The Impact of Forest Sector Investments on Leading Economics and in Co2 Emissions Changes in Jambi Province

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Abstracts. Jambi Province has 2.18 million hectares of forest which absorbing CO2 emissions of 41.30 MT. This research aims: to analyze the magnitude of the role of the forestry sector in the forestry sector, the forestry sector-based industrial sector and the 10 leading economic commodities in Jambi Province, analyze the impact of the forestry sector investment on the forestry sector, forest sector-based industrial sector and 10 leading commodities economy and analyzing the impact of the forestry sector investment on CO2 emissions absorbed by the forestry sector itself and CO2 emissions issued by the forestry sector-based industrial sector and 10 leading economic commodities in Jambi Province. The data analysis tool used in this research is the environment-insightful SAM. The role of forestry sector in Jambi (timber industrial forest, non-timber industrial forest and other forest products), the forestry sector-based industrial sector and ten leading economic commodities (mining, transportation, plantations, food crops, electricity and drinking water and livestock) provide value added greater than one (>1) which means that the sector provides more than one role for the economy. Except for the paper and paper products, the processing and construction industries have a smaller value than one, meaning that the sector provides a smaller economic role of less than one, because this industry lacks competitiveness towards a sustainable industrial sector in the domestic market or international. The impact of the forestry sector investment was able to increase economic output by 365 percent, absorb CO2 emissions by 61 percent and 0.06 percent in the rubber sector (one of the sectors including 10 leading commodities). While the impact of forestry sector investment on economic output increased 1.93 percent, CO2 emissions 0.53 percent and 10 leading economic commodities increased 2.4 percent of economic output, CO2 emissions 2.42 percent.

1. Introduction
Over thirty years during the New Order era, forest management in Indonesia was very centralized (Resosudarmo, 2004), where the forests were managed by large companies in the form of Forest Concession Rights (HPH) which were fully issued and controlled by the central government in Jakarta. Although the HPH is required to contribute to the economic development of the local community through the role of the Bina Desa HPH, in reality the community only gets a small benefit from the concessions operating in the area. Thus, forest management with the HPH system will only marginalize the role of local communities.

Jambi Province in 2013 had an area of ± 2.18 million hectares (1.58 percent of Indonesia's total area) consisting of natural forest / nature conservation area 666.10 thousand hectares (31.57 percent), protected forest area 179, 93 thousand hectares (8.53 percent), limited production forest area 261.45 thousand hectares (12.39 percent), fixed production forest area 968.89 thousand hectares (45.92 percent) and convertible production forest area of 31 42 thousand hectares (1.49 percent).
As the contribution continues to decline, it is important to remember that forest products are actually not substitutes and competitors for products in other sectors. Forest products are complementary goods. So that the role of the forest sector in the economy continues to be prioritized, due to direct and indirect back and front linkages (backward and forward linkage) with other production sectors, so that this sector remains prioritized.

On the other hand, Jambi has the potential to reduce emissions of Green House Gas (GHG) to 69 Mt (Mechanical Technician) CO2 by 2030, with the right mix between domestic policy and international support (Hooijer et al, 2006). Indonesia intends to reduce its emissions unconditionally by 29 percent from the 2.8 GT CO2 emissions projection in 2030 (http://nationalgeographic.co.id/berita/2017/11).

Forestry investment policy as a solution that can be empowered, in order to restore the role of the region and strive to revive activities, vitality, and realize the region so that it can create and increase added value in the economy, and maintain environmental sustainability. Danisworo(2002) explained investment must be able to control and utilize the potential of the environment.

On the other hand, the results of the research were carried out by Heriberta, 2016 with the title, Revitalization of the forestry sector in Jambi province through the SNSE approach in 2012, the results obtained: that the economic structure of Jambi is supported by several economic sectors including forest-based sectors and which have an impact on Emission absorption CO2 in the forestry sector 19.24 million MT and produces CO2 emissions in other economic sectors 22.06 million MT in Jambi Province.

2. Formulation of the Research
Forest resources are increasingly degraded, due to the loss of the capacity of forest ecosystems, such as non-functioning forest protection, water and soil conservation power and carbon / CO2 decline. Because the role of the forest sector in the economy has direct and indirect back and front linkages with other production sectors, the questions in this research are:

a) How big is the role of the forestry sector in the forestry sector, sector-based industrial sector forestry and 10 leading economic commodities in Jambi Province,

b) What is the impact of the forestry sector investment on the forestry sector itself, the forestry sector-based industrial sector and 10 economic commodities in Jambi Province,

c) What is the impact of the forestry sector investment on CO2 emissions absorbed by the forestry sector itself and CO2 emissions issued by the industrial sector based on the forestry sector as well as 10 economic commodities in Jambi Province

3. Literature review and hypotheses

3.1 Main Theories
The main theory used in this research is the Harrod Domar Theory (New Growth Theory) or modified growth theory model by incorporating human capital factors with the main input of R & D (Mankiw, Romer and Weil, 2006). Harrod-Domar believes that an increase in investment will not only increase aggregate demand in the short term, but will also increase aggregate supply through increasing capital stock in the long run and this will increase the ability of the community to increase output (economic growth).

