the availability of electricity for 10 (ten) years in Humbang Hasundutan District.

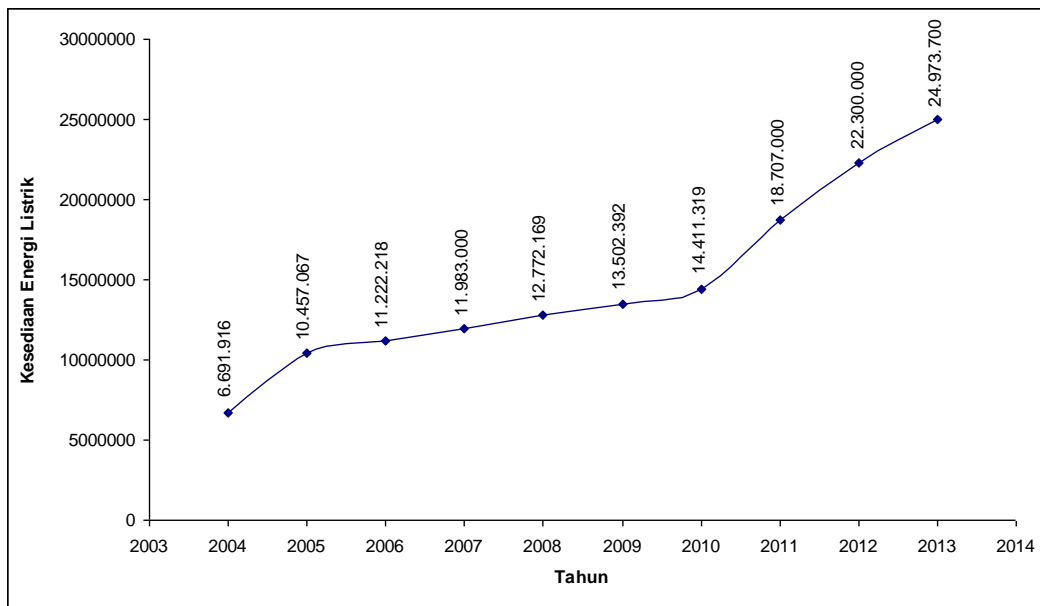
Table.4.3: Electrical Energy Supply in Humbang Development in 2004-2013

Years	Number of Customers	Power Installed	Electrical Energy Production	Electricity Sold
(1)	(2)	(3)	(4)	(5)
2004	17.492	6.691.916	884.729	
2005	19.159	10.457.067	1.084.822	
2006	20.830	11.222.218	1.098.284	717.486
2007	21.637	11.983.000	1.298.377	7.959.291.855
2008	22.552	12.772.169	1.389.104	8.645.826.000
2009	23.592	13.502.392	1.496.914	10.829.833.000
2010	24.227	14.411.319	1.917.182	22.979.000.000
2011	32.181	18.707.000	52.085.000	21.484.062
2012	33.512	22.300.000		
2013	36.467	24.973.700		

Sumber : Data BPS Humbang Hasundutan

From the above provisional data, the average electricity supply availability for 10 years = 14, 7021. From the data above, it can be illustrated the 10-year the Energy is Growth based on graph in Humbang Hasundutan District from 2004-2013

Picture.4.3: Graph of Electrical Energy Supplies in Humbang District of ten years



Source: Data BPS Humbang Hasundutan

4.2 Hypothesis testing

The Effect Analysis of Human Quality Index on Electrical Energy facilities . Hypothesis Testing by using the statistical formulas presented in the previous chapter the influence of Human Quality Index (X1) and Supporting Facilities (X2) through Electrical Energy Supply (Y) is depicted with equation = $\bar{Y} = a + b\bar{X}$.

