Efficiency Environmental Policy: Input-Output Approach Orientation

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Abstract: This study has the objective to calculate and analyze environmental efficiency when a country ratified the Kyoto Protocol or not to ratify it both the developed and developing countries as well. Output to be analyzed is GDP and CO2 emissions, while the input to be analyzed is the use of energy, stocks traded and Labour. The analysis Method of is Envelope Data analysis (DEA) with samples of G20 countries by 2004-2014. To be analyzed is the degree of efficiency after implementing the Kyoto protocol and how the processing results when viewed from based on the input and output targets. This is to answer the formulation of the problem posed in this study namely How the level of environmental efficiency if the Kyoto Protocol is implemented and how policy advice for each of the G20 countries based on the input and output targets. The study concluded the following: with the policy implemented Kyoto Protocol was able to further improve environmental efficiency in some other countries such as Russia, Argentina, China and Germany. This shows that the policy of the Kyoto Protocol been successful in carrying out its role as controller of the growth in emissions in developed countries and growing, especially G20 members. Besides, there are also countries that suffered losses in the level of environmental efficiency if not implement the Kyoto Protocol. But on the other side of some countries are not affected if there is no Kyoto Protocol, for example Italy, Mexico, Saudi Arabia, Australia and America. Efficiency is not the only primary standard to make a country become a standard for other countries, on the other hand the performance quality of the environment should also be considered. One country may succeed in reducing the environmental inefficiency by ratifying the Kyoto Protocol, and it has the efficient performance in relation to environmental quality and sustainable productive based on Malmquist index. Based on the criteria of the target input and target output, it can be seen that the member countries of G20 reach the optimal level when viewed from the variable GDP (positive output) and shares traded or stock traded (input) eg Argentina, Australia, Brazil, Canada and Indonesia. However, this is not optimal when viewed through the use of energy (input target), emissions (output targets), and labor (input target).

Keywords: Emissions, GDP, Labour, Energy Use, Stock Traded.

Introduction

Along with the development of increasingly massive industry sector, encouraging the use of energy makes increasingly less controllable environment conditions by increasingly degraded, especially air pollution. Environmental conditions are thus becoming its own demands for all countries to pay attention to energy utilization in the process of economic development in order to achieve economies notice sustainable. Energy utilization concept is to increase the process of industrialization and urbanization, and environmental issues all of them can be regarded as a process unit, which implicitly will encourage growth in the production and consumption of energy (Yang and Wang, 2013).

Review of literature

Pearce and Turner (1990) argues that the closely related among Economy, energy, and environment. Economy-environment relationships by Pearce and Turner (1990), that the economic activity of members of the negative environmental impact because as the environment as a reservoir emissions from their economic activity. This is because the economic system does not like the system environment in a certain degree are able to recycle 'waste' as a result of the production process. Therefore, the economy and the environment have a negative relationship. System environment by recycling power automatically become a 'recycler' for the economic system as long as does not exceed the carrying capacity. The next economic relations and energy are also noteworthy, Pearce and Turner (1990) explain that economic activity cannot be separated from the role of energy. Various energy is used mainly primary energy such as petroleum, coal and natural gas and others, in the production process that involves energy-producing 'waste'. When waste exceeds the ambient quality, it will not be in recycle naturally (Fare et al. 1989). As per the law of the thermodynamics, that energy cannot be created or destroyed, so that every energy use will end up somewhere in the neighborhood (Pearce and Turner, 1990). Again, the environment becomes 'recycler' of residue resulting from the use of energy. But keep in mind that not all the 'waste' can be recycled (Pearce and Turner, 1990) (Kemfert.2009). Along with the second law of thermodynamics that the production process that produces waste and when the production process refuse to recycle 'waste material' will remain a 'waste'. The latter is the relationship between energy and the economy. The production process of the economic system is in need energy, the engine of economic
growth which has a major role (Kemfert. 2009). It seems that energy is a central issue in this connection. Therefore, if it is associated with waste control policy as a residue of energy (CO2 emissions), can the policy of the Kyoto protocol inefficiencies suppress the impact of waste from the production process as well as energy.