3.2 Supporting Theories
The supporting theory used in this research is a planning model with consistency characteristics (Thorbecke Erik, 1985), which links the environment in the model (Pal Barundeb, 2011). Adopting and implementing green economy is not an easy thing, because it needs public funding support, policy reforms and even regulatory changes (UNEP, 2011 and Blanc, 2011). Indonesia which has a different area, and each region has different ways of implementation, depending on the weaknesses and economic strength of the region (Chapple, 2008). In the Indonesian context, based on a report from UNEP, Indonesia has an initiative to implement green economy in development. Among them is the inclusion of green economy in the Medium Term Development Plan contained in Law No: 17 2007 (Yusuf, 2011).
The failure of Indonesia to implement green economy requires careful planning in development. According to UNEP (2011), in particular policies need to be transitioned to a green economy. Changes in fiscal policy, reforms and reduction of subsidies that endanger the environment, it is necessary to invest in the forestry sector as a "green" key sector, through regulations, environmental regulations and law enforcement (UNEP, 2011).

Some researches on the economy of a district or province or country by using an IO Model analysis tool, SNSE or SAM environment. The research was conducted by Sihombing (2004), Sastrowiharjo (1989) and Wahyudi (2010) in Jambi Province, with SAM model concluding: sectoral growth related to the inequality of income distribution, which also done by Pieters (2010).

Parikh et al. (2009), Pieters (2010) used India's extended SAM 2002-2003 by detailing the wage / salary balance based on expenditure survey data distinguishing 3 levels of education and 10 sectors of labor, linking sectors and household income. This research uses the Theil and Gini Ratio indices, looking at the impact of sectoral growth on household income inequality.

Pal Barundeb, Sanjib Pohit and Joyashree Roy, 2011 in their research used the analytical tool Environmental Social Accounting Matrix 2006-07 in India, concluded: Building 35 ESAM sectors in a descriptive and detailed manner from the energy sector. Increased greenhouse gas emissions due to interdependency between production sectors are higher. The direct effect of the rice sector on GHG emissions is around 6MTs / Rs. lakh output of the overall effect on GHG emissions throughout 32 MT / Rs. lakh output. The research was conducted by Endriana Lilia, 2012 on the identification of key green economy sectors in sustainable development in Indonesia.

4. Methodology
The first step is to analyze the role of the forestry sector in the Jambi Province by using the 2012 SNSE model. SNSE Jambi 2012 was formed from Jambi IO 2007 updated to IO 2012 with a 53x53 matrix, then disaggregated into a 2012 SNSE with a 72x72 matrix. Then obtained the labor multiplier, capital multiplier, factor multiplier, institutional multiplier and total multiplier to explain the role of the forestry sector in the economy in Jambi Province.

4.1 First and Second Research Formulation:
Encouraging an increase in output in this research, by adding up the multiplier of the production activities of each sector, then compared relatively between sectors or obtained an index. Formulated as follows:

\[ \text{Multiplier Index} = \frac{\sum_{j=1}^{N} a_{ij}^{aa}}{\sum_{i=1}^{n} \sum_{j=1}^{n} a_{ij}^{aa}} \]

Information:
- \( a_{ij}^{aa} \) is the row element i column j of the production activity block (aa) in the output multiplier \((I - A)^{-1}\)
- \( N \) is sum sector production (n = 53)

4.2 Third Research Formulation:
The emission coefficient obtained is made in the form of a matrix called the coefficient of emissions matrix \((D_j)\). The matrix is multiplied by the balance sheet multiplier matrix or \((I - A)^4\) and the result is an emission multiplier matrix \((T)\). Formulated as follows:

\[ T = D_j (I - A)^4 \]
The emission multiplier matrix (T), shows the impact of exogenous balance changes on CO2 emissions produced. The T matrix has different blocks, sector emission blocks, household emission blocks, and others that can be used as impact analysis (Pal, Pohit and Roy, 2011).

Emission multiplier values can be formulated as follows:

\[
(IM) = n \sum_{j=1}^{n} \frac{\beta_{ij}}{\sum_{i=1}^{n} \beta_{ij}}
\]

\(\beta_{ij}\) are line elements i and column j on the T emission multiplier matrix, and n is the number of production sectors (in this study there are n = 53).