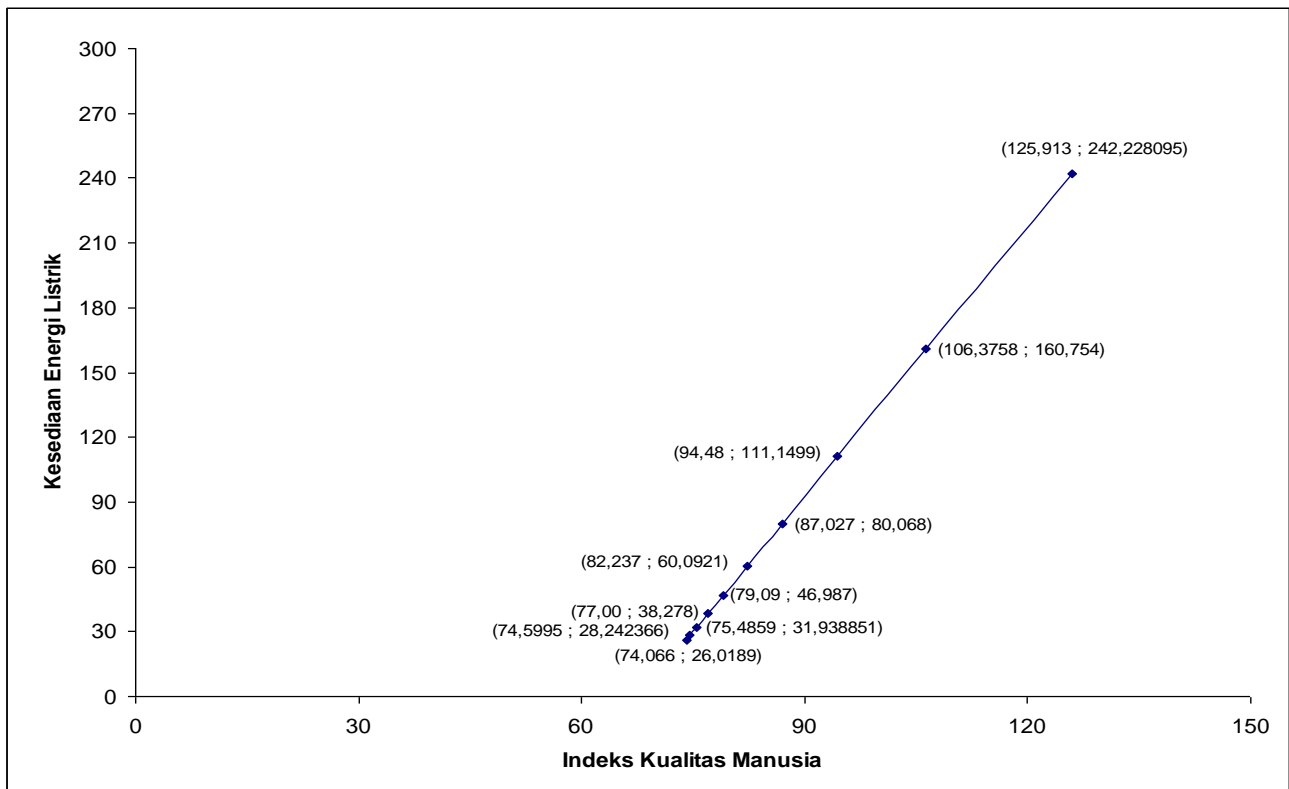
4.2.1 Relation of Human Quality Index with Electrical Energy Facilities

The relationship between the Human Quality Index and Electrical Energy facilities can be described by the equation $\bar{Y} = a + b\bar{X}_1$ where a and b can be calculated using a simple linear regression formula

$$b = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2} \quad a = \bar{Y} - b\bar{X}$$

From the results of the equation obtained the value of $b = 4.17$ and $a = -282.84$, from the results of the calculation of a and b it can be described the regression equation as follows: $Y = -282.84 + 4.17X_1$ or $X_1 = 67.827 + 0,2398Y$ it means that electricity supply for 10 years 242,2280951, the estimated increase in the Human Quality Index is $X_1 = 67,827 + (0,2398)(242,2281) = 125$ points (the calculation is attached).

