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**Assessing the impact of fiscal policies in green forestry and renewable energy sectors on poverty reduction and job creation in Indonesia**

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# Assessing the impacts of fiscal policies in green forestry and renewable energy sectors on poverty reduction and job creation in Indonesia

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## Abstract

In 2009, Indonesia has committed itself to reduce GHGs emission by 41% by 2020 with international assistance. Over all sectors, about 80% of total GHG emissions in Indonesia come from land use, land use change and forestry (LULUCF). In line with this, Indonesia also started implementing a “green economy” in several major sectors such as forestry and renewable energy sectors, to achieve sustainable economic growth in future. For the forestry sector, Indonesia has started a fiscal policy to boost green investment and to support the implementation of a green economy through the REDD+ and Japanese credit mechanism schemes. For renewable energy sector, Indonesia has started to remove the subsidy on energy sector and to invest more on renewable energy. This study examines whether fiscal policies regarding the green sectors - mainly forestry and renewable energy - have a positive impact on poverty reduction and job creation in both rural and urban areas in Sumatera, Kalimantan and Papua. This study employs the social accounting matrix analysis, using the 2005 Indonesian inter-regional social accounting matrix table with the extension of the green sectors. To identify the green sectors in Indonesia, this study follows the green sectors classification based on the 2013 ILO green jobs mapping study. The results of this study show that regions Java and Bali play an important role as major suppliers to other regions; the green sectors have a strong backward linkage to the economy. Also, the fiscal policies implemented on green forestry, green oil palm plantations and the green renewable energy sector in Java and Bali has a positive impact on the economy.

**Keywords:** *fiscal policy, green sectors, Indonesia, Inter-regional social accounting matrix*

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## 1. INTRODUCTION

As one of the largest nations, Indonesia plays a role model for other countries in the south-east Asian region. Indonesia is one of largest forest covered countries in the world. In 2004, Indonesia announced its long-term development mission with policies to support the poor to create jobs and growth. In 2007, pro-environmental policies are added to its long-term development mission. In 2009, Indonesia's President, Susilo Bambang Yudhoyono promised to reduce GHG<sub>s</sub> emission by 26% by 2020 using its national resources, and by 41% with international assistance. By 2014, Indonesia targeted to achieve an annual economic growth of about 7%. To achieve these targets, Indonesia has developed a National Mitigation Action Plan on Greenhouse Gas Emission Reduction/ Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca (RAN-GRK). This showed the Indonesian government has adapted the concept of a green economy in its medium-long term national development plan.

The second national report of IPCC (2009) states that the largest emission sources come from land use and land use change and forestry; these accounted for about 87% of total emissions in Indonesia. This is not surprisingly because Indonesia is one of largest forested countries in the world, while Indonesia has also been identified as one of countries with the highest level of deforestation. Between 2000 and 2014, agricultural production has been expanded by conversion of forested areas, also by illegal logging and manmade forest fires on a massive scale. Based on the Presidential Regulation No. 61/2011 of the National Action Plan to reduce GHG emissions, the forestry, energy and transportation sectors have been selected as three of five key sectors for reducing emission.

To support a smooth transition to a green economy, in February 2009, Indonesia set aside about IDR 73.3 trillion as a fiscal stimulus. In the RAN-GRK scheme, several financial sources have been identified both domestic and international; to fund the mitigation efforts of emissions in the five selected sectors. Indonesia will utilize the national government budget (APBN), private investment fund, fiscal incentives. For example, to support the investment in the renewable energy sector, Indonesia has applied fiscal incentives e.g.. reductions in income tax, import duties and VAT (Damuri and Atje, 2013).

Indonesia's efforts to implement a green economy by integrating the emission reduction targets in the medium and long-term; received big supports from several international organizations, such as UNEP, ILO, GIZ and the Norwegian government. In 2013, ILO published a green jobs mapping study for Indonesia, identifying the main green sectors and estimating green jobs in Indonesia. ILO has identified nine green sectors: agriculture, forestry, fishery, mining and energy, manufacturing, waste disposal, construction, transport, tourism. Successful fiscal policies in these green sectors should have a positive impact on poverty reduction and job creation. This is important to simultaneously achieve the targeted level of economic growth and emission

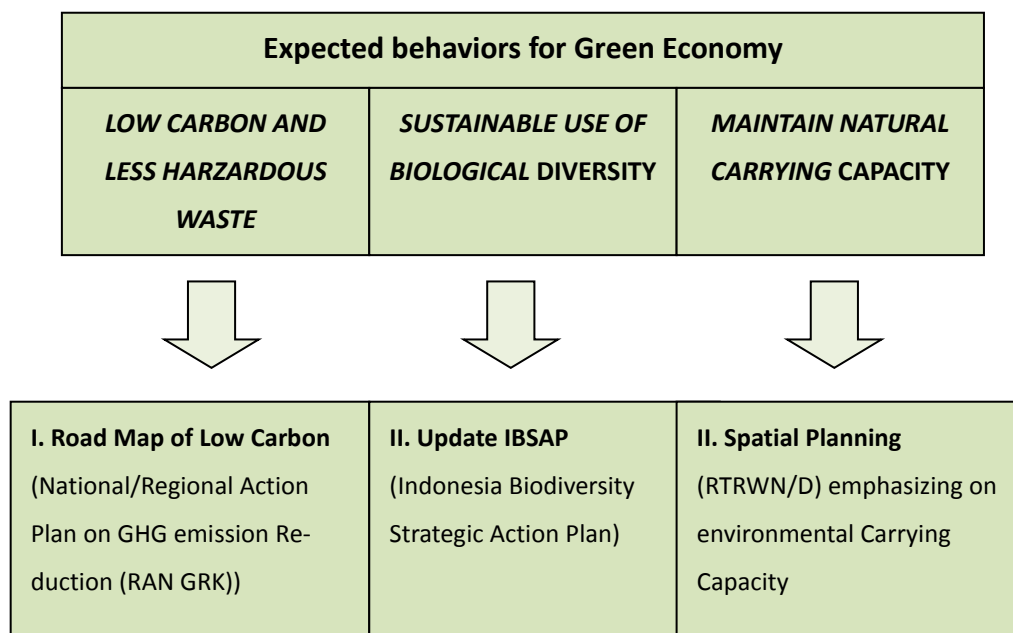
reduction.

This study examines the impact of the fiscal policies supporting the forestry and renewable energy sector on household income and job creation, using the matrix analysis of green sector-extended inter-regional social accounting. This study follows the classifications of green sectors of the 2013 ILO green jobs mapping study. To capture the distribution of household and labor in different regions, the 2005 Indonesia inter-regional social accounting table has been used. This is important because the distribution of income and resources is different in targeted region. For example, there are more poor people with limited access to electricity in Papua and Kalimantan than in Java and Bali.