4.3 Estimated CO2 Emissions per Sector

Estimates of CO2 per sector used in this study were obtained from processing CO2 emissions according to the type of energy in 2012 issued by the Jakarta Central Bureau of Statistics. The intended data is used to estimate CO2 emissions, such as premium, diesel, kerosene, LNG and other refined products.

The total value of CO2 emissions is distributed proportionally to each sector, institution and production factor that uses these five types of energy. The proportion of the distribution is carried out in accordance with the rupiah value for the energy use of each sector, institution and production factor in the SNSE table.

| No. | Item                                      | Forest Area (ha) | Forest to be Managed (ha) | Remaining Forest to be managed (ha) | Rp. (Million) | Rp. (Million) |
|-----|-------------------------------------------|------------------|--------------------------|-----------------------------------|---------------|---------------|
| 1.  | Forest Area                               | 2,179,440        |                          |                                   |               |               |
| 2.  | Forest Area based on Law                  | 1,560,000        | 540,000                  |                                   |               |               |
|     | 30% x 5.2 Mil ha                          |                  |                          |                                   |               |               |
| 3.  | Industrial Forest Area Managed            | 663,721          |                          |                                   |               |               |
| 4.  | Industrial Forest Area Established        | 780,000          |                          |                                   |               |               |
| 5.  | Opportunities for land to be Managed by Industrial Plantations | 116,279          | 116,279                  | 12                                | 1,395.35      | 0             |
|     | - Community Forest                         |                  |                          |                                   |               |               |
|     | - Community Based Forest                   | 21,000           |                          |                                   |               |               |
|     | - Village Forest                           | 54,000           |                          |                                   |               |               |
|     | - Public Forest                            |                  |                          |                                   |               |               |
| 6.  | Total                                     | 313,721          | 313,721                  | 12                                | 3,764.65      | 0             |
|     | The total cost of revitalizing all forestry | 430,000          |                          |                                   | 5,160.00      | 0             |
|     | Managed in timber industry forests         | 116,418          |                          |                                   | 1,395.35      | 0             |
|     | Managed in non- timber industry forests    | 212,639          |                          |                                   | 2,550.00      | 0             |
Managed in other forest products 100,943 1,209,650

Source: Jambi Provincial Forestry Service.

In forestry sector investment, forest planted by tree species: Timber industrial forest: trees included in the research model are acacia trees, non-timber industrial forests: mahogany trees and other forest products: Singkawang (Shorea Sumatranas)

The investment implementation requires a scenario, as follows:
Scenario: Without investment
Scenario I: Timber industrial forest, non-timber industrial forest and other forest products, 20% each or a total of Rp.1,032 trillion.
Scenario II: Timber industrial forest, non-timber industrial forest and other forest products, each with 50% or a total of Rp.2,580 trillion.
Scenario III: Timber industrial forest, non-timber industrial forest and other forest products, each 100% or a total of Rp. 5,160 trillion.

5. Result and discussion

5.1 The Role of the Forestry Sector in Jambi Province
The Strategic Plan of the Forestry Service as a foundation for integrated forest management in the area. Furthermore, the role of the forestry sector on the economy can be explained through the SNSE multiplier analysis commonly used in regional development planning, such as: value added multiplier with the following results:

| No. | Commodities                 | VAM  | Economic Output (Million Rp) | Ranking |
|-----|-----------------------------|------|-----------------------------|---------|
| 1   | Timber Industrial Forest    | 1,3724 | 627,419,17               | 10      |
| 2   | Non-Timber Industrial Forest| 1,3949 | 165,666,80                | 14      |
| 3   | Other Forest Products       | 1,4251 | 805,865,67                | 7       |

Source: Processed Data.

The multiplication figures reflected by the added value of the forestry sector have a large influence on the economy of Jambi Province, such as: other forest products sectors, non-timber industrial forests and timber industry forests. All three have high multipliers, each of which is 1.4251 in the other forest products sector, the non-timber industrial forest sector is 1.3949 and 1.3724 in the timber industry forest sector.

The multiplication figure of 1.4251 in the other forest products sector means that for each injection on the exogenous balance sheet of another forest product sector of one million rupiah will have an impact on the increase in labor and capital revenues in the Jambi Province economy at Rp.805.9 billion. The same definition for the amount of the coefficient of value added in other economic sectors.

5.2 The Role of the Forestry-Based Industrial Sector in Jambi Province
Forest as a resource that can provide goods and services for the needs of the community. Therefore forest management is needed as the main resource in economic development and has a positive impact on economic development, including input to the industrial sector based on the forestry sector and encouraging the development of other economies and spurring economic growth.
Table 3. The Role of the Forestry-Based Industrial Sector in Jambi Province

| No. | Commodities                                      | VAM   | Economic Output (Million Rp) | Ranking |
|-----|--------------------------------------------------|-------|-----------------------------|---------|
| 1.  | Sawmill and Wood Processing Industry             | 1,0097| 605,767,77                  | 45      |
| 2.  | Plywood Industry and the like                    | 1,1576| 4,873,820,03                | 12      |
| 3.  | Manufacture of building materials and furniture from wood | 1,1438| 723,948,69                  | 43      |
| 4.  | Manufacture of Paper and Paper Products          | 0,2920| 3,083,283,48                | 19      |

Source: Processed Data.