Picture.4.4: Graphs of Human Quality Industry Relationships and Electrical Energy Supplies ten years in Humbang Hasundutan district

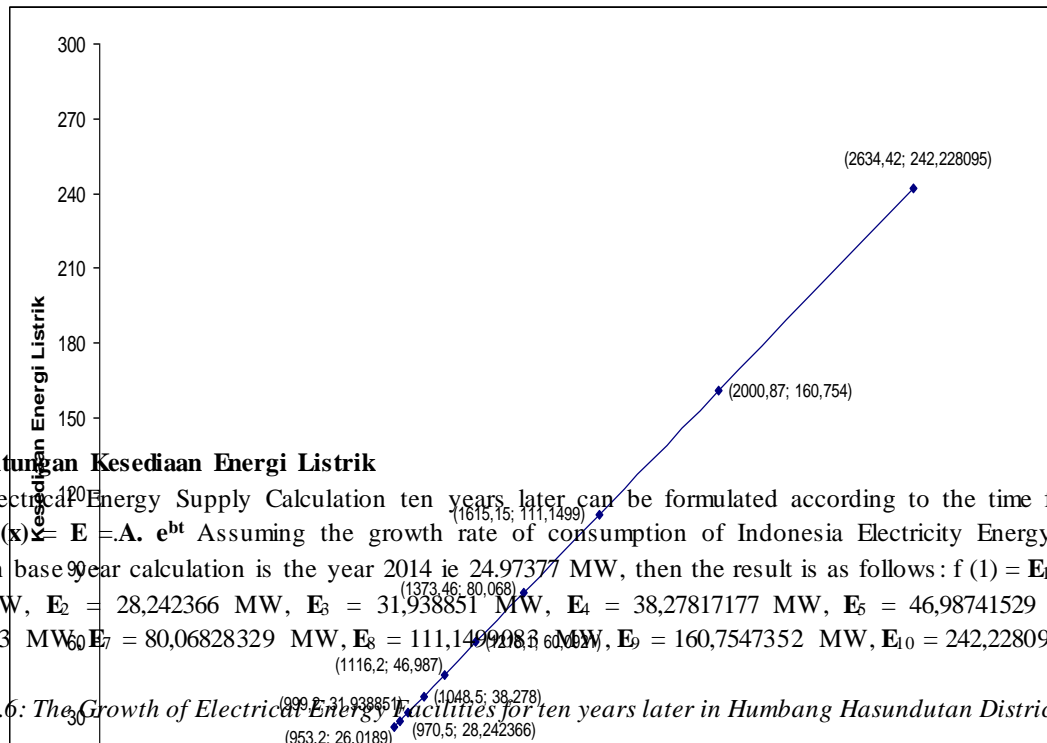


4.2.2 Relation of Supporting Facilities to Electrical Energy Supply

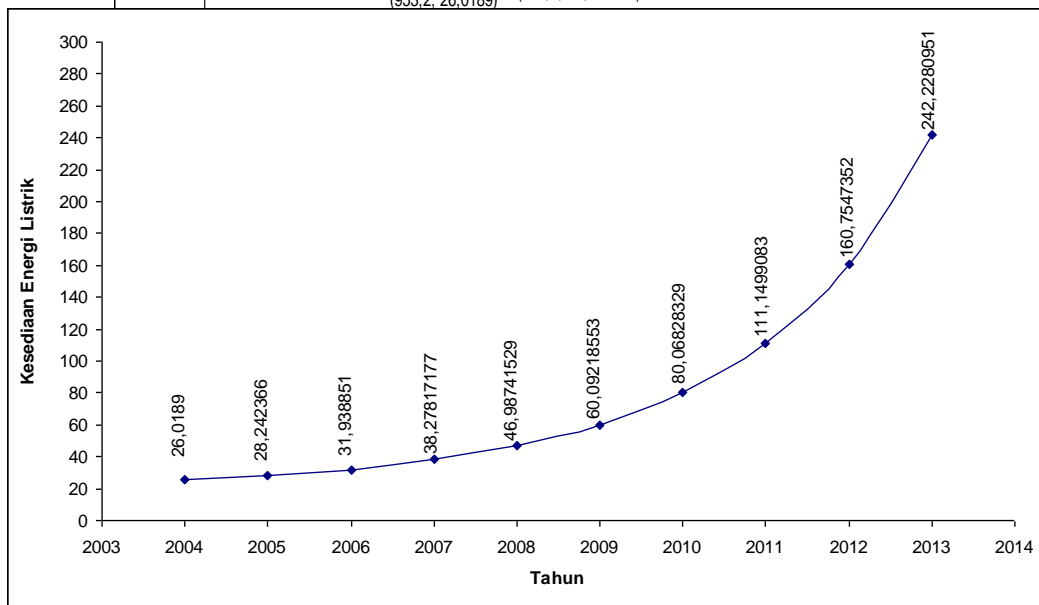
The relation of supporting means with the availability of electric energy can be illustrated by the following equation: =