## 2. LITERATURE REVIEW

### 2.1 Concept of Green Economy in Indonesia

Indonesia has announced to achieve reductions in greenhouse gas emissions by about 26% and 41% by 2020, using its national resources or with international assistance respectively. Simultaneously, Indonesia has targeted a stable annual economic growth of about 7%. In addition, Indonesia announced its national concept of a green economy consisting out of three components: low carbon and low hazardous waste; sustainable use and biological diversity and maintaining the natural carry capacity. Indonesia wants sustainable use of natural resources, reduction in poverty, creation of jobs and sustainable economic growth. To support the transition to green growth, the government of Indonesia is implementing some policies to remove the barriers such as removing costly energy subsidy, promoting cleaner energy sources (renewable energy), and implementing REDD scheme (Jupesta, 2011). In addition, in 2011, Indonesia has developed its National Mitigation Action Plan on Greenhouse Gas Emission Reduction/ Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca (RAN-GRK). A detailed representation of these components of green economy is given in figure 2.1.



**Figure 2.1: Three main components of green economy in Indonesia.**

(Source: Ministry of Environment and Ministry of Finance, 2012)

Indonesia has selected five key sectors with targets in emission reduction: forestry, waste management, energy and transportation, agriculture and industry. Forestry should account for a 87% reduction in total emissions, where energy should contribute about 5% (Ministry of Envi-

ronment, 2010). To support the successful of transition to a green economy, Indonesia has announced a fiscal reform, with four components: optimization of state revenues, improve quality of government spending, controlling budget deficit, and reducing the debt-to-GDP ratio. Indonesia has identified several fiscal and financial sources to fund the emission reduction for five key sectors, as presented in table2.1.

**Table2.1: Fiscal Policy Focus to support green economy in Indonesia.** (Source: Ministry of Environment and Ministry of Finance, 2012)

<b>FISCAL</b>	<b>FINANCIAL</b>
<b>1. Incentives</b> <ul style="list-style-type: none"> <li>• Biofuels</li> <li>• Geothermal</li> <li>• Transfer Fiscal for CC action at province/district</li> </ul> <b>2. Fossil Fuel Subsidy</b>	<b>1. Mobilization of International Climate Finance</b> <ul style="list-style-type: none"> <li>• Indonesia Climate Change Trust Fund(ICCTF)</li> <li>• Indonesia Green Investment Fund(IGIF)</li> <li>• Climate Investment Funds(CTF &amp; SCF)</li> </ul> <b>2. Optimization of Domestic Finance</b> <ul style="list-style-type: none"> <li>• Banks and Insurance</li> <li>• Public: APBN, APBD</li> <li>• Private: CSR, Carbon Market</li> </ul>
<b>3. Government Guarantee</b> <ul style="list-style-type: none"> <li>• Green Infrastructure</li> </ul>	

## 2.2 Challenges and fiscal instruments to support REDD+ in forestry sector in Indonesia

The forestry sector has played an important role in the Indonesian economy over the past five decades and is an important source of national revenues as well as a source of income for about half the people in rural areas. People in rural areas are highly dependent on agricultural, forestry and estate crops. Most people in rural areas in Indonesia who are working there are counted as informal labor. The forestry sector combined with forestry products contributes about 3.5%tothe Indonesian economy (ITS Global, 2011). Palm oil, pulp and paper, and wood and rubber are major subsectors in the forestry sector.

However, Indonesia also faces deforestation and illegal logging since many years. A recent study describes Indonesia as the country with the highest deforestation rate, surpassing Brazil (Lawson, S , 2014). The main drivers of deforestation are the conversion of land use from forest to cultivating estate crops and illegal logging. About 75% of forested products are exported to meet the increasing the global demand. Indonesia identified land use and land use change by the forestry sector as the largest emission sources. They accounted for more than 80% of total emis-

sions. Therefore, emission reduction by the forestry sector plays an important role in achieving the reduction target by 2020.

In 2011, the Indonesian and Norwegian governments have signed a letter of intent, stating that Norway will support Indonesia with US\$ 1 billion to help emissions reduction from deforestation and the forestry sector in a REDD+ scheme. a moratorium on forest and peat conversion (palm oil expansion) is an effort to reduce the deforestation rate. Indonesia has decided to use available “degraded land” for the conversion to palm oil plantations and for production of other agricultural and estate crops. Indonesia has also established a REDD+ task force and plans to utilize both government and private funds to finance REDD+. The development of REDD+ consists of the extension of another 2 years moratorium, developing one map, development of a REDD+ safeguard, and FREDDI. The financial sources for REDD+ and a green forestry sector can be classified into three main categories: public budget, private investment, and overseas development partnerships. A detailed view of each sub categories presented in table 2.2.

**Table 2.2: Finance sources for the green forest sector in Indonesia.** (Source: United Nations, 2010)

<p><b>PUBLIC BUDGET</b></p> <ul style="list-style-type: none"> <li>• Annual National Budget (Tax-Based Revenue, Forest Non-Tax Revenue)</li> <li>• Province Budget (Province APBD and Fiscal Balance Budget)</li> <li>• District Budget (Province APBD and Fiscal Balance Budget)</li> </ul>
<p><b>PRIVATE INVESTMENT</b></p> <ul style="list-style-type: none"> <li>• National Investment</li> <li>• Foreign Investment</li> </ul>
<p><b>OVERSEAS DEVELOPMENT PARTNERSHIPS</b></p> <ul style="list-style-type: none"> <li>• Bilateral and Multilateral</li> <li>• FCPF, IFP, GEF, ICCTF, FIP, etc.</li> <li>• REDD+ Readiness Investment, FLEGT, Forest Fire, Bio Diversity, Community Development, Institutional Capacity Building, etc.</li> </ul>

### 2.3 Challenges and fiscal instruments to support the renewable energy sectors.

Indonesia used to be one of major exporters of oil and gas in the world market and also as

a member of the APEC countries. However, starting from 2004, oil and gas production in Indonesia has decreased. At the same time, energy consumption has been increasing due to the needs of economic growth. Therefore, a lack in the supply of energy arose forced this country to import oil and gas. To maintain a fuel price which is affordable to the poor, a subsidy for fuel is implemented. However, the subsidy on fuel caused a burden on the government budget due to the increasing energy production and consumption. At the same time, Indonesia also faces a problem in limited access to electricity for people in some rural areas. In 2012, about 25% of the population has limited or no access to electricity. Therefore, the government has designed targeted electricity access for each region. In addition, to reduce the dependency on oil and gas, the Indonesian government has targeted to increase the share of renewable energy. Based on Presidential Decree No. 5/2006, the share of renewable energy should increase to about 17% of total energy sources by 2025, from geothermal, solar PV, biomass and other renewable energy sources. To support the successful development of a renewable energy sector, incentive schemes have been developed through financial and fiscal incentives, and provision of goods and services below market value. Fiscal incentives to support the development of a renewable energy sector can be classified into two categories: import duties and VAT exemption, and income tax reduction as presented in table 2.3.