Result of Research

Based on the results of data processing, it appears that the level of efficiency above the respective country varies with

Tabel 1 Score Efficiency

| Negara    | Skor Efisiensi | Rank | Negara    | Skor Efisiensi | Rank | Efficiency Loss Rata-Rata Gdp 2004-2010 | Estimasi Biaya Kebijakan |
|-----------|----------------|------|-----------|----------------|------|----------------------------------------|---------------------------|
| Australia | 100.00         | 1    | Australia | 100.00         | 1    | 0.00                                   | na                        |
| Italia    | 100.00         | 1    | Italia    | 100.00         | 1    | 0.00                                   | na                        |
| Meksiko   | 100.00         | 1    | Meksiko   | 100.00         | 1    | 0.00                                   | na                        |
| Sau.Ar    | 100.00         | 1    | Sau.Ar    | 100.00         | 1    | 0.00                                   | na                        |
| Turki     | 100.00         | 1    | Turki     | 100.00         | 1    | 0.00                                   | na                        |
| Amerika   | 100.00         | 1    | Amerika   | 100.00         | 1    | 0.00                                   | na                        |
| Prancis   | 99.84          | 2    | Prancis   | 99.98          | 2    | 0.14                                   | $2,607,470,843,483.09     |
| Ingris    | 99.13          | 3    | Ingris    | 99.6           | 4    | 0.47                                   | $2,572,453,411,534.91     |
| Rusia     | 98.39          | 4    | Rusia     | 100.00         | 1    | 1.61                                   | $1,466,292,960,234.18     |
| Argentina | 97.67          | 5    | Argentina | 100.00         | 1    | 2.33                                   | $420,449,859,642.59       |
| Jerman    | 97.10          | 6    | Jerman    | 100.00         | 1    | 2.90                                   | $3,393,502,138,750.82     |
| China     | 96.01          | 7    | China     | 100.00         | 1    | 3.99                                   | $5,396,786,316,934.95     |
| Afasel    | 94.77          | 8    | Afasel    | 98.45          | 5    | 3.68                                   | $312,654,784,049.41       |
| Canada    | 94.49          | 9    | Canada    | 97.34          | 6    | 2.85                                   | $1,520,878,010,651.73     |
| Jepang    | 93.30          | 10   | Jepang    | 99.67          | 3    | 6.37                                   | $5,048,833,745,952.95     |
| India     | 92.65          | 11   | India     | 94.57          | 7    | 1.92                                   | $1,411,359,910,212.77     |
| EU        | 85.37          | 12   | EU        | 100.00         | 1    | 14.63                                  | $16,818,739,226,770.90    |
| Indonesia | 82.02          | 13   | Indonesia | 89.27          | 8    | 7.25                                   | $596,548,838,598.73       |
| Korsel    | 72.28          | 14   | Korsel    | 75.2           | 9    | 2.92                                   | $1,071,785,867,814.50     |
| Brazil    | 65.03          | 15   | Brazil    | 67.21          | 10   | 2.18                                   | $1,694,257,002,633.55     |