$\bar{Y} = a + b\bar{X}_2$ where the values of a and b can be calculated as the above equations so that $b = 0,1286$ is obtained and a is obtained by the equation $a = \bar{Y} - b\bar{X}_2$ so, $a = 14,7021 - 0,1286(865,2) = -96,56$. From the results of calculations a and b it can be written regression equation as follows: $Y = -96,56 + 0,1286X_2$ atau $X_2 = 750,855 + 7,776Y$ it means if the availability of Electrical Energy 10 years later 242,2281 then it is estimated that the increase of facilities The support is $X_2 = 750,855 + 7,776(242,2281) = 2634,42$ unit.

Picture.4.5: Graph Connection of Supporting Supply and Electrical Supply Energy Support in Humbang Hasundutan Regency



Picture.4.6: The Growth of Electrical Energy Facilities for ten years later in Humbang Hasundutan District



4.2.4. Significant Test of Simple Correlation

To know the level of influence (coefficient of determination) between 2 variables used a simple correlation test that can be calculated using the formula as follows:

- a. Correlation between Human Quality Index (X1) with Electrical Energy (Y)

$$r = \frac{n(\sum X_1 Y) - \sum X_1 \sum Y}{\sqrt{[n \sum X_1^2 - (\sum X_1)^2][n \sum Y^2 - (\sum Y)^2]}}$$

$$r = \frac{10(10.551,53) - (713,53)(147,021)}{\sqrt{[10(50.927,16) - (427)^2][10(2.447,70) - (147,021)^2]}}$$

$$r = \frac{105.515,3 - 1049038941}{\sqrt{[509.271,6 - 5091250609][24.477 - 2161517444]}}$$

$$r = \frac{611,4059}{\sqrt{[146,5391][2861,8256]}} = \frac{611,4059}{\sqrt{419.369,3478}} = \frac{611,4059}{647,5873293}$$

$$r = 0,9441 = 94,41\%$$

The calculation results show that the level of influence for improving the Index of Human Quality Index is 0.9441 it means that 94.41% change in the value of the Human Quality Index is due to changes in Electricity Supply Increase. This figure is quite large so it can be concluded that only a small part of the change in the cause of other factors. In other words the electrical energy supply function with the Human Quality Index is closely related.

- b. Correlation between Supporting Facilities (X2) with Electrical Energy (Y)

$$r = \frac{n(\sum X_2 Y) - \sum X_2 \sum Y}{\sqrt{[n \sum X_2^2 - (\sum X_2)^2][n \sum Y^2 - (\sum Y)^2]}}$$

$$r = \frac{10(129161,345) - (8652)(147,021)}{\sqrt{[10(7500942) - (8652)^2][10(2.447,70) - (147,021)^2]}}$$

$$r = \frac{129161345 - 1272025692}{\sqrt{[(75009420) - (74857104)][(24477,0472) - (2161517444)]}}$$

$$r = \frac{19587,758}{\sqrt{[152.316][2861,872]}} = \frac{19587,758}{\sqrt{435909011,3}} = \frac{19587,758}{20878,43412}$$