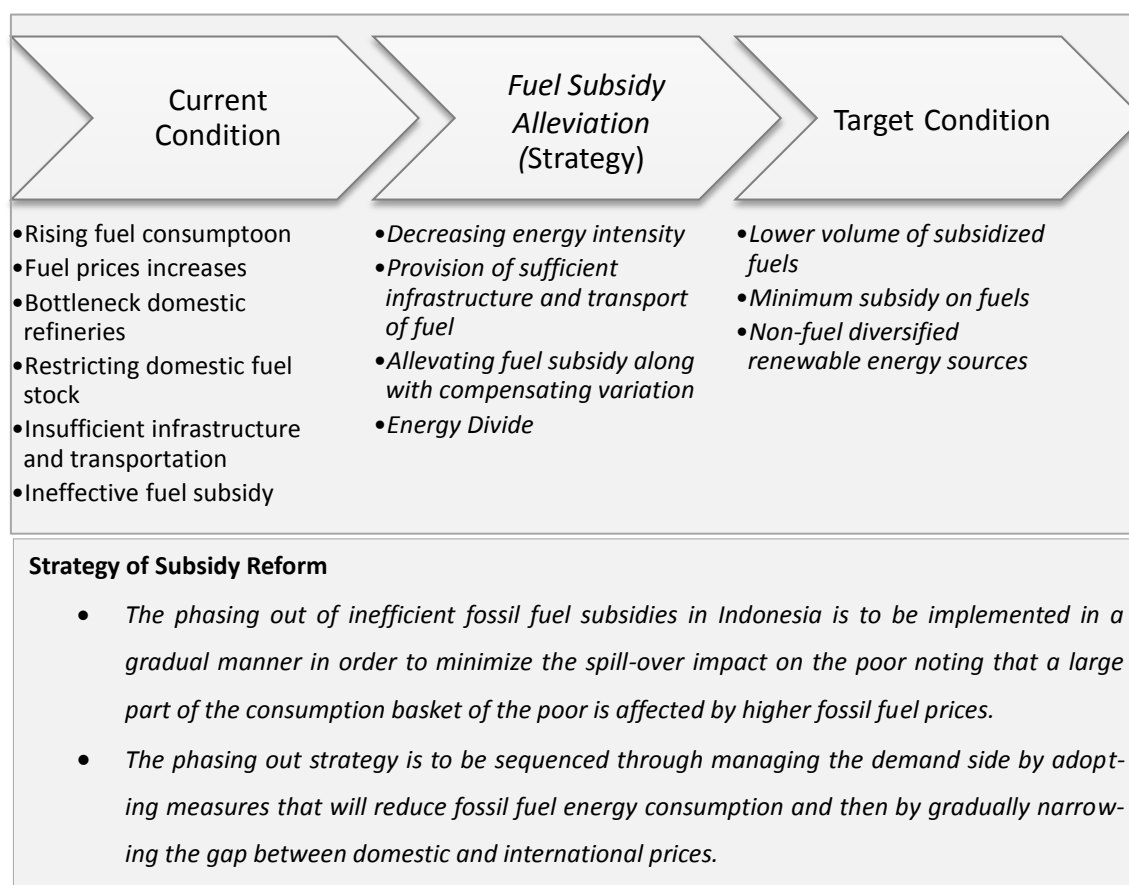


**Table 2.3: Incentive schemes and regulations for renewable energy.** (Source: Damuri and Atje, 2013)

<b>INCENTIVE SCHEME</b>	<b>RELATED REGULATIONS</b>	<b>REMARKS</b>
<b>Financial Incentives</b>		
Indonesia Infrastructure Guarantee Fund	MoF Regulation 260/2010	SOE providing Guarantee to attract private capital investment in infrastructure development.
The Geothermal Fund	MoF Regulation 3/2012	Provides finance for exploration only to be paid for if sites prove productive.
Development Credits for Biofuels and Plantation Revitalization	MoF Regulation 117/2006 MoF Regulation 79/2007	Low-cost loans for farmers and farmer groups that plant energy crops.
Government Financial Guarantee	MoF Regulation 139/2011	Government guarantee for geothermal and hydro power plant projects as part of FTP II of electricity development.
<b>Fiscal Incentives</b>		
Import Duty and VAT exemption	MoF Regulation No. 21/2010	Import duty Exemption on machinery and capital development of power plants. Exemption from VAT on importation of taxable goods.
Income Tax Reduction	MoF Regulation No. 21/2010	Reduction and various facilities for income tax on energy development projects, including net income reduction, accelerated depreciation, dividends reduced for foreign investors and compensation for losses.
<b>Provision of Goods or Services Below Market Value</b>		
The Geothermal Fund	MoF Regulation 3/2012	Survey and exploration services, only to be paid for if sites prove productive.
Guarantee on Business Viability of PLN	MoF Regulation 139/2011	Guarantee that PLN would perform its business activities and respect contracts with IPP.
Public Competitive Bidding	MEMR Regulation 1/2006	Agrees favorable tariffs with most competitive company bidding for tender.
Feed in Tariffs	MEMR Regulation 4/2012 MEMR Regulation 22/2012	FIT for biomass and mini hydro power plant. FIT for Geothermal power plants.
Mandatory Utilization	MEMR Regulation	Obligatory usage of biofuels for fuel mix. Mandatory usage of

	32/2008	biofuels in mining industry.
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In line with the incentive schemes to support the development of renewable energy sector, Indonesia also developed a policy framework to phase out fuel subsidies as presented in Figure 2.2.



**Figure 2.2: Policy framework to phase-out fuel subsidies.** (Source: Fiscal policy office, Republic of Indonesia, 2011)

### **3. METHODOLOGY**

#### **3.1 The 2005 Indonesian Inter-regional social accounting matrix table**

This study utilizes the 2005 Indonesian inter-regional social accounting matrix table which was compiled by Resosudarmo, Nurdianto and Hartono (2009). The 2005 Indonesian IRSAM was mainly based on the Inter-Regional Input-Output Table, with additional data sources such as the National Socio-Economic Survey (SUSENAS), the National and Regional Balance of Payment, Current Account, Population Census, National Labor Force Survey (SAKERNAS). In the IRSAM, the transaction for each region occurs into two channels which are with other regions and other countries. IRSAM for Indonesia of 2005 consists of five regions, are Sumatera, Kalimantan, Java and Bali, Sulawesi and Eastern Indonesia. The simplified the 2005 Indonesian IRSAM is presented on the appendix.

Moreover, the classification of 2005 IRSAM for each region has factors on production, institutions, production sectors, commodities, other accounts, National Government Accounts. The factor production has three classifications: labor, capital and land. The labor is differentiated into 16 classifications which are 8 formal and 8 informal classes. Institutions have three classifications: households, companies and local government. Households are divided into rural and urban. Production is classified into 35 sectors. The other accounts are: local tax, subsidy and inventory. At the national level accounts, there are three types of accounts: capital accounts (central, local and private), central government account, and tax and subsidy accounts. A detailed classification of accounts in IRSAM 2005 can be seen in the Table3.1.