The multiplier figure 1.1576 in the industrial sector of plywood and the like, means that every injection on the exogenous balance in the balance sheet of the plywood industry and the like amounting to one million rupiah will have an impact on increasing the economy of Jambi Province by Rp. 1.1576 million and the position of economic output in the plywood industry and the like is Rp. 4,873.82 billion.

5.3 the Role of 10 Leading Economic Commodities in Jambi Province

Sectoral growth or an increase in output income of a sector will encourage an increase in output income of other related sectors. The following is the order of ranking of outputs in the highest economy, based on the sectors and commodities produced, explained in the following Table:

Table 4. The Role of 10 Leading Economic Commodities in Jambi Province

| No. | Commodities                  | Economic Output (Rp Million) | VA     | Ranking |
|-----|------------------------------|------------------------------|--------|---------|
| 1.  | Mining                       | 7,435,204,85                 | 1,2217 | 1       |
| 2.  | Processing industry          | 4,242,635,16                 | 0,5042 | 2       |
| 3.  | Transportation               | 3,709,847,41                 | 1,0410 | 3       |
| 4.  | Plantation                   | 2,707,867,98                 | 1,3245 | 4       |
| 5.  | Crops                        | 2,212,132,33                 | 1,3669 | 5       |
| 6.  | Electricity and drinking water| 1,064,639,12                 | 1,0928 | 6       |
| 7.  | Other Forest Products        | 805,865,67                   | 1,4251 | 7       |
| 8.  | Ranch                        | 720,063,74                   | 1,3521 | 8       |
| 9.  | Construction                 | 708,234,23                   | 0,9916 | 9       |
| 10. | Timber Industry Forest       | 627,419,17                   | 1,3724 | 10      |

Source: Processed Data.

The table above explains that the largest order of output in the economy of Jambi Province is the mining sector Rp. 7.4 trillion with a value added of 1.2217, which means that every injection of the exogenous balance in the mining sector balance sheet of one million rupiahs will be carried out with an injection of Rp. 1.2217 million and produce output in the economy of Rp.7.44 trillion. Likewise with the next sequence, the same understanding for the magnitude of the coefficient of value added in other economic sectors.

5.4 Impact of Forestry Sector Investment on the Forestry Sector

Regional economic multiplier to measure the impact of an activity, such as investment in production, distribution, income and demand that describes the structure of the regional economy. Impact of investment in the forestry sector in Jambi Province, through scenarios I, II and III. Scenario I: Timber industrial forest, non-timber industrial forest and other forest products, 20 percent each or a total
investment of Rp.1,032 billion. Scenario II: Timber industrial forest, non-timber industrial forest and other forest products, each 50 percent or a total of Rp.2.58 billion and scenario III: Timber industrial forest, non-timber industrial forest and other forest products, each 100 percent or a total of Rp. 5.16 billion.

Table 5. Impact of Forestry Sector Investment on the Forestry Sector

| No. | Commodities                  | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   |
|-----|------------------------------|------------------------------|-----|------------------------------|-----|------------------------------|-----|
| 1.  | Timber Industrial Forest     | 906.140,55                   | 44.42% | 1.344.540,6                 | 114.30% | 2.075.207,5                 | 230.75% |
| 2.  | Non-Timber Industrial Forest | 649.346,53                   | 291.96% | 1.448.017,2                 | 774.05% | 2.779.135,0                 | 1.577,54% |
| 3.  | Other Forest Products        | 1.045.739,6                  | 29.77% | 1.411.856,6                 | 75.20% | 2.022.051,5                 | 150.92% |

Source: Processed Data.

In scenario 1, the impact on the timber industry forest sector increased by 44.42 percent (Rp. 906.14 billion), initially the output produced was Rp. 627.42 billion, the non-timber industrial forest sector increased more by 292 percent (Rp. 649.35 billion), initially the output produced was Rp. 165.67 billion and other forest products sectors increased by only 29.77 percent (Rp. 1,045.74 billion), initially the output produced was Rp. 805.87 billion. Likewise in scenarios II and III have the same understanding.

5.5 The Impact of Forestry Sector Investment on the Forestry-Based Industrial Sector

The integration of the production sector with labor, capital, government and households has led to an increase in income in the production balance, which has a direct or indirect result of an increase in income on the balance sheet of production factors and institutional balance sheets. After an interaction between activities in another block that passes through a system, the increase in income in all blocks of the balance sheet will have an impact again on increasing other economic income and so on.