While several other countries were able to increase the efficiency of the environment but cannot at the full efficient frontier line. Which means that the country - the country has not been able to suppress the growth rate of CO2 emissions in order to increase the size of their GDP in those countries. Among the countries that experienced it is the country of South Africa, France, Britain, Canada, Japan, Indonesia, South Korea, Brazil and India. From the table above inefficiency score is calculated by the equation model scenarios it can be seen that six DMU namely Australia, Italy, Turkey, USA, Mexico and Saudi Arabia that operate efficiently during the implementation of the Kyoto Protocol as well as the policy if there is no such policy. It interpret with or without the state policy - the country is always found on the production frontier. And always allocate funds for environmental regulation cost (Yang and Wang, 2013) .Score efficiency biggest loss if there is no Kyoto Protocol occur in Indonesia, which have added level of environmental inefficiency of 7.25 per cent if it does not implement the Kyoto Protocol policies. By participating in the treaty the Kyoto Protocol then automatically during the years 2004 - 2014 and tried to apply it, the State of Indonesia is able to reduce inefficiencies their environment although it has not yet reached full efficiency, it interpret right with the costs of implementing emissions reduction policies on the ratings of seven of more than 4 trillion dollars of total average - average GDP during the years 2004 - 2014, which means that Indonesia is able to suppress the bad growth rate of their output in the form of emissions and still be able to raise the level of their GDP which is good output but not been able to efficiently improve its environmental efficiency. Countries - other countries that succeed in reducing the level of inefficiency environment to zero and maximize efficiency their environment Russia, Argentina, Germany and the European Union.

Furthermore, the results will be compared with the input-oriented perspective (reduction of inputs to produce the same output) compared with output oriented perspective
(with the same input produces the maximum output). It can be concluded that the orientation of the input of several more countries can avoid the efficiency loss that can occur if it is not applied to the Kyoto protocol. Some of them the possibility of efficiency loss from Indonesia, for example, using input oriented Indonesia from the original use output oriented efficiency loss that can occur at 9.75 percent can be reduced to 7.25 percent, some countries others who are experiencing similar things is a South Korean original use output oriented efficiency loss that can occur at 6.32 percent can be pressed to figure 2.92 percent if the orientation was changed to input oriented, as well as with Brazil if the switch to input oriented initially have efficiency loss of 9:19 per cent if it does not implement the Kyoto protocol can be pressed to figure 2:18 percent by using input oriented. More efficiency of decreasing the risk of loss that may occur may be implicated in the increased efficiency in the cost of the policy. The cost of a policy for environmental improvements in some countries also decreased, which means the country can increase the efficiency of their environment without increasing costs sole discretion, some countries which decreased the cost of policies, among others, India, Korea, Brazil, France, India, and Japan.

Based on the results of the run efficiencies above, using a CRS and VRS input oriented, some countries increased environmental efficiency than if the state - the country does not implement the Kyoto Protocol during the years 2004-2014. Countries that managed to increase its efficiency to perfection by applying a policy package Kyoto protocol in the country, among others, Russia, Argentina, Germany, China and the European Union. While, several countries were able to increase the efficiency of the environment but it cannot match at the full efficient frontier line. Which means that the country has not been able to suppress the growth rate of CO2 in order to increase their GDP in those countries. Those countries are France, Britain, South Africa, Canada, Japan, India, Indonesia, South Korea, and Brazil. From the table above inefficiency score is calculated by the equation model scenarios it can be seen that six DMU namely Australia, Italy, Turkey, USA, Mexico and Saudi Arabia that operate efficiently during the implementation of the Kyoto Protocol as well as the policy if there is no such policy. It interprets with or without the state policy - the country is always found on the production frontier. And always allocate funds for environmental regulation cost (Yang and Wang, 2013). Score efficiency biggest loss if there is no Kyoto Protocol occurs in Indonesia, which have added level of environmental inefficiency of 7:25 per cent if the case does not implement the Kyoto Protocol policies. By participating in the treaty the Kyoto Protocol then automatically during the years 2004-2014 Indonesia is able to reduce inefficiencies of the environment although it has not yet reached full efficiency, it interprets the costs of implementing emissions reduction policies on the ratings of seven of more than 4 trillion dollars of total average - average GDP for the year 2004-2014, which means that Indonesia is able to suppress the bad growth rate of their output in the form of emissions and still be able to raise the level of their GDP which is good output but not been able to efficiently improve its environmental efficiency. Countries - other countries that succeed in reducing the level of inefficiency environment to zero and maximize efficiency of the environment Russia, Argentina, Germany, China and the European Union.