**Table3.1: Structure of 2005 Indonesia IRSAM.** (Source: Resosudarmo et al., 2009)

			EXPENDITURE													
			Classification	Region 1				Region 2				Nat. Gov't			ROW	TOTAL
				IRSAM	Fact.	Inst.	Comm.	LG	Fact.	Inst.	Comm.					
RECEIPTS	Region 1	Factors	$a_{11}^{11}$	$a_{12}^{11}$	$a_{14}^{11}$	$a_{11}^{12}$	$a_{12}^{12}$	$a_{14}^{12}$	$z_{11}^1$	$z_{12}^1$	$y_1^1$					
		Institutions	$a_{21}^{11}$						$z_{21}^1$		$y_2^1$					
		Commodities									$y_3^1$					
		Local Gov't	$a_{41}^{11}$			$a_{44}^{11}$	$a_{41}^{12}$		$a_{44}^{12}$		$y_4^1$					
	Region 2	Factors	$a_{11}^{21}$			$a_{14}^{21}$	$a_{11}^{22}$		$a_{14}^{22}$	$z_{11}^2$	$z_{12}^2$	$y_1^2$				
		Institutions	$a_{21}^{21}$				$a_{21}^{22}$			$z_{21}^2$		$y_2^2$				
		Commodities									$y_3^3$					
		Local Gov't	$a_{41}^{21}$			$a_{44}^{21}$	$a_{41}^{22}$		$a_{44}^{22}$	$z_{41}^2$	$z_{42}^2$	$y_4^4$				
	National Gov't		$z_{11}^1$	$z_{21}^1$			$z_{21}^1$	$z_{21}^2$	$z_{41}^2$			$x_{12}$				
	Rest of the World		$z_{12}^1$				$z_{12}^2$	$z_{42}^2$	$x_{22}$							
Total			$y_1^1$	$y_2^1$	$y_3^1$	$y_4^1$	$y_1^2$	$y_2^2$	$y_3^3$	$y_4^4$	$x_{11}$	$x_{21}$				

To show a simplified accounts flow among regions, a simplified framework for account transaction between Sumatera and Kalimantan region is presented in table 3.2.

**Table 3.2: Simplified Framework of the 2005 Social Accounting Matrix for Sumatera Region.** (Authors' Compilation)

IRSAM 2005 Classification	Sumatera Region					Other Regions				National Accounts			
						Expenditure							
Receipt		1	2	3	4	5	6	7	8	9	10	11	12
Factors of Production	1			$A_{1,3}$									$A_{1,12}$
Institution	2	$A_{2,1}$	$A_{2,2}$	$A_{2,3}$		$A_{2,5}$	$A_{2,6}$				$A_{2,10}$		$A_{2,12}$
Production Sectors	3		$A_{3,2}$	$A_{3,3}$	$A_{3,4}$		$A_{3,6}$	$A_{3,7}$	$A_{3,8}$	$A_{3,9}$	$A_{3,10}$		$A_{3,12}$
Others	4			$A_{4,3}$						$A_{4,9}$			
Factors of Production	5							$A_{5,7}$					$A_{5,12}$
Institution	6	$A_{6,1}$	$A_{6,2}$			$A_{6,5}$	$A_{6,6}$		$A_{6,8}$		$A_{6,10}$		$A_{6,12}$
Production Sectors	7		$A_{7,2}$	$A_{7,3}$	$A_{7,4}$		$A_{7,6}$	$A_{7,7}$	$A_{7,8}$	$A_{7,9}$	$A_{7,10}$		$A_{7,12}$
Others	8							$A_{8,7}$		$A_{8,9}$			
Capital	9		$A_{9,2}$				$A_{9,6}$				$A_{9,10}$		$A_{9,12}$
Central Government	10	$A_{10,1}$	$A_{10,2}$	$A_{10,3}$		$A_{10,5}$	$A_{10,6}$	$A_{10,7}$			$A_{10,10}$	$A_{10,11}$	$A_{10,12}$
Imported Commodity	11		$A_{11,2}$	$A_{11,3}$			$A_{11,6}$	$A_{11,7}$		$A_{11,9}$	$A_{11,10}$		
Rest of the World	12	$A_{12,1}$	$A_{12,2}$			$A_{12,5}$	$A_{12,6}$					$A_{12,11}$	

Table 3.2 presents the simplified economic flow among accounts in Social Accounting Matrix for Sumatera region and Kalimantan region. In other words, the table above contains matrices that record all transactions of receipt and expenditure from one account to others. The receipt of one account from others also means the expenditure done by other accounts. For the receipt account of Sumatera SAM, sub-matrix  $A_{1,3}$  shows the receipt of factors of production from production sectors in Sumatera Region in terms of wage, salary and surplus and sub-matrix  $A_{1,12}$  shows the receipt of factors of production in Sumatera Region from abroad (the rest of the world) mainly in form of capital inflow from abroad to Sumatera Region. Sub-matrices  $A_{2,1}$ ,  $A_{2,2}$ ,  $A_{2,3}$  are the receipt accounts for institution (household, local government, and enterprises) from accounts in Sumatera Region. Sub-matrix  $A_{2,1}$  shows the receipt of institution from factors of production,  $A_{2,2}$  shows the receipt from institution such as local government subsidy to household, the receipt of household from enterprise, receipt of local government from enterprise like tax. Sub-matrix  $A_{2,3}$  shows the receipt of institution from production sectors. Sub-matrix  $A_{2,10}$  is the receipt of institution from central government such as subsidy from cen-

tral government to household, enterprise, and to local government. Sub-matrix  $A_{2,12}$  shows the receipt of institution from the rest of the world.

Furthermore, in the receipt or income accounts in Sumatera region, Sub-matrices  $A_{3,2}$ ,  $A_{3,3}$  and  $A_{3,4}$  show the receipt of production sectors account from institution, production sectors, and others respectively. Sub-matrices  $A_{3,6}$ ,  $A_{3,7}$ ,  $A_{3,8}$  show the receipt of production sectors from other regional account. Sub-matrix  $A_{3,6}$  shows the receipt from production sectors from institution in other region as final demand. Sub-matrix  $A_{3,7}$  shows the income of production sector from production sectors in other region due to its use as intermediate input for production sectors in other region. Sub-matrices  $A_{3,9}$ ,  $A_{3,10}$ ,  $A_{3,12}$  are the receipts from production sectors from national account. Sub-matrix  $A_{3,9}$  shows the receipt of production sectors from capital in national level in form of physical investment. Sub-matrix  $A_{3,10}$  shows the receipt of production sectors as final demand by central government for production sectors. Sub-matrix  $A_{3,12}$  shows the receipt of production sectors from abroad or the rest of the world. As for the receipt of other accounts are shown in sub-matrices  $A_{4,3}$  and  $A_{4,9}$ . The sub-matrix  $A_{4,3}$  shows the receipt of other accounts from production sectors and sub-matrix  $A_{4,9}$  shows its receipt from central government.