Table 6. The Impact of Forestry Sector Investment on the Forestry-Based Industrial Sector

| No.  | Commodities                                | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   |
|------|--------------------------------------------|------------------------------|-----|------------------------------|-----|------------------------------|-----|
| 1.   | Sawmill and Wood Processing Industry       | 607.836,59                   | 0.34% | 611.130,78                   | 0.89% | 616.621,11                   | 1.79% |
| 2.   | Plywood Industry and the like              | 4.874.512,76                 | 0.01% | 4.875.615,18                 | 0.04% | 4.877.452,54                 | 0.07% |
| 3.   | Manufacture of building materials and furniture from wood | 731.012,79 | 0.98% | 742.267,72                   | 2.53% | 761.025,93                   | 5.12% |
| 4.   | Manufacture of Paper and Paper Products    | 3.113.600,19                 | 0.98% | 3.161.510,21                 | 2.54% | 3.241.360,24                 | 5.13% |

Source: Processed Data.

Scenario 1, the investment is made in the timber industry sector, non-timber industrial forest and other forest products 20 percent or a total of Rp.1.03 billion, so the impact on the Sawmill and Timber Processing Industry sector increases 0.34 percent (Rp. 607.84 billion), initially the output produced was Rp. 605.77 billion, the Plywood Industry and the like sector increased smaller, namely 0.01 percent (Rp. 4,874.51 billion), initially the output of Rp. 4,873.82 billion and the Building Material Industry and Furniture from Wood increased by 0.98 percent (Rp. 731.01 billion), initially the output produced was
Rp. 723.95 billion and the Paper and Paper Products Industry sector increased only 0.98 percent (Rp.3,113.6 billion), initially the output was Rp. 3,083.28 billion. Likewise in scenarios II and III have the same understanding.

5.6 The Impact of Forestry Sector Investment on 10 Leading Economic Commodities in Jambi Province

The impact of the investment in the forestry sector on 10 main commodities in Jambi Province, through scenario I, the impact on the mining sector increased 0.27 percent (Rp.7,446.82 billion), initially the output produced was Rp.7,435.2 billion, the industrial sector increased more that is 0.89 percent (Rp.4,280.95 billion), initially the output produced is Rp. 4,242.64 billion and the transportation sector increased only 1.18 percent (Rp. 3,747.79 billion), initially the output produced was Rp. 3,709.85 billion and the plantation sector increased only 0.43 percent (Rp. 2,713.69 billion), initially the output produced was Rp. 2,707.87 billion. Likewise scenarios II and III have the same understanding.

Table 7. The Impact of Forestry Sector Investment on 10 Leading Economic Commodities in Jambi Province

| No. | Commodities         | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   |
|-----|---------------------|------------------------------|-----|------------------------------|-----|------------------------------|-----|
| 1.  | Mining              | 7,446,818,23                 | 0.27| 7,465,273,04                 | 0.68| 7,496,031,06                 | 2.38|
| 2.  | Processing industry | 4,280,949,10                | 0.89| 4,341,942,95                 | 2.32| 4,443,599,37                 | 4.69|
| 3.  | Transportation      | 3,747,785,58                | 1.18| 3,808,527,69                 | 3.06| 3,909,764,55                 | 6.21|
| 4.  | Plantation          | 2,713,694,78                | 0.43| 2,722,983,64                 | 1.13| 2,738,465,07                 | 2.28|
| 5.  | Crops               | 2,237,063,00                | 1.09| 2,276,822,87                 | 2.83| 2,343,089,32                 | 5.72|
| 6.  | Electricity and drinking water | 1,079,478,85 | 1.39| 1,103,132,66                 | 3.62| 1,142,555,68                 | 7.32|
| 7.  | Other Forest Products | 1,045,739,68 | 29.77| 1,411,856,62                 | 75.20| 2,022,051,52                 | 150.92|
| 8.  | Ranch               | 728,573,37                  | 0.93| 742,139,33                   | 2.41| 764,749,27                   | 4.89|
| 9.  | Construction        | 720,605,26                  | 1.76| 740,389,81                   | 4.56| 773,364,06                   | 9.24|
| 10. | Timber Industry Forest | 906,140,55 | 44.42| 1,344,540,67                 | 114.30| 2,075,207,53                 | 230.75|

Source: Processed Data.

The impact of the forestry sector investment on the 10 main commodities of Jambi Province (mining sector, processing industry, transportation, plantation, food crops, electricity & drinking water, other forest products, livestock, construction and timber industry forest sector) changed to: Mineral Goods Industry sector non-metals, Rice, grain and flour milling industry, Air Transportation, Oil and Gas Mining, Other Oil and Gas Refining Industries, Oil and Gas Refining Industry (Solar for Industries), Other Goods Industry, Other Food Industries, Premium Oil and Rubber Refining Industry and rubber. The same definition for the magnitude of the economic output coefficient of the economic sector in terms of the following Table.