It can be compared on the use of input oriented (reduction of inputs to produce the same output) with the use output oriented (with the same input produces the maximum output) it can be concluded with an orientation input some countries are more able to avoid the efficiency loss that can occur if you do not apply the Kyoto protocol, Some of them the possibility of efficiency loss from Indonesia, for example, using input oriented Indonesia from the original use output oriented efficiency loss that can occur at 9.75 percent can be reduced to 7:25 percent, some countries others who are experiencing similar things is a South Korean original use output oriented efficiency loss that can occur at 6:32 percent can be pressed to figure 2.92 percent if the orientation was changed to input oriented, as well as with Brazil if the switch to input oriented initially have efficiency loss of 9:19 per cent if it does not implement the Kyoto protocol can be pressed to figure 2:18 percent by using input oriented. More efficiency of decreasing the risk of loss that may occur may be implicated in the increased efficiency in the cost of the policy. The cost of a policy for environmental improvements in some countries also decreased, which means the country can improve its environmental efficiency without increasing costs sole discretion, some countries which decreased the cost of policies, among others, India, Korea, Brazil, France, India, and Japan.

**Table 2 Output Target Relating to GDP**

| Country    | Rata-rata     | GDP (Current US$) | Selisih |
|------------|---------------|------------------|---------|
| Argentina  | 282917983458.91 | *                | *       |
| Australia  | 856112670484.68 | *                | *       |
| Brazil     | 1272979574540.86 | *                | *       |
| Canada     | 1312366039497.32 | *                | *       |
| China      | 4009790363737.18 | *                | *       |
From data in table 2, it can be concluded all member countries of the G20 have reached efficiencies perfect surroundings when seen from the GDP of each country.

Table 3 Emissions Magnitude G20 countries based Output Target

| Country              | Emisi CO2 (kt) | Rata-rata | Output Target | Selisih |
|----------------------|----------------|-----------|----------------|---------|
| Argentina            |                | 176616.10 | 156170.00      | 20446.10|
| Australia            |                | 376333.52 | 348757.00      | 27576.52|
| Brazil               |                | 379453.22 | 574033.00      | -194579.78|
| Canada               |                | 527484.36 | 552349.00      | -24864.64|
| China                |                | 723561.00 | 5288166.00     | 1947444.19|
| European Union       |                | 383387.29 | 4068782.00     | -234910.71|
| France               |                | 370021.85 | 390103.00      | -20081.15|
| Germany              |                | 768101.95 | 825896.00      | -57794.05|
| India                |                | 1788628.09| 1657522.27     | 131105.82|
| Indonesia            |                | 405746.43 | 371371.95      | 34374.48|
| Italy                |                | 431973.38 | 472768.00      | -40794.62|
| Japan                |                | 1185517.87| 1259655.00     | -74137.13|
| Korea, Rep.          |                | 516677.40 | 588388.91      | -71711.51|
| Mexico               |                | 443924.21 | 410744.00      | 33180.21|
| Russian Federation   |                | 1664594.77| 1602963.00     | 61631.77|
| South Africa         |                | 456755.63 | 427132.00      | 29623.63|
| Turkey               |                | 275741.66 | 225407.00      | 50334.66|
| Saudi Arabia         |                | 431211.99 | 395834.00      | 35377.99|
| United Kingdom       |                | 508363.30 | 540409.00      | -32045.70|
| United States        |                | 5558471.51| 5790765.00     | -232293.49|