In the case of the income receipt by other region from Sumatera region and the same region as well as the expenditure spent by other region specifically on the factors of production accounts, which are in sub-matrices  $A_{5,7}$  and  $A_{5,12}$ . Sub-matrix  $A_{5,7}$  shows the income received by factors of production account in other region from production sectors that use labor, land, and capital from other region. Meanwhile, sub-matrix  $A_{5,12}$  shows the income received by factors of production account in other region from the rest of the world. As for the income received by institution accounts in other region, sub-matrix  $A_{6,1}$  displays the receipt by institution in other region from the factors of production in Sumatera region as for the use of capital, labor and land. Sub-matrix  $A_{6,2}$  shows the receipt of institution in other region from institution in Sumatera Region which is known as transfer among institution. The receipt of institution accounts in other region from other region are displayed in sub-matrices  $A_{6,5}$ ,  $A_{6,6}$  and  $A_{6,8}$ . The sub-matrix  $A_{6,5}$  shows the receipt of institution in other region from factors of production in the same region, meanwhile sub-matrix  $A_{6,6}$  displays income received by institution from institution in other region, and sub-matrix  $A_{6,7}$  shows the income received by institution in other region from national accounts are shown in sub-matrices  $A_{6,10}$  and  $A_{6,12}$ . The sub-matrix  $A_{6,10}$  shows the income received by institution in other region from national government (such as subsidy) and sub-matrix  $A_{6,12}$  shows the receipt of institution in other region from abroad. As for the incomes received by production sector account in other region from Sumatera Region are shown by sub-matrices  $A_{7,2}$ ,  $A_{7,3}$  and  $A_{7,4}$ . The sub-matrix  $A_{7,2}$  shows the income received by production sectors in other region from institution in Sumatera region which is known as final demand. Sub-matrix  $A_{7,3}$  shows the receipt of production sector in other region from production sectors in Sumatera Re-

gion which is known as intermediate input. Sub-matrix  $A_{7,4}$  displays the income received by production sector in other region from others account in Sumatera region. As for the income received by production sectors in other region from accounts in other regions are shown by sub-matrices  $A_{7,6}$ ,  $A_{7,7}$  and  $A_{7,8}$ . The sub-matrix  $A_{7,6}$  shows the income received by production sectors in other region from institution in other region. Sub-matrix  $A_{7,7}$  shows the income received by production sectors from production sectors using region, which is known as intermediate demand. Sub-matrix  $A_{7,8}$  shows the income received by production sector from other accounts using the region. Meanwhile, incomes received by production sectors in other region from national account are shown by sub-matrices  $A_{7,9}$ ,  $A_{7,10}$  and  $A_{7,11}$ . The sub-matrix  $A_{7,9}$  shows the income received by production sectors in other region from capital at the national level. Sub-matrix  $A_{7,10}$  shows the receipt of production sectors in other region from central government (such as in form as subsidy), and  $A_{7,12}$  shows the income received from the rest of the world. Moreover, for the income received by other account in other region are shown by sub-matrices  $A_{8,7}$  and  $A_{8,9}$ . The sub-matrix  $A_{8,7}$  shows the receipt of other accounts from production sectors using region such as regional tax. Sub-matrix  $A_{8,9}$  shows the income received by other account in other region from capital account at the national level.

Furthermore, as for incomes received by capital account at national level are shown by sub-matrices  $A_{9,2}$ ,  $A_{9,6}$ ,  $A_{9,10}$  and  $A_{9,12}$ . The sub-matrix  $A_{9,2}$  shows the income received by capital account from institutions in Sumatera region which is known as saving. Sub-matrix  $A_{9,6}$  shows the receipt of capital account in national level from institution in other region which is also known as saving from other region. Sub-matrix  $A_{9,10}$  shows the income received by capital account at national level from central government which is known as central government's saving. Sub-matrix  $A_{9,12}$  shows the income received by capital account from abroad as the rent or capital inflow from the world. Moreover, Sub-matrices  $A_{10,1}$ ,  $A_{10,2}$ , and  $A_{10,3}$  show the income received by central government from accounts in Sumatera region. Meanwhile, sub-matrices  $A_{10,5}$ ,  $A_{10,6}$  and  $A_{10,7}$  show the income received by central government from accounts in other region, and sub-matrices  $A_{10,10}$ ,  $A_{10,11}$  and  $A_{10,12}$  show the income received by central government from central government, from imported commodities, and from abroad respectively. Moreover, Sub-matrices  $A_{11,2}$  and  $A_{12,3}$  show the income received by imported commodities from institution and production sectors in Sumatera region respectively. These are also known as the final demand and intermediate demand for imported commodities in Sumatera region respectively. Meanwhile sub-matrices  $A_{11,6}$  and  $A_{11,7}$  show the income received by imported commodity from institution and production sectors in other region category. Lastly, sub-matrix  $A_{11,10}$  shows the income received by imported commodity from central government or also known as total value of commodity imported by central government. Sub-matrices  $A_{12,1}$  and  $A_{12,2}$  show the income received by rest of the world from factors of production and institution in Sumatera region re-

spectively. Sub-matrices  $A_{12,5}$  and  $A_{12,6}$  show the receipt of the rest of the world from the transfer of factors of production and institution in other region category. And the last sub-matrix  $A_{12,11}$  shows the income received by the rest of the world from imported commodity.

In addition, 2005 Indonesian inter-regional social accounting classified the labor into 16 classifications into specific labor in rural and urban areas as presented in table 3.3. A detailed classification of other accounts can be seen in Appendix 2.

**Table 3.3: Labor Classifications in Social Accounting Matrix for the Sumatera and Kalimantan Region** (Authors' adaptation of classification)

No	Labor Classification	No	Labor Classification
1	Formal Rural Agricultural Labor	9	Informal Rural Agricultural Labor
2	Formal Urban Agricultural Labor	10	Informal Urban Agricultural Labor
3	Formal Rural Manual Labor	11	Informal Rural Manual Labor
4	Formal Urban Manual Labor	12	Informal Urban Manual Labor
5	Formal Rural Clerical Labor	13	Informal Rural Clerical Labor
6	Formal Urban Clerical Labor	14	Informal Urban Clerical Labor
7	Formal Rural Professional Labor	15	Informal Rural Professional Labor
8	Formal Urban Professional Labor	16	Informal Urban Professional Labor

### 3.2 Ratios for Green Sectors in Indonesia

Since this study intends to examine the impact of fiscal policies on the green sectors using social accounting matrix analysis, the first step is to construct green sectors-extended 2005 Indonesia inter-regional social accounting matrix table. This study follows a classification of green sectors based on the 2013 ILO green jobs mapping study. The 2013 ILO green jobs mapping study classified the green sectors into nine broad categories: agriculture, forestry, fishery, mining and energy, manufacturing, construction, transport; waste management and tourism (ILO, 2013). This study selected the main green sectors to be matched with the 2005 Indonesia inter-regional social accounting matrix for the purpose of construction of a green sectors-extended 2005 Indonesia inter-regional social accounting matrix table. This study utilizes the ratios between parent sectors and each of green sectors in Indonesia based on the 2013 ILO green jobs mapping study in order to disaggregate green sectors from their parent sectors in the 2005 Indonesia inter-regional social accounting matrix table. The detailed classification of green sectors and disaggregation ratios used for the construction of green sectors extended 2005 Indonesia inter-regional social accounting matrix table is presented in appendix 3.