Table 8. 10 Leading Commodities in the Economic Sector After Investment in Forestry Sector in Jambi Province

| No. | Commodities                  | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   | Economic Output (Rp Million) | %   |
|-----|------------------------------|------------------------------|-----|------------------------------|-----|------------------------------|-----|
| 1.  | Nonmetallic Mineral Goods Industry | 16,750,432,22 | 1.09| 17,038,569,69                 | 2.83| 17,518,798,82                 | 5.73|
| 2.  | Rice, grain and flour milling industry | 11,944,516,24 | 1.27| 12,183,848,98                 | 3.30| 12,582,736,88                 | 6.68|
| 3.  | Air Freight                  | 11,082,974,63               | 0.83| 11,229,123,62                 | 2.16| 11,472,705,27                 | 4.37|
| 4.  | Oil and Gas Mining           | 11,145,639,93               | 0.05| 11,154,311,55                 | 0.13| 11,168,764,24                 | 0.26|
5. Other Oil and Gas Refining Industries 8,995,793,98 0,08 9,007,139,08 0,21 9,026,047,59 0,42

6. Oil and Gas Refining Industry (Solar for Industry) 7,496,646,76 0,74 7,583,624,83 1,91 7,728,588,27 3,85

7. Other Goods Industry 6,871,580,91 1,29 7,010,681,21 3,34 7,242,515,05 6,76

8. Other Food Industries 5,640,784,65 0,92 5,722,845,72 2,39 5,859,614,16 4,84

9. Premium Oil and Gas Refining Industry 5,108,162,62 1,11 5,197,425,24 2,88 5,346,196,29 5,82

10 Rubber 5,237,318,84 0,02 5,238,915,48 0,05 5,241,576,54 0,10

Source: Processed Data.

This change occurs because investments made in the forestry sector do not touch / do not provide value added to 10 leading commodities before investing in the forestry sector.

This means that there is an interaction between activities in other blocks that pass through a system, eventually the increase in income on all balance sheets will have an impact on increasing income between sectors, so that the impact on the economy changes ten leading commodities after investment (Table 5.2.d).

5.7 Impact of Forestry Sector Investment on CO2 Emissions absorbed by the Forestry Sector

The economic development model that is applied is no longer in line with global needs, so it requires planning that supports living standards in a sustainable manner (UNEP, 2012). The current development model focuses more on the growth of production by exploiting existing natural resources (Muttaqin, 2012). The development model, also called brown economy, where the economy depends on fossil fuels, resulting in environmental degradation (UNEP, 2011). Therefore, at the General Assembly of the United Nations (UN) tried to introduce and implement an initiative namely green economy as a solution to overcome the decline in absorption of carbon emissions (Ocampo, 2012).

| No. | Commodities                  | CO\text{2} Emission  | CO\text{2} Emission  | CO\text{2} Emission  |
|-----|------------------------------|----------------------|----------------------|----------------------|
| 1.  | Timber Industrial Forest     | -                    | -15,208,271,75       | -54,27               | -23,472,938,18       |
|     |                              | 10,249,471,89        | 32,1                 | 5                    | 70,37                |
| 2.  | Non-Timber Industrial Forest | -                    | -139,388,386,03      | -91,80               | -267,523,854,00      |
|     |                              | 62,507,105,24        | 81,7                 | 1                    | 95,73                |
| 3.  | Other Forest Products        | -1,106,290,72        | -1,493,606,78        | -42,92               | -2,139,133,55        |
|     |                              | 22,9                 | 4                    | 60,15                |                      |

Source: Processed Data.

Timber Forest Industry in Jambi Province managed to absorb CO2 emissions of 4.7 MT / ha, non-timber industrial forest sector managed to absorb CO2 emissions as much as 28.68 MT / ha and other forest products sector managed to absorb CO2 emissions as much as 0.51 MT / ha after it was done forestry sector investment of Rp.1,032 billion or in scenario I. Likewise in scenarios II and III have the same understanding.

5.8 Impact of Forestry Sector Investment on CO2 Emissions Issued by the Industrial Sector Based on the Forestry Sector

As the development increases, the externalities of air pollution are like two sides of a coin. On the other hand, development and economic growth are spurred, but on the other hand a reduction in CO2
emissions is required. Furthermore, the impact of the forestry sector investment on CO2 emissions, as illustrated in the following:

### Table 10. Impact of Forestry Sector Investment on CO2 Emissions generated by the Industrial Sector Based on the Forestry Sector

| No. | Commodities                        | Economic Output (Rp Million) | % | Economic Output (Rp Million) | % | Economic Output (Rp Million) | % |
|-----|-----------------------------------|------------------------------|---|-------------------------------|---|-------------------------------|---|
| 1.  | Sawmill and Wood Processing Industry | 93.222,82                   | 0,34 | 93.728,04                   | 0,89 | 94.570,08                   | 1,79 |
| 2.  | Plywood Industry and the like      | 90.364,66                   | 0,01 | 90.385,09                   | 0,04 | 90.419,16                   | 0,07 |
| 3.  | Manufacture of building materials and furniture from wood | - | - | - | - | - | - |
| 4.  | Manufacture of Paper and Paper Products | - | - | - | - | - | - |

Source: Processed Data.