Source: Data processed

Table on the emission of each country from the processing of the data, describe some States are still too many producing CO2 emissions. Based on the advice of the table the results of running the data it appears that several countries to increase their efficiency should lower their industrial activities or redesign the construction industry for more environmentally friendly so its CO2 emissions can be reduced by suggested by the results of processing the data in Table 5. The State should suppress emissions example Argentina is a country, which should reduce CO2 emissions by 20446.10 Kilo Ton to achieve perfect environmental efficiency. Likewise, Australia, China, India and Indonesia. For the details can be explained in detail each country on this following explanation. Australia had to suppress the production of CO2 emissions amounting to 27576.52 to achieve perfect environmental efficiency. Brazil to become
more efficient still has a quota of CO2 emissions amounting to 194579.78 to achieve perfect environmental efficiency. Canada to become more efficient still has a quota of CO2 emissions amounting to 24864.64 to achieve perfect environmental efficiency. In the contrary, China should reduce the production of CO2 emissions by 1947444.19 to achieve perfect environmental efficiency. European Union and France to be more efficient still has a production quota of CO2 emissions amounting respectively to 234910.71 and 20081.15 to achieve perfect environmental efficiency. Also Germany to become more efficient still has a quota of CO2 emissions amounting to 57794.05 to achieve perfect environmental efficiency. But India must reduce the production of CO2 emissions amounting to 131105.82 to achieve perfect environmental efficiency. Indonesia too, should reduce the production of CO2 emissions amounting to 34374.48 to achieve perfect environmental efficiency. While, Italy, Japan, and Korea become more efficient still has a production quota of CO2 emissions. It means they can still emit some emission to be efficient in production. It is not like United Kingdom and United States, countries like Mexico, Russian Fed, South Africa, Turkey, and Saudi Arabia should reduce the production of CO2 emissions in certain amount to achieve perfect environmental efficiency.

Table 4 Based Input Target relating to Labor Force

| Country           | Labor Force (Total) | Rata-rata | Input Target | Selish |
|-------------------|---------------------|-----------|--------------|--------|
| Argentina         | 18319297.32         | 17450419.00 | 868878.32    |
| Australia         | 11393802.27         | 10229629.00 | 1164173.27   |
| Brazil            | 9990534.05          | 66515091.26 | 3339026.79   |
| Canada            | 18628949.82         | 17583498.00 | 1045451.82   |
| China             | 774161385.86        | *          | *            |
| European Union    | 242757112.41        | *          | *            |
| France            | 29512309.18         | *          | *            |
| Germany           | 41770319.05         | 40743681.00 | 1026638.05   |
| India             | 467935455.32        | *          | *            |
| Indonesia         | 112805140.41        | 27918164.32 | 84886976.09  |
| Italy             | 24960491.32         | 24731410.00 | 229081.32    |
| Japan             | 66167136.55         | 66634317.00 | -467180.45   |
| Korea, Rep.       | 24887208.32         | 23806662.00 | 1080546.32   |
| Mexico            | 49191515.45         | 44117855.00 | 5073660.45   |
| Russian Federation| 76233575.41         | 74660649.00 | 1572926.41   |
| South Africa      | 18544170.32         | 16958748.00 | 1585422.32   |
| Turkey            | 24773055.91         | 21864556.00 | 2908499.91   |
| Saudi Arabia      | 9477030.55          | 7753305.00  | 1723725.55   |
| United Kingdom    | 31786099.68         | 30345295.00 | 1440804.68   |
| United States     | 156468034.36        | *          | *            |