### 3.3 Methodology

This study employs accounting multiplier analysis using the green sectors-extended 2005 inter-regional social accounting matrix framework, to examine poverty reduction (household income) and job creation as the impact of the green fiscal policies of the Indonesian government on the selected green sectors - forestry and renewable energy sectors. This study follows the standard accounting multiplier equation which uses the Leontief inverse matrix analysis. The steps in applying the accounting multiplier approach to the ESAM are briefly described: The first step is to partition the green sectors extended 2005 Indonesia IRSAM into endogenous and exogenous accounts. In this study, exogenous accounts are local government of five regions, central government, capital account, and the rest of the world. The remaining accounts are endogenous account. The second step is to calculate the matrix of expenditure propensities of endogenous variables, which is **A**, by dividing each element of endogenous accounts by total column or *T*, in example  $a_{21}$  is  $A_{21}$  divided by  $T_1$ , as presented in table 3.4.

**Table 3.4: The simplified green sectors extended 2005 Indonesia IRSAM Framework for Calculation of Accounting Multiplier Analysis**

	Factors	Institutions	Production	Exogenous	Total
Factors			$A_{13}/T_3=a_{13}$	$A_{14}=x_{14}$	$T_1=y_1$
Institutions	$A_{21}/T_1=a_{21}$	$A_{22}/T_2=a_{22}$		$A_{24}=x_{24}$	$T_2=y_2$
Production		$A_{32}/T_2=a_{32}$	$A_{33}/T_3=a_{33}$	$A_{34}=x_{34}$	$T_3=y_3$
Exogenous	$A_{41}/T_1=a_{41}$	$A_{42}/T_2=a_{42}$	$A_{43}/T_3=a_{43}$	$A_{44}=x_{44}$	$T_4=y_4$
Total	$T_1/T_1=1$	$T_2/T_2=1$	$T_3/T_3=1$	$T_4=x_4$	

The third step is to calculate an inverse matrix which is written as  $(\mathbf{I}-\mathbf{A})^{-1}$ . **I** is a diagonal matrix, with a diagonal value of 1. The fourth step is to calculate the output change ( $\Delta \mathbf{y}$ ) which is the inverse matrix  $(\mathbf{I}-\mathbf{A})^{-1}$  multiplied by the change or shock on exogenous accounts ( $\Delta \mathbf{x}$ ). This step is also applied into the calculations of household and labor impacts of green fiscal policies on green sectors (forestry and renewable energy) using some simulation scenarios. The steps are presented in detail in the following equations:

$$\mathbf{y} = \mathbf{A}\mathbf{y} + \mathbf{x} \quad [1]$$

Where:

$\mathbf{y}$ = vector of total income

$\mathbf{x}$ = vector exogenous accounts

$\mathbf{A}$  = matrix of coefficient

Which can be written as:

$$\mathbf{y} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{x} \dots \dots \dots [2]$$

Where:

$(\mathbf{I} - \mathbf{A})^{-1}$ =accounting multiplier matrix

$\mathbf{A}$  = matrix coefficient of the matrix of 3x3 orders (for simplification).

In this study, the green sectors extended 2005 EIRSAM model has a matrix of 335x335 orders. It can be written as:

$$\mathbf{A} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$\mathbf{I}$  =identity matrix which has diagonal elements are all 1. It can be written as:  $\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Therefore, the total change aftershocks on exogenous accounts can be expressed as follow:

$$\Delta \mathbf{y} = (\mathbf{I} - \mathbf{A})^{-1}\Delta \mathbf{x} \dots \dots \dots [3]$$

Where:

$\Delta \mathbf{y}$  = total change

$\Delta \mathbf{x}$ = shock on exogenous account.

The exogenous accounts used in this study are local governments of each region, central government, indirect taxes, subsidies, national government, imported commodity, and rest of the world accounts.

#### **4. RESULTS**

The backward linkage results show that the Java and Bali region have the strongest backward linkage with other regions such as Sumatera, Kalimantan, Sulawesi and Eastern Indonesia. The Java and Bali regions are important partners in supplying production in other regions (See table 4.1).

**Table 4.1 Macro-backward linkages among all regions**

Types of Backward Linkage	SUMATERA						
	Labor	Non labor-capital	Non labor-land	Household rural	Household urban	Companies	Production sector
Total Backward Linkage	7.32	2.35	5.39	6.48	6.18	1.85	5.59
Backward linkage Sumatera-Sumatera	67%	75%	71%	68%	56%	80%	72%
Backward linkage Sumatera-Java and Bali	29%	22%	26%	28%	40%	18%	25%
Backward linkage Sumatera-Kalimantan	2%	2%	2%	2%	3%	1%	2%
Backward linkage Sumatera-Sulawesi	1%	0%	1%	1%	1%	0%	1%
Backward linkage Sumatera-Eastern of Indonesia	1%	0%	0%	0%	1%	0%	0%

Types of Backward Linkage	JAVA AND BALI						
	Labor	Non la-bor-capital	Non la-bor-land	Household rural	Household urban	Companies	Production sector
Total Backward Linkage	7.10	3.85	4.41	6.32	5.89	1.69	5.89
Backward linkage Java and Bali-Sumatera	9%	8%	9%	11%	10%	7%	10%
Backward linkage Java and Bali-Java and Bali	85%	87%	86%	81%	83%	90%	83%
Backward linkage Java and Bali-Kalimantan	4%	3%	3%	5%	4%	2%	5%
Backward linkage Java and Bali -Sulawesi	1%	1%	1%	1%	1%	0%	1%
Backward linkage Java & Bali-Eastern of Indonesia	1%	1%	1%	1%	1%	0%	2%

Types of Backward Linkage	KALIMANTAN						
	Labor	Non la- bor-capital	Non la- bor-land	Household rural	Household urban	Companies	Production sector
Total Backward Linkage	6.86	1.53	4.18	5.99	5.75	1.53	4.24
Backward linkage Kalimantan-Sumatera	7%	3%	5%	9%	8%	1%	6%
Backward linkage Kalimantan-Java and Bali	41%	14%	29%	47%	48%	6%	25%
Backward linkage Kalimantan-Kalimantan	50%	82%	64%	41%	41%	92%	68%
Backward linkage Kalimantan-Sulawesi	1%	1%	1%	2%	1%	0%	1%
Backward linkage Kalimantan-Eastern of Indonesia	1%	0%	1%	1%	1%	0%	1%