The impact of the forestry sector investment on CO2 emissions generated by the forest sector-based industrial sector, such as the Sawmill and Timber Processing sector will produce CO2 emissions of 93,223 MT or increase by 0.34 percent before investment produces CO2 of 92,905 MT and Plywood Industry and the like produces CO2 emissions of 90,365 MT or an increase of 0.01 percent before investment, CO2 emissions produced as much as 90,352 MT in scenario I, namely forestry sector investment of Rp.1,032 billion.

Each sector produces CO2 production, because each of these sectors requires fuel derived from fossils to produce CO2 emissions that are also produced by the community as a result of exhaust from breathing. Likewise in scenarios II and III have the same understanding.

### 5.9 The Impact of Forestry Sector Investment on CO2 Emissions produced by 10 Economic Leading Commodities in Jambi Province

The impact of the forestry sector investment on CO2 emissions produced by 10 leading commodities, the first is the nonmetallic mineral goods industry sector which has a production multiplier of 0.52, which means that 1 billion rupiah will increase the output of the economy amounting to 0.52 billion rupiah. This sector has a nominal effect on the ceramics industry sector. The fossil energy used by this sector is relatively very low, so that direct emissions are also low. The total emissions generated by the sector are more due to indirect emissions from consuming other sectors as inputs. Of the 0.117 million MT CO2 emissions produced every 1 billion output revenues in the non-metal Mineral Industry sector, or an increase of 1.09 percent due to direct use of fossil fuels (scenario 1).

### Table 11. The Impact of Forestry Sector Investment on CO2 Emissions produced by 10 Economic Leading Commodities in Jambi Province

| No. | Commodity                               | Emission CO2 (MT) | % | Emission CO2 (MT) | % | Emission CO2 (MT) | % |
|-----|-----------------------------------------|-------------------|---|-------------------|---|-------------------|---|
| 1.  | Nonmetallic Mineral Goods Industry      | 117.601,87        | 1,09 | 119.624,84       | 2,83 | 122.996,44       | 5,73 |
| 2.  | Rice, grain and flour milling industry  | 3.764,44          | 1,27 | 3.839,87         | 3,30 | 3.965,58         | 6,68 |
| 3.  | Air Freight                             | 215.390,79        | 0,83 | 218.231,11       | 2,16 | 222.964,97       | 4,37 |
| 4.  | Oil and Gas Mining                      | 41.062,76         | 0,05 | 41.094,71        | 0,13 | 41.147,95        | 0,26 |
| 5.  | Other Oil and Gas Refining Industries   | 390.727,60        | 0,08 | 391.220,37       | 0,21 | 392.041,65       | 0,42 |
6. Oil and Gas Refining Industry (Solar for Industry)

| Industry                      | Value Added | Var. | Value Added | Var. | Value Added | Var. | Value Added |
|-------------------------------|-------------|------|-------------|------|-------------|------|-------------|
| 6. Oil and Gas Refining       | 1.326,19    | 0.74 | 1.341,58    | 1.91 | 1.367,22    | 3.85 |

7. Other Goods Industry

| Industry                      | Value Added | Var. | Value Added | Var. | Value Added | Var. | Value Added |
|-------------------------------|-------------|------|-------------|------|-------------|------|-------------|
| 7. Other Goods Industry       | 1.347,677   | 1.29 | 1.375,152   | 3.34 | 1.420,626   | 6.76 |

8. Other Food Industries

| Industry                      | Value Added | Var. | Value Added | Var. | Value Added | Var. | Value Added |
|-------------------------------|-------------|------|-------------|------|-------------|------|-------------|
| 8. Other Food Industries      | 79,313,63   | 0.92 | 80,467,47   | 2.39 | 82,390,54   | 4.84 |

9. Premium Oil and Gas Refining Industry

| Industry                      | Value Added | Var. | Value Added | Var. | Value Added | Var. | Value Added |
|-------------------------------|-------------|------|-------------|------|-------------|------|-------------|
| 9. Premium Oil and Gas Refining Industry | 52,218,56  | 1.11 | 53,131,05   | 2.88 | 54,651,87   | 5.82 |

10. Rubber

| Industry                      | Value Added | Var. | Value Added | Var. | Value Added | Var. | Value Added |
|-------------------------------|-------------|------|-------------|------|-------------|------|-------------|
| 10. Rubber                    | -683,126,48 | 0.02 | -683,334,74 | 0.05 | -683,681,83 | 0.10 |

Source: Processed Data.