Source: Data Management

Table 4 shows Argentina should reduce the employment of 868878.32 to achieve perfect environmental efficiency. Australia had to reduce employment by 1164173.27 to achieve perfect environmental efficiency. Brazil must reduce the employment of 3339026.79 to achieve perfect environmental efficiency. Canada should reduce employment RGI amounting 1045451.82 to achieve perfect environmental efficiency. China has attained a perfect environmental efficiency when seen from the side of labor. The European Union has reached a perfect environmental efficiency when seen from the side of labor. France already achieve efficiencies perfect surroundings when seen from the side of labor. Germany had to reduce employment by 1026638.05 to achieve perfect environmental efficiency. India has reached a perfect environmental efficiency when seen from the side of labor. Indonesia reduced employment by 84886976.09 to achieve perfect environmental efficiency. Italy had to reduce employment at 229081.32 to achieve perfect environmental efficiency. Japan must increase employment amounting to 467180.45 to achieve perfect environmental efficiency. Korea Rep. should reduce the employment of 1080546.32 to achieve perfect environmental efficiency. Mexico must reduce the employment of 5073660.45 to achieve perfect environmental efficiency. Russian Fed. Should reduce the employment of 1572926.41 to achieve perfect environmental efficiency. Mexico had to reduce employment by 1585422.32 to achieve perfect environmental efficiency. Turkey should reduce employment by 2908499.91 to achieve perfect environmental efficiency.
environmental efficiency. Saudi Arabia should reduce the employment of 1723725.55 to achieve perfect environmental efficiency. United Kingdom should reduce the employment of 1440804.68 to achieve perfect environmental efficiency. United States has reached a perfect environmental efficiency when seen from the side of labor.

Table 5. The amount of energy use G20 countries Based Input Target

| Country             | Energy Use (kt of oil eq.) | Rata-rata | Input Target | Selisih |
|---------------------|---------------------------|----------|--------------|---------|
| Argentina           | 75578.39                  | 67303.00 | 8275.39      |
| Australia           | 122077.20                 | 112696.00| 9381.20      |
| Brazil              | 246731.85                 | 210042.00| 36689.85     |
| Canada              | 259644.59                 | 267619.00| -7974.41     |
| China               | 2272391.22                | 1639854.00| 632537.22    |
| European Union      | 1726008.01                | 1783907.00| -57898.99    |
| France              | 259907.89                 | 269777.00| -9869.11     |
| Germany             | 323811.70                 | 340676.00| -16864.30    |
| India               | 659484.00                 | 519165.00| 140319.00    |
| Indonesia           | 196236.53                 | 152402.44| 43834.09     |
| Italy               | 171659.73                 | 181990.00| -10330.27    |
| Japan               | 488008.93                 | 522488.00| -34479.07    |
| Korea, Rep.         | 237074.50                 | 208284.00| 28790.50     |
| Mexico              | 179344.11                 | 159324.00| 20020.11     |
| Russian Federation  | 688334.11                 | 647392.00| 40942.11     |
| South Africa        | 138103.35                 | 128722.00| 9381.35      |
| Turkey              | 101518.50                 | 80858.00 | 20660.50     |
| Saudi Arabia        | 169741.34                 | 143706.00| 26035.34     |
| United Kingdom      | 203878.16                 | 221558.00| -17679.84    |
| United States       | 2231815.20                | 2307819.00| -76003.80    |

Source: Data processed

From the table of energy use appears once that almost all countries in the G20 inefficient in its use of energy, better use of excess energy (negative sign) and the shortage of energy use (a positive sign). For the excess should reduce the use of energy, while the shortage of energy use must increase its energy for industry and households. Argentina must reduce energy use by 8275.39 to achieve perfect environmental efficiency. Australia must reduce energy use by 9381.20 to achieve perfect environmental efficiency. Brazil must reduce energy use by 36689.85 to achieve perfect environmental efficiency. China must reduce energy use by 7974.41 to achieve perfect environmental efficiency. The European Union must increase energy use efficiency of 57898.99 to achieve perfect environment. France must increase energy use by 9869.11 to achieve perfect environmental efficiency. Germany should increase the use of energy of 16864.30 to achieve efficiency perfect environment. India must reduce energy use by 632537.22 to achieve perfect environmental efficiency. The European Union must increase energy use efficiency of 57898.99 to achieve perfect environment. France must increase energy use by 9869.11 to achieve perfect environmental efficiency. Germany should increase the use of energy of 16864.30 to achieve efficiency perfect environment. India must reduce energy use by 632537.22 to achieve perfect environmental efficiency. Italy must increase energy use efficiency of 10330.27 to achieve perfect environment. Japan must increase energy use efficiency of 34479.07 to achieve perfect environment. Korea Rep. must reduce energy use by 28790.50 to achieve perfect environmental efficiency. Mexico must reduce energy use by 20020.11 to achieve efficiency perfect environment. Russian Fed. must reduce energy use by 40942.11 to achieve perfect environmental efficiency. South Africa must reduce energy use by 9381.35 to achieve efficiency perfect environment. Turkey must reduce energy use by 20660.50 to achieve perfect environmental efficiency. United Kingdom should increase energy use efficiency of 17679.84 to achieve perfect environment. United States must increase energy use efficiency of 76003.80 to achieve perfect environment.