Types of Backward Linkage	SULAWESI						
	Labor	Non la- bor-capital	Nonla- bor-land	Household rural	Household urban	Companies	Production sector
Total Backward Linkage	7.51	3.41	5.89	6.62	6.40	2.67	5.89
Backward linkage Sulawesi-Sumatera	6%	4%	5%	8%	7%	2%	5%
Backward linkage Sulawesi-Java and Bali	36%	24%	29%	40%	42%	9%	27%
Backward linkage Sulawesi-Kalimantan	3%	3%	3%	4%	4%	4%	5%
Backward linkage Sulawesi-Sulawesi	53%	64%	56%	46%	45%	72%	61%
Backward linkage Sulawesi-Eastern of Indonesia	2%	4%	6%	2%	2%	13%	2%

Types of Backward Linkage	EASTERN OF INDONESIA						
	Labor	Non la- bor-capital	Nonla- bor-land	Household rural	Household urban	Companies	Production sector
Total Backward Linkage	7.62	3.42	4.56	6.73	6.52	2.36	5.67
Backward linkage Eastern of Indonesia-Sumatera	7%	4%	4%	9%	8%	1%	5%
Backward linkage Eastern of Indonesia-Java & Bali	38%	18%	23%	44%	44%	6%	27%
Backward linkage Eastern of Indonesia-Kalimantan	3%	2%	2%	4%	4%	2%	3%
Backward linkage Eastern of Indonesia-Sulawesi	3%	10%	10%	3%	3%	26%	6%
Backward linkage Eastern of Indonesia-Eastern of In- donesia	48%	66%	60%	40%	41%	65%	58%

The detailed backward linkage results for domestic intermediate inputs transactions among the production sectors in the Sumatera region) shows that six green sectors have the strongest backward linkages, i.e.: green oil palm and green food and drink processing have backward linkage about 2.96 and 2.67, respectively. It is not surprising that green oil palm has the strongest backward linkage, because the Sumatera region is well known as one of largest producers for oil palm production.

**Table 4.2 Top ten strongest backward linkages in domestic intermediate transaction in the Sumatera Region.** (Authors' calculation)

No	Production sector	Backward linkage
1	Green oil palm	2.96
2	Green food and drink processing	2.67
3	Hotel and Restaurant	2.51
4	Fish Processing	2.46
5	Green renewable energy	2.42
6	Green rattan and bamboo manufacturing	2.35
7	Conventional wood processing	2.35
8	Pulp and Paper	2.33
9	Green livestock	2.32
10	Green other food crops	2.29

To assess the impact of fiscal policies implemented on the green forestry and renewable energy sectors, this study uses a 10% increase of local government's budget in each region because of the 10% increase in local government subsidy spent on the green forestry, green oil palm production and green renewable energy sector in each region. The IRSAM accounting multiplier results show that the total change in the Java and Bali regions accounts for the largest share in total changes; i.e. about 61%. The total change in the Sumatera region accounts for about 21% of total changes because of the 10% increase in local government budget spent on green sectors.

The impact on each account in the IRSAM framework is a 10% increase of local government budget (spent on green forestry, green oil palm and green renewable energy in each region.) The output change is found to account for largest share of total changes for each region, i.e. between 42% and 52%. The labor impact of a 10% increase of local government spending is found to account for the second largest share of total impact, i.e. about 13% except for labor impact in the Kalimantan region. In the case of Kalimantan region, the impact on labor- capital accounts for about 23% of total impact of a 10% increase of local government budget spent for

green forestry, green oil palm and green renewable energy sectors. In each region case, a 10% increase of local government spent for green forestry, green oil palm and green renewable energy sectors is also found to give positive impact or increase in household income both in rural and urban areas as presented in the table 4.3.

**Table 4.3 Summary results in each region due to 10% increase of local government budget spent for green forestry, green oil palm and green renewable energy sectors.** (Authors' calculation)

Account	Sumatera	Java and Bali	Kalimantan	Sulawesi	Eastern Indonesia
Labor	13%	13%	<b>8%</b>	13%	<b>14%</b>
Non labor-capital	15%	13%	<b>23%</b>	13%	13%
Non labor-land	1%	<b>0%</b>	1%	1%	1%
Household rural	7%	<b>8%</b>	<b>4%</b>	7%	7%
Household urban	11%	12%	7%	<b>13%</b>	12%
Companies	3%	4%	6%	7%	<b>12%</b>
Total output	50%	51%	<b>52%</b>	46%	42%
Total changes in each region	21%	<b>61%</b>	8%	6%	4%

As mentioned in the previous section, this study utilizes the 2005 Indonesia Inter-regional social accounting matrix with extension of the green sectors. One of advantages of using the 2005 Indonesia inter-regional social accounting matrix is the detailed of labor classification (about 16 labor classification). In terms of impact on each categories of labor, a 10% increase of local government budget for green forestry, green oil palm and green renewable energy sectors in each region positively impacts the increase of labor (mainly in unpaid rural agricultural labor and production labor), paid urban transportation. It also positively impacts the labor in Eastern Indonesia region, the poorest region in Indonesia (See table 4.4).

**Table 4.4: Detailed impact or changes on labor classification.** (Authors' calculation)

Labor classification	Sumatera	Java and Bali	Kalimantan	Sulawesi	Eastern Indonesia
Labor Agricultural paid rural	6%	4%	5%	5%	5%
Labor Agricultural paid urban	4%	1%	2%	4%	3%
<b>Labor Agricultural unpaid rural</b>	<b>14%</b>	<b>10%</b>	<b>11%</b>	<b>12%</b>	<b>14%</b>
Labor Agricultural unpaid urban	6%	2%	3%	7%	7%
Labor Production, transportation paid rural	4%	5%	7%	3%	3%



<b>Labor Production, transportation paid urban</b>	<b>10%</b>	<b>12%</b>	<b>14%</b>	7%	<b>8%</b>
Labor Production, transportation unpaid rural	2%	3%	3%	1%	2%
Labor Production, transportation unpaid urban	3%	4%	3%	2%	3%
Labor Clerical, sales & services paid rural	3%	5%	3%	3%	3%
<b>Labor Clerical, sales &amp; services paid urban</b>	<b>18%</b>	<b>22%</b>	<b>18%</b>	<b>19%</b>	<b>18%</b>
Labor Clerical, sales & services unpaid rural	4%	6%	4%	3%	3%
Labor Clerical, sales & services unpaid urban	8%	10%	7%	8%	7%
Labor Professional, managerial and non civilian paid rural	5%	5%	5%	6%	6%
<b>Labor Professional, managerial &amp; non civilian paid urban</b>	<b>13%</b>	<b>11%</b>	<b>13%</b>	<b>19%</b>	<b>18%</b>
Labor Professional, managerial & non civilian unpaid rural	0%	0%	0%	0%	0%
Labor Professional, managerial & non civilian unpaid urban	1%	1%	1%	1%	1%

## 5. CONCLUSIONS

Based on the above results, the conclusions are as follows:

1. The Java and Bali region has the strongest backward linkage with other regions such as Sumatera, Kalimantan, Sulawesi and Eastern Indonesia. This indicates that the Java and Bali region plays an important role as supplier to other regions. The policies implemented in the Java and Bali region will strongly impact other regions.
2. It is found that green sectors have strongest backward linkages in the economy. It indicates that investment or fiscal policies implemented in the green sectors in Indonesia will have positive impacts on the economy.
3. The simulation scenario on fiscal policy on green forestry, green oil palm and green renewable energy sectors (a 10% increase in local government spending on those selected sectors in each region) has positive impacts on labor, household income, and output.