$$r = 0,93818 = 93,818\%$$

4.2.5 Multiple Regression Test

To test whether each coefficient can give an illustration of Y for X and vice versa it is necessary to do multiple linear regression calculations. Testing the coefficients with the assumption that the regression has been accepted is expressed by the following equation:

$$Y = a_0 + a_1 X_1 + a_2 X_2$$

$$a_1 = \frac{(\sum X_2^2)(\sum X_1 Y) - (\sum X_1 X_2)(\sum X_2 Y)}{(\sum X_1^2)(\sum X_2^2) - (\sum X_1 X_2)^2}$$

$$a_1 = \frac{(7500942)(10551,53) - (61780347)(129161,345)}{(50927,16)(7500942) - (61780347)^2}$$

$$a_1 = \frac{7914641454,26 - 7979632713,87}{38200167334,72 - 38168112754,04}$$

$$a_1 = \frac{-64991258961}{32054584068}$$

$$a_1 = -2,0275$$

$$a_2 = \frac{(\sum X_1^2)(\sum X_2 Y) - (\sum X_1 X_2)(\sum X_1 Y)}{(\sum X_1^2)(\sum X_2^2) - (\sum X_1 X_2)^2}$$

$$a_2 = \frac{(50927,16)(129161345) - (61780347)(10551,53)}{(50927,16)(7500942) - (61780347)^2}$$

$$a_2 = \frac{65778204826302 - 65187718478091}{38200167334,72 - 38168112754,04}$$

$$a_2 = \frac{59048634,8211}{320545840,6791} = 0,184$$

$$a_0 = \bar{Y} + a_1 \bar{X}_1 + a_2 \bar{X}_2$$

$$a_0 = (14,7021) + (-2,0275 \bar{X}_1) + (0,184 \bar{X}_2)$$

$$a_0 = (14,7021) + (-2,0275 \cdot 71,353) + (0,184 \cdot 865,2)$$

$$a_0 = 14,7021 - 144,668 + 159,12 = 29,1541$$

$$\bar{Y} = 29,1541 - 2,0275X_1 + 0,184X_2$$

Thus multiple linear regression equations can be written as follows: $Y = 29,1541 - 2,0275X_1 + 0,184X_2$

4.2.6 Multiple Correlation Test

$$r_{12} = \sqrt{\frac{r^2 y_1 + r^2 y_2 - 2ry_1 \cdot ry_2 \cdot r}{r - r_{12}^2}}$$

$$r_{12} = \sqrt{\frac{(0,9441)^2 + (0,93818)^2 - 2(0,9441)(0,93818)(0,9679)}{1 - (0,9679)^2}}$$

$$r_{12} = \sqrt{\frac{0,89132481 + 0,880181712 - 1,714607242}{1 - 0,93683041}}$$

$$r_{12} = \sqrt{\frac{0,05689928}{0,06316959}} = \sqrt{0,900738472}$$

$$r_{12} = 0,9490 = 94,90\%$$

V. CONCLUSION

After analyzing data the following conclusions are derived.

- In terms of the growth of human quality index for 10 (ten) years between 2003 and 2013 increased 0.62%, supporting facilities increased 4.24%, energy needs 34.85%
- There is a correlation between human quality index on electricity supply for 10 (ten) years 94, 41%.
- There is a correlation between index of human quality to supporting facilities for 10 (ten) years is 11, 46%.
- Assuming the growth rate of consumption of Indonesia Electricity Energy 4, i% and assumption based on calculation in 2014 i.e 24,97377MW, then the result is as follows : $f(1) = E_1 = A.e^{bt} = 26,0189 \text{ MW}$, $E_2 = 28,242366 \text{ MW}$, $E_3 =$

31,938851 MW, $E_4 = 38,27817177$ MW, $E_5 = 46,98741529$ MW, $E_6 = 60,09218553$ MW, $E_7 = 80,06828329$ MW, $E_8 = 111,1499083$ MW, $E_9 = 160,7547352$ MW, $E_{10} = 242,2280951$ MW.

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