From the table 6 it appears that the stock traded input target is not at all to bring up the numbers of each State. This means that additional input or reduction suggested for each country is not required. This would suggest that each G-20 member countries has reached almost perfect environmental efficiency when seen from the data stock traded each country.
Table 6. Input Targets Related to Stock Traded

| Country            | Stock Traded (Current US$) | Rata-rata | Input Target | Selisih |
|--------------------|----------------------------|-----------|--------------|---------|
| Argentina          | 22513054734.93             | *         | *            |         |
| Australia          | 984393205925.18            | *         | *            |         |
| Brazil             | 629577397410.25            | *         | *            |         |
| Canada             | 1289843972193.20           | *         | *            |         |
| China              | 5432055507584.39           | *         | *            |         |
| European Union     | 12652220554102.20          | *         | *            |         |
| France             | 1825332706196.77           | *         | *            |         |
| Germany            | 1877493577284.91           | *         | *            |         |
| India              | 768213775783.93            | *         | *            |         |
| Indonesia          | 94299907949.70             | *         | *            |         |
| Italy              | 957227428973.16            | *         | *            |         |
| Japan              | 4629369779060.55           | *         | *            |         |
| Korea, Rep.        | 1526703908889.64           | *         | *            |         |
| Mexico             | 95174125232.43             | *         | *            |         |
| Russian Federation | 659755160700.34            | *         | *            |         |
| South Africa       | 321687900656.59            | *         | *            |         |
| Turkey             | 299240026902.80            |           |              |         |
| Saudi Arabia       | 581315262087.25            | *         | *            |         |
| United Kingdom     | 4194263430060.00           | *         | *            |         |
| United States      | 32714420545984.40          | *         | *            |         |

Source: Data processed

Ideally this is so that the environment is not being subjected increasingly impact of stock trading in which was a reflection of the increasingly good financial performance or the production of each of the company. Ideal production performance should give no harmful impact on the environment.

CONCLUSION

Based on the results of research and discussion in the previous chapter, it can be concluded in some sentences. This research shows that the policy of the Kyoto Protocol been successful in carrying out its role as controller of the growth in emissions in developed countries and growing, especially G20 members. Some of which are South Africa, and the UK Argentina, China, Brazil, Canada, European Union, France, Germany, India, Indonesia, Japan, South Korea, Russia. Besides, there are also countries that suffered losses in the level of environmental efficiency if not implement the Kyoto Protocol. But on the other side of some countries are not affected if there is no Kyoto Protocol, for example Italy, Mexico, Saudi Arabia, Australia and America. Efficiency is not the only primary standard to make a country become a standard for other countries, on the other hand the performance quality of the environment should also be considered. One country may succeed in reducing the environmental inefficiency by ratifying the Kyoto Protocol, and it has the efficient performance in relation to environmental quality and sustainable productive based on Malquist index. Based on the criteria of the target input and target output, it can be seen that the member countries of G20 reach the optimal level when viewed from the variable GDP (positive output) and shares traded or stock traded (input) eg Argentina, Australia, Brazil, Canada and Indonesia. However, they are not optimal when viewed through the use of energy (input target), emissions (output targets), and labor (input target).

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