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## 7. APPENDICES

**Appendix 1: Sectoral Classification and Definition of the 2005 Indonesian EIRSAM.**Source: EIRSAM Model by Resosudarmo et al.(2009)

No	Sector Name	Description
1	Paddy	Paddy
2	Other Food crops	maize, cassava, sweet potatoes, other root crops, groundnut, soybean, other bean, vegetables, fruits, cereals and other food crops
3	Estate crops	rubber, sugarcane, coconut, fiber crops, tobacco, coffee, tea, clove, cacao, cashew fruit, other estate crops and other agriculture
4	Livestock	livestock and livestock product except fresh milk, fresh milk, poultry and its product, and other livestock raising
5	Forestry	wood and other forest product
6	Fishery	sea fish and other sea product, inland water fish and its product, and shrimp
7	Oil, Gas and Geo-thermal Mining	crude oil and natural gas mining, and exertion on geothermal energy
8	Coal and other mining	coal, tin ore, nickel ore, bauxite ore, copper ore, gold ore, silver ore, ore and sand iron, other mining, mining of chemical non-metal, crude salt, and quarrying all kinds
9	Refinery	petroleum refineries product and liquefied of natural gas
10	Palm oil	crude Palm Oil and refined Palm Oil
11	Fish Processing	salty fish and dry fish; processed and preserved fish
12	Food and Drink Processing	meat, entrails of slaughtered animal, processed and preserved meat, dairy products, canning and preserving of fruits and vegetables, rice, wheat flour, other flour, bakery products and the like, noodle, macaroni and the like, sugar, peeled grain, chocolate and sugar confectionery, milled and peeled coffee, processed tea, soya bean product, other foods, animal feed,

No	Sector Name	Description
		alcoholic beverages, non-alcoholic beverages, tobacco products, and cigarettes
13	Textiles	cleaning kapok, yarn, textile, made up textile goods except wearing apparel, knitting mills, manufacture of wearing apparel, manufacture of carpet, rope and textile
14	Foot and Leather	leather tanneries and leather finishing, leather products and footwear
15	Wood Processing	sawmill and preserved wood, manufacture of plywood and the like, wooden building components, manufacture of furniture and fixtures mainly made of wood, bamboo and rattan, manufacture of other products mainly made of wood bamboo, rattan and cork, manufacture of non-plastic plait
16	Pulp and Paper	pulp, paper and cardboard, paper and cardboard products, and printing and publishing
17	Rubber Processing	smoked and crumb rubber, tire, other rubber products, and plastics product
18	Petrochemical	basic chemical except fertilizer, fertilizer, pesticides, synthetics resin, plastic and fibber, paints, varnishes and lacquers, drug and medicine, native medicine, soap and cleaning preparation, cosmetics and other chemicals product
19	Cement	manufacture of cement
20	Basic Metal	basic iron and steel, basic iron and steel products, non-ferrous basic metal, and non-ferrous basic metal products
21	Metal Processing	kitchen wares, hand tools and agricultural tools, furniture and fixed primarily made of metal, structural metal products, and other metal products
22	Electricity Machinery	prime movers engine, machinery and apparatus, electric generator and electrical motor, electrical machinery and apparatus, communication equipment and apparatus, household electronics appliances, other electrical appliances and battery
23	Transport Equipment	ship and its repair, train and its repair, motor vehicle except motor cycle, motor cycle, other transport equipment, and aircraft and its repair

No	Sector Name	Description
24	Other Industries	ceramic and earthenware, glass product, clay and ceramic structural products, measuring, photographic and optical equipment, jewelry, musicals instruments, sporting and athletics goods, other manufacturing industries
25	Electricity, Gas and Drinking Water	electricity, gas, and water supply
26	Construction	residential and non-residential building, construction on agriculture, public work on road, bridge and harbor, construction and installation on electricity, gas, water supply and communication, and other construction
27	Trade	trade, maintenance, and repair
28	Hotel and Restaurant	restaurant and hotel
29	Land Transportation	railway transport and road transport
30	Water Transportation	sea transport and river and lake transport
31	Air Transportation	air transport
32	Communications	services allied to transport and communication services
33	Finance	banking, other financial intermediaries, insurance and pension funds, real estate and dormitory, business services and agriculture services
34	Public Services	general government
35	Other Services	government education services, government health services, other government services, private education services, private health services, other private community services, private motion picture and its distribution, amusement, recreational and cultural services, personal and household services and other goods and services etc.

**Appendix 2: Detailed classifications of accounts in the 2005 Indonesian inter-regional social accounting matrix.** Authors' compilation

No	Accounts	Detailed Classification
1	Household	Rural Household Urban Household
2	Other account	Regional Tax Regional Subsidy Local Inventory
3	National account	Capital of Local Government Capital of Central Government Capital of Private Indirect Taxes of Central Government Subsidies of Central Government Central Government Imported Commodities Rest of the world

**Appendix3:Detailed green sectors classifications in Indonesia and disaggregation ratios based on the 2013 ILO green jobs mapping study.** (Authors' compilation based on the 2013 ILO green jobs mapping study)

No	Parent sectors	Green sectors	Disaggregation ratios
1	Paddy	Brown paddy	0.94
		Green paddy	0.06
2	Other food crops	Brown food crops	0.94
		Green other food crops	0.06
3	Estate crops	Brown estate crops	0.94
		Green estate crops	0.06
4	Livestock	Brown livestock	0.94
		Green livestock	0.06
5	Forestry	Brown forestry	0.82
		Green forestry	0.18
6	Fishery	Brown fishery	0.82
		Green fishery	0.18
7	Oil palm	Brown oil palm	0.91
		Green oil palm	0.09
8	Food and drink processing	Brown food and drink processing	0.97
		Green food and drink processing	0.03
9	Wood processing	Brown wood processing	0.97
		Green wood processing	0.03
10	Petrochemical	Brown petrochemical	0.97
		Green petrochemical	0.03
11	Cement	Brown cement	0.97
		Green cement	0.03
12	Electricity, gas, drinking water	Brown electricity	0.98
		Green electricity (renewable energy)	0.02
13	Construction	Brown construction	0.92
		Green construction	0.08
14	Land, water, air transportations and communication	Brown transportations and communications	0.90
		Green transportations	0.10