The second leading economic sector is rice milling, grain and flour as an impact of the forestry sector investment. The multiplier of production is 1.1529, which means that if the output income of the rice milling, grain and flour industry sector increases by 1 billion rupiah, then increasing economic output is 1.1529 billion rupiah. The growth of the sector is nominally the most influenced by the food industry sector and the trade sector, because these two sectors are widely used as input between the sector through the use of labor in the forestry sector (indirect impacts). The sector also produces high emissions. This is in addition to the fact that the sector uses fossil fuels directly, so that even though emissions are not direct, they are still high. The increase in output income of the rice mill, grain and flour industry by 1 billion rupiahs is expected to produce emissions of 3,764 MT, an increase of 1.27 percent. The same definition for the magnitude of other economic sector coefficients, both in scenarios II and III.

6. Conclusion and Suggestion

6.1 Conclusion

The role of the forestry sector in Jambi Province is reflected in the value added of the wood industry forest sector, non-timber industrial forest and forest products as well as the forest sector-based industrial sector which is greater than one which means an billion rupiah exogenous forestry injection increasing economic output greater than one billion rupiah. Except for the paper and paper products industry, the value added is smaller than one means if an injection is carried out on the exogenous balance sheet of the paper industry sector, it will increase economic output by a small one billion rupiah, because this industry lacks competitiveness towards a sustainable industrial sector in the market domestic and international. While the ten leading commodities in the economic sector include: mining, transportation, plantations, food crops, electricity and drinking water, other forest products, livestock, and industrial timber forests as the impact of the forestry sector investment also has greater added value than one (except processing industries and construction).

The impact of forestry sector investment on output in the economy, especially the non-timber forest sector increased by 1,578 percent, the timber industry forest sector increased 231 percent and other forest products sectors increased by 151 percent. The impact on the sawmill and wood processing industry sector increased 1.79 percent, the Plywood Industry and the like increased by 0.07 percent, and the building materials and wood furniture industry sector increased 5.12 percent, the paper industry sector and paper goods increased by 5.13 percent. The output of each of these sectors was Rp. 605.77 billion, Rp. 4873.82 billion, Rp. 723.95 billion and Rp. 3,083.28 billion.

Furthermore, the impact on the changes in the sector of 10 leading economic commodities in Jambi Province: non-metallic mineral goods industry, oil and gas mining, other oil and gas refining industries, oil and gas refining industries (diesel for industries) and premium oil and gas refining industries, and subsequently the industrial sector of rice milling, grain and flour, air transportation, other goods industries other food industries, and rubber (forest industry).

The impact of the forestry sector investment on the absorption of CO2 emissions by the forestry sector itself increased the average wood industry forest sector by 52.26 percent, non-timber forest sector absorption of CO2 emissions increased by 89.75 percent and other forest products CO2 emissions increased by 42 percent. Before there was investment in the forestry sector, CO2 emissions were
absorbed by the timber industry sector as much as 3.19 MT / ha, the non-timber forest sector absorbed CO2 emissions of 5.25 MT / ha and other forest products absorbed CO2 emissions of 0.39 MT / Ha.

The impact of the forestry sector investment on CO2 emissions generated by the Sawmill and Wood Processing Industry sector increased by 1.01 percent and the Plywood Industry sector and the like increased 0.04 percent. The industrial sector of building materials and wood furniture and other forest products produces no CO2 emissions because companies in this sector run: B3 waste management, air pollution control, water control and Amdal implementation. The impact of the investment in the forestry sector on increasing CO2 emissions in the 10 main commodities of Jambi Province, among others: the non-metallic mineral goods industry sector, the industrial sector of rice milling, grain and flour, the air transport sector, the oil and gas mining sector, other oil and gas industries industrial sector of oil and gas refining (diesel for industry), other goods industry sector, food industry sector, premium oil refining industry sector, while rubber sector absorb CO2 emissions increased by 0.06 percent.

6.2 Suggestion

First, the sector which is the leading sector needs special attention and is a priority in development. For example: superior seed assistance programs, ease of business credit, building groups and cooperatives, improvements in land use (land use). Industry sector development based on superior sectors can also be carried out and other programs that can drive output.

Second, sector groups that can encourage high output, but low CO2 emissions produced, policies need to be implemented that can reduce CO2 emissions.

Third, sector groups that produce low CO2 emissions but do not encourage output, policies need to be implemented that can drive output. Among them by increasing production productivity through technology development, research & development (R & D) or other activities